

PROJECT MANUAL



GRIER MIDDLE SCHOOL GASTON COUNTY SCHOOLS

1622 GARRISON BLVD
GASTONIA, NORTH CAROLINA 28054

BID SET

12 JANUARY 2023

ARCHITECT



227 W. TRADE STREET
SUITE 700
CHARLOTTE, NC 28202
PHONE: 704.333.6686



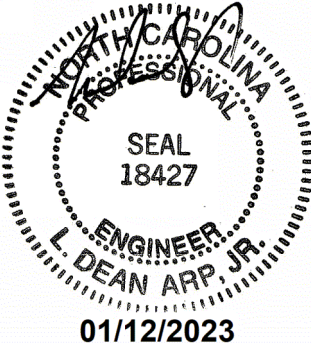

LS3P COMMISSION NUMBER: 9201-218240





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**VOLUME 1 OF 2
DIVISIONS 00-14**

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DOCUMENT 000002 – PROJECT DIRECTORY AND SEALS PAGES

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END OF PROJECT DIRECTORY AND SEALS PAGES

TABLE OF CONTENTS

VOLUME ONE

DIVISION 00 — PROCUREMENT AND CONTRACTING REQUIREMENTS

- 000101 - PROJECT TITLE PAGE
- 000107 - PROJECT DIRECTORY AND SEALS PAGES
- 000110 - TABLE OF CONTENTS
- 001113 - ADVERTISEMENT FOR BIDS
- 002112 - A701-2018 INSTRUCTIONS TO BIDDERS
- 003126 - EXISTING HAZARDOUS MATERIAL INFORMATION
 - NESHAP INSPECTION REPORT FOR BUILDING G BUILDING J AND DUGOUTS
 - NESHAP INSPECTION REPORT FOR MS MAIN CAMPUS
- 003132 - GEOTECHNICAL DATA
 - GEOTECHNICAL REPORT
- 004113 - BID FORM
- 004321 - ALLOWANCE FORM
- 004322 - UNIT PRICES FORM
- 004323 - ALTERNATES FORM
- 006000 - PROJECT FORMS
- 006211 - SUBMITTAL TRANSMITTAL FORM
- 006276 - APPLICATION FOR PAYMENT FORM (CONT. SHEET)
- 006276.13 - SALES TAX FORM NC
- 006313 - BIDDERS REQUEST FOR INTERPRETATION FORM
- 006325 - BIDDERS REQUEST FOR SUBSTITUTION FORM
- 007213 - A201-2017 GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION
- 007339 - MINORITY BUSINESS GUIDELINES

DIVISION 01 — GENERAL REQUIREMENTS

- 011000 - SUMMARY
- 012100 - ALLOWANCES
- 012200 - UNIT PRICES
- 012300 - ALTERNATES
- 012500 - SUBSTITUTION PROCEDURES
- 012600 - CONTRACT MODIFICATION PROCEDURES
- 012900 - PAYMENT PROCEDURES
- 013100 - PROJECT MANAGEMENT AND COORDINATION
- 013200 - CONSTRUCTION PROGRESS DOCUMENTATION
- 013300 - SUBMITTAL PROCEDURES
 - DIGITAL DATA LETTER OF AGREEMENT
- 014000 - QUALITY REQUIREMENTS
- 015000 - TEMPORARY FACILITIES AND CONTROLS
- 016000 - PRODUCT REQUIREMENTS
- 017300 - EXECUTION
- 017700 - CLOSEOUT PROCEDURES
- 017823 - OPERATION AND MAINTENANCE DATA
- 017836 - WARRANTIES
- 017839 - PROJECT RECORD DOCUMENTS

DIVISION 02 — EXISTING CONDITIONS

024116 - STRUCTURE DEMOLITION

DIVISION 03 — CONCRETE

033000 - CAST IN PLACE CONCRETE

033543 - POLISHED CONCRETE FINISHING

DIVISION 04 — MASONRY

042000 - UNIT MASONRY

047200 - CAST STONE MASONRY

DIVISION 05 — METALS

051200 - STRUCTURAL STEEL FRAMING

052100 - STEEL JOISTS

053100 - STEEL DECKING

055000 - METAL FABRICATIONS

055113 - METAL PAN STAIRS

055213 - PIPE AND TUBE RAILINGS

DIVISION 06 — WOOD, PLASTICS, AND COMPOSITES

061053 - MISCELLANEOUS ROUGH CARPENTRY

061600 - SHEATHING

064116 - PLASTIC-LAMINATE-FACED ARCHITECTURAL CABINETS

DIVISION 07 — THERMAL AND MOISTURE PROTECTION

071113 - BITUMINOUS DAMPPROOFING

072100 - THERMAL INSULATION

072726 - FLUID-APPLIED MEMBRANE AIR BARRIERS

075216 - SBS MODIFIED BITUMINOUS MEMBRANE ROOFING

075419 - POLYVINYL-CHLORIDE (PVC) ROOFING

076200 - SHEET METAL FLASHING AND TRIM

077200 - ROOF ACCESSORIES

078100 - APPLIED FIREPROOFING

078413 - PENETRATION FIRESTOPPING

078443 - JOINT FIRESTOPPING

079200 - JOINT SEALANTS

079219 - ACCOUSTICAL JOINT SEALANTS

DIVISION 08 — OPENINGS

081113 - HOLLOW METAL DOORS AND FRAMES

081416 - FLUSH WOOD DOORS

083113 - ACCESS DOORS AND FRAMES

083313 - COILING COUNTER DOORS

083323 - OVERHEAD COILING DOORS

084113 - ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS

085113 - ALUMINUM WINDOWS

086200 - UNIT SKYLIGHTS

087100 - DOOR HARDWARE

088000 - GLAZING

088300 - MIRRORS

088700 - GLAZING SURFACE FILMS

089119 - FIXED LOUVERS

DIVISION 09 — FINISHES

092216 - NON-STRUCTURAL METAL FRAMING
092400 - PORTLAND CEMENT PLASTER
092900 - GYPSUM BOARD
093013 - CERAMIC TILING
095113 - ACOUSTIC PANEL CEILINGS
096463 - WOOD STAGE FLOORING
096466 - WOOD ATHLETIC FLOORING
096513 - RESILIENT BASE AND ACCESSORIES
096516 - RESILIENT SHEET FLOORING
096519 - RESILIENT TILE FLOORING
096566 - RESILIENT ATHLETIC FLOORING
096623 - RESINOUS MATRIX TERRAZZO FLOORING
096723 - RESINOUS FLOORING
096813 - TILE CARPETING
098433 - SOUND-ABSORBING WALL UNITS
098436 - SOUND-DIFFUSING CEILING UNITS
099123 - INTERIOR PAINTING
099600 - HIGH-PERFORMANCE COATINGS

DIVISION 10 — SPECIALTIES

101100 - VISUAL DISPLAY UNITS
101419 - DIMENSIONAL LETTER SIGNAGE
101423 - PANEL SIGNAGE
101453 - TRAFFIC SIGNAGE
102113.19 - PLASTIC TOILET COMPARTMENTS
102123 - CUBICLE CURTAINS AND TRACKS
102600 - WALL AND DOOR PROTECTION
102800 - TOILET AND BATH ACCESSORIES
104400 - FIRE PROTECTION SPECIALTIES
105113 - METAL LOCKERS
105613 - METAL STORAGE SHELVING
107316 - PRE-ENGINEERED METAL CANOPIES
107516 - GROUND-SET FLAGPOLES

DIVISION 11 — EQUIPMENT

111313 - LOADING DOCK BUMPERS
112300 - COMMERCIAL LAUNDRY EQUIPMENT
113013 - RESIDENTIAL APPLIANCES
114000 - FOOD SERVICE EQUIPMENT
115213 - PROJECTION SCREENS
115850 - KILNS
116143 - STAGE CURTAINS
116623 - GYMNASIUM EQUIPMENT
116653 - GYMNASIUM DIVIDERS
116800 - EXTERIOR ATHLETIC EQUIPMENT

DIVISION 12 — FURNISHINGS

122413 - ROLLER WINDOW SHADES

123550 - MEDIA CENTER CASEWORK
123551 - MUSIC INSTRUMENT STORAGE CASEWORK
123553 - LABORATORY CASEWORK
123616 - METAL COUNTERTOPS
123661 - SOLID SURFACING COUNTERTOPS
126223 - PORTABLE BLEACHERS
126600 - TELESCOPING STANDS

DIVISION 13 — SPECIAL CONSTRUCTION

133416 - GRANDSTANDS
133419 - METAL BUILDING SYSTEMS

DIVISION 14 — CONVEYING EQUIPMENT

142100 - ELECTRIC TRACTION ELEVATORS

VOLUME TWO**DIVISION 21 — FIRE SUPPRESSION**

210500 - FIRE PROTECTION GENERAL
211313 - WET PIPE SPRINKLER SYSTEM
213000 - FIRE PUMPS

DIVISION 22 — PLUMBING

220500 - PLUMBING GENERAL
220503 - PLUMBING PIPE, TUBE AND FITTINGS
220523 - GENERAL DUTY VALVES FOR PLUMBING PIPING
220529 - HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT
220553 - IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT
220700 - PLUMBING INSULATION

DIVISION 23 — HEATING VENTILATING AND AIR CONDITIONING

230500 - COMMON WORK RESULTS FOR HVAC
230513 - COMMON MOTOR REQUIREMENTS FOR HVAC EQUIPMENT
230516 - EXPANSION FITTINGS AND LOOPS FOR HVAC PIPING
230519 - METERS AND GAGES FOR HVAC EQUIPMENT
230523 - GENERAL DUTY VALVES FOR HVAC PIPING
230529 - HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT
230548 - VIBRATION AND SEISMIC CONTROLS FOR HVAC PIPING AND EQUIPMENT
230553 - IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT
230593 - TESTING, ADJUSTING AND BALANCING FOR HVAC
230700 - HVAC INSULATION
230900 - BUILDING AUTOMATION
231123 - FACILITY NATURAL GAS PIPING
232113 - HYDRONIC PIPING
232114 - PREINSULATED BELOW GRADE PIPING
232123 - HYDRONIC PUMPS
232300 - REFRIGERANT PIPING
232500 - WATER TREATMENT
233113 - METAL DUCTS
233300 - AIR DUCT ACCESSORIES

233423 - HVAC POWER VENTILATORS (GREENHECK)
233600 - AIR TERMINAL UNITS
233713 - DIFFUSERS, REGISTERS AND GRILLES
233723 - HVAC GRAVITY VENTILATORS
235100 - BREECHING, CHIMNEY, AND STACKS
235223 - CAST IRON BOILERS (WEIL MCLAIN)
236426 - ROTARY SCREW WATER CHILLERS (TRANE RTAC)
237200 - ENERGY RECOVERY UNIT (GREENHECK ERV)
237313 - MODULAR INDOOR CENTRAL STATION AHU (TRANE SNES)
237413 - PACKAGED DX, OUTDOOR, CENTRAL-STATION AIR-HANDLING UNITS

DIVISION 26 — ELECTRICAL

260500 - COMMON WORK RESULTS FOR ELECTRICAL
260519 - LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES
260523 - CONTROL VOLTAGE ELECTRICAL POWER CABLES
260526 - GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS
260529 - HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS
260533 - RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS
260543 - UNDERGROUND DUCTS AND RACEWAYS FOR ELECTRICAL SYSTEMS
260548 - VIBRATION AND SEISMIC CONTROLS FOR ELECTRICAL SYSTEMS
260553 - IDENTIFICATION FOR ELECTRICAL SYSTEMS
260923 - LIGHTING CONTROL DEVICES
262200 - LOW - VOLTAGE TRANSFORMERS
262413 - SWITCHBOARDS
262416 - PANELBOARDS
262726 - WIRING DEVICES
262811 - SAFETY DEVICE SYSTEMS
262813 - FUSES
262816 - ENCLOSED SWITCHES AND CIRCUIT BREAKERS
263213 - ENGINE GENERATORS
263600 - TRANSFER SWITCHES
264313 - SURGE PROTECTION DEVICE
265119 - LED INTERIOR LIGHTING
265123.10 - TWO WAY COMMUNICATION SYSTEMS
265561 - THEATRICAL LIGHTING
265619 - LED EXTERIOR LIGHTING
265668 - EXTERIOR ATHLETIC LIGHTING

DIVISION 27 — COMMUNICATIONS

270526 - GROUNDING AND BONDING FOR COMMUNICATIONS SYSTEMS
270536 - CABLE TRAYS FOR COMMUNICATIONS SYSTEMS
270553 - IDENTIFICATION FOR COMMUNICATIONS SYSTEMS
271116 - COMMUNICATIONS RACKS, FRAMES, AND ENCLOSURES
271323 - COMMUNICATIONS OPTICAL FIBER BACKBONE CABLING
271513 - COMMUNICATIONS COPPER HORIZONTAL CABLING
275116 - PUBLIC ADDRESS SYSTEM
275116.01 - MULTI-PURPOSE ROOM AND GYMNASIUM SOUND SYSTEMS

DIVISION 28 — ELECTRONIC SAFETY AND SECURITY

281000 - ACCESS CONTROL
281600 - INTRUSION DETECTION

282000 - VIDEO SURVEILLANCE
283111 - DIGITAL, ADDRESSABLE FIRE-ALARM SYSTEM

DIVISION 31 — EARTHWORK

311000 - SITE CLEARING AND EROSION CONTROL
312000 - EARTH MOVING
313116 - TERMITE CONTROL

DIVISION 32 — EXTERIOR IMPROVEMENTS

321216 - ASPHALT PAVING
321313 - CONCRETE PAVING
321400 - UNIT PAVING
321530 - AGGREGATE PAVING
321801 - TRACK AND FIELD LINE MARKINGS
321802 - FIELD EVENT MATERIALS
323113 - CHAIN LINK FENCES AND GATES
323119 - DECORATIVE METAL FENCES AND GATES
323223 - SEGMENTAL RETAINING WALLS
328400 - IRRIGATION
329200 - TURF AND GRASSES
329300 - PLANTS

DIVISION 33 — UTILITIES

331100 - WATER DISTRIBUTION SYSTEM
333100 - GRAVITY FLOW SANITARY SEWERAGE SYSTEM
334100 - STORM DRAINAGE SYSTEM
334600 - SUBDRAINAGE

END OF TABLE OF CONTENTS

Bid Advertisement:

PROJECT: Grier Middle School Replacement for Gaston County Schools
LOCATION: 1622 Garrison Boulevard, Gastonia, NC 28054
OWNER: Gaston County Schools
P.O. Box 1397, 943 Osceola Street (28054), Gastonia, NC 28053
Contact: Mr. Morgen A. Houchard, Ed.D. mahouchard@gaston.k12.nc.us

The Owner will receive sealed bids until the bid time and date at the location below for the construction of a New Middle School located at 1622 Garrison Boulevard, Gastonia, NC 28054.

Single-Prime Bids only.

BID SUBMITTAL

The Owner will consider single-prime bids as listed above. The provisions of North Carolina General Statutes 143-128, including guidelines for single-prime contracting options and minority business enterprise participation, shall be observed in letting and executing the Work. Applicable provisions of North Carolina General Statutes Chapter 87 shall be observed in the receiving of bids and awarding of contracts. Bidders must submit with each bid acceptable bid security in the form of a bid bond, a certified check, a cashier's check, or a money order (no cash) in the name of the Owner in the amount of 5 percent of the bid amount. No bids may be withdrawn for a period of 90 days following opening of bids. The Owner reserves the right to reject any and all bids and to waive minor informalities and irregularities.

Bid Date: Thursday, February 23, 2023
Bid Time: 3:30 p.m., local time, for single-prime (all trades) bids only
Location: Gaston County School District, 943 Osceola Street, Gastonia, NC, 28053
Main Conference Room

Bids will be thereafter publicly opened and read aloud.

PRE-BID CONFERENCE

A pre-bid conference for all bidders will be on Monday, January 30, 2023, at 3:30 p.m. local time. All prospective bidders are advised to attend.

Location: Gaston County School District, 943 Osceola Street, Gastonia, NC, 28053
Main Conference Room

DOCUMENTS

Bidding documents, consisting of drawings, specifications, instructions, and forms, may be obtained after January 12, 2023. Bid documents will only be issued electronically, at no cost to Prime Bidders. Electronic copies of the documents (.pdf format) are available online at <http://infoexchange.ls3p.com>.

This information is also available on the Gaston County Schools website at <http://www.gaston.k12.nc.us/currentifb> under "Current Invitations for Bid."

Contact for questions is Goran Pogarcic, Senior Designer: Email: goranpogarcic@ls3p.com ; Phone: 704.371.7879

BID SUBMITTAL

Bid security shall be submitted with each bid in the amount of 5 percent of the bid amount. No bids may be withdrawn for the period disclosed in the Form of Bid. The Owner reserves the right to reject any and all bids and to waive minor informalities and irregularities.

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DRAFT AIA® Document A701™ - 2018

Instructions to Bidders

for the following Project:

(Name, location, and detailed description)

<< >>
<< >>
<< >>

THE OWNER:

(Name, legal status, address, and other information)

<< >>< >>
<< >>
<< >>
<< >>

THE ARCHITECT:

(Name, legal status, address, and other information)

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TABLE OF ARTICLES

- 1 DEFINITIONS
- 2 BIDDER'S REPRESENTATIONS
- 3 BIDDING DOCUMENTS
- 4 BIDDING PROCEDURES
- 5 CONSIDERATION OF BIDS
- 6 POST-BID INFORMATION
- 7 PERFORMANCE BOND AND PAYMENT BOND
- 8 ENUMERATION OF THE PROPOSED CONTRACT DOCUMENTS

ADDITIONS AND DELETIONS:
The author of this document has added information needed for its completion. The author may also have revised the text of the original AIA standard form. An *Additions and Deletions Report* that notes added information as well as revisions to the standard form text is available from the author and should be reviewed.

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

FEDERAL, STATE, AND LOCAL LAWS MAY IMPOSE REQUIREMENTS ON PUBLIC PROCUREMENT CONTRACTS. CONSULT LOCAL AUTHORITIES OR AN ATTORNEY TO VERIFY REQUIREMENTS APPLICABLE TO THIS PROCUREMENT BEFORE COMPLETING THIS FORM.

It is intended that AIA Document G612™-2017, Owner's Instructions to the Architect, Parts A and B will be completed prior to using this document.

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ARTICLE 1 DEFINITIONS

§ 1.1 Bidding Documents include the Bidding Requirements and the Proposed Contract Documents. The Bidding Requirements consist of the advertisement or invitation to bid, Instructions to Bidders, supplementary instructions to bidders, the bid form, and any other bidding forms. The Proposed Contract Documents consist of the unexecuted form of Agreement between the Owner and Contractor and that Agreement's Exhibits, Conditions of the Contract (General, Supplementary and other Conditions), Drawings, Specifications, all Addenda, and all other documents enumerated in Article 8 of these Instructions.

§ 1.2 Definitions set forth in the General Conditions of the Contract for Construction, or in other Proposed Contract Documents apply to the Bidding Documents.

§ 1.3 Addenda are written or graphic instruments issued by the Architect, which, by additions, deletions, clarifications, or corrections, modify or interpret the Bidding Documents.

§ 1.4 A Bid is a complete and properly executed proposal to do the Work for the sums stipulated therein, submitted in accordance with the Bidding Documents.

§ 1.5 The Base Bid is the sum stated in the Bid for which the Bidder offers to perform the Work described in the Bidding Documents, to which Work may be added or deleted by sums stated in Alternate Bids.

§ 1.6 An Alternate Bid (or Alternate) is an amount stated in the Bid to be added to or deducted from, or that does not change, the Base Bid if the corresponding change in the Work, as described in the Bidding Documents, is accepted.

§ 1.7 A Unit Price is an amount stated in the Bid as a price per unit of measurement for materials, equipment, or services, or a portion of the Work, as described in the Bidding Documents.

§ 1.8 A Bidder is a person or entity who submits a Bid and who meets the requirements set forth in the Bidding Documents.

§ 1.9 A Sub-bidder is a person or entity who submits a bid to a Bidder for materials, equipment, or labor for a portion of the Work.

ARTICLE 2 BIDDER'S REPRESENTATIONS

§ 2.1 By submitting a Bid, the Bidder represents that:

- .1 the Bidder has read and understands the Bidding Documents;
- .2 the Bidder understands how the Bidding Documents relate to other portions of the Project, if any, being bid concurrently or presently under construction;
- .3 the Bid complies with the Bidding Documents;
- .4 the Bidder has visited the site, become familiar with local conditions under which the Work is to be performed, and has correlated the Bidder's observations with the requirements of the Proposed Contract Documents;
- .5 the Bid is based upon the materials, equipment, and systems required by the Bidding Documents without exception; and
- .6 the Bidder has read and understands the provisions for liquidated damages, if any, set forth in the form of Agreement between the Owner and Contractor.

ARTICLE 3 BIDDING DOCUMENTS

§ 3.1 Distribution

§ 3.1.1 Bidders shall obtain complete Bidding Documents, as indicated below, from the issuing office designated in the advertisement or invitation to bid, for the deposit sum, if any, stated therein.

(Indicate how, such as by email, website, host site/platform, paper copy, or other method Bidders shall obtain Bidding Documents.)

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§ 3.1.2 Any required deposit shall be refunded to Bidders who submit a bona fide Bid and return the paper Bidding Documents in good condition within ten days after receipt of Bids. The cost to replace missing or damaged paper

documents will be deducted from the deposit. A Bidder receiving a Contract award may retain the paper Bidding Documents, and the Bidder's deposit will be refunded.

§ 3.1.3 Bidding Documents will not be issued directly to Sub-bidders unless specifically offered in the advertisement or invitation to bid, or in supplementary instructions to bidders.

§ 3.1.4 Bidders shall use complete Bidding Documents in preparing Bids. Neither the Owner nor Architect assumes responsibility for errors or misinterpretations resulting from the use of incomplete Bidding Documents.

§ 3.1.5 The Bidding Documents will be available for the sole purpose of obtaining Bids on the Work. No license or grant of use is conferred by distribution of the Bidding Documents.

§ 3.2 Modification or Interpretation of Bidding Documents

§ 3.2.1 The Bidder shall carefully study the Bidding Documents, shall examine the site and local conditions, and shall notify the Architect of errors, inconsistencies, or ambiguities discovered and request clarification or interpretation pursuant to Section 3.2.2.

§ 3.2.2 Requests for clarification or interpretation of the Bidding Documents shall be submitted by the Bidder in writing and shall be received by the Architect at least seven days prior to the date for receipt of Bids. *(Indicate how, such as by email, website, host site/platform, paper copy, or other method Bidders shall submit requests for clarification and interpretation.)*

« »

§ 3.2.3 Modifications and interpretations of the Bidding Documents shall be made by Addendum. Modifications and interpretations of the Bidding Documents made in any other manner shall not be binding, and Bidders shall not rely upon them.

§ 3.3 Substitutions

§ 3.3.1 The materials, products, and equipment described in the Bidding Documents establish a standard of required function, dimension, appearance, and quality to be met by any proposed substitution.

§ 3.3.2 Substitution Process

§ 3.3.2.1 Written requests for substitutions shall be received by the Architect at least ten days prior to the date for receipt of Bids. Requests shall be submitted in the same manner as that established for submitting clarifications and interpretations in Section 3.2.2.

§ 3.3.2.2 Bidders shall submit substitution requests on a Substitution Request Form if one is provided in the Bidding Documents.

§ 3.3.2.3 If a Substitution Request Form is not provided, requests shall include (1) the name of the material or equipment specified in the Bidding Documents; (2) the reason for the requested substitution; (3) a complete description of the proposed substitution including the name of the material or equipment proposed as the substitute, performance and test data, and relevant drawings; and (4) any other information necessary for an evaluation. The request shall include a statement setting forth changes in other materials, equipment, or other portions of the Work, including changes in the work of other contracts or the impact on any Project Certifications (such as LEED), that will result from incorporation of the proposed substitution.

§ 3.3.3 The burden of proof of the merit of the proposed substitution is upon the proposer. The Architect's decision of approval or disapproval of a proposed substitution shall be final.

§ 3.3.4 If the Architect approves a proposed substitution prior to receipt of Bids, such approval shall be set forth in an Addendum. Approvals made in any other manner shall not be binding, and Bidders shall not rely upon them.

§ 3.3.5 No substitutions will be considered after the Contract award unless specifically provided for in the Contract Documents.

§ 3.4 Addenda

§ 3.4.1 Addenda will be transmitted to Bidders known by the issuing office to have received complete Bidding Documents.

(Indicate how, such as by email, website, host site/platform, paper copy, or other method Addenda will be transmitted.)

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§ 3.4.2 Addenda will be available where Bidding Documents are on file.

§ 3.4.3 Addenda will be issued no later than four days prior to the date for receipt of Bids, except an Addendum withdrawing the request for Bids or one which includes postponement of the date for receipt of Bids.

§ 3.4.4 Prior to submitting a Bid, each Bidder shall ascertain that the Bidder has received all Addenda issued, and the Bidder shall acknowledge their receipt in the Bid.

ARTICLE 4 BIDDING PROCEDURES

§ 4.1 Preparation of Bids

§ 4.1.1 Bids shall be submitted on the forms included with or identified in the Bidding Documents.

§ 4.1.2 All blanks on the bid form shall be legibly executed. Paper bid forms shall be executed in a non-erasable medium.

§ 4.1.3 Sums shall be expressed in both words and numbers, unless noted otherwise on the bid form. In case of discrepancy, the amount entered in words shall govern.

§ 4.1.4 Edits to entries made on paper bid forms must be initialed by the signer of the Bid.

§ 4.1.5 All requested Alternates shall be bid. If no change in the Base Bid is required, enter "No Change" or as required by the bid form.

§ 4.1.6 Where two or more Bids for designated portions of the Work have been requested, the Bidder may, without forfeiture of the bid security, state the Bidder's refusal to accept award of less than the combination of Bids stipulated by the Bidder. The Bidder shall neither make additional stipulations on the bid form nor qualify the Bid in any other manner.

§ 4.1.7 Each copy of the Bid shall state the legal name and legal status of the Bidder. As part of the documentation submitted with the Bid, the Bidder shall provide evidence of its legal authority to perform the Work in the jurisdiction where the Project is located. Each copy of the Bid shall be signed by the person or persons legally authorized to bind the Bidder to a contract. A Bid by a corporation shall further name the state of incorporation and have the corporate seal affixed. A Bid submitted by an agent shall have a current power of attorney attached, certifying the agent's authority to bind the Bidder.

§ 4.1.8 A Bidder shall incur all costs associated with the preparation of its Bid.

§ 4.2 Bid Security

§ 4.2.1 Each Bid shall be accompanied by the following bid security:

(Insert the form and amount of bid security.)

<< >>

§ 4.2.2 The Bidder pledges to enter into a Contract with the Owner on the terms stated in the Bid and shall, if required, furnish bonds covering the faithful performance of the Contract and payment of all obligations arising thereunder. Should the Bidder refuse to enter into such Contract or fail to furnish such bonds if required, the amount of the bid security shall be forfeited to the Owner as liquidated damages, not as a penalty. In the event the Owner fails to comply with Section 6.2, the amount of the bid security shall not be forfeited to the Owner.

§ 4.2.3 If a surety bond is required as bid security, it shall be written on AIA Document A310™, Bid Bond, unless otherwise provided in the Bidding Documents. The attorney-in-fact who executes the bond on behalf of the surety shall

affix to the bond a certified and current copy of an acceptable power of attorney. The Bidder shall provide surety bonds from a company or companies lawfully authorized to issue surety bonds in the jurisdiction where the Project is located.

§ 4.2.4 The Owner will have the right to retain the bid security of Bidders to whom an award is being considered until (a) the Contract has been executed and bonds, if required, have been furnished; (b) the specified time has elapsed so that Bids may be withdrawn; or (c) all Bids have been rejected. However, if no Contract has been awarded or a Bidder has not been notified of the acceptance of its Bid, a Bidder may, beginning *« »* days after the opening of Bids, withdraw its Bid and request the return of its bid security.

§ 4.3 Submission of Bids

§ 4.3.1 A Bidder shall submit its Bid as indicated below:

(Indicate how, such as by website, host site/platform, paper copy, or other method Bidders shall submit their Bid.)

« »

§ 4.3.2 Paper copies of the Bid, the bid security, and any other documents required to be submitted with the Bid shall be enclosed in a sealed opaque envelope. The envelope shall be addressed to the party receiving the Bids and shall be identified with the Project name, the Bidder's name and address, and, if applicable, the designated portion of the Work for which the Bid is submitted. If the Bid is sent by mail, the sealed envelope shall be enclosed in a separate mailing envelope with the notation "SEALED BID ENCLOSED" on the face thereof.

§ 4.3.3 Bids shall be submitted by the date and time and at the place indicated in the invitation to bid. Bids submitted after the date and time for receipt of Bids, or at an incorrect place, will not be accepted.

§ 4.3.4 The Bidder shall assume full responsibility for timely delivery at the location designated for receipt of Bids.

§ 4.3.5 A Bid submitted by any method other than as provided in this Section 4.3 will not be accepted.

§ 4.4 Modification or Withdrawal of Bid

§ 4.4.1 Prior to the date and time designated for receipt of Bids, a Bidder may submit a new Bid to replace a Bid previously submitted, or withdraw its Bid entirely, by notice to the party designated to receive the Bids. Such notice shall be received and duly recorded by the receiving party on or before the date and time set for receipt of Bids. The receiving party shall verify that replaced or withdrawn Bids are removed from the other submitted Bids and not considered. Notice of submission of a replacement Bid or withdrawal of a Bid shall be worded so as not to reveal the amount of the original Bid.

§ 4.4.2 Withdrawn Bids may be resubmitted up to the date and time designated for the receipt of Bids in the same format as that established in Section 4.3, provided they fully conform with these Instructions to Bidders. Bid security shall be in an amount sufficient for the Bid as resubmitted.

§ 4.4.3 After the date and time designated for receipt of Bids, a Bidder who discovers that it made a clerical error in its Bid shall notify the Architect of such error within two days, or pursuant to a timeframe specified by the law of the jurisdiction where the Project is located, requesting withdrawal of its Bid. Upon providing evidence of such error to the reasonable satisfaction of the Architect, the Bid shall be withdrawn and not resubmitted. If a Bid is withdrawn pursuant to this Section 4.4.3, the bid security will be attended to as follows:

(State the terms and conditions, such as Bid rank, for returning or retaining the bid security.)

« »

ARTICLE 5 CONSIDERATION OF BIDS

§ 5.1 Opening of Bids

If stipulated in an advertisement or invitation to bid, or when otherwise required by law, Bids properly identified and received within the specified time limits will be publicly opened and read aloud. A summary of the Bids may be made available to Bidders.

§ 5.2 Rejection of Bids

Unless otherwise prohibited by law, the Owner shall have the right to reject any or all Bids.

§ 5.3 Acceptance of Bid (Award)

§ 5.3.1 It is the intent of the Owner to award a Contract to the lowest responsive and responsible Bidder, provided the Bid has been submitted in accordance with the requirements of the Bidding Documents. Unless otherwise prohibited by law, the Owner shall have the right to waive informalities and irregularities in a Bid received and to accept the Bid which, in the Owner's judgment, is in the Owner's best interests.

§ 5.3.2 Unless otherwise prohibited by law, the Owner shall have the right to accept Alternates in any order or combination, unless otherwise specifically provided in the Bidding Documents, and to determine the lowest responsive and responsible Bidder on the basis of the sum of the Base Bid and Alternates accepted.

ARTICLE 6 POST-BID INFORMATION

§ 6.1 Contractor's Qualification Statement

Bidders to whom award of a Contract is under consideration shall submit to the Architect, upon request and within the timeframe specified by the Architect, a properly executed AIA Document A305™, Contractor's Qualification Statement, unless such a Statement has been previously required and submitted for this Bid.

§ 6.2 Owner's Financial Capability

A Bidder to whom award of a Contract is under consideration may request in writing, fourteen days prior to the expiration of the time for withdrawal of Bids, that the Owner furnish to the Bidder reasonable evidence that financial arrangements have been made to fulfill the Owner's obligations under the Contract. The Owner shall then furnish such reasonable evidence to the Bidder no later than seven days prior to the expiration of the time for withdrawal of Bids. Unless such reasonable evidence is furnished within the allotted time, the Bidder will not be required to execute the Agreement between the Owner and Contractor.

§ 6.3 Submittals

§ 6.3.1 After notification of selection for the award of the Contract, the Bidder shall, as soon as practicable or as stipulated in the Bidding Documents, submit in writing to the Owner through the Architect:

- .1 a designation of the Work to be performed with the Bidder's own forces;
- .2 names of the principal products and systems proposed for the Work and the manufacturers and suppliers of each; and
- .3 names of persons or entities (including those who are to furnish materials or equipment fabricated to a special design) proposed for the principal portions of the Work.

§ 6.3.2 The Bidder will be required to establish to the satisfaction of the Architect and Owner the reliability and responsibility of the persons or entities proposed to furnish and perform the Work described in the Bidding Documents.

§ 6.3.3 Prior to the execution of the Contract, the Architect will notify the Bidder if either the Owner or Architect, after due investigation, has reasonable objection to a person or entity proposed by the Bidder. If the Owner or Architect has reasonable objection to a proposed person or entity, the Bidder may, at the Bidder's option, withdraw the Bid or submit an acceptable substitute person or entity. The Bidder may also submit any required adjustment in the Base Bid or Alternate Bid to account for the difference in cost occasioned by such substitution. The Owner may accept the adjusted bid price or disqualify the Bidder. In the event of either withdrawal or disqualification, bid security will not be forfeited.

§ 6.3.4 Persons and entities proposed by the Bidder and to whom the Owner and Architect have made no reasonable objection must be used on the Work for which they were proposed and shall not be changed except with the written consent of the Owner and Architect.

ARTICLE 7 PERFORMANCE BOND AND PAYMENT BOND

§ 7.1 Bond Requirements

§ 7.1.1 If stipulated in the Bidding Documents, the Bidder shall furnish bonds covering the faithful performance of the Contract and payment of all obligations arising thereunder.

§ 7.1.2 If the furnishing of such bonds is stipulated in the Bidding Documents, the cost shall be included in the Bid. If the furnishing of such bonds is required after receipt of bids and before execution of the Contract, the cost of such bonds shall be added to the Bid in determining the Contract Sum.

§ 7.1.3 The Bidder shall provide surety bonds from a company or companies lawfully authorized to issue surety bonds in the jurisdiction where the Project is located.

§ 7.1.4 Unless otherwise indicated below, the Penal Sum of the Payment and Performance Bonds shall be the amount of the Contract Sum.

(If Payment or Performance Bonds are to be in an amount other than 100% of the Contract Sum, indicate the dollar amount or percentage of the Contract Sum.)

<< >>

§ 7.2 Time of Delivery and Form of Bonds

§ 7.2.1 The Bidder shall deliver the required bonds to the Owner not later than three days following the date of execution of the Contract. If the Work is to commence sooner in response to a letter of intent, the Bidder shall, prior to commencement of the Work, submit evidence satisfactory to the Owner that such bonds will be furnished and delivered in accordance with this Section 7.2.1.

§ 7.2.2 Unless otherwise provided, the bonds shall be written on AIA Document A312, Performance Bond and Payment Bond.

§ 7.2.3 The bonds shall be dated on or after the date of the Contract.

§ 7.2.4 The Bidder shall require the attorney-in-fact who executes the required bonds on behalf of the surety to affix to the bond a certified and current copy of the power of attorney.

ARTICLE 8 ENUMERATION OF THE PROPOSED CONTRACT DOCUMENTS

§ 8.1 Copies of the proposed Contract Documents have been made available to the Bidder and consist of the following documents:

- .1 AIA Document A101™–2017, Standard Form of Agreement Between Owner and Contractor, unless otherwise stated below.

(Insert the complete AIA Document number, including year, and Document title.)

<< >>

- .2 AIA Document A101™–2017, Exhibit A, Insurance and Bonds, unless otherwise stated below.

(Insert the complete AIA Document number, including year, and Document title.)

<< >>

- .3 AIA Document A201™–2017, General Conditions of the Contract for Construction, unless otherwise stated below.

(Insert the complete AIA Document number, including year, and Document title.)

<< >>

- .4 AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, dated as indicated below:

(Insert the date of the E203-2013.)

<< >>

- .5 Drawings

Number

Title

Date

- .6 Specifications

Section

Title

Date

Pages

.7 Addenda:

Number	Date	Pages

.8 Other Exhibits:

(Check all boxes that apply and include appropriate information identifying the exhibit where required.)

AIA Document E204™–2017, Sustainable Projects Exhibit, dated as indicated below:
(Insert the date of the E204-2017.)

The Sustainability Plan:

Title	Date	Pages

Supplementary and other Conditions of the Contract:

Document	Title	Date	Pages

.9 Other documents listed below:

(List here any additional documents that are intended to form part of the Proposed Contract Documents.)

DOCUMENT 003126 - EXISTING HAZARDOUS MATERIAL INFORMATION

1.1 EXISTING HAZARDOUS MATERIAL INFORMATION

- A. This Document with its referenced attachments is part of the Procurement and Contracting Requirements for Project. They provide Owner's information for Bidders' convenience and are intended to supplement rather than serve in lieu of Bidders' own investigations. They are made available for Bidders' convenience and information, but are not a warranty of existing conditions. This Document and its attachments are not part of the Contract Documents.
- B. An existing asbestos report for Project, prepared by Terracon Consultants, Inc., dated August 24, 2022 and September 2, 2022, is available for viewing as appended to this Document.
- C. Related Requirements:
1. Document 002113 "Instructions to Bidders" for the Bidder's responsibilities for examination of Project site and existing conditions.
 2. Document 003132 "Geotechnical Data" for reports and soil-boring data from geotechnical investigations that are made available to bidders.
 3. Section 024116 "Structure Demolition" for notification requirements if materials suspected of containing hazardous materials are encountered.
 4. Section 024119 "Selective Structure Demolition" for notification requirements if materials suspected of containing hazardous materials are encountered.

END OF DOCUMENT 003126

ATTACHMENTS:

1. "NESHAP Asbestos Inspection Report: Grier Middle School – Old Gym, Concessions Building, & Athletic Fields", dated August 24, 2022 prepared for Gaston County Schools.
2. "NESHAP Asbestos Inspection Report: Grier Middle School – Buildings A, B, C, D,E, F, H, I, Media Center, and Greenhouse", dated September 2, 2022, prepared for Gaston County Schools.

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NESHAP Asbestos Inspection Report

Grier Middle School – Old Gym, Concessions Building, and Athletic Fields
1622 E. Garrison Boulevard
Gastonia, North Carolina

August 24, 2022

Terracon Project No. 71227143



Prepared for:

Gaston County Schools
Gastonia, North Carolina

Prepared by:

Terracon Consultants, Inc.
Charlotte, North Carolina



2701 Westport Road
Charlotte, NC 28208

P (704) 509-1777
F (704) 509-1888

Terracon.com

August 24, 2022

Gaston County Schools
943 Osceola Street
Gastonia, North Carolina

Attn: Paul Nault
P: (704) 866-6277
E: phnault@gaston.k12.nc.us

Re: NESHAP Asbestos Inspection Report
Grier Middle School – Old Gym, Concessions Building, and Athletic Fields
1622 E. Garrison Boulevard
Gastonia, North Carolina
Terracon Project No. 71227743

Dear Paul Nault:

Terracon Consultants, Inc. (Terracon) is pleased to submit the attached report for the above referenced site to Gaston County Schools. The purpose of this report is to present the results of an asbestos inspection performed between April 4, 2022 and July 27, 2022. This inspection was conducted in general accordance with Terracon's proposal number P71227143 and Gaston County Schools purchase order number 360-10008930. We understand that this inspection was requested due to planned demolition of the Old Gym, concessions building, and athletic fields at the above referenced site.

Asbestos was identified in samples of friable and non-friable materials at the project site. Please refer to the attached report for details.

Note, a separate report will be issued for the remaining buildings on the campus.

Terracon appreciates the opportunity to provide this service to Gaston County Schools. If you have any questions regarding this report, please contact the undersigned at (704) 509-1777.

Sincerely,
Terracon Consultants, Inc.

Erick Hutson
Field Industrial Hygienist

Russell Harrings, CIH
Authorized Project Reviewer

Explore with us

TABLE OF CONTENTS

1.0	INTRODUCTION	1
1.1	Reliance.....	1
2.0	BUILDING DESCRIPTION.....	1
3.0	FIELD ACTIVITIES.....	2
3.1	Visual Assessment.....	2
3.2	Physical Assessment	2
3.3	Sample Collection.....	2
3.4	Sample Analysis	3
4.0	REGULATORY OVERVIEW.....	3
5.0	FINDINGS.....	4
6.0	LIMITATION / GENERAL COMMENTS.....	4

APPENDIX A	SUMMARY OF IDENTIFIED MATERIALS CONTAINING ASBESTOS
APPENDIX B	PHOTOGRAPHS OF IDENTIFIED MATERIALS CONTAINING ASBESTOS
APPENDIX C	ASBESTOS LABORATORY ANALYTICAL RESULTS
APPENDIX D	EXCERPT FROM AHERA MANAGEMENT PLAN
APPENDIX E	DRAWINGS FROM SITE

NESHAP ASBESTOS INSPECTION REPORT

Grier Middle School – Old Gym, Concessions Building, and Athletic Fields
1622 E. Garrison Boulevard
Gastonia, North Carolina
Terracon Project No. 71227143
August 24, 2022

1.0 INTRODUCTION

Terracon Consultants, Inc. (Terracon) conducted an asbestos inspection of the Old Gym (Building G), Concessions Building (Building J), and the athletic fields located on the campus of Grier Middle School at 1622 E. Garrison Boulevard in Gastonia, North Carolina. The inspection was conducted between April 4, 2022 and July 27, 2022, by North Carolina accredited asbestos inspectors in general accordance with Terracon proposal number P71227143 and Gaston County Schools purchase order number 360-10008930. Interior and exterior building components were inspected, and homogeneous areas of suspect asbestos-containing materials (ACM) were visually identified and documented. Although reasonable effort was made to inspect accessible suspect asbestos-containing materials, additional suspect but un-sampled materials could be in walls, in voids, or in other concealed areas. Suspect ACM samples were collected in general accordance with the sampling protocols outlined in United States Environmental Protection Agency (USEPA) 40 Code of Federal Regulations (CFR) Part 763 Subpart E 763, known as the Asbestos Hazard Emergency Response Act (AHERA). Samples were delivered to an accredited laboratory for analysis by Polarized Light Microscopy (PLM).

We understand this asbestos inspection was requested due to the planned demolition of Old Gym (Building G), Concessions Building (Building J), and the athletic fields to satisfy requirements of the USEPA 40 CFR Part 61, Subpart M, the National Emission Standards for Hazardous Air Pollutants (NESHAP).

Note, a separate report will be issued for the remaining buildings on the campus.

1.1 Reliance

This report is for the exclusive use of Gaston County Schools for the project being discussed. Reliance by any other party on this report is prohibited without written authorization of Terracon and Gaston County Schools. Reliance on this report by Gaston County Schools and all authorized parties will be subject to the terms, conditions, and limitations stated in the proposal, this report, and Terracon's purchase order. The limitations of liability defined in Terracon's purchase order is the aggregate limit of Terracon's liability to Gaston County Schools and all relying parties.

2.0 BUILDING DESCRIPTION

Old Gym (Building G)

The Old Gym building is a single-story, steel-framed gymnasium building constructed atop a concrete slab on grade. A brick veneer covers the exterior of the building. Interior walls consist of CMU block. The floors are bare concrete in most areas with 9"x9" vinyl floor tile under the bleachers. Ceilings are open in the gym and finished with plaster in the side rooms. The roof is a flat, built-up roof over a wood deck. Heating is provided by ceiling-mounted, steam-powered heaters. The building does not have air conditioning.

Concessions Building (Building J)

The Concessions Building is a single-story, wood-framed building constructed atop a concrete slab on grade. A brick veneer covers the exterior of the building. Interior walls consist of brick. The floors are finished with bare wood. The roof is an A-frame wood roof with asphalt shingles and felt paper. The building is unconditioned.

Athletic Fields

Two dugouts are located at the baseball field on the northwest corner of the site. The dugouts are wood-framed structures with open sides and no floors. The roofs are single sloped wood roofs with asphalt shingles and felt paper. No suspect asbestos-containing materials were observed associated with the football field on the southwest corner of the site.

3.0 FIELD ACTIVITIES

The inspection was conducted by North Carolina licensed asbestos inspectors Russell Harrings (NC Accreditation No. 12222), Erick Hutson (NC Accreditation No. 12849), and Chad Chavis (NC Accreditation No. 12929). The inspection was conducted in general accordance with the sample collection protocols established in USEPA 40 CFR Part 763 Subpart E 763.86, AHERA. A summary of inspection activities is provided below.

Terracon supplemented the field activities with data in the school's Asbestos Hazard Emergency Response Act (AHERA) Management Plan. An excerpt from the AHERA Management Plan is included in Appendix D.

3.1 Visual Assessment

Inspection activities were initiated with visual observation of the subject buildings to identify homogeneous areas (HAs) of suspect ACM. An HA consists of building materials that appear similar throughout in terms of color and texture with consideration given to the date of application. Assessment was conducted in visually accessible areas of the buildings proposed for demolition.

Building materials identified as concrete, glass, wood, masonry, metal, or rubber were not considered suspect ACM.

3.2 Physical Assessment

A physical assessment of each HA of suspect ACM was conducted to assess the friability and condition of the materials. A friable material is defined by the USEPA as a material which can be crumbled, pulverized or reduced to powder by hand pressure when dry. Friability was assessed by physically touching suspect asbestos-containing materials.

3.3 Sample Collection

Based on results of the visual observation, bulk samples of suspect ACM were collected in general accordance with USEPA AHERA sampling protocols. Samples of suspect asbestos-containing materials were collected from randomly selected locations in each homogeneous area. Samples were placed in sealable containers and labeled with unique sample numbers using an indelible marker.

The selection of sample locations and frequency of sampling were based on Terracon's observations and the assumption that like materials in the same area are homogeneous in content.

Terracon collected 41 bulk samples from 13 homogeneous areas of suspect ACM. A summary of suspect ACM samples collected during the inspection is included in Appendix C.

3.4 Sample Analysis

Bulk samples were submitted under chain of custody to EMSL Analytical, Inc. (EMSL) of Pineville, North Carolina for analysis by Polarized Light Microscopy (PLM) with dispersion staining techniques per EPA method (40 CFR 763, Subpart F). The asbestos content, where applicable, was determined by microscopical visual estimation. EMSL is a National Voluntary Laboratory Accreditation Program (NVLAP) accredited laboratory (NVLAP No. 200841-0).

4.0 REGULATORY OVERVIEW

The asbestos NESHAP (40 CFR Part 61, Subpart M) regulates asbestos fiber emissions and asbestos waste disposal practices. The asbestos NESHAP regulation also requires the identification and classification of existing ACM according to friability prior to demolition or renovation activity. Friable ACM is a material containing more than 1% asbestos that, when dry, can be crumbled, pulverized, or reduced to powder by hand pressure. All friable ACM is considered regulated asbestos-containing material (RACM).

The asbestos NESHAP regulation classifies ACM as either RACM, Category I non-friable ACM, or Category II non-friable ACM. RACM includes all friable ACM, along with Category I non-friable and Category II non-friable ACM that has become friable, will be or has been subjected to sanding, grinding, cutting or abrading, or ACM that has a high probability of becoming or has become crumbled, pulverized, or reduced to powder in the course of renovation or demolition activity. Category I non-friable ACM are exclusively asbestos-containing packings, gaskets, resilient floor coverings, resilient floor covering mastics, and asphalt roofing products that contain more than 1% asbestos. Category II non-friable ACM are all other non-friable materials, other than Category I non-friable ACM, that contain more than 1% asbestos. Category II non-friable ACM generally includes, but is not limited to, cementitious material such as: cement pipes, cement siding, cement panels, glazing, mortar, and grouts.

The OSHA asbestos standard for construction (29 CFR 1926.1101) regulates workplace exposure to asbestos. The OSHA standard requires that employee exposure to airborne asbestos fibers be maintained below 0.1 asbestos fibers per cubic centimeter of air (0.1 f/cc). The OSHA standard classifies construction and maintenance activities which could disturb ACM and specifies work practices and precautions which employers must follow when engaging in each class of regulated work. States which administer their own federally-approved state OSHA programs may require additional precautions. The standard also specifies requirements for handling materials containing asbestos in concentrations less than or equal to one percent.

In the state of North Carolina, the Health Hazards Control Unit (HHCU) regulates asbestos activities. The NC HHCU requires that asbestos-related activities conducted in a public building be performed by personnel accredited by NC HHCU. RACM must be removed prior to renovation or demolition activities which will disturb the materials. The owner or operator must provide the NC HHCU with written notification of planned removal activities at least 10 working days prior to the commencement of

asbestos abatement activities. Removal of RACM must be conducted by a State of North Carolina licensed asbestos abatement contractor. In addition, third party air monitoring may be required following the abatement.

5.0 FINDINGS

Asbestos was identified in samples of the following materials collected at the project site.

Old Gym (Building G)

HA No.	Material Description	General Location
G 2	4" Hot Water Pipe Elbow Insulation	Throughout Interior, May be Located above Ceilings
G 4	Exterior Window Frame Caulk	Exterior Windows
G 5	Exterior Window Glazing	Exterior Windows
G 6	Exterior Door Caulk	Exterior Door Frames
G 8	9"x9" Floor Tile and Mastic	Under Bleachers along West Wall
G 9	Tank Insulation	Hot Water Tank in Old Boiler Room

Concessions Building (Building J)

No asbestos detected

Athletic Fields

No asbestos detected

A summary of the classification, condition and approximate quantity of identified materials containing asbestos is presented in Appendix A. The laboratory analytical results are included in Appendix C. An excerpt from the AHERA Management Plan is included in Appendix D.

Because the proposed demolition activities may crush or pulverize the identified ACM, they must be removed prior to demolition by a qualified asbestos abatement contractor. Qualified asbestos abatement contractors should be contacted to obtain competitive bids for abatement.

6.0 LIMITATIONS/GENERAL COMMENTS

This asbestos inspection was conducted in a manner consistent with the level of care and skill ordinarily exercised by members of the profession currently practicing under similar conditions in the same locale. The results, findings, conclusions, and recommendations expressed in this report are based on conditions observed during our inspection of the building. The information contained in this report is relevant to the date on which this inspection was performed and should not be relied upon to represent conditions at a later date. This report has been prepared on behalf of and exclusively for use by Gaston County Schools for specific application to their project as discussed. This report is not a bidding document. Contractors or consultants reviewing this report must draw their own conclusions regarding further investigation or remediation deemed necessary. Terracon does not warrant the work of regulatory agencies, laboratories, or other third parties supplying information which may have been used in the preparation of this report. No warranties, express or implied, are made.

APPENDIX A

SUMMARY OF IDENTIFIED MATERIALS CONTAINING ASBESTOS
 Grier Middle School – Old Gym, Concessions Building, and Athletic Fields
 1622 E. Garrison Boulevard
 Gastonia, North Carolina

Old Gym (Building G)

HA No.	Material Description	General Location	Condition / Classification	Percent / Type Asbestos *	Estimated Quantity**
G 2	4" Hot Water Pipe Elbow Insulation	Throughout Interior, May be Located above Ceilings	Good / Friable	20% - 25% Chrysotile	45 Elbows
G 4	Exterior Window Frame Caulk	Exterior Windows	Good / Category II Non-friable	3% Chrysotile	22 Window Frames
G 5	Exterior Window Glazing	Exterior Windows	Good / Category II Non-friable	4% Chrysotile	74 Windows
G 6	Exterior Door Caulk	Exterior Doors	Good / Category II Non-friable	Grey Caulk: 2% Chrysotile Tan Caulk: None Detected	5 Door Frames
G 8	9"x9" Floor Tile and Mastic	Under Bleachers along West Wall	Good / Category I Non-friable	Floor Tile: 2% Chrysotile Mastic: Assumed ACM	270 ft ²
G 9	Tank Insulation	Hot Water Tank in Old Boiler Room	Good / Friable	5% Chrysotile 25% Amosite	120 ft ²

Concessions Building (Building J)

No asbestos detected

Athletic Fields

No asbestos detected

* % and Type Asbestos = this column contains both the analytical result of the sample with the highest concentration of asbestos detected in the samples that make up the HA and the types of asbestos identified.

** Estimated quantities are based on cursory field observations and actual quantities may vary significantly, especially if these materials are present in hidden and/or inaccessible areas not evaluated as part of this inspection.

APPENDIX B

PHOTOGRAPHS FROM SITE



Photo #1 Old Gym (Building G)



Photo #2 HA# G 2 – 4" Canvas Pipe Elbow
Insulation Hot Water (Old Gym)



Photo #3 HA# G 4 – Exterior Window Frame
Caulk (Old Gym)



Photo #4 HA# G 5 – Exterior Window Glazing
(Old Gym)

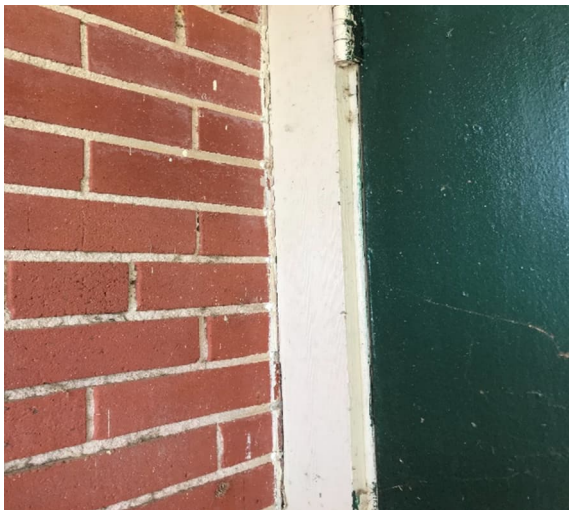


Photo #5 HA# G 6 – Exterior Door Caulk
(Old Gym)



Photo #6 HA# G 8 – 9"x9" Floor Tile and Mastic
(Old Gym)



Photo #7 HA# G 9 – Tank Insulation (Old Gym)



Photo #8 Concessions Building



Photo #9 Dugouts at Baseball Field

APPENDIX C

ASBESTOS LABORATORY ANALYTICAL RESULTS

Inspector: Erick Hutson
 License: 12849
 Date: 4/15/2022 - 4/21/2022

Job Name: Grier Middle School
 Job Number: 71157008
 Area(s): Building G

Sample No.	Homogeneous Material Description	Sample Location	Condition	Quantity	Friable/ Non-Friable	Lab Results
G 1-1	Plaster (Ceiling)	Main Entrance Corridor	Good	1,600 ft ²	Friable	White Coat: None Detected Grey Coat: None Detected
G 1-2	Plaster (Ceiling)	Mens Locker Room				White Coat: None Detected Grey Coat: None Detected
G 1-3	Plaster (Ceiling)	Mens Locker Room				White Coat: None Detected Grey Coat: None Detected
G 1-4	Plaster (Ceiling)	Womens Locker Room				White Coat: None Detected Grey Coat: None Detected
G 1-5	Plaster (Ceiling)	Womens Shower Room				White Coat: None Detected Grey Coat: None Detected
G 2-1	4" Hot Water Pipe Elbow Insulation	Gym	Good	45 Elbows	Friable	20% Chrysotile
G 2-2	4" Hot Water Pipe Elbow Insulation	Gym				20% Chrysotile
G 2-3	4" Hot Water Pipe Elbow Insulation	Gym				20% Chrysotile
G 3-1	4" Canvas Wrapped Hot Water Pipe Insulation	Gym	Good	600 ft	Friable	None Detected
G 3-2	4" Canvas Wrapped Hot Water Pipe Insulation	Gym				None Detected
G 3-3	4" Canvas Wrapped Hot Water Pipe Insulation	Gym				None Detected
G 4-1	Exterior Window Frame Caulk	Front of Building	Good	22 Window Frames	Non-Friable	3% Chrysotile
G 4-2	Exterior Window Frame Caulk	Front of Building				3% Chrysotile
G 4-3	Exterior Window Frame Caulk	Front of Building				2% Chrysotile
G 5-1	Exterior Window Glazing	Front of Building	Good	74 Windows	Non-Friable	4% Chrysotile
G 5-2	Exterior Window Glazing	Front of Building				None Detected
G 5-3	Exterior Window Glazing	Front of Building				None Detected
G 6-1	Exterior Door Caulk	Front Entrance Door	Good	5 Door Frames	Non-Friable	None Detected
G 6-2	Exterior Door Caulk	Side Entrance Door				None Detected
G 6-3	Exterior Door Caulk	Rear Entrance Door				Grey Caulk: 2% Chrysotile Tan Caulk: None Detected
G 7-1	Interior Door Frame Caulk	Office	Good	12 Doors	Non-Friable	None Detected
G 7-2	Interior Door Frame Caulk	Storage				None Detected
G 7-3	Interior Door Frame Caulk	Classroom				None Detected



EMSL Analytical, Inc.

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<http://www.EMSL.com> / charlottelab@emsl.com

EMSL Order: 412204021

Customer ID: TITA52

Customer PO: 71157008

Project ID:

Attention: Erick Hutson
Terracon Consultants, Inc.
2701 Westport Road
Charlotte, NC 28208

Phone: (803) 984-9498

Fax: (704) 509-1888

Received Date: 04/25/2022 9:40 AM

Analysis Date: 04/27/2022 - 04/28/2022

Collected Date:

Project: Grier Middle School - 71157008 - Building G

Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

Sample	Description	Appearance	Non-Asbestos		Asbestos
			% Fibrous	% Non-Fibrous	% Type
G 1-1-White Coat 412204021-0001	Main Entrance Corridor - Plaster (Ceiling)	White Non-Fibrous Homogeneous		30% Ca Carbonate 70% Non-fibrous (Other)	None Detected
G 1-1-Gray Coat 412204021-0001A	Main Entrance Corridor - Plaster (Ceiling)	Gray Non-Fibrous Homogeneous		40% Quartz 60% Non-fibrous (Other)	None Detected
G 1-2-White Coat 412204021-0002	Mens Locker Room - Plaster (Ceiling)	White Non-Fibrous Homogeneous		20% Ca Carbonate 80% Non-fibrous (Other)	None Detected
G 1-2-Gray Coat 412204021-0002A	Mens Locker Room - Plaster (Ceiling)	Gray Non-Fibrous Homogeneous		40% Quartz 60% Non-fibrous (Other)	None Detected
G 1-3-White Coat 412204021-0003	Mens Locker Room - Plaster (Ceiling)	White Non-Fibrous Homogeneous		20% Ca Carbonate 80% Non-fibrous (Other)	None Detected
G 1-3-Gray Coat 412204021-0003A	Mens Locker Room - Plaster (Ceiling)	Gray Non-Fibrous Homogeneous		40% Quartz 60% Non-fibrous (Other)	None Detected
G 1-4-White Coat 412204021-0004	Womens Locker Room - Plaster (Ceiling)	White Non-Fibrous Homogeneous		10% Ca Carbonate 90% Non-fibrous (Other)	None Detected
G 1-4-Gray Coat 412204021-0004A	Womens Locker Room - Plaster (Ceiling)	Gray Non-Fibrous Homogeneous		40% Quartz 60% Non-fibrous (Other)	None Detected
G 1-5-White Coat 412204021-0005	Womens Locker Room - Plaster (Ceiling)	White Non-Fibrous Homogeneous		10% Ca Carbonate 90% Non-fibrous (Other)	None Detected
G 1-5-Gray Coat 412204021-0005A	Womens Locker Room - Plaster (Ceiling)	Gray Fibrous Homogeneous		40% Quartz 60% Non-fibrous (Other)	None Detected
G 2-1 412204021-0006	Gym - 4" Canvas Pipe elbow Insulation Hot Water	Gray Fibrous Homogeneous		80% Non-fibrous (Other)	20% Chrysotile
G 2-2 412204021-0007	Gym - 4" Canvas Pipe elbow Insulation Hot Water	Gray Fibrous Homogeneous		80% Non-fibrous (Other)	20% Chrysotile
G 2-3 412204021-0008	Gym - 4" Canvas Pipe elbow Insulation Hot Water	Gray Fibrous Homogeneous	20% Min. Wool	60% Non-fibrous (Other)	20% Chrysotile
G 3-1 412204021-0009	Gym - 4" Canvas Pipe Wrap Hot Water	Yellow/Green Fibrous Homogeneous	95% Cellulose 2% Min. Wool	3% Non-fibrous (Other)	None Detected
<i>Result includes a small amount of inseparable attached insulation.</i>					
G 3-2 412204021-0010	Gym - 4" Canvas Pipe Wrap Hot Water	Yellow Fibrous Homogeneous	90% Cellulose 5% Min. Wool	5% Non-fibrous (Other)	None Detected
<i>Result includes a small amount of inseparable attached insulation.</i>					

Initial report from: 04/28/2022 15:40:04



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EMSL Order: 412204021
Customer ID: TITA52
Customer PO: 71157008
Project ID:

Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

Sample	Description	Appearance	Non-Asbestos		Asbestos
			% Fibrous	% Non-Fibrous	% Type
G 3-3 412204021-0011	Gym - 4" Canvas Pipe Wrap Hot Water	White/Beige Fibrous Homogeneous	95% Cellulose	5% Non-fibrous (Other)	None Detected
G 4-1 412204021-0012	Front of Building - Exterior Window Frame Caulk	Gray/White Non-Fibrous Homogeneous		97% Non-fibrous (Other)	3% Chrysotile
G 4-2 412204021-0013	Front of Building - Exterior Window Frame Caulk	Gray/White Non-Fibrous Homogeneous		97% Non-fibrous (Other)	3% Chrysotile
G 4-3 412204021-0014	Front of Building - Exterior Window Frame Caulk	Gray/Tan Non-Fibrous Homogeneous		98% Non-fibrous (Other)	2% Chrysotile
G 5-1 412204021-0015	Front of Building - Exterior Window Glazing	Gray/White Non-Fibrous Homogeneous		96% Non-fibrous (Other)	4% Chrysotile
G 5-2 412204021-0016	Front of Building - Exterior Window Glazing	White Non-Fibrous Homogeneous		15% Ca Carbonate 85% Non-fibrous (Other)	None Detected
G 5-3 412204021-0017	Front of Building - Exterior Window Glazing	Tan/White Non-Fibrous Homogeneous		20% Ca Carbonate 80% Non-fibrous (Other)	None Detected
G 6-1 412204021-0018	Front Entrance Door - Exterior Door Caulk	Gray/Beige Non-Fibrous Homogeneous		2% Quartz 15% Ca Carbonate 83% Non-fibrous (Other)	None Detected
G 6-2 412204021-0019	Side Entrance Door - Exterior Door Caulk	Gray/Beige Non-Fibrous Homogeneous		15% Ca Carbonate 85% Non-fibrous (Other)	None Detected
G 6-3-Gray Caulk 412204021-0020	Rear Entrance Door - Exterior Door Caulk	Gray/White Non-Fibrous Homogeneous		98% Non-fibrous (Other)	2% Chrysotile
G 6-3-Tan Caulk 412204021-0020A	Rear Entrance Door - Exterior Door Caulk	Tan/White Non-Fibrous Homogeneous		15% Ca Carbonate 85% Non-fibrous (Other)	None Detected
G 7-1 412204021-0021	Office - Interior Door Frame Caulk	Tan/White/Green Non-Fibrous Homogeneous	10% Cellulose	15% Ca Carbonate 75% Non-fibrous (Other)	None Detected
G 7-2 412204021-0022	Storage - Interior Door Frame Caulk	Tan/White/Green Non-Fibrous Homogeneous	5% Cellulose	15% Ca Carbonate 80% Non-fibrous (Other)	None Detected
G 7-3 412204021-0023	Classroom - Interior Door Frame Caulk	White Non-Fibrous Homogeneous	5% Cellulose	15% Ca Carbonate 80% Non-fibrous (Other)	None Detected

Initial report from: 04/28/2022 15:40:04



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EMSL Order: 412204021

Customer ID: TITA52

Customer PO: 71157008

Project ID:

Analyst(s)

Jessica Cooper (11)

Madeline Baldelli (18)

Lee Plumley, Laboratory Manager
or Other Approved Signatory

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Samples analyzed by EMSL Analytical, Inc. Pineville, NC NVLAP Lab Code 200841-0, VA 3333 00312

Initial report from: 04/28/2022 15:40:04



Asbestos Inspection Form

Inspector: Chad Chavis
License: 12929
Date: 7/26/2022

Job Name: Grier Middle School
Job Number: 71227143
Area(s): Building G Roof

Sample No.	Homogeneous Material Description	Sample Location	Condition	Quantity	Friable/ Non-Friable	Lab Results
GR 1-1	Roof Membrane	Lower G Roof	Good	10,500 ft ²	Non-Friable	None Detected
GR 1-2	Roof Membrane	Lower G Roof				None Detected
GR 1-3	Roof Membrane	Lower G Roof				None Detected
GR 2-1	Roof Flashing	Lower G Roof	Good	800 ft	Non-Friable	None Detected
GR 2-2	Roof Flashing	Lower G Roof				None Detected
GR 2-3	Roof Flashing	Lower G Roof				None Detected
GR 3-1	Silver Paint Penetrations	Lower G Roof	Good	100 ft ²	Non-Friable	None Detected
GR 3-2	Silver Paint Penetrations	Lower G Roof				None Detected
GR 3-3	Silver Paint Penetrations	Lower G Roof				None Detected



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<http://www.EMSL.com> / charlottelab@emsl.com

EMSL Order: 412207384

Customer ID: TITA52

Customer PO: 71227143

Project ID:

Attention: Chad Chavis
Terracon Consultants, Inc.
2701 Westport Road
Charlotte, NC 28208

Phone: (704) 307-3045

Fax: (704) 509-1888

Received Date: 07/29/2022 12:45 PM

Analysis Date: 08/01/2022 - 08/02/2022

Collected Date: 07/26/2022

Project: Grier Middle School Demolition/ 71227143/ Building G Roof

Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

Sample	Description	Appearance	Non-Asbestos		Asbestos
			% Fibrous	% Non-Fibrous	% Type
GR 1-1-Membrane <small>412207384-0001</small>	Lower G Roof - Roof Membrane	Black Non-Fibrous Homogeneous	20% Glass	80% Non-fibrous (Other)	None Detected
GR 1-1-Tar <small>412207384-0001A</small>	Lower G Roof - Roof Membrane	Black Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
GR 1-1-Gray Insulation <small>412207384-0001B</small>	Lower G Roof - Roof Membrane	Gray Fibrous Homogeneous	95% Cellulose	5% Non-fibrous (Other)	None Detected
GR 1-1-Tar <small>412207384-0001C</small>	Lower G Roof - Roof Membrane	Black Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
GR 1-1-Felt <small>412207384-0001D</small>	Lower G Roof - Roof Membrane	Black Non-Fibrous Homogeneous	90% Cellulose	10% Non-fibrous (Other)	None Detected
GR 1-1-White Insulation <small>412207384-0001E</small>	Lower G Roof - Roof Membrane	White/Yellow Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
GR 1-2-Membrane <small>412207384-0002</small>	Lower G Roof - Roof Membrane	Black Fibrous Homogeneous	15% Glass	85% Non-fibrous (Other)	None Detected
GR 1-2-Tar <small>412207384-0002A</small>	Lower G Roof - Roof Membrane	Black Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
GR 1-2-Gray Insulation <small>412207384-0002B</small>	Lower G Roof - Roof Membrane	Gray Fibrous Homogeneous	95% Cellulose	5% Non-fibrous (Other)	None Detected
GR 1-2-Tar <small>412207384-0002C</small>	Lower G Roof - Roof Membrane	Black Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
GR 1-2-Felt <small>412207384-0002D</small>	Lower G Roof - Roof Membrane	Gray/Black Fibrous Homogeneous	90% Cellulose	10% Non-fibrous (Other)	None Detected
GR 1-2-White Insulation <small>412207384-0002E</small>	Lower G Roof - Roof Membrane	White/Yellow Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
GR 1-3-Membrane <small>412207384-0003</small>	Lower G Roof - Roof Membrane	Black Fibrous Homogeneous	2% Cellulose 10% Glass	88% Non-fibrous (Other)	None Detected
GR 1-3-Tar <small>412207384-0003A</small>	Lower G Roof - Roof Membrane	Black Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
GR 1-3-Gray Insulation <small>412207384-0003B</small>	Lower G Roof - Roof Membrane	Gray Fibrous Homogeneous	99% Cellulose	1% Non-fibrous (Other)	None Detected
GR 1-3-Tar <small>412207384-0003C</small>	Lower G Roof - Roof Membrane	Black Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected

Initial report from: 08/03/2022 13:19:26



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<http://www.EMSL.com> / charlottelab@emsl.com

EMSL Order: 412207384
Customer ID: TITA52
Customer PO: 71227143
Project ID:

Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

Sample	Description	Appearance	Non-Asbestos		Asbestos
			% Fibrous	% Non-Fibrous	% Type
GR 1-3-White Insulation <small>412207384-0003D</small>	Lower G Roof - Roof Membrane	White Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
GR 2-1 <small>412207384-0004</small>	Lower G Roof - Roof Flashing	Black Fibrous Homogeneous	2% Cellulose 5% Glass	30% Quartz 63% Non-fibrous (Other)	None Detected
GR 2-2 <small>412207384-0005</small>	Lower G Roof - Roof Flashing	Gray/Black Fibrous Homogeneous	10% Cellulose 5% Glass	85% Non-fibrous (Other)	None Detected
GR 2-3 <small>412207384-0006</small>	Lower G Roof - Roof Flashing	Black Non-Fibrous Homogeneous	10% Cellulose	90% Non-fibrous (Other)	None Detected
GR 3-1-Silver Paint <small>412207384-0007</small>	Lower G Roof - Silver Paint Penetrations	Silver Non-Fibrous Homogeneous	2% Cellulose	98% Non-fibrous (Other)	None Detected
GR 3-1-Tar <small>412207384-0007A</small>	Lower G Roof - Silver Paint Penetrations	Yellow/Clear Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
GR 3-2-Silver Paint <small>412207384-0008</small>	Lower G Roof - Silver Paint Penetrations	Silver Non-Fibrous Homogeneous	2% Cellulose	98% Non-fibrous (Other)	None Detected
GR 3-2-Tar <small>412207384-0008A</small>	Lower G Roof - Silver Paint Penetrations	Black Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
GR 3-3-Silver Paint <small>412207384-0009</small>	Lower G Roof - Silver Paint Penetrations	Silver Non-Fibrous Homogeneous	<1% Cellulose	100% Non-fibrous (Other)	None Detected
GR 3-3-Tar <small>412207384-0009A</small>	Lower G Roof - Silver Paint Penetrations	Black Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected

Analyst(s)
 Ashley Hill (8)
 Brant Alyea (18)

Lee Plumley, Laboratory Manager
 or Other Approved Signatory

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Samples analyzed by EMSL Analytical, Inc. Pineville, NC NVLAP Lab Code 200841-0, VA 3333 00312

Initial report from: 08/03/2022 13:19:26

Inspector: Chad Chavis
 License: 12929
 Date: 7/27/2022

Job Name: Grier Middle School
 Job Number: 71227143
 Area(s): Building J and Dugouts

Sample No.	Homogeneous Material Description	Sample Location	Condition	Quantity	Friable/ Non-Friable	Lab Results
J1-1	Exterior White Door Caulk	Exterior Side Doors	Good	3 Door Frames	Non-Friable	None Detected
J1-2	Exterior White Door Caulk	Exterior Side Doors				None Detected
J1-3	Exterior White Door Caulk	Exterior Side Doors				None Detected
J2-1	Roof Shingles and Felt Paper	Roof	Good	400 ft ²	Non-Friable	None Detected
J2-2	Roof Shingles and Felt Paper	Roof				None Detected
J2-3	Roof Shingles and Felt Paper	Roof				None Detected
DO1-1	Roof Shingles and Felt Paper	Home Team Dugout	Good	500 ft ²	Non-Friable	None Detected
DO1-2	Roof Shingles and Felt Paper	Home Team Dugout				None Detected
DO1-3	Roof Shingles and Felt Paper	Visitor Team Dugout				None Detected



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EMSL Order: 412207387

Customer ID: TITA52

Customer PO: 71227143

Project ID:

Attention: Chad Chavis
Terracon Consultants, Inc.
2701 Westport Road
Charlotte, NC 28208

Phone: (704) 307-3045

Fax: (704) 509-1888

Received Date: 07/29/2022 12:45 PM

Analysis Date: 08/02/2022

Collected Date: 07/27/2022

Project: Grier Middle School Demolition/ 71227143/ Building J and Dugouts

Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

Sample	Description	Appearance	Non-Asbestos		Asbestos
			% Fibrous	% Non-Fibrous	% Type
J1-1 412207387-0001	Exterior Side Doors - Exterior White Door Caulk	White Non-Fibrous Homogeneous		15% Ca Carbonate 85% Non-fibrous (Other)	None Detected
J1-2 412207387-0002	Exterior Side Doors - Exterior White Door Caulk	White Non-Fibrous Homogeneous		15% Ca Carbonate 85% Non-fibrous (Other)	None Detected
J1-3 412207387-0003	Exterior Side Doors - Exterior White Door Caulk	White Non-Fibrous Homogeneous		15% Ca Carbonate 85% Non-fibrous (Other)	None Detected
J2-1-Shingle 412207387-0004	Roof - Roof Shingles and Felt Paper	Black Non-Fibrous Homogeneous	10% Glass	10% Quartz 80% Non-fibrous (Other)	None Detected
J2-1-Felt 412207387-0004A	Roof - Roof Shingles and Felt Paper	Black Fibrous Homogeneous	85% Cellulose	15% Non-fibrous (Other)	None Detected
J2-2-Shingle 412207387-0005	Roof - Roof Shingles and Felt Paper	Black Fibrous Homogeneous	10% Glass	10% Quartz 80% Non-fibrous (Other)	None Detected
J2-2-Felt 412207387-0005A	Roof - Roof Shingles and Felt Paper	Black Fibrous Homogeneous	85% Cellulose	15% Non-fibrous (Other)	None Detected
J2-3-Shingle 412207387-0006	Roof - Roof Shingles and Felt Paper	Black Fibrous Homogeneous	15% Glass	10% Quartz 75% Non-fibrous (Other)	None Detected
J2-3-Felt 412207387-0006A	Roof - Roof Shingles and Felt Paper	Black Fibrous Homogeneous	90% Cellulose	10% Non-fibrous (Other)	None Detected
DO1-1-Shingle 412207387-0007	Home Team Dugout - Roof Shingles and Felt Paper	Black/Green Fibrous Homogeneous	10% Glass	10% Quartz 80% Non-fibrous (Other)	None Detected
DO1-1-Felt 412207387-0007A	Home Team Dugout - Roof Shingles and Felt Paper	Black Fibrous Homogeneous	85% Cellulose	15% Non-fibrous (Other)	None Detected
DO1-2-Shingle 412207387-0008	Home Team Dugout - Roof Shingles and Felt Paper	Black Fibrous Homogeneous	10% Glass	10% Quartz 80% Non-fibrous (Other)	None Detected
DO1-2-Felt 412207387-0008A	Home Team Dugout - Roof Shingles and Felt Paper	Black Fibrous Homogeneous	85% Cellulose	15% Non-fibrous (Other)	None Detected
DO1-3-Shingle 412207387-0009	Visitor Team Dugout - Roof Shingles and Felt Paper	Gray/Black/Green Fibrous Homogeneous	15% Glass	10% Quartz 75% Non-fibrous (Other)	None Detected
DO1-3-Felt 412207387-0009A	Visitor Team Dugout - Roof Shingles and Felt Paper	Black Fibrous Homogeneous	90% Cellulose	10% Non-fibrous (Other)	None Detected

Initial report from: 08/03/2022 13:21:40



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EMSL Order: 412207387

Customer ID: TITA52

Customer PO: 71227143

Project ID:

Analyst(s)

Brant Alyea (10)

Jessica Cooper (5)

Lee Plumley, Laboratory Manager
or Other Approved Signatory

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Samples analyzed by EMSL Analytical, Inc. Pineville, NC NVLAP Lab Code 200841-0, VA 3333 00312

Initial report from: 08/03/2022 13:21:40

APPENDIX D

EXCERPT FROM AHERA MANAGEMENT PLAN

INVENTORY OF ACBM

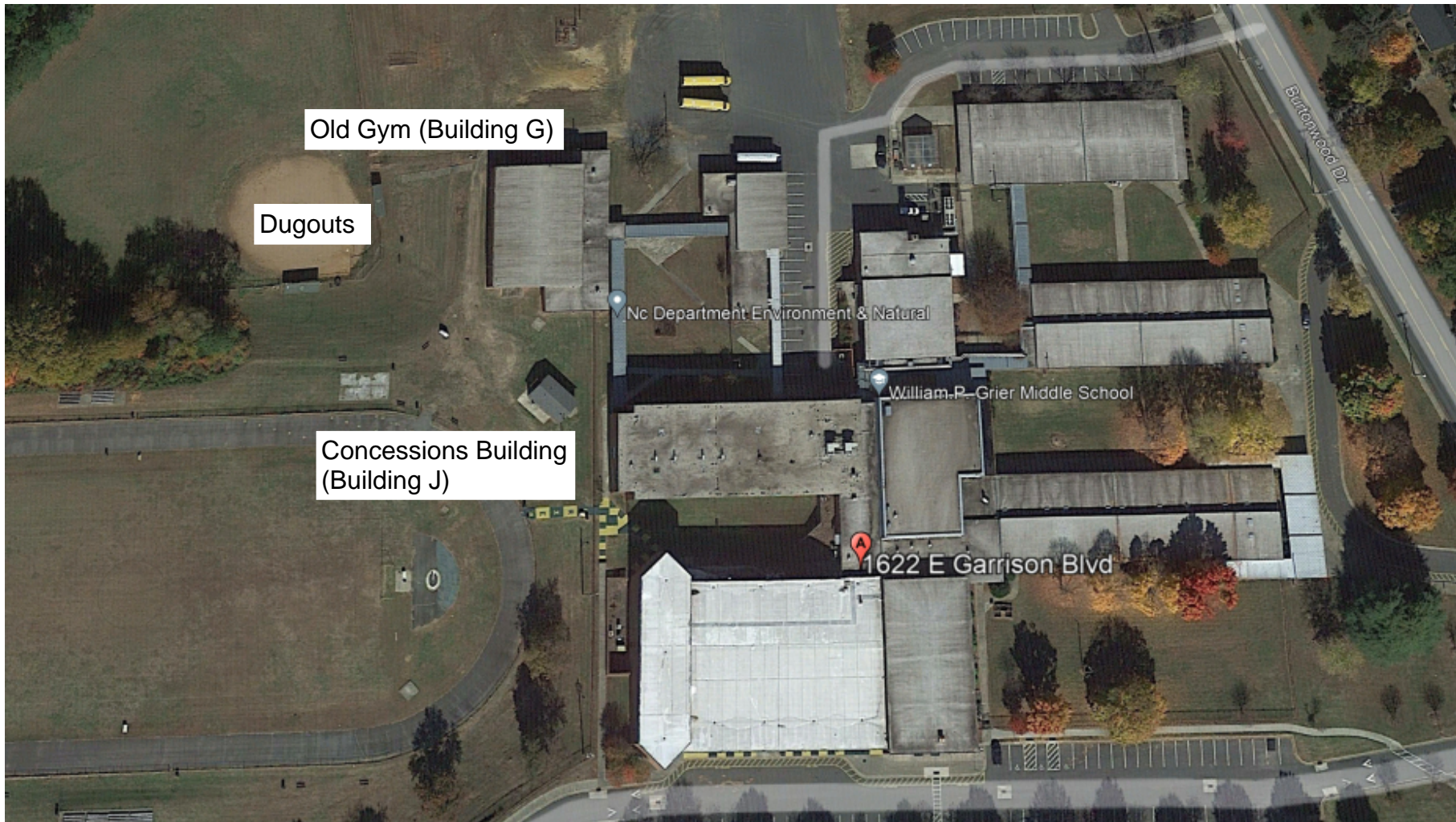
BUILDING & ADDRESS	HOMOGENEOUS AREA	TYPE OF MATERIAL OR NO ACBM	TYPE AND % OF ASBESTOS OR ASSUMED	ASSESSMENT CATEGORY	AMOUNT OF MATERIAL	LOCATIONS	COMMENTS
Building Area D (Continued)	Vinyl Floor Tile	Misc. Non-Friable Material	5% Chrysotile	(Abated) 5	8,500 SF	Vinyl Floor Tile Throughout Building	Good Condition
	Heating Cabinet	Misc. Non-Friable Material	Assumed			Liner Panel in Heating Cabinets	Good Condition
Building Area E	Acoustical Plaster Ceiling	Surfacing Material	5% Chrysotile			Plaster Ceiling	Good Condition
	Vinyl Floor Tile	Misc. Non-Friable Material	5% Chrysotile	(Abated) 5		Vinyl Tile Throughout Building	Good Condition
	Boiler Jacket, hot water storage Tank & Boiler Breaching Insulation	Thermal System Insulation	50% Amosite 50% Chrysotile	1	1,000 SF	Boiler Jackets, Hot Water Tank & Boiler Breaching in Boiler Room	Damaged Insulation
Building Area F	Acoustical Plaster Ceiling	Surfacing Material	10% Chrysotile			Acoustical Plaster Ceiling in Home Ec. Area	Good Condition
	Vinyl Floor Tile	Misc. Non-Friable Material	5% Chrysotile		1,000 SF	Vinyl Floor Tile in Home Ec. Area & Shop Office	Good Condition
Building Area G	Insulation on Hot Water Storage Tank	Thermal System Insulation	5% Chrysotile 25% Amosite	1	200 SF	Insulation Jacket on Hot Water Storage Tank	Damaged Insulation
	Cement Pipe Fitting Insulation	Thermal System Insulation	25% Chrysotile	5	30 Each	Cement Pipe Fitting Insulation in Gym & Mechanical Room	Good Condition
	Vinyl Floor Tile	Misc. Non-Friable Material	2% Chrysotile	Removed 5	6,000 SF	Vinyl Floor Tile in Gym	Good Condition
Building Area H	Vinyl Floor Tile	Misc. Non-Friable Material	5% Chrysotile	(Abated) 5	7,500 SF	Vinyl Floor Tile Throughout Building	Good Condition

INSPECTOR Name John E. Daves
 Accreditation # 10210

Signature John E. Daves
 Agency The Georgia Institute of Technology

APPENDIX D
DRAWINGS FROM SITE

CAMPUS MAP



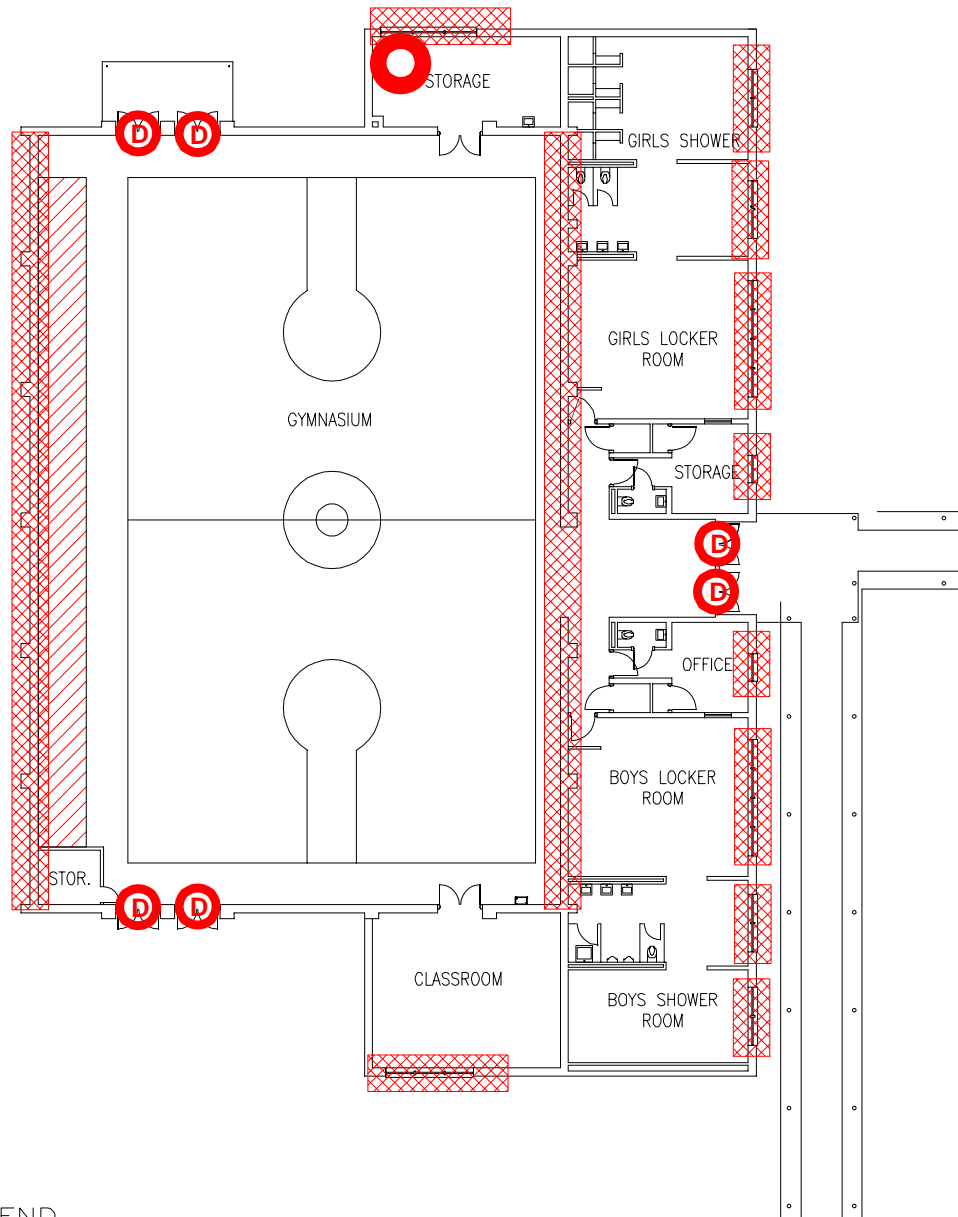
Terracon
 2701 WESTPORT ROAD
 CHARLOTTE, NORTH CAROLINA 28208

GRIER MIDDLE SCHOOL
 1622 EAST GARRISON BOULEVARD
 GASTONIA, NORTH CAROLINA





DESCRIPTION

DATE	SIGNATURE
AUG 2022	NONE
PREPARED BY	APPROVED BY
RTH	RTH
REVISIONS	
PRODUCT NUMBER	
71227143	
SHEET	
1	

IDENTIFIED ASBESTOS-CONTAINING MATERIALS OLD GYM (BUILDING G)



LEGEND

-  ASBESTOS-CONTAINING FLOOR TILE AND ASBESTOS-CONTAINING MASTIC
-  ASBESTOS-CONTAINING WINDOW FRAME CAULK AND GLAZING
-  ASBESTOS-CONTAINING TANK INSULATION
-  ASBESTOS-CONTAINING DOOR FRAME CAULK

ASBESTOS-CONTAINING PIPE INSULATION ELBOWS THROUGHOUT BUILDING. MAY BE LOCATED ABOVE CEILING

DATE	SCALE
AUG 2007	NONE
RTH	RTH
RTH	RTH
REVISIONS	
7/12/27/43	
SHEET	
2	

DESCRIPTION

GRIER MIDDLE SCHOOL
1622 EAST GARRISON BOULEVARD
GASTONIA, NORTH CAROLINA

Terracon
2701 WESTPORT ROAD
CHARLOTTE, NORTH CAROLINA 28208

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NESHAP Asbestos Inspection Report

Grier Middle School –
Buildings A, B, C, D, E, F, H, I, Media Center, and Greenhouse
1622 E. Garrison Boulevard
Gastonia, North Carolina

September 2, 2022

Terracon Project No. 71227143



Prepared for:
Gaston County Schools
Gastonia, North Carolina

Prepared by:
Terracon Consultants, Inc.
Charlotte, North Carolina



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Charlotte, NC 28208

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Terracon.com

September 2, 2022

Gaston County Schools
943 Osceola Street
Gastonia, North Carolina

Attn: Paul Nault
P: (704) 866-6277
E: phnault@gaston.k12.nc.us

Re: NESHAP Asbestos Inspection Report
Grier Middle School - Buildings A, B, C, D, E, F, H, I, Media Center, and Greenhouse
1622 E. Garrison Boulevard
Gastonia, North Carolina
Terracon Project No. 71227743

Dear Paul Nault:


Terracon Consultants, Inc. (Terracon) is pleased to submit the attached report for the above referenced site to Gaston County Schools. The purpose of this report is to present the results of an asbestos inspection performed between April 4, 2022 and July 27, 2022. This inspection was conducted in general accordance with Terracon's purchase order number 360-10008930 dated April 4, 2022. We understand that this inspection was requested due to planned demolition of the buildings at the above referenced site.

Asbestos was identified in samples of non-friable materials at the project site. Please refer to the attached report for details.

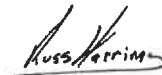
Note, a separate report has been issued for the Old Gym, Concessions Building, and athletic fields on the campus. See report titled *NESHAP Asbestos Inspection Report, Grier Middle School – Old Gym, Concessions Building, and Athletic Fields*, dated August 24, 2022.

Terracon appreciates the opportunity to provide this service to Gaston County Schools. If you have any questions regarding this report, please contact the undersigned at (704) 509-1777.

Sincerely,
Terracon Consultants, Inc.



Erick Hutson
Field Industrial Hygienist



Russell Harrings, CIH
Authorized Project Reviewer

Explore with us

TABLE OF CONTENTS

1.0	INTRODUCTION	1
1.1	Reliance.....	1
2.0	BUILDING DESCRIPTION.....	1
3.0	FIELD ACTIVITIES.....	3
3.1	Visual Assessment.....	3
3.2	Physical Assessment	4
3.3	Sample Collection.....	4
3.4	Sample Analysis	4
4.0	REGULATORY OVERVIEW.....	4
5.0	FINDINGS.....	5
6.0	LIMITATION / GENERAL COMMENTS.....	7

APPENDIX A	SUMMARY OF IDENTIFIED MATERIALS CONTAINING ASBESTOS
APPENDIX B	PHOTOGRAPHS OF IDENTIFIED MATERIALS CONTAINING ASBESTOS
APPENDIX C	ASBESTOS LABORATORY ANALYTICAL RESULTS
APPENDIX D	EXCERPT FROM AHERA MANAGEMENT PLAN
APPENDIX E	DRAWINGS FROM SITE

NESHAP ASBESTOS INSPECTION REPORT

Grier Middle School – Buildings A, B, C, D, E, F, H, I, Media Center, and Greenhouse
1622 E. Garrison Boulevard
Gastonia, North Carolina
Terracon Project No. 71227143
September 2, 2022

1.0 INTRODUCTION

Terracon Consultants, Inc. (Terracon) conducted an asbestos inspection of buildings A, B, C, D, E, F, H, I, media center, and greenhouse located on the campus of Grier Middle School at 1622 E. Garrison Boulevard in Gastonia, North Carolina. The inspection was conducted between April 4, 2022 and July 27, 2022, by North Carolina licensed asbestos inspectors in general accordance with Terracon purchase order number 360-10008930 dated April 4, 2022. Interior and exterior building components were inspected, and homogeneous areas of suspect asbestos-containing materials (ACM) were visually identified and documented. Although reasonable effort was made to inspect accessible suspect asbestos-containing materials, additional suspect but un-sampled materials could be in walls, in voids, or in other concealed areas. Suspect ACM samples were collected in general accordance with the sampling protocols outlined in United States Environmental Protection Agency (USEPA) 40 Code of Federal Regulations (CFR) Part 763 Subpart E 763, known as the Asbestos Hazard Emergency Response Act (AHERA). Samples were delivered to an accredited laboratory for analysis by Polarized Light Microscopy (PLM).

We understand this asbestos inspection was requested due to the planned demolition of the above-referenced buildings to satisfy requirements of the USEPA 40 CFR Part 61, Subpart M, the National Emission Standards for Hazardous Air Pollutants (NESHAP).

Note, a separate report has been issued for the Old Gym, Concessions Building, and athletic fields on the campus. See report titled *NESHAP Asbestos Inspection Report, Grier Middle School – Old Gym, Concessions Building, and Athletic Fields*, dated August 24, 2022.

1.1 Reliance

This report is for the exclusive use of Gaston County Schools for the project being discussed. Reliance by any other party on this report is prohibited without written authorization of Terracon and Gaston County Schools. Reliance on this report by Gaston County Schools and all authorized parties will be subject to the terms, conditions, and limitations stated in the proposal, this report, and Terracon's Purchase Order. The limitations of liability defined in Terracon's Agreement for Services Purchase Order is the aggregate limit of Terracon's liability to Gaston County Schools and all relying parties.

2.0 BUILDING DESCRIPTION

Building A

The building is a two-story, steel-framed building constructed atop a concrete slab on grade. This building is primarily comprised of classrooms with some mechanical and storage spaces on the lower level. A brick veneer covers the exterior of the building. Interior walls consist of drywall and joint compound and CMU block. The floors throughout the building are concrete and finished with vinyl floor tile and terrazzo. Ceilings are finished with lay-in ceiling tiles and acoustical plaster. The roof is a flat, built-up roof over a concrete deck. The heating, ventilation, and air conditioning (HVAC)

system is a boiler and chiller system with some supplemental fan coil units mounted on the roof. Abandoned radiators are located below the exterior windows.

Building B

The building is a single-story, steel-framed building constructed atop a concrete slab on grade. This building includes the auditorium and several office spaces. A brick veneer covers the exterior of the building. Interior walls consist of drywall and joint compound, CMU block, and plaster. The floors throughout the building are concrete and finished with vinyl floor tile, carpet, and terrazzo. Ceilings are finished with lay-in ceiling tiles and acoustical plaster. The roof is a flat, built-up roof over a concrete deck. The HVAC system is a boiler and chiller system.

Building C

The building is a single-story, steel-framed building constructed atop a concrete slab on grade. The building is comprised of classrooms. A brick veneer covers the exterior of the building. Interior walls consist of CMU block. The floors throughout the building are concrete and finished with vinyl floor tile. Ceilings are finished with acoustical plaster in the classrooms and smooth plaster in the restrooms. The roof is a flat, built-up roof over a concrete deck. The heating, ventilation, and air conditioning (HVAC) systems are mounted inside each classroom. Abandoned radiators are located below the exterior windows.

Building D

The building is a two-story, steel-framed building constructed atop a concrete slab on grade. The building is comprised of classrooms. A brick veneer covers the exterior of the building. Interior walls consist of CMU block. The floors throughout the building are concrete and finished with vinyl floor tile. Ceilings are finished with acoustical plaster in the classrooms and smooth plaster in the restrooms. The roof is a flat, built-up roof over a concrete deck. The HVAC system is a boiler and chiller system. Abandoned radiators are located below the exterior windows.

Building E

The building is a two-story, steel-framed building constructed atop a concrete slab on grade. This building includes the cafeteria, kitchen, and mechanical room in the basement. A brick veneer covers the exterior of the building. Interior walls consist of drywall and joint compound and CMU block. The floors throughout the building are concrete and finished with vinyl floor tile and ceramic tile. Ceilings are finished with lay-in ceiling tiles, smooth plaster, and acoustical plaster. The roof is a flat, built-up roof over a concrete deck. The HVAC system is a boiler and chiller system with the mechanical equipment for the campus located in the basement and the chiller located outside this building.

Building F

The building is a single-story, steel-framed building constructed atop a concrete slab on grade. This building includes a classroom and shop areas. A brick veneer covers the exterior of the building. Interior walls consist of drywall, plaster, and CMU block. The floors throughout the building are concrete and finished with peel and stick sheet flooring, vinyl floor tile, and carpet. Ceilings are finished with acoustical plaster in the classroom and open to the roof deck in the shop areas. The roof is a flat, built-up roof over a concrete deck. The HVAC system is a boiler and chiller system.

Building H

The building is a single-story, steel-framed building constructed atop a concrete slab on grade. The building is comprised of classrooms. A brick veneer covers the exterior of the building. Interior walls

consist of CMU block. The floors throughout the building are concrete and finished with vinyl floor tile. Ceilings are finished with acoustical plaster in the classrooms and smooth plaster in the restrooms. The roof is a flat, built-up roof over a concrete deck. The HVAC system is a boiler and chiller system. Abandoned radiators are located below the exterior windows.

Building I

The building is a two-story, steel-framed building constructed atop a concrete slab on grade. This building includes the main office, new gym, locker rooms, and the band and music rooms. A brick veneer covers the exterior of the building. Interior walls consist of drywall and CMU block. The floors throughout the building are concrete and finished with vinyl floor tile, sheet flooring and carpet. Ceilings are finished with lay-in ceiling tiles. The roof is a flat, thermoplastic polyolefin (TPO) roof over a concrete deck. The HVAC system is a boiler and chiller system.

Media Center

The building is a single-story, steel-framed building constructed atop a concrete slab on grade. A brick veneer covers the exterior of the building. Interior walls consist of drywall and joint compound and CMU block. The floors throughout the building are concrete and finished with vinyl floor tile and carpet. Ceilings are finished with lay-in ceiling tiles. The roof is a flat, built-up roof over a concrete deck. The HVAC system is a boiler and chiller system.

Greenhouse

The building is a single-story, metal-framed building with no floor. The walls and roof are plastic. The building has ventilation fans. No suspect asbestos-containing materials were observed associated with this building.

3.0 FIELD ACTIVITIES

The inspection was conducted by North Carolina licensed asbestos inspectors Russell Harrings (NC Accreditation No. 12222), Erick Hutson (NC Accreditation No. 12849), and Chad Chavis (NC Accreditation No. 12929). The inspection was conducted in general accordance with the sample collection protocols established in USEPA 40 CFR Part 763 Subpart E 763.86, AHERA. A summary of inspection activities is provided below.

Terracon supplemented the field activities with data in the school's Asbestos Hazard Emergency Response Act (AHERA) Management Plan. An excerpt from the AHERA Management Plan is included in Appendix D.

3.1 Visual Assessment

Inspection activities were initiated with visual observation of the subject buildings to identify homogeneous areas (HAs) of suspect ACM. An HA consists of building materials that appear similar throughout in terms of color and texture with consideration given to the date of application. Assessment was conducted in visually accessible areas of the buildings proposed for demolition.

Building materials identified as concrete, glass, wood, masonry, metal, or rubber were not considered suspect ACM.

3.2 Physical Assessment

A physical assessment of each HA of suspect ACM was conducted to assess the friability and condition of the materials. A friable material is defined by the USEPA as a material which can be crumbled, pulverized, or reduced to powder by hand pressure when dry. Friability was assessed by physically touching suspect asbestos-containing materials.

3.3 Sample Collection

Based on results of the visual observation, bulk samples of suspect ACM were collected in general accordance with USEPA AHERA sampling protocols. Samples of suspect asbestos-containing materials were collected from randomly selected locations in each homogeneous area. Samples were placed in sealable containers and labeled with unique sample numbers using an indelible marker.

The selection of sample locations and frequency of sampling were based on Terracon's observations and the assumption that like materials in the same area are homogeneous in content.

Terracon collected 561 bulk samples from 175 homogeneous areas of suspect ACM. A summary of suspect ACM samples collected during the inspection is included in Appendix C.

3.4 Sample Analysis

Bulk samples were submitted under chain of custody to EMSL Analytical, Inc. (EMSL) of Pineville, North Carolina for analysis by Polarized Light Microscopy (PLM) with dispersion staining techniques per EPA method (40 CFR 763, Subpart F). The asbestos content, where applicable, was determined by microscopical visual estimation. EMSL is a National Voluntary Laboratory Accreditation Program (NVLAP) accredited laboratory (NVLAP No. 200841-0).

4.0 REGULATORY OVERVIEW

The asbestos NESHAP (40 CFR Part 61, Subpart M) regulates asbestos fiber emissions and asbestos waste disposal practices. The asbestos NESHAP regulation also requires the identification and classification of existing ACM according to friability prior to demolition or renovation activity. Friable ACM is a material containing more than 1% asbestos that, when dry, can be crumbled, pulverized, or reduced to powder by hand pressure. All friable ACM is considered regulated asbestos-containing material (RACM).

The asbestos NESHAP regulation classifies ACM as either RACM, Category I non-friable ACM, or Category II non-friable ACM. RACM includes all friable ACM, along with Category I non-friable and Category II non-friable ACM that has become friable, will be or has been subjected to sanding, grinding, cutting or abrading, or ACM that has a high probability of becoming or has become crumbled, pulverized, or reduced to powder in the course of renovation or demolition activity. Category I non-friable ACM are exclusively asbestos-containing packings, gaskets, resilient floor coverings, resilient floor covering mastics, and asphalt roofing products that contain more than 1% asbestos. Category II non-friable ACM are all other non-friable materials, other than Category I non-friable ACM, that contain more than 1% asbestos. Category II non-friable ACM generally includes, but is not limited to, cementitious material such as: cement pipes, cement siding, cement panels, glazing, mortar, and grouts.

The OSHA asbestos standard for construction (29 CFR 1926.1101) regulates workplace exposure to asbestos. The OSHA standard requires that employee exposure to airborne asbestos fibers be maintained below 0.1 asbestos fibers per cubic centimeter of air (0.1 f/cc). The OSHA standard classifies construction and maintenance activities which could disturb ACM and specifies work practices and precautions which employers must follow when engaging in each class of regulated work. States which administer their own federally-approved state OSHA programs may require additional precautions. The standard also specifies requirements for handling materials containing asbestos in concentrations less than or equal to one percent.

In the state of North Carolina, the Health Hazards Control Unit (HHCU) regulates asbestos activities. The NC HHCU requires that asbestos-related activities conducted in a public building be performed by personnel accredited by NC HHCU. RACM must be removed prior to renovation or demolition activities which will disturb the materials. The owner or operator must provide the NC HHCU with written notification of planned removal activities at least 10 working days prior to the commencement of asbestos abatement activities. Removal of RACM must be conducted by a State of North Carolina licensed asbestos abatement contractor. In addition, third party air monitoring may be required following the abatement.

5.0 FINDINGS

Asbestos was identified in samples of the following materials collected at the project site.

Building A

HA No.	Material Description	General Location
A 6	Interior Window Caulk	Interior Side of Exterior Windows
A 15	1" Pipe Elbow Insulation	Lower – Storage Room/Closet, May be Located above Ceilings Throughout Building
A 17	White Sink Mastic	Lower – Room 102
A 19	Gray Window Glazing	Exterior Windows
A 20	Gray Window Caulk	Exterior Windows
A 24	Acoustical Plaster Ceilings	Throughout Building Interior
A 25	Heating Cabinet Liner Panels	Radiator Cabinets below Windows throughout Building
A 26	Fire Doors †	Interior and Exterior Doors throughout Building
A 27	Cementitious Panels	Bottoms of Exterior Overhangs
AR 9	Roof Flashing	Roof Overhangs
AR 10	Gray Roof Caulk	Roof Overhangs

Building B

HA No.	Material Description	General Location
B 3	1" Pipe Elbow Insulation	Storage Room, May be Located above Ceilings Throughout Building
B 6	Interior Door Caulk	Interior Door Frames
B 16	Interior Window Caulk	Interior Side of Exterior Windows
B 19	White Door Caulk	Exterior Door Frames
B 23	Acoustical Plaster Ceilings	Auditorium and Hallways
B 24	9"x9" Grey Floor Tile and Mastic	Auditorium and Storage Room
B 25	9"x9" Tan Floor Tile and Mastic	Storage Room
B 26	Fire Doors †	Interior and Exterior Doors throughout Building
B 27	Cementitious Panels	Bottom of Exterior Overhang, North Doors

Building C

HA No.	Material Description	General Location
C 6	Exterior Door Caulk	Exterior Door Frames
C 7	Exterior Window Glazing	Exterior Windows
C 8	Exterior Window Caulk	Exterior Windows
C 9	Acoustical Plaster Ceilings	Throughout Classrooms
C 10	Heating Cabinet Liner Panels	Radiator Cabinets below Windows throughout Building
C 11	Fire Doors †	Interior and Exterior Doors throughout Building

Building D

HA No.	Material Description	General Location
D 6	Exterior Window Caulk	Exterior Windows
D 7	Exterior Window Glazing	Exterior Windows
D 8	Exterior Door Caulk	Exterior Door Frames
D 9	Black Sink Coating	Room 400 – Storage
D 10	Acoustical Plaster Ceilings	Throughout Classrooms
D 11	Heating Cabinet Liner Panels	Radiator Cabinets below Windows throughout Building
D 12	Fire Doors †	Interior and Exterior Doors throughout Building

Building E

HA No.	Material Description	General Location
E 9	Exterior White Door Caulk	Exterior Door Frames
E 10	Interior Door Caulk	Interior Door Frames
E 11	2" Pipe Elbow Insulation	Kitchen, May be Located above Ceilings Throughout Building
E 16	Exterior Window Glazing	Exterior Windows
E 17	Exterior Window Frame Caulk	Exterior Windows
E 25	Fire Doors †	Interior and Exterior Doors throughout Building

Building F

HA No.	Material Description	General Location
F 8	Exterior Window Frame Caulk	Exterior Windows
F 9	Exterior Door Caulk	Exterior Door Frames
F 12	Acoustical Plaster Ceilings	Life Skills Classroom
F 13	Cementitious Panels	Bottom of Exterior Overhang, West Doors
F 14	Fire Doors †	Interior and Exterior Doors throughout Building
FR 3	Silver Paint Penetrations	Upper Roof F

Building H

HA No.	Material Description	General Location
H 6	Exterior Window Glazing	Exterior Windows
H 7	Exterior Window Frame Caulk	Exterior Windows
H 8	Exterior Door Caulk	Exterior Door Frames
H 9	9"x9" Grey Floor Tile and Mastic	Janitor's Closet and Janitor's Restroom
H 10	Fire Doors †	Interior and Exterior Doors throughout Building

Building I

HA No.	Material Description	General Location
I 17	Grey Sink Coating	Upper – Band Room Break Room
I 21	Fire Doors †	Interior and Exterior Doors throughout Building

Media Center Building

HA No.	Material Description	General Location
MC 12	Fire Doors †	Interior and Exterior Doors throughout Building

Greenhouse

No Suspect Asbestos-Containing Materials

A summary of the classification, condition, and approximate quantity of identified materials containing asbestos is presented in Appendix A. The laboratory analytical results are included in Appendix C. An excerpt from the AHERA Management Plan is included in Appendix D.

Because the proposed demolition activities may crush or pulverize the identified ACM, they must be removed prior to demolition by a qualified asbestos abatement contractor. Qualified asbestos abatement contractors should be contacted to obtain competitive bids for abatement.

6.0 LIMITATIONS/GENERAL COMMENTS

NESHAP regulations require a "thorough inspection" prior to demolition of a building, which includes destructive sampling. Due to occupancy of the buildings, the scope of this inspection was limited to non-destructive sampling and, as such, will not meet the requirements of NESHAP for demolition. An additional asbestos inspection, including destructive sampling, will be required prior to demolition of the buildings at the site. Terracon can provide a separate proposal for this additional asbestos inspection, upon request.

This asbestos inspection was conducted in a manner consistent with the level of care and skill ordinarily exercised by members of the profession currently practicing under similar conditions in the

same locale. The results, findings, conclusions, and recommendations expressed in this report are based on conditions observed during our inspection of the building. The information contained in this report is relevant to the date on which this inspection was performed and should not be relied upon to represent conditions at a later date. This report has been prepared on behalf of and exclusively for use by Gaston County Schools for specific application to their project as discussed. This report is not a bidding document. Contractors or consultants reviewing this report must draw their own conclusions regarding further investigation or remediation deemed necessary. Terracon does not warrant the work of regulatory agencies, laboratories, or other third parties supplying information which may have been used in the preparation of this report. No warranties, express or implied, are made.

APPENDIX A

SUMMARY OF IDENTIFIED MATERIALS CONTAINING ASBESTOS

Grier Middle School
 1622 E. Garrison Boulevard
 Gastonia, North Carolina

Building A

HA No.	Material Description	General Location	Condition / Classification	Percent / Type Asbestos *	Estimated Quantity**
A 6	Interior Window Caulk	Interior Side of Exterior Windows	Good / Category II Non-Friable	3% Chrysotile	150 Windows
A 15	1" Pipe Elbow Insulation	Lower – Storage Room/Closet, May be Located above Ceilings Throughout Building	Good / Friable	Insulation: 2% Amosite 15% Chrysotile Wrap: None Detected	Unable to Quantify
A 17	White Sink Mastic	Lower – Room 102	Good / Category II Non-Friable	3% Chrysotile	1 Sink
A 19	Gray Window Glazing	Exterior Windows	Good / Category II Non-Friable	2% Chrysotile	150 Windows
A 20	Gray Window Caulk	Exterior Windows	Good / Category II Non-Friable	3% Chrysotile	150 Windows
A 24	Acoustical Plaster Ceilings	Throughout Building Interior	Good / Friable	Up to 10% Chrysotile	18,100 ft ²
A 25	Heating Cabinet Liner Panels	Radiator Cabinets below Windows throughout Building	Good / Category II Non-Friable	Assumed ACM	1,300 ft ²
A 26	Fire Doors †	Interior and Exterior Doors throughout Building	Good / Friable	Assumed ACM	55 doors
A 27	Cementitious Panels	Bottoms of Exterior Overhangs	Good / Category II Non-Friable	Assumed ACM	110 ft ²
AR 9	Roof Flashing	Roof Overhangs	Good / Category I Non-Friable	Top Flashing: None Detected Felt: None Detected Bottom Flashing: 10% Chrysotile	450 ft
AR 10	Gray Roof Caulk	Roof Overhangs	Good / Category II Non-Friable	Gray Caulk: None Detected Black Caulk: 10% Chrysotile	450 ft

Note, remnant asbestos-containing floor tile and mastic may be concealed below cabinets and bookshelves.

Building B

HA No.	Material Description	General Location	Condition / Classification	Percent / Type Asbestos *	Estimated Quantity**
B 3	1" Pipe Elbow Insulation	Storage Room, May be Located above Ceilings Throughout Building	Good / Friable	Wrap: None Detected Insulation: 30% Chrysotile	Unable to Quantify
B 6	Interior Door Caulk	Interior Door Frames	Good / Category II Non-Friable	3% Chrysotile	21 Door Frames
B 16	Interior Window Caulk	Interior Side of Exterior Windows	Good / Category II Non-Friable	3% Chrysotile	2 Windows
B 19	White Door Caulk	Exterior Door Frames	Good / Category II Non-Friable	4% Chrysotile	3 Door Frames
B 23	Acoustical Plaster Ceilings	Auditorium and Hallways	Good / Friable	Up to 10% Chrysotile	6,000 ft ²
B 24	9"x9" Grey Floor Tile and Mastic	Auditorium and Storage Room	Good / Category I Non-Friable	Floor Tile: 5% Chrysotile Mastic: Assumed ACM	3,000 ft ²
B 25	9"x9" Tan Floor Tile and Mastic	Storage Room	Good / Category I Non-Friable	Floor Tile: 5% Chrysotile Mastic: Assumed ACM	10 ft ²
B 26	Fire Doors †	Interior and Exterior Doors throughout Building	Good / Friable	Assumed ACM	45 doors
B 27	Cementitious Panels	Bottom of Exterior Overhang, North Doors	Good / Category II Non-Friable	Assumed ACM	50 ft ²

Note, remnant asbestos-containing floor tile and mastic may be concealed below cabinets and bookshelves.

Building C

HA No.	Material Description	General Location	Condition / Classification	Percent / Type Asbestos *	Estimated Quantity**
C 6	Exterior Door Caulk	Exterior Door Frames	Good / Category II Non-Friable	3% Chrysotile	10 Door Frames
C 7	Exterior Window Glazing	Exterior Windows	Good / Category II Non-Friable	2% Chrysotile	80 Windows
C 8	Exterior Window Caulk	Exterior Windows	Good / Category II Non-Friable	4% Chrysotile	10 Window Frames
C 9	Acoustical Plaster Ceilings	Throughout Classrooms	Good / Friable	Up to 10% Chrysotile	10,000 ft ²
C 10	Heating Cabinet Liner Panels	Radiator Cabinets below Windows throughout Building	Good / Category II Non-Friable	Assumed ACM	750 ft ²
C 11	Fire Doors †	Interior and Exterior Doors throughout Building	Good / Friable	Assumed ACM	30 doors

Note, remnant asbestos-containing floor tile and mastic may be concealed below cabinets and bookshelves.

Building D

HA No.	Material Description	General Location	Condition / Classification	Percent / Type Asbestos *	Estimated Quantity**
D 6	Exterior Window Caulk	Exterior Windows	Good / Category II Non-Friable	3% Chrysotile	10 Window Frames
D 7	Exterior Window Glazing	Exterior Windows	Good / Category II Non-Friable	2% Chrysotile	80 Windows
D 8	Exterior Door Caulk	Exterior Door Frames	Good / Category II Non-Friable	4% Chrysotile	13 Door Frames
D 9	Black Sink Coating	Room 400 – Storage	Good / Category II Non-Friable	6% Chrysotile	1 Sink
D 10	Acoustical Plaster Ceilings	Throughout Classrooms	Good / Friable	Up to 10% Chrysotile	7,900 ft ²
D 11	Heating Cabinet Liner Panels	Radiator Cabinets below Windows throughout Building	Good / Category II Non-Friable	Assumed ACM	750 ft ²
D 12	Fire Doors †	Interior and Exterior Doors throughout Building	Good / Friable	Assumed ACM	22 doors

Note, remnant asbestos-containing floor tile and mastic may be concealed below cabinets and bookshelves.

Building E

HA No.	Material Description	General Location	Condition / Classification	Percent / Type Asbestos *	Estimated Quantity**
E 9	Exterior White Door Caulk	Exterior Door Frames	Good / Category II Non-Friable	5% Chrysotile	5 Door Frames
E 10	Interior Door Caulk	Interior Door Frames	Good / Category II Non-Friable	5% Chrysotile	12 Door Frames
E 11	2" Pipe Elbow Insulation	Kitchen, May be Located above Ceilings Throughout Building	Good / Friable	Wrap: None Detected Insulation: 60% Chrysotile	Unable to Quantify
E 16	Exterior Window Glazing	Exterior Windows	Good / Category II Non-Friable	2% Chrysotile	12 Windows
E 17	Exterior Window Frame Caulk	Exterior Windows	Good / Category II Non-Friable	3% Chrysotile	12 Windows
E 25	Fire Doors †	Interior and Exterior Doors throughout Building	Good / Friable	Assumed ACM	30 doors

Building F

HA No.	Material Description	General Location	Condition / Classification	Percent / Type Asbestos *	Estimated Quantity**
F 8	Exterior Window Frame Caulk	Exterior Windows	Good / Category II Non-Friable	3% Chrysotile	40 Windows
F 9	Exterior Door Caulk	Exterior Door Frames	Good / Category II Non-Friable	White Caulk: None Detected Tan Caulk: 3% Chrysotile	5 Door Frames
F 12	Acoustical Plaster Ceilings	Life Skills Classroom	Good / Friable	Up to 10% Chrysotile	1,150 ft ²
F 13	Cementitious Panels	Bottom of Exterior Overhang, West Doors	Good / Category II Non-Friable	Assumed ACM	140 ft ²
F 14	Fire Doors †	Interior and Exterior Doors throughout Building	Good / Friable	Assumed ACM	13 doors
FR 3	Silver Paint Penetrations	Upper Roof F	Good / Category I Non-Friable	Silver Paint: None Detected Tar: 2% Chrysotile	3 Penetrations

Building H

HA No.	Material Description	General Location	Condition / Classification	Percent / Type Asbestos *	Estimated Quantity**
H 6	Exterior Window Glazing	Exterior Windows	Good / Category II Non-Friable	2% Chrysotile	80 Windows
H 7	Exterior Window Frame Caulk	Exterior Windows	Good / Category II Non-Friable	2% Chrysotile	10 Windows
H 8	Exterior Door Caulk	Exterior Door Frames	Good / Category II Non-Friable	2% Chrysotile	8 Door Frames
H 9	9"x9" Grey Floor Tile and Mastic	Janitor's Closet and Janitor's Restroom	Good / Category I Non-Friable	Floor Tile: 5% Chrysotile Mastic: Assumed ACM	200 ft ²
H 10	Fire Doors †	Interior and Exterior Doors throughout Building	Good / Friable	Assumed ACM	20 doors

Note, remnant asbestos-containing floor tile and mastic may be concealed below cabinets and bookshelves.

Building I

HA No.	Material Description	General Location	Condition / Classification	Percent / Type Asbestos *	Estimated Quantity**
I 17	Grey Sink Coating	Upper – Band Room Break Room	Good / Category II Non-Friable	3% Chrysotile	1 Sink
I 21	Fire Doors †	Interior and Exterior Doors throughout Building	Good / Friable	Assumed ACM	75 doors

Media Center Building

HA No.	Material Description	General Location	Condition / Classification	Percent / Type Asbestos *	Estimated Quantity**
MC 12	Fire Doors †	Interior and Exterior Doors throughout Building	Good / Friable	Assumed ACM	17 doors

Greenhouse

No Suspect Asbestos-Containing Materials

† Fire doors throughout the school campus should be assumed to contain asbestos insulation until they can be sampled by a North Carolina asbestos inspector to confirm or refute this assumption.

* % and Type Asbestos = this column contains both the analytical result of the sample with the highest concentration of asbestos detected in the samples that make up the HA and the types of asbestos identified.

** Estimated quantities are based on cursory field observations and actual quantities may vary significantly, especially if these materials are present in hidden and/or inaccessible areas not evaluated as part of this inspection.

APPENDIX B

PHOTOGRAPHS FROM SITE

Building A



Photo #1 Building A Exterior



Photo #2 HA# A 6 – Interior Window Caulk



Photo #3 # A 15 – 1" Pipe Elbow Insulation



Photo #4 HA# A 17 – White Sink Mastic



Photo #5 HA# A 19 – Gray Window Glazing
HA# A 20 – Gray Window Caulk



Photo #6 HA# A 24 – Acoustical Plaster Ceilings

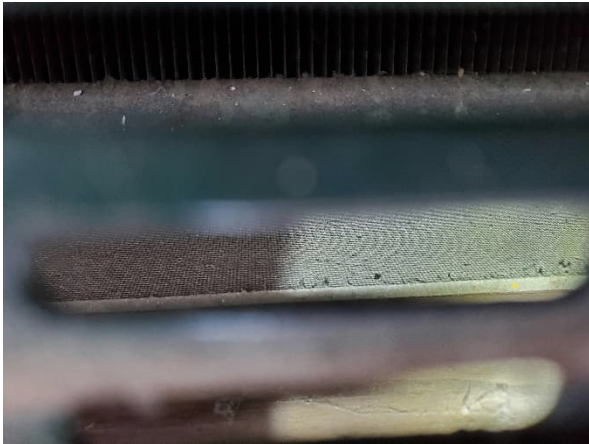


Photo #7 HA# A 25 – Heating Cabinet Liner Panels



Photo #8 HA# A 26 – Fire Doors (multiple types)



Photo #9 # A 27 – Cementitious Panels



Photo #10 HA# AR 9 – Roof Flashing
HA# AR 10 – Gray Roof Caulk

Building B



Photo #1 Building B Exterior



Photo #2 HA# B 3 – 1" Pipe Elbow Insulation

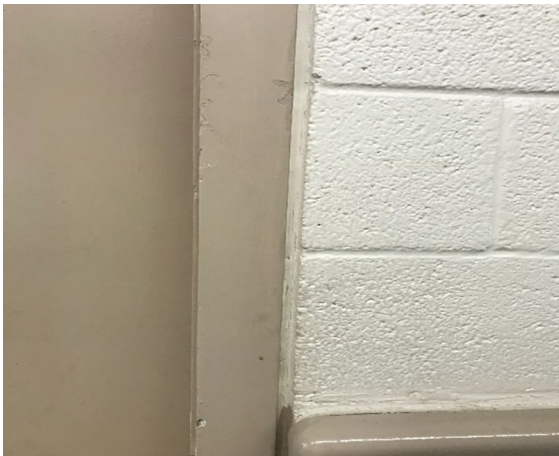


Photo #3 HA# B 6 – Interior Door Caulk



Photo #4 HA# B 16 – Interior Window Caulk

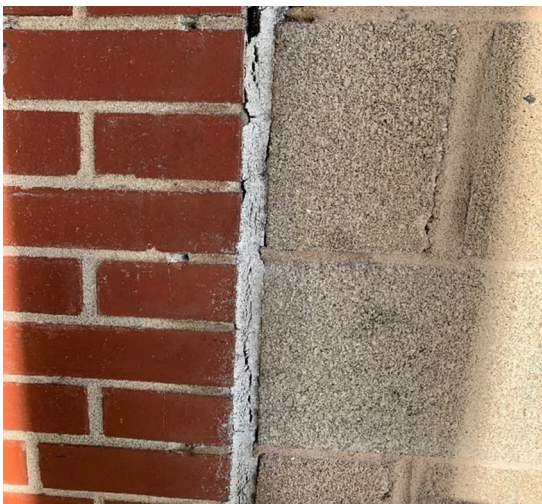


Photo #5 HA# B 19 – White Door Caulk

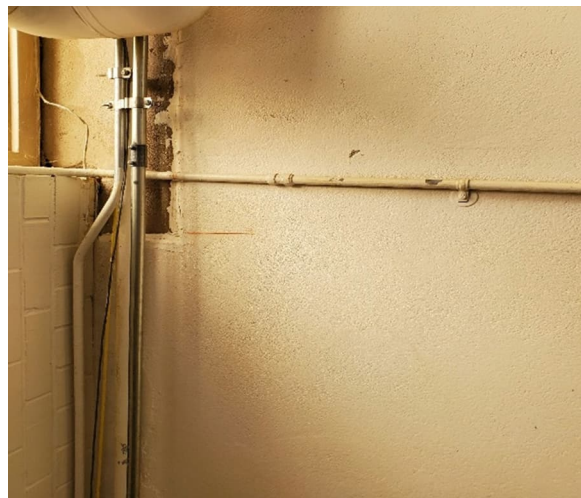


Photo #6 HA# B 23 – Acoustical Plaster Ceilings



Photo #7 HA# B 24 – 9"x9" Grey Floor Tile & Mastic
HA# B 25 – 9"x9" Tan Floor Tile & Mastic



Photo #8 HA# B 26 – Fire Doors (multiple types)



Photo #9 HA# B 27 – Cementitious Panels

Building C



Photo #1 Building C Exterior



Photo #2 HA# C 6 – Exterior Door Caulk



Photo #3 HA# C 7 – Exterior Window Glazing



Photo #4 HA# C 8 – Exterior Window Caulk



Photo #5 HA# C 9 – Acoustical Plaster Ceilings



Photo #6 HA# C 10 – Heating Cabinet Liner Panels



Photo #7 HA# C 11 – Fire Doors (multiple types)

Building D



Photo #1 Building D Exterior



Photo #2 HA# D 6 – Exterior Window Caulk
HA# D 7 – Exterior Window Glazing



Photo #3 HA# D 8 – Exterior Door Caulk



Photo #4 HA# D 9 – Black Sink Coating



Photo #5 HA# D 10 – Acoustical Plaster Ceilings



Photo #6 HA# D 11 – Heating Cabinet Liner Panels



Photo #7 HA# D 12 – Fire Doors (multiple types)

Building E



Photo #1 Building E Exterior

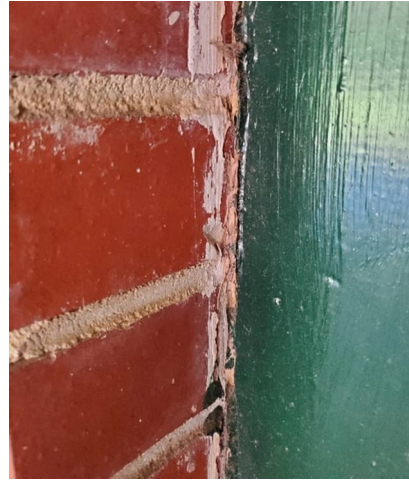


Photo #2 HA# E 9 – White Exterior Door Caulk



Photo #3 HA# E 10 – Interior Door Caulk



Photo #4 HA# E 11 – 2" Pipe Elbow Insulation



Photo #5 HA# E 16 – Exterior Window Glazing
HA# E 17 – Exterior Window Frame Caulk



Photo #6 HA# E 25 – Fire Doors (multiple types)

Building F



Photo #1 Building F Exterior



Photo #2 HA# F 8 – Exterior Window Frame Caulk



Photo #3 HA# F 9 – Exterior Door Caulk



Photo #4 HA# F 12 – Acoustical Plaster Ceilings



Photo #5 HA# F 13 – Cementitious Panels



Photo #6 HA# F 14 – Fire Doors (multiple types)



Photo #7 HA# FR 3 – Silver Paint Penetrations

Building H



Photo #1 Building H Exterior



Photo #2 HA# H 6 – Exterior Window Glazing
HA# H 7 – Exterior Window Frame Caulk

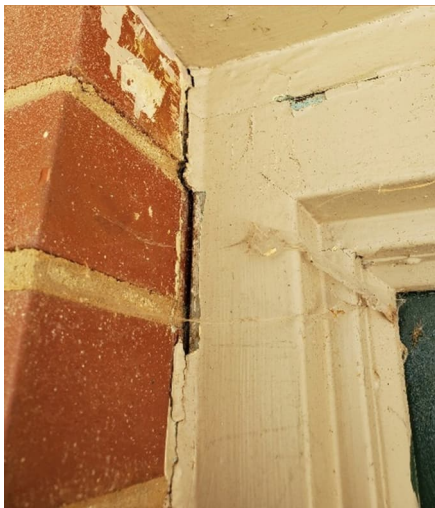


Photo #3 HA# H 8 – Exterior Door Caulk

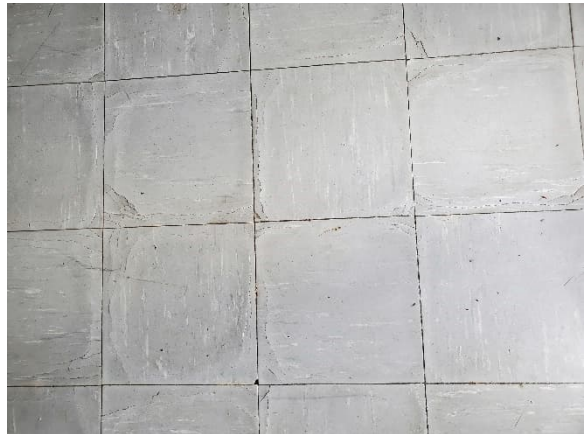


Photo #4 HA# H 9 – 9"x9" Grey Floor Tile & Mastic



Photo #5 HA# H 10 – Fire Doors (multiple types)

Building I



Photo #1 Building I Exterior



Photo #2 HA# I 17 – Grey Sink Coating



Photo #3 HA# I 21 – Fire Doors (multiple types)

Media Center Building



Photo #1 Media Center Building Exterior



Photo #2 HA# MC 12 – Fire Doors (multiple types)

Greenhouse



Photo #1 Greenhouse Exterior

APPENDIX C

ASBESTOS LABORATORY ANALYTICAL RESULTS

Inspector: Erick Hutson
 License: 12849
 Date: 4/15/2022 - 4/21/2022

Job Name: Grier Middle School
 Job Number: 71157008
 Area(s): Building A

Sample No.	Homogeneous Material Description	Sample Location	Floor	Condition	Quantity	Friable/ Non-Friable	Lab Results
A 1-1	2'x2' Pinhole Fissure Ceiling Tile	Upper - Outside Teachers Break Room	U	Good	6,400 ft²	Friable	None Detected
A 1-2	2'x2' Pinhole Fissure Ceiling Tile	Upper - Outside Health Room	U				None Detected
A 1-3	2'x2' Pinhole Fissure Ceiling Tile	Upper - Outside Storage Room	U				None Detected
A 2-1	CMU Block Surface Filler	Upper - Janitor Closet	U	Good	15,000 ft²	Friable	None Detected
A 2-2	CMU Block Surface Filler	Upper - Teacher Break Room	U				None Detected
A 2-3	CMU Block Surface Filler	Upper - Room 203	U				None Detected
A 2-4	CMU Block Surface Filler	Lower - Room 104	L				None Detected
A 2-5	CMU Block Surface Filler	Lower - Outside Room 101	U				None Detected
A 3-1	4" Black Covebase and Mastic	Upper - Teacher Break Room	U	Good	200 ft	Non-Friable	Covebase: None Detected Mastic: None Detected
A 3-2	4" Black Covebase and Mastic	Upper - Room 205	U				Covebase: None Detected Mastic: None Detected
A 3-3	4" Black Covebase and Mastic	Lower - Room 105	L				Covebase: None Detected Mastic: None Detected
A 4-1	12"x12" Beige/Tan Smear Floor Tile and Mastic	Upper - Outside Stairwell	U	Good	7,000 ft²	Non-Friable	Floor Tile: None Detected Mastic: None Detected
A 4-2	12"x12" Beige/Tan Smear Floor Tile and Mastic	Upper - Room 202	U				Floor Tile: None Detected Mastic: None Detected
A 4-3	12"x12" Beige/Tan Smear Floor Tile and Mastic	Lower - Room 105	L				Floor Tile: None Detected Mastic: None Detected
A 5-1	Interior Door Caulk	Upper - Conference Room	U	Good	52 doors	Non-Friable	None Detected
A 5-2	Interior Door Caulk	Lower - Room 104	L				None Detected
A 5-3	Interior Door Caulk	Lower - Room 106	L				None Detected
A 6-1	Interior Window Caulk	Upper - Room 204	U	Good	150 windows	Non-Friable	3% Chrysotile
A 6-2	Interior Window Caulk	Lower - Room 103	L				3% Chrysotile
A 6-3	Interior Window Caulk	Lower - Room 104	L				2% Chrysotile
A 7-1	5" Paper Pipe Wrap Dual Temp	Upper - Outside Teachers Break Room	U	Good	300 ft	Friable	None Detected
A 7-2	5" Paper Pipe Wrap Dual Temp	Upper - Outside Room 205	U				None Detected
A 7-3	5" Paper Pipe Wrap Dual Temp	Lower - Outside Room 106	L				None Detected
A 8-1	Wallboard and Joint Compound (Wall)	Upper - Outside Janitor Closet	U	Good	800 ft²	Friable	Wallboard: None Detected Joint Compound: None Detected
A 8-2	Wallboard and Joint Compound (Wall)	Upper - Conference Room	U				Wallboard: None Detected Joint Compound: None Detected
A 8-3	Wallboard and Joint Compound (Wall)	Upper - Break Room	U				Wallboard: None Detected Joint Compound: None Detected
A 9-1	Tan Fiber Board	Upper - Hallway Outside Teachers Break Room	U	Good	100 ft²	Friable	None Detected
A 9-2	Tan Fiber Board	Upper - Hallway Outside Teachers Break Room	U				None Detected
A 9-3	Tan Fiber Board	Upper - Hallway Outside Teachers Break Room	U				None Detected
A 10-1	12"x12" Brown/Brown Smear Floor Tile and Mastic	Upper - Janitor Closet	U	Good	150 ft²	Non-Friable	Floor Tile: None Detected Mastic: None Detected
A 10-2	12"x12" Brown/Brown Smear Floor Tile and Mastic	Upper - Janitor Closet	U				Floor Tile: None Detected Mastic: None Detected
A 10-3	12"x12" Brown/Brown Smear Floor Tile and Mastic	Upper - Janitor Closet	U				Floor Tile: None Detected Mastic: None Detected
A 11-1	Black Mastic	Upper - Conference Room Under Carpet	U	Good	150 ft²	Non-Friable	None Detected
A 11-2	Black Mastic	Upper - Conference Room Under Carpet	U				None Detected
A 11-3	Black Mastic	Upper - Conference Room Under Carpet	U				None Detected
A 12-1	White Duct Mastic	Upper - Janitor Closet	U	Good	50 ft	Non-Friable	None Detected
A 12-2	White Duct Mastic	Upper - Janitor Closet	U				None Detected

Inspector: Erick Hutson
 License: 12849
 Date: 4/15/2022 - 4/21/2022

Job Name: Grier Middle School
 Job Number: 71157008
 Area(s): Building A

Sample No.	Homogeneous Material Description	Sample Location	Floor	Condition	Quantity	Friable/ Non-Friable	Lab Results
A 12-3	White Duct Mastic	Upper - Janitor Closet	U				None Detected
A 13-1	Plaster (Ceiling)	Lower - Mechanical Room	L	Good	1,200 ft ²	Friable	White Coat: None Detected Grey Coat: None Detected
A 13-2	Plaster (Ceiling)	Lower - Mechanical Room	L				White Coat: None Detected Grey Coat: None Detected
A 13-3	Plaster (Ceiling)	Lower - Mechanical Room	L				White Coat: None Detected Grey Coat: None Detected
A 13-4	Plaster (Ceiling)	Upper - Mens Restroom	U				White Coat: None Detected Grey Coat: None Detected
A 13-5	Plaster (Ceiling)	Upper - Womens Restroom	U				White Coat: None Detected Grey Coat: None Detected
A 14-1	4" Canvas Pipe Wrap Hot Water	Lower - Mechanical Room	L	Good	200 ft	Friable	None Detected
A 14-2	4" Canvas Pipe Wrap Hot Water	Lower - Mechanical Room	L				None Detected
A 14-3	4" Canvas Pipe Wrap Hot Water	Lower - Mechanical Room	L				None Detected
A 15-1	1" Pipe Elbow Insulation	Lower - Storage Room/Closet	L	Good	Unable to Quantify	Friable	Insulation: 2% Amosite 15% Chrysotile Wrap: None Detected
A 15-2	1" Pipe Elbow Insulation	Lower - Storage Room/Closet	L				Insulation: 2% Amosite 15% Chrysotile Wrap: None Detected
A 15-3	1" Pipe Elbow Insulation	Lower - Storage Room/Closet	L				Insulation: 2% Amosite 15% Chrysotile Wrap: None Detected
A16-1	1" Fabric Pipe Wrap	Lower - Storage Room/Closet	L	Good	100 ft	Friable	None Detected
A16-2	1" Fabric Pipe Wrap	Lower - Storage Room/Closet	L				None Detected
A16-3	1" Fabric Pipe Wrap	Lower - Storage Room/Closet	L				None Detected
A 17-1	White Sink Mastic	Lower - Room 102	L	Good	1 sink	Non-Friable	2% Chrysotile
A 17-2	White Sink Mastic	Lower - Room 102	L				2% Chrysotile
A 17-3	White Sink Mastic	Lower - Room 102	L				3% Chrysotile
A 18-1	Red Fire Stop	Upper - Hallway	U	Good	20 ft ²	Non-Friable	None Detected
A 18-2	Red Fire Stop	Lower - Hallway 104	L				None Detected
A 18-3	Red Fire Stop	Upper - Hallway	U				None Detected



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<http://www.EMSL.com> / charlottelab@emsl.com

EMSL Order: 412204033

Customer ID: TITA52

Customer PO: 71157008

Project ID:

Attention: Erick Hutson
Terracon Consultants, Inc.
2701 Westport Road
Charlotte, NC 28208

Phone: (803) 984-9498

Fax: (704) 509-1888

Received Date: 04/25/2022 9:40 AM

Analysis Date: 04/28/2022

Collected Date: 04/15/2022

Project: Grier Middle School - 71157008 - Building A

Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

Sample	Description	Appearance	Non-Asbestos		Asbestos
			% Fibrous	% Non-Fibrous	% Type
A 1-1 412204033-0001	Upper - Outside Teachers Break Room - 2'x2' Pinhole Fissure Ceiling Tile	Tan/White Fibrous Homogeneous	60% Cellulose 2% Min. Wool	30% Perlite 8% Non-fibrous (Other)	None Detected
A 1-2 412204033-0002	Upper - Outside Health Room - 2'x2' Pinhole Fissure Ceiling Tile	Tan/White Fibrous Homogeneous	60% Cellulose 2% Min. Wool	30% Perlite 8% Non-fibrous (Other)	None Detected
A 1-3 412204033-0003	Upper - Outside Storage Room - 2'x2' Pinhole Fissure Ceiling Tile	Gray/White Fibrous Homogeneous	60% Cellulose 10% Min. Wool	15% Perlite 15% Non-fibrous (Other)	None Detected
A 2-1 412204033-0004	Upper - Janitor Closet - CMU Block Surface Filler	Gray/Beige Non-Fibrous Homogeneous		5% Quartz 10% Ca Carbonate 85% Non-fibrous (Other)	None Detected
A 2-2 412204033-0005	Upper - Teacher Break Room - CMU Block Surface Filler	Yellow/Beige Non-Fibrous Homogeneous		5% Ca Carbonate 95% Non-fibrous (Other)	None Detected
A 2-3 412204033-0006	Upper - Room 203 - CMU Block Surface Filler	White/Green Non-Fibrous Homogeneous		5% Ca Carbonate 95% Non-fibrous (Other)	None Detected
A 2-4 412204033-0007	Lower - Room 104 - CMU Block Surface Filler	Tan/White/Green Non-Fibrous Homogeneous		5% Quartz 15% Ca Carbonate 80% Non-fibrous (Other)	None Detected
A 2-5 412204033-0008	Lower - Outside Room 101 - CMU Block Surface Filler	Gray/Tan Non-Fibrous Homogeneous		5% Quartz 15% Ca Carbonate 80% Non-fibrous (Other)	None Detected
A 3-1-Cove Base 412204033-0009	Upper - Teacher Break Room - 4" Black Covebase and Mastic	Black Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
A 3-1-Mastic 412204033-0009A	Upper - Teacher Break Room - 4" Black Covebase and Mastic	Beige Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
A 3-2-Cove Base 412204033-0010	Upper - Room 205 - 4" Black Covebase and Mastic	Black Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
A 3-2-Mastic 412204033-0010A	Upper - Room 205 - 4" Black Covebase and Mastic	Beige Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
A 3-3-Cove Base 412204033-0011	Lower - Room 105 - 4" Black Covebase and Mastic	Black Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
A 3-3-Mastic 412204033-0011A	Lower - Room 105 - 4" Black Covebase and Mastic	Tan Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected

Initial report from: 04/29/2022 08:21:03



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EMSL Order: 412204033
Customer ID: TITA52
Customer PO: 71157008
Project ID:

Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

Sample	Description	Appearance	Non-Asbestos		Asbestos
			% Fibrous	% Non-Fibrous	% Type
A 4-1-Floor Tile 412204033-0012	Upper - Outside Stairwell - 12"x12" Beige-Tan Smear Floor Tile and Mastic	Tan Non-Fibrous Homogeneous		30% Ca Carbonate 70% Non-fibrous (Other)	None Detected
A 4-1-Mastic 412204033-0012A	Upper - Outside Stairwell - 12"x12" Beige-Tan Smear Floor Tile and Mastic	Tan Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
A 4-2-Floor Tile 412204033-0013	Upper - Room 202 - 12"x12" Beige-Tan Smear Floor Tile and Mastic	Tan Non-Fibrous Homogeneous		30% Ca Carbonate 70% Non-fibrous (Other)	None Detected
A 4-2-Mastic 412204033-0013A	Upper - Room 202 - 12"x12" Beige-Tan Smear Floor Tile and Mastic	Tan Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
A 4-3-Floor Tile 412204033-0014	Lower - Room 105 - 12"x12" Beige-Tan Smear Floor Tile and Mastic	Tan Non-Fibrous Homogeneous		30% Ca Carbonate 70% Non-fibrous (Other)	None Detected
A 4-3-Mastic 412204033-0014A	Lower - Room 105 - 12"x12" Beige-Tan Smear Floor Tile and Mastic	Tan Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
A 5-1 412204033-0015	Upper - Conference Room - Interior Door Caulk	Beige Non-Fibrous Homogeneous		5% Ca Carbonate 95% Non-fibrous (Other)	None Detected
A 5-2 412204033-0016	Lower - Room 104 - Interior Door Caulk	Beige Non-Fibrous Homogeneous		5% Ca Carbonate 95% Non-fibrous (Other)	None Detected
A 5-3 412204033-0017	Lower - Room 106 - Interior Door Caulk	White/Beige Non-Fibrous Homogeneous		10% Ca Carbonate 90% Non-fibrous (Other)	None Detected
A 6-1 412204033-0018	Upper - Room 204 - Interior Window Caulk	Tan Fibrous Homogeneous		5% Ca Carbonate 92% Non-fibrous (Other)	3% Chrysotile
A 6-2 412204033-0019	Lower - Room 103 - Interior Window Caulk	Tan Fibrous Homogeneous		5% Ca Carbonate 92% Non-fibrous (Other)	3% Chrysotile
A 6-3 412204033-0020	Lower - Room 104 - Interior Window Caulk	Gray/Tan Non-Fibrous Homogeneous		98% Non-fibrous (Other)	2% Chrysotile
A 7-1 412204033-0021	Upper - Outside Teachers Break Room - Paper Pipe Wrap Dual Temp	Silver/Beige Fibrous Homogeneous	70% Cellulose 2% Glass	28% Non-fibrous (Other)	None Detected
A 7-2 412204033-0022	Upper - Outside Room 205 - Paper Pipe Wrap Dual Temp	Silver/Beige Fibrous Homogeneous	70% Cellulose 2% Glass	28% Non-fibrous (Other)	None Detected
A 7-3 412204033-0023	Lower - Outside Room 106 - Paper Pipe Wrap Dual Temp	White/Silver Fibrous Homogeneous	60% Cellulose 10% Glass	30% Non-fibrous (Other)	None Detected
A 8-1-Joint Compound 412204033-0024	Upper - Outside Janitor Closet - Wallboard and Joint Compound - Wall	White Non-Fibrous Homogeneous		30% Ca Carbonate 70% Non-fibrous (Other)	None Detected

Initial report from: 04/29/2022 08:21:03



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EMSL Order: 412204033

Customer ID: TITA52

Customer PO: 71157008

Project ID:

Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

Sample	Description	Appearance	Non-Asbestos		Asbestos
			% Fibrous	% Non-Fibrous	% Type
A 8-1-Wallboard 412204033-0024A	Upper - Outside Janitor Closet - Wallboard and Joint Compound - Wall	Brown/Gray Fibrous Homogeneous	10% Cellulose 1% Glass	89% Non-fibrous (Other)	None Detected
A 8-2-Joint Compound 412204033-0025	Upper - Conference Room - Wallboard and Joint Compound - Wall	White Non-Fibrous Homogeneous		30% Ca Carbonate 70% Non-fibrous (Other)	None Detected
A 8-2-Wallboard 412204033-0025A	Upper - Conference Room - Wallboard and Joint Compound - Wall	Brown/Gray Fibrous Homogeneous	10% Cellulose 1% Glass	89% Non-fibrous (Other)	None Detected
A 8-3-Joint Compound 412204033-0026	Upper - Break Room - Wallboard and Joint Compound - Wall	White Non-Fibrous Homogeneous		30% Ca Carbonate 70% Non-fibrous (Other)	None Detected
A 8-3-Wallboard 412204033-0026A	Upper - Break Room - Wallboard and Joint Compound - Wall	Gray Non-Fibrous Homogeneous	10% Cellulose	90% Non-fibrous (Other)	None Detected
A 9-1 412204033-0027	Upper - Hallway Outside Teachers Break Room - Tan Fiber Board	Gray/White Fibrous Homogeneous	50% Cellulose	30% Perlite 20% Non-fibrous (Other)	None Detected
A 9-2 412204033-0028	Upper - Hallway Outside Teachers Break Room - Tan Fiber Board	Gray/Tan Fibrous Homogeneous	50% Cellulose	30% Perlite 20% Non-fibrous (Other)	None Detected
A 9-3 412204033-0029	Upper - Hallway Outside Teachers Break Room - Tan Fiber Board	Gray Fibrous Homogeneous	60% Cellulose	30% Perlite 10% Non-fibrous (Other)	None Detected
A 10-1-Floor Tile 412204033-0030	Upper - Janitor Closet - 12"x12" Brown-Brown Smear Floor Tile and Mastic	Tan Non-Fibrous Homogeneous		30% Ca Carbonate 70% Non-fibrous (Other)	None Detected
A 10-1-Mastic 412204033-0030A	Upper - Janitor Closet - 12"x12" Brown-Brown Smear Floor Tile and Mastic	Tan Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
A 10-2-Floor Tile 412204033-0031	Upper - Janitor Closet - 12"x12" Brown-Brown Smear Floor Tile and Mastic	Tan Non-Fibrous Homogeneous		30% Ca Carbonate 70% Non-fibrous (Other)	None Detected
A 10-2-Mastic 412204033-0031A	Upper - Janitor Closet - 12"x12" Brown-Brown Smear Floor Tile and Mastic	Tan Non-Fibrous Homogeneous	<1% Cellulose	100% Non-fibrous (Other)	None Detected
A 10-3-Floor Tile 412204033-0032	Upper - Janitor Closet - 12"x12" Brown-Brown Smear Floor Tile and Mastic	Tan Non-Fibrous Homogeneous		30% Ca Carbonate 70% Non-fibrous (Other)	None Detected
A 10-3-Mastic 412204033-0032A	Upper - Janitor Closet - 12"x12" Brown-Brown Smear Floor Tile and Mastic	Tan Non-Fibrous Homogeneous	2% Cellulose	98% Non-fibrous (Other)	None Detected
A 11-1 412204033-0033	Upper - Conference Room under Carpet - Black Mastic	Tan/Black Non-Fibrous Homogeneous	1% Cellulose	99% Non-fibrous (Other)	None Detected

Initial report from: 04/29/2022 08:21:03



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EMSL Order: 412204033
Customer ID: TITA52
Customer PO: 71157008
Project ID:

Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

Sample	Description	Appearance	Non-Asbestos		Asbestos
			% Fibrous	% Non-Fibrous	% Type
A 11-2 412204033-0034	Upper - Conference Room under Carpet - Black Mastic	Tan/Black Non-Fibrous Homogeneous	2% Cellulose	98% Non-fibrous (Other)	None Detected
A 11-3 412204033-0035	Upper - Conference Room under Carpet - Black Mastic	Black Non-Fibrous Homogeneous	2% Cellulose	98% Non-fibrous (Other)	None Detected
A 12-1 412204033-0036	Upper - Janitor Closet - White Duct Mastic	Beige Fibrous Homogeneous	2% Cellulose 3% Synthetic	95% Non-fibrous (Other)	None Detected
A 12-2 412204033-0037	Upper - Janitor Closet - White Duct Mastic	Beige Non-Fibrous Homogeneous	2% Cellulose 1% Synthetic	97% Non-fibrous (Other)	None Detected
A 12-3 412204033-0038	Upper - Janitor Closet - White Duct Mastic	Beige Non-Fibrous Homogeneous	2% Synthetic	98% Non-fibrous (Other)	None Detected
A 13-1-White Coat 412204033-0039	Lower - Mechanical Room - Plaster - Ceiling	White Non-Fibrous Homogeneous		10% Ca Carbonate 90% Non-fibrous (Other)	None Detected
A 13-1-Gray Coat 412204033-0039A	Lower - Mechanical Room - Plaster - Ceiling	Gray Non-Fibrous Homogeneous	1% Cellulose	30% Quartz 69% Non-fibrous (Other)	None Detected
A 13-2-White Coat 412204033-0040	Lower - Mechanical Room - Plaster - Ceiling	White Non-Fibrous Homogeneous		10% Ca Carbonate 90% Non-fibrous (Other)	None Detected
A 13-2-Gray Coat 412204033-0040A	Lower - Mechanical Room - Plaster - Ceiling	Gray Non-Fibrous Homogeneous	<1% Cellulose	30% Quartz 70% Non-fibrous (Other)	None Detected
A 13-3-White Coat 412204033-0041	Lower - Mechanical Room - Plaster - Ceiling	White Non-Fibrous Homogeneous		20% Ca Carbonate 80% Non-fibrous (Other)	None Detected
A 13-3-Gray Coat 412204033-0041A	Lower - Mechanical Room - Plaster - Ceiling	Gray Non-Fibrous Homogeneous	<1% Cellulose	30% Quartz 70% Non-fibrous (Other)	None Detected
A 13-4-White Coat 412204033-0042	Upper - Mens Restroom - Plaster - Ceiling	White Non-Fibrous Homogeneous		20% Ca Carbonate 80% Non-fibrous (Other)	None Detected
A 13-4-Gray Coat 412204033-0042A	Upper - Mens Restroom - Plaster - Ceiling	Gray Non-Fibrous Homogeneous		40% Quartz 60% Non-fibrous (Other)	None Detected
A 13-5-White Coat 412204033-0043	Upper - Womens Restroom - Plaster - Ceiling	White Non-Fibrous Homogeneous		20% Ca Carbonate 80% Non-fibrous (Other)	None Detected
A 13-5-Gray Coat 412204033-0043A	Upper - Womens Restroom - Plaster - Ceiling	Gray Non-Fibrous Homogeneous		40% Quartz 60% Non-fibrous (Other)	None Detected
A 14-1 412204033-0044	Lower - Mechanical Room - 4" Canvas Pipe Wrap Hot Water	Tan/Green/Beige Fibrous Homogeneous	90% Cellulose 2% Glass	8% Non-fibrous (Other)	None Detected
A 14-2 412204033-0045	Lower - Mechanical Room - 4" Canvas Pipe Wrap Hot Water	Tan/Green/Beige Fibrous Homogeneous	90% Cellulose 2% Glass	8% Non-fibrous (Other)	None Detected
A 14-3 412204033-0046	Lower - Mechanical Room - 4" Canvas Pipe Wrap Hot Water	Tan/Green/Beige Fibrous Homogeneous	80% Cellulose 10% Glass	10% Non-fibrous (Other)	None Detected
A 15-1-Wrap 412204033-0047	Lower - Storage Room-Closet - 1" Pipe Elbow Insulation	Beige Fibrous Homogeneous	99% Cellulose	1% Non-fibrous (Other)	None Detected

Initial report from: 04/29/2022 08:21:03



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EMSL Order: 412204033
Customer ID: TITA52
Customer PO: 71157008
Project ID:

Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

Sample	Description	Appearance	Non-Asbestos		Asbestos
			% Fibrous	% Non-Fibrous	% Type
A 15-1-Insulation 412204033-0047A	Lower - Storage Room-Closet - 1" Pipe Elbow Insulation	Gray Fibrous Homogeneous	10% Min. Wool	73% Non-fibrous (Other)	2% Amosite 15% Chrysotile
A 15-2-Wrap 412204033-0048	Lower - Storage Room-Closet - 1" Pipe Elbow Insulation	Beige Fibrous Homogeneous	99% Cellulose	1% Non-fibrous (Other)	None Detected
A 15-2-Insulation 412204033-0048A	Lower - Storage Room-Closet - 1" Pipe Elbow Insulation	Gray Fibrous Homogeneous	15% Min. Wool	68% Non-fibrous (Other)	2% Amosite 15% Chrysotile
A 15-3-Wrap 412204033-0049	Lower - Storage Room-Closet - 1" Pipe Elbow Insulation	White Fibrous Homogeneous	99% Cellulose	1% Non-fibrous (Other)	None Detected
A 15-3-Insulation 412204033-0049A	Lower - Storage Room-Closet - 1" Pipe Elbow Insulation	Gray Fibrous Homogeneous		83% Non-fibrous (Other)	2% Amosite 15% Chrysotile
A 16-1-Wrap 412204033-0050	Lower - Storage Room-Closet - 1" Fabric Pipe Wrap	Tan Fibrous Homogeneous	100% Cellulose		None Detected
A 16-1-Insulation 412204033-0050A	Lower - Storage Room-Closet - 1" Fabric Pipe Wrap	Yellow Fibrous Homogeneous	100% Glass		None Detected
A 16-2-Wrap 412204033-0051	Lower - Storage Room-Closet - 1" Fabric Pipe Wrap	Tan Fibrous Homogeneous	100% Cellulose		None Detected
A 16-2-Insulation 412204033-0051A	Lower - Storage Room-Closet - 1" Fabric Pipe Wrap	Yellow Fibrous Homogeneous	100% Glass		None Detected
A 16-3-Wrap 412204033-0052	Lower - Storage Room-Closet - 1" Fabric Pipe Wrap	Tan Fibrous Homogeneous	99% Cellulose	1% Non-fibrous (Other)	None Detected
A 16-3-Insulation 412204033-0052A	Lower - Storage Room-Closet - 1" Fabric Pipe Wrap	Yellow Fibrous Homogeneous	99% Glass	1% Non-fibrous (Other)	None Detected
A 17-1 412204033-0053	Lower - Room 102 - White Sink Mastic	White/Black Fibrous Homogeneous		98% Non-fibrous (Other)	2% Chrysotile
A 17-2 412204033-0054	Lower - Room 102 - White Sink Mastic	White/Black Fibrous Homogeneous		98% Non-fibrous (Other)	2% Chrysotile
A 17-3 412204033-0055	Lower - Room 102 - White Sink Mastic	White/Black Non-Fibrous Homogeneous		97% Non-fibrous (Other)	3% Chrysotile
A 18-1 412204033-0056	Upper - Hallway - Red Fire Stop	Red Fibrous Homogeneous	5% Synthetic	95% Non-fibrous (Other)	None Detected
A 18-2 412204033-0057	Lower - Hallway 104 - Red Fire Stop	Red Non-Fibrous Homogeneous	5% Synthetic	95% Non-fibrous (Other)	None Detected
A 18-3 412204033-0058	Upper - Hallway - Red Fire Stop	Red Non-Fibrous Homogeneous	2% Synthetic	98% Non-fibrous (Other)	None Detected

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EMSL Order: 412204033

Customer ID: TITA52

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Project ID:

Analyst(s)

Kristie Elliott (52)

Madeline Baldelli (29)

Lee Plumley, Laboratory Manager
or Other Approved Signatory

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Samples analyzed by EMSL Analytical, Inc. Pineville, NC NVLAP Lab Code 200841-0, VA 3333 00312

Initial report from: 04/29/2022 08:21:03

Inspector: Chad Chavis
 License: 12929
 Date: 7/27/2022

Job Name: Grier Middle School
 Job Number: 71157008
 Area(s): Building A Additional Sampling

Sample No.	Homogeneous Material Description	Sample Location	Floor	Condition	Quantity	Friable/ Non-Friable	Lab Results
A2-6	CMU Block Surface Filler	Room 204	U	Good		Friable	None Detected
A2-7	CMU Block Surface Filler	Hallway Room 205	U				None Detected
A19-1	Gray Window Glazing	Front Windows	Ext	Good	150 Windows	Non-Friable	2% Chrysotile
A19-2	Gray Window Glazing	Front Windows	Ext				None Detected
A19-3	Gray Window Glazing	Back Windows	Ext				2% Chrysotile
A20-1	Gray Window Caulk	Front Windows	Ext	Good	150 Windows	Non-Friable	3% Chrysotile
A20-2	Gray Window Caulk	Front Windows	Ext				2% Chrysotile
A20-3	Gray Window Caulk	Back Windows	Ext				3% Chrysotile
A21-1	Exterior Door Caulk	Side Door	Ext	Good		Non-Friable	None Detected
A21-2	Exterior Door Caulk	Side Door	Ext				None Detected
A21-3	Exterior Door Caulk	Side Door	Ext				None Detected
A22-1	Gray Sidewalk Caulk	Next to Side Door	Ext	Good		Non-Friable	None Detected
A22-2	Gray Sidewalk Caulk	Next to Side Door	Ext				None Detected
A22-3	Gray Sidewalk Caulk	Next to Side Door	Ext				None Detected
A23-1	Terrazzo Flooring	Upper Level	U	Good		Non-Friable	None Detected
A23-2	Terrazzo Flooring	Upper Level	U				None Detected
A23-3	Terrazzo Flooring	Lower Level	L				None Detected
AR 1-1	Roof Membrane	Building A Roof	R	Good		Non-Friable	None Detected
AR 1-2	Roof Membrane	Building A Roof	R				None Detected
AR 1-3	Roof Membrane	Building A Roof	R				None Detected
AR 2-1	Roof Flashing	Building A Roof	R	Good		Non-Friable	None Detected
AR 2-2	Roof Flashing	Building A Roof	R				None Detected
AR 2-3	Roof Flashing	Building A Roof	R				None Detected
AR 3-1	Silver Paint Penetrations	Building A Roof	R	Good		Non-Friable	None Detected
AR 3-2	Silver Paint Penetrations	Building A Roof	R				None Detected
AR 3-3	Silver Paint Penetrations	Building A Roof	R				None Detected
AR 4-1	Silver Paint on Vent	Building A Roof	R	Good		Non-Friable	None Detected
AR 4-2	Silver Paint on Vent	Building A Roof	R				None Detected
AR 4-3	Silver Paint on Vent	Building A Roof	R				None Detected
AR 5-1	Black Roof Tar Patch	Building A Roof	R	Good		Non-Friable	None Detected
AR 5-2	Black Roof Tar Patch	Building A Roof	R				None Detected
AR 5-3	Black Roof Tar Patch	Building A Roof	R				None Detected
AR 6-1	Gray Frame Mastic	Building A Roof	R	Good		Non-Friable	None Detected
AR 6-2	Gray Frame Mastic	Building A Roof	R				None Detected
AR 6-3	Gray Frame Mastic	Building A Roof	R				None Detected
AR 7-1	White Vent Caulk	Building A Roof	R	Good		Non-Friable	None Detected
AR 7-2	White Vent Caulk	Building A Roof	R				None Detected
AR 7-3	White Vent Caulk	Building A Roof	R				None Detected
AR 8-1	Roof Membrane	Front Overhang A	R	Good		Non-Friable	None Detected
AR 8-2	Roof Membrane	Back Overhang A	R				None Detected
AR 8-3	Roof Membrane	Back Overhang A	R				None Detected

Inspector: Chad Chavis
 License: 12929
 Date: 7/27/2022

Job Name: Grier Middle School
 Job Number: 71157008
 Area(s): Building A Additional Sampling

Sample No.	Homogeneous Material Description	Sample Location	Floor	Condition	Quantity	Friable/ Non-Friable	Lab Results
AR 9-1	Roof Flashing	Front Overhang A	R	Good	450 ft	Non-Friable	Top Flashing: None Detected Felt: None Detected Bottom Flashing: 10% Chrysotile
AR 9-2	Roof Flashing	Back Overhang A	R				Top Flashing: None Detected Felt: None Detected Bottom Flashing: 10% Chrysotile
AR 9-3	Roof Flashing	Back Overhang A	R				Top Flashing: None Detected Felt: None Detected Bottom Flashing: 8% Chrysotile
AR 10-1	Gray Roof Caulk	Front Overhang A	R	Good	450 ft	Non-Friable	Gray Caulk: None Detected Black Caulk: 10% Chrysotile
AR 10-2	Gray Roof Caulk	Back Overhang A	R				Gray Caulk: None Detected Black Caulk: 10% Chrysotile
AR 10-3	Gray Roof Caulk	Back Overhang A	R				Gray Caulk: None Detected Black Caulk: 10% Chrysotile



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EMSL Order: 412207373

Customer ID: TITA52

Customer PO: 71227143

Project ID:

Attention: Chad Chavis
Terracon Consultants, Inc.
2701 Westport Road
Charlotte, NC 28208

Phone: (704) 307-3045

Fax: (704) 509-1888

Received Date: 07/29/2022 12:45 PM

Analysis Date: 08/02/2022

Collected Date: 07/27/2022

Project: Grier Middle School Demolition/ 71227143/ Building A Additional Sampling

Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

Sample	Description	Appearance	Non-Asbestos		Asbestos
			% Fibrous	% Non-Fibrous	% Type
A2-6 <small>412207373-0001</small>	Room 204 - CMU Block Surface Filler	Tan/White Non-Fibrous Homogeneous		10% Ca Carbonate 90% Non-fibrous (Other)	None Detected
A2-7 <small>412207373-0002</small>	Hallway Room 205 - CMU Block Surface Filler	Tan/White/Beige Non-Fibrous Homogeneous		15% Quartz 10% Ca Carbonate 75% Non-fibrous (Other)	None Detected
A19-1 <small>412207373-0003</small>	Front Windows - Gray Window Glazing	Gray/White Non-Fibrous Homogeneous		98% Non-fibrous (Other)	2% Chrysotile
A19-2-Caulk <small>412207373-0004</small>	Front Windows - Gray Window Glazing	Gray/White Non-Fibrous Homogeneous		15% Ca Carbonate 85% Non-fibrous (Other)	None Detected
A19-2-Glazing <small>412207373-0004A</small>	Front Windows - Gray Window Glazing	Gray/White Non-Fibrous Homogeneous	2% Fibrous (Other)	98% Non-fibrous (Other)	None Detected
A19-3 <small>412207373-0005</small>	Backndows - Gray Window Glazing	Gray/Tan Non-Fibrous Homogeneous		98% Non-fibrous (Other)	2% Chrysotile
A20-1 <small>412207373-0006</small>	Front Windows - Gray Window Caulk	Gray/White Non-Fibrous Homogeneous		97% Non-fibrous (Other)	3% Chrysotile
A20-2 <small>412207373-0007</small>	Front Windows - Gray Window Caulk	Gray/White Non-Fibrous Homogeneous		98% Non-fibrous (Other)	2% Chrysotile
A20-3 <small>412207373-0008</small>	Back Windows - Gray Window Caulk	Gray/White Non-Fibrous Homogeneous		97% Non-fibrous (Other)	3% Chrysotile
A21-1 <small>412207373-0009</small>	Side Door - Exterior Door Caulk	Brown/Green Non-Fibrous Homogeneous	2% Glass	15% Ca Carbonate 83% Non-fibrous (Other)	None Detected
A21-2 <small>412207373-0010</small>	Side Door - Exterior Door Caulk	Brown/Green Non-Fibrous Homogeneous	2% Glass	15% Ca Carbonate 83% Non-fibrous (Other)	None Detected
A21-3 <small>412207373-0011</small>	Side Door - Exterior Door Caulk	Brown/Gray/Green Non-Fibrous Homogeneous		15% Ca Carbonate 85% Non-fibrous (Other)	None Detected
A22-1 <small>412207373-0012</small>	Next to Side Door - Gray Sidewalk Caulk	Gray/Clear Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
A22-2 <small>412207373-0013</small>	Next to Side Door - Gray Sidewalk Caulk	Gray/Clear Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
A22-3 <small>412207373-0014</small>	Next to Side Door - Gray Sidewalk Caulk	Gray/Clear Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
A23-1 <small>412207373-0015</small>	Upper Level - Terrazo Flooring	Gray/White/Variou Non-Fibrous Homogeneous		40% Quartz 60% Non-fibrous (Other)	None Detected

Initial report from: 08/04/2022 07:49:52



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EMSL Order: 412207373
Customer ID: TITA52
Customer PO: 71227143
Project ID:

Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

Sample	Description	Appearance	Non-Asbestos		Asbestos
			% Fibrous	% Non-Fibrous	% Type
A23-2 412207373-0016	Upper Level - Terrazo Flooring	Gray/White/Various Non-Fibrous Homogeneous		40% Quartz 60% Non-fibrous (Other)	None Detected
A23-3-Flooring 412207373-0017	Lower Level - Terrazo Flooring	White/Black Non-Fibrous Homogeneous		20% Quartz 80% Non-fibrous (Other)	None Detected
A23-3-Mortar 412207373-0017A	Lower Level - Terrazo Flooring	Gray Non-Fibrous Homogeneous		30% Quartz 70% Non-fibrous (Other)	None Detected
AR 1-1-Membrane 412207373-0018	Building A Roof - Roof Membrane	Black Fibrous Homogeneous	25% Cellulose	75% Non-fibrous (Other)	None Detected
AR 1-1-Insulation 412207373-0018A	Building A Roof - Roof Membrane	Gray/Tan Non-Fibrous Homogeneous	95% Cellulose	5% Non-fibrous (Other)	None Detected
AR 1-2-Membrane 412207373-0019	Building A Roof - Roof Membrane	Black Non-Fibrous Homogeneous	25% Cellulose	10% Quartz 65% Non-fibrous (Other)	None Detected
AR 1-2-Insulation 412207373-0019A	Building A Roof - Roof Membrane	Tan Fibrous Homogeneous	95% Cellulose	5% Non-fibrous (Other)	None Detected
AR 1-3-Membrane 412207373-0020	Building A Roof - Roof Membrane	Black Fibrous Homogeneous	10% Glass	5% Quartz 85% Non-fibrous (Other)	None Detected
AR 1-3-Insulation 412207373-0020A	Building A Roof - Roof Membrane	Brown/Yellow Fibrous Homogeneous	80% Cellulose	20% Non-fibrous (Other)	None Detected
AR 2-1 412207373-0021	Building A Roof - Roof Flashing	White/Black Fibrous Homogeneous	25% Cellulose	10% Quartz 65% Non-fibrous (Other)	None Detected
AR 2-2 412207373-0022	Building A Roof - Roof Flashing	White/Black Fibrous Homogeneous	25% Glass	10% Quartz 65% Non-fibrous (Other)	None Detected
AR 2-3 412207373-0023	Building A Roof - Roof Flashing	Brown/Black Fibrous Homogeneous	15% Cellulose	5% Quartz 80% Non-fibrous (Other)	None Detected
AR 3-1 412207373-0024	Building A Roof - Silver Paint Penetrations	Gray/Silver Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
AR 3-2 412207373-0025	Building A Roof - Silver Paint Penetrations	Gray/Silver Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
AR 3-3 412207373-0026	Building A Roof - Silver Paint Penetrations	White/Silver Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
AR 4-1 412207373-0027	Building A Roof - Silver Paint on Vent	Silver Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
AR 4-2 412207373-0028	Building A Roof - Silver Paint on Vent	Silver Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
AR 4-3 412207373-0029	Building A Roof - Silver Paint on Vent	Red/Black Non-Fibrous Homogeneous	2% Cellulose	98% Non-fibrous (Other)	None Detected
AR 5-1-Silver Paint 412207373-0030	Building A Roof - Black Roof Tar Patch	Silver Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected

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EMSL Order: 412207373
Customer ID: TITA52
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Project ID:

Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

Sample	Description	Appearance	Non-Asbestos		Asbestos
			% Fibrous	% Non-Fibrous	% Type
AR 5-1-Patch <small>412207373-0030A</small>	Building A Roof - Black Roof Tar Patch	Black Fibrous Homogeneous	25% Cellulose	75% Non-fibrous (Other)	None Detected
AR 5-2-Silver Paint <small>412207373-0031</small>	Building A Roof - Black Roof Tar Patch	Silver Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
AR 5-2-Patch <small>412207373-0031A</small>	Building A Roof - Black Roof Tar Patch	Black Fibrous Homogeneous	25% Cellulose	75% Non-fibrous (Other)	None Detected
AR 5-3-Silver Paint <small>412207373-0032</small>	Building A Roof - Black Roof Tar Patch	Silver Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
AR 5-3-Patch <small>412207373-0032A</small>	Building A Roof - Black Roof Tar Patch	Black Fibrous Homogeneous	15% Cellulose	85% Non-fibrous (Other)	None Detected
AR 6-1 <small>412207373-0033</small>	Building A Roof - Gray Frame Mastic	Gray/White Fibrous Homogeneous	10% Synthetic	90% Non-fibrous (Other)	None Detected
AR 6-2 <small>412207373-0034</small>	Building A Roof - Gray Frame Mastic	Gray/White Non-Fibrous Homogeneous		15% Ca Carbonate 85% Non-fibrous (Other)	None Detected
AR 6-3 <small>412207373-0035</small>	Building A Roof - Gray Frame Mastic	Gray/White Non-Fibrous Homogeneous	3% Synthetic	15% Ca Carbonate 82% Non-fibrous (Other)	None Detected
AR 7-1 <small>412207373-0036</small>	Building A Roof - White Vent Caulk	Gray/White Non-Fibrous Homogeneous		15% Ca Carbonate 85% Non-fibrous (Other)	None Detected
AR 7-2 <small>412207373-0037</small>	Building A Roof - White Vent Caulk	Gray/White Non-Fibrous Homogeneous		15% Ca Carbonate 85% Non-fibrous (Other)	None Detected
AR 7-3 <small>412207373-0038</small>	Building A Roof - White Vent Caulk	Gray/White Non-Fibrous Homogeneous		10% Ca Carbonate 90% Non-fibrous (Other)	None Detected
AR 8-1 <small>412207373-0039</small>	Front Overhang A - Roof Membrane	Black Fibrous Homogeneous	15% Glass	85% Non-fibrous (Other)	None Detected
AR 8-2 <small>412207373-0040</small>	Back Overhang A - Roof Membrane	Black Fibrous Homogeneous	15% Glass	85% Non-fibrous (Other)	None Detected
AR 8-3 <small>412207373-0041</small>	Back Overhang A - Roof Membrane	Black Fibrous Homogeneous	10% Glass	90% Non-fibrous (Other)	None Detected
AR 9-1-Top Flashing <small>412207373-0042</small>	Front Overhang A - Roof Flashing	Black Non-Fibrous Homogeneous	15% Glass	85% Non-fibrous (Other)	None Detected
AR 9-1-Felt <small>412207373-0042A</small>	Front Overhang A - Roof Flashing	Black Fibrous Homogeneous	35% Glass	65% Non-fibrous (Other)	None Detected
AR 9-1-Bottom Flashing <small>412207373-0042B</small>	Front Overhang A - Roof Flashing	Gray/Black Fibrous Homogeneous		90% Non-fibrous (Other)	10% Chrysotile
AR 9-2-Top Flashing <small>412207373-0043</small>	Back Overhang A - Roof Flashing	Black Fibrous Homogeneous	15% Glass	85% Non-fibrous (Other)	None Detected
AR 9-2-Felt <small>412207373-0043A</small>	Back Overhang A - Roof Flashing	Black Fibrous Homogeneous	35% Glass	65% Non-fibrous (Other)	None Detected

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EMSL Order: 412207373
Customer ID: TITA52
Customer PO: 71227143
Project ID:

Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

Sample	Description	Appearance	Non-Asbestos		Asbestos
			% Fibrous	% Non-Fibrous	% Type
AR 9-2-Bottom Flashing <i>412207373-0043B</i>	Back Overhang A - Roof Flashing	Black Fibrous Homogeneous		90% Non-fibrous (Other)	10% Chrysotile
AR 9-3-Top Flashing <i>412207373-0044</i>	Back Overhang A - Roof Flashing	Brown/Black Non-Fibrous Homogeneous	2% Glass	98% Non-fibrous (Other)	None Detected
AR 9-3-Felt <i>412207373-0044A</i>	Back Overhang A - Roof Flashing	Black Fibrous Homogeneous	10% Glass	90% Non-fibrous (Other)	None Detected
AR 9-3-Bottom Flashing <i>412207373-0044B</i>	Back Overhang A - Roof Flashing	Black Non-Fibrous Homogeneous		92% Non-fibrous (Other)	8% Chrysotile
AR 10-1-Gray Caulk <i>412207373-0045</i>	Front Overhang A - Gray Roof Caulk	Gray/White Non-Fibrous Homogeneous		15% Ca Carbonate 85% Non-fibrous (Other)	None Detected
AR 10-1-Black Caulk <i>412207373-0045A</i>	Front Overhang A - Gray Roof Caulk	Black Fibrous Homogeneous		90% Non-fibrous (Other)	10% Chrysotile
AR 10-2-Gray Caulk <i>412207373-0046</i>	Back Overhang A - Gray Roof Caulk	Gray/White Non-Fibrous Homogeneous		15% Ca Carbonate 85% Non-fibrous (Other)	None Detected
AR 10-2-Black Caulk <i>412207373-0046A</i>	Back Overhang A - Gray Roof Caulk	Black Fibrous Homogeneous		90% Non-fibrous (Other)	10% Chrysotile
AR 10-3-Gray Caulk <i>412207373-0047</i>	Back Overhang A - Gray Roof Caulk	Gray/White Non-Fibrous Homogeneous		15% Ca Carbonate 85% Non-fibrous (Other)	None Detected
AR 10-3-Black Caulk <i>412207373-0047A</i>	Back Overhang A - Gray Roof Caulk	Gray/Black Non-Fibrous Homogeneous		90% Non-fibrous (Other)	10% Chrysotile

Analyst(s) _____

Brant Alyea (42)

Madeline Baldelli (22)

Lee Plumley, Laboratory Manager
or Other Approved Signatory

EMSL maintains liability limited to cost of analysis. Interpretation and use of test results are the responsibility of the client. This report relates only to the samples reported above, and may not be reproduced, except in full, without written approval by EMSL. EMSL bears no responsibility for sample collection activities or analytical method limitations. The report reflects the samples as received. Results are generated from the field sampling data (sampling volumes and areas, locations, etc.) provided by the client on the Chain of Custody. Samples are within quality control criteria and met method specifications unless otherwise noted. The above analyses were performed in general compliance with Appendix E to Subpart E of 40 CFR (previously EPA 600/M4-82-020 "Interim Method") but augmented with procedures outlined in the 1993 ("final") version of the method. This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST or any agency of the federal government. Non-friable organically bound materials present a problem matrix and therefore EMSL recommends gravimetric reduction prior to analysis. Unless requested by the client, building materials manufactured with multiple layers (i.e. linoleum, wallboard, etc.) are reported as a single sample. Estimation of uncertainty is available on request.

Samples analyzed by EMSL Analytical, Inc. Pineville, NC NVLAP Lab Code 200841-0, VA 3333 00312

Initial report from: 08/04/2022 07:49:52

Inspector: Erick Hutson
 License: 12849
 Date: 4/15/2022 - 4/21/2022

Job Name: Grier Middle School
 Job Number: 71157008-32
 Area(s): Building B

Sample No.	Homogeneous Material Description	Sample Location	Condition	Quantity	Friable/ Non-Friable	Lab Results
B 1-1	Plaster (Ceiling)	Storage Room Center	Good	600 ft ²	Friable	White Coat: None Detected Brown Coat: None Detected
B 1-2	Plaster (Ceiling)	Storage Room Right				White Coat: None Detected Brown Coat: None Detected
B 1-3	Plaster (Ceiling)	Storage Room Left				White Coat: None Detected Brown Coat: None Detected
B 2-1	Plaster (Wall)	Stage Stairs North	Good	2,000 ft ²	Friable	White Coat: None Detected Brown Coat: None Detected
B 2-2	Plaster (Wall)	Stage Stairs South				White Coat: None Detected Brown Coat: None Detected
B 2-3	Plaster (Wall)	Stage Left Wall				White Coat: None Detected Brown Coat: None Detected
B 2-4	Plaster (Wall)	Stage North				White Coat: None Detected Brown Coat: None Detected
B 2-5	Plaster (Wall)	Stage South				White Coat: None Detected Brown Coat: None Detected
B 3-1	1" Pipe Elbow Insulation	Stage Storage Room	Good	Unable to Quantify	Friable	Wrap: None Detected Insulation: 30% Chrysotile
B 3-2	1" Pipe Elbow Insulation	Stage Storage Room				Wrap: None Detected Insulation: 30% Chrysotile
B 3-3	1" Pipe Elbow Insulation	Stage Storage Room				Wrap: None Detected Insulation: 25% Chrysotile
B 4-1	12"x12" Beige/Tan Smear Floor Tile and Mastic	Stage Stairs Left	Good	400 ft ²	Non-Friable	Floor Tile: None Detected Mastic: None Detected Leveler: None Detected
B 4-2	12"x12" Beige/Tan Smear Floor Tile and Mastic	Stage Stairs Right				Floor Tile: None Detected Mastic: None Detected Leveler: None Detected
B 4-3	12"x12" Beige/Tan Smear Floor Tile and Mastic	Stage Stairs Outside Storage				Floor Tile: None Detected Mastic: None Detected Leveler: None Detected
B 5-1	12"x12" Green Floor Tile and Mastic	Auditorium North	Good	600 ft ²	Non-Friable	Floor Tile: None Detected Mastic: None Detected
B 5-2	12"x12" Green Floor Tile and Mastic	Auditorium Near Stairs				Floor Tile: None Detected Mastic: None Detected
B 5-3	12"x12" Green Floor Tile and Mastic	Auditorium Stairs				Floor Tile: None Detected Mastic: None Detected
B 6-1	Interior Door Caulk	Academy Room	Good	21 doors	Non-Friable	3% Chrysotile
B 6-2	Interior Door Caulk	Guidance Office				2% Chrysotile
B 6-3	Interior Door Caulk	Auditorium Entrance				3% Chrysotile
B 7-1	12"x12" Tan/Brown Smear Floor Tile and Mastic	Nurses Room	Good	100 ft ²	Non-Friable	Floor Tile: None Detected Mastic: None Detected
B 7-2	12"x12" Tan/Brown Smear Floor Tile and Mastic	Nurses Room				Floor Tile: None Detected Mastic: None Detected
B 7-3	12"x12" Tan/Brown Smear Floor Tile and Mastic	Nurses Room				Floor Tile: None Detected Mastic: None Detected
B 8-1	4" Black Covebase and Mastic	Nurses Room	Good	600 ft	Non-Friable	Covebase: None Detected Mastic: None Detected

Inspector: Erick Hutson
 License: 12849
 Date: 4/15/2022 - 4/21/2022

Job Name: Grier Middle School
 Job Number: 71157008-32
 Area(s): Building B

Sample No.	Homogeneous Material Description	Sample Location	Condition	Quantity	Friable/ Non-Friable	Lab Results
B 8-2	4" Black Covebase and Mastic	Office				Covebase: None Detected Mastic: None Detected
B 8-3	4" Black Covebase and Mastic	Copier Room				Covebase: None Detected Mastic: None Detected
B 9-1	Wallboard (Ceiling)	Mens Bathroom	Good	800 ft ²	Friable	Wallboard: None Detected Joint Compound: None Detected
B 9-2	Wallboard (Ceiling)	Womens Bathroom				Wallboard: None Detected Joint Compound: None Detected
B 9-3	Wallboard (Ceiling)	Facility Restroom				Wallboard: None Detected Joint Compound: None Detected
B 10-1	2'x2' Pinhole Fissure Ceiling Tile	Nurses Room	Good	800 ft ²	Friable	None Detected
B 10-2	2'x2' Pinhole Fissure Ceiling Tile	Office				None Detected
B 10-3	2'x2' Pinhole Fissure Ceiling Tile	Copier Room				None Detected
B 11-1	Yellow Carpet Glue	Office	Good	150 ft ²	Non-Friable	None Detected
B 11-2	Yellow Carpet Glue	Office				None Detected
B 11-3	Yellow Carpet Glue	Office				None Detected
B 12-1	6" Canvas Pipe Wrap Hot Water	Hallway Outside Office	Good	200 ft ²	Friable	None Detected
B 12-2	6" Canvas Pipe Wrap Hot Water	Copier Room				None Detected
B 12-3	6" Canvas Pipe Wrap Hot Water	Academy Room				None Detected
B 13-1	CMU Block Surface Filler	Nurses Room	Good	12,000 ft ²	Friable	None Detected
B 13-2	CMU Block Surface Filler	Auditorium				None Detected
B 13-3	CMU Block Surface Filler	Copier Room				None Detected
B 14-1	12"x12" White/Multi-Colored Smear Floor Tile and Mastic	Copier Room	Good	250 ft ²	Non-Friable	Floor Tile: None Detected Mastic: None Detected
B 14-2	12"x12" White/Multi-Colored Smear Floor Tile and Mastic	Copier Room				Floor Tile: None Detected Mastic: None Detected
B 14-3	12"x12" White/Multi-Colored Smear Floor Tile and Mastic	Academy Room				Floor Tile: None Detected Mastic: None Detected
B 15-1	2" Canvas Pipe Wrap Hot Water	Stage Storage	Good	120 ft	Friable	None Detected
B 15-2	2" Canvas Pipe Wrap Hot Water	Stage Storage				None Detected
B 15-3	2" Canvas Pipe Wrap Hot Water	Stage Storage				None Detected
B 16-1	Interior Window Caulk	Entrance Hallway	Good	2 windows	Non-Friable	3% Chrysotile
B 16-2	Interior Window Caulk	Entrance Hallway				3% Chrysotile
B 16-3	Interior Window Caulk	Entrance Hallway				2% Chrysotile
B 17-1	12"x12" Beige/Dark Brown Smear Floor Tile and Mastic	Guidance Office	Good	150 ft ²	Non-Friable	Floor Tile: None Detected Mastic: None Detected
B 17-2	12"x12" Beige/Dark Brown Smear Floor Tile and Mastic	Guidance Office				Floor Tile: None Detected Mastic: None Detected
B 17-3	12"x12" Beige/Dark Brown Smear Floor Tile and Mastic	Guidance Office				Floor Tile: None Detected Mastic: None Detected
B 18-1	4" Grey Covebase and Mastic	Stage	Good	50 ft	Non-Friable	Covebase: None Detected Mastic: None Detected
B 18-2	4" Grey Covebase and Mastic	Stage				Covebase: None Detected Mastic: None Detected
B 18-3	4" Grey Covebase and Mastic	Stage				Covebase: None Detected Mastic: None Detected



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EMSL Order: 412204008

Customer ID: TITA52

Customer PO: 71157008

Project ID:

Attention: Erick Hutson
Terracon Consultants, Inc.
2701 Westport Road
Charlotte, NC 28208

Phone: (803) 984-9498

Fax: (704) 509-1888

Received Date: 04/25/2022 9:40 AM

Analysis Date: 04/28/2022

Collected Date: 04/15/2022

Project: Grier Middle School - 71157008-32 - Building B

Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

Sample	Description	Appearance	Non-Asbestos		Asbestos
			% Fibrous	% Non-Fibrous	% Type
B 1-1-White Coat <small>412204008-0001</small>	Storage Room Center - Plaster - Ceiling	White Non-Fibrous Homogeneous		10% Ca Carbonate 90% Non-fibrous (Other)	None Detected
B 1-1-Brown Coat <small>412204008-0001A</small>	Storage Room Center - Plaster - Ceiling	Brown Non-Fibrous Homogeneous		30% Quartz 70% Non-fibrous (Other)	None Detected
B 1-2-White Coat <small>412204008-0002</small>	Storage Room Right - Plaster - Ceiling	White Non-Fibrous Homogeneous		10% Ca Carbonate 90% Non-fibrous (Other)	None Detected
B 1-2-Brown Coat <small>412204008-0002A</small>	Storage Room Right - Plaster - Ceiling	Brown Non-Fibrous Homogeneous		30% Quartz 70% Non-fibrous (Other)	None Detected
B 1-3-White Coat <small>412204008-0003</small>	Storage Room Left - Plaster - Ceiling	White Non-Fibrous Homogeneous		15% Ca Carbonate 85% Non-fibrous (Other)	None Detected
B 1-3-Brown Coat <small>412204008-0003A</small>	Storage Room Left - Plaster - Ceiling	Gray Non-Fibrous Homogeneous		30% Quartz 70% Non-fibrous (Other)	None Detected
B 2-1-White Coat <small>412204008-0004</small>	Stage Stairs North - Plaster - Wall	White Non-Fibrous Homogeneous		10% Ca Carbonate 90% Non-fibrous (Other)	None Detected
B 2-1-Brown Coat <small>412204008-0004A</small>	Stage Stairs North - Plaster - Wall	Brown Non-Fibrous Homogeneous		30% Quartz 70% Non-fibrous (Other)	None Detected
B 2-2-White Coat <small>412204008-0005</small>	Stage Stairs South - Plaster - Wall	White Non-Fibrous Homogeneous		10% Ca Carbonate 90% Non-fibrous (Other)	None Detected
B 2-2-Brown Coat <small>412204008-0005A</small>	Stage Stairs South - Plaster - Wall	Brown Non-Fibrous Homogeneous		30% Quartz 70% Non-fibrous (Other)	None Detected
B 2-3-White Coat <small>412204008-0006</small>	Stage Left Wall - Plaster - Wall	White Non-Fibrous Homogeneous		10% Ca Carbonate 90% Non-fibrous (Other)	None Detected
B 2-3-Brown Coat <small>412204008-0006A</small>	Stage Left Wall - Plaster - Wall	Brown Non-Fibrous Homogeneous		30% Quartz 70% Non-fibrous (Other)	None Detected
B 2-4-White Coat <small>412204008-0007</small>	Stage North - Plaster - Wall	White Non-Fibrous Homogeneous		15% Ca Carbonate 85% Non-fibrous (Other)	None Detected
B 2-4-Brown Coat <small>412204008-0007A</small>	Stage North - Plaster - Wall	Brown/Gray Non-Fibrous Homogeneous		35% Quartz 65% Non-fibrous (Other)	None Detected
B 2-5-White Coat <small>412204008-0008</small>	Stage South - Plaster - Wall	White Non-Fibrous Homogeneous		15% Ca Carbonate 85% Non-fibrous (Other)	None Detected
B 2-5-Brown Coat <small>412204008-0008A</small>	Stage South - Plaster - Wall	Brown/Gray Non-Fibrous Homogeneous		35% Quartz 65% Non-fibrous (Other)	None Detected

Initial report from: 04/29/2022 09:39:58



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EMSL Order: 412204008
Customer ID: TITA52
Customer PO: 71157008
Project ID:

Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

Sample	Description	Appearance	Non-Asbestos		Asbestos
			% Fibrous	% Non-Fibrous	% Type
B 3-1-Wrap 412204008-0009	Stage Storage Room - 1" Pipe Elbow Insulation	White Fibrous Heterogeneous	70% Cellulose	30% Non-fibrous (Other)	None Detected
B 3-1-Insulation 412204008-0009A	Stage Storage Room - 1" Pipe Elbow Insulation	Gray/White Fibrous Homogeneous	40% Min. Wool 10% Glass	20% Non-fibrous (Other)	30% Chrysotile
B 3-2-Wrap 412204008-0010	Stage Storage Room - 1" Pipe Elbow Insulation	White Fibrous Heterogeneous	70% Cellulose	30% Non-fibrous (Other)	None Detected
B 3-2-Insulation 412204008-0010A	Stage Storage Room - 1" Pipe Elbow Insulation	Gray/White Fibrous Heterogeneous	40% Min. Wool 10% Glass	20% Non-fibrous (Other)	30% Chrysotile
B 3-3-Wrap 412204008-0011	Stage Storage Room - 1" Pipe Elbow Insulation	White/Blue Non-Fibrous Homogeneous	95% Cellulose	5% Non-fibrous (Other)	None Detected
B 3-3-Insulation 412204008-0011A	Stage Storage Room - 1" Pipe Elbow Insulation	Gray Non-Fibrous Homogeneous		75% Non-fibrous (Other)	25% Chrysotile
B 4-1-Floor Tile 412204008-0012	Stage Stairs Left - 12"x12" Beige-Tan Smear Floor Tile and Mastic	Tan Non-Fibrous Homogeneous		40% Ca Carbonate 60% Non-fibrous (Other)	None Detected
B 4-1-Mastic 412204008-0012A	Stage Stairs Left - 12"x12" Beige-Tan Smear Floor Tile and Mastic	Tan Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
B 4-1-Leveler 412204008-0012B	Stage Stairs Left - 12"x12" Beige-Tan Smear Floor Tile and Mastic	Gray/Beige Non-Fibrous Homogeneous		10% Ca Carbonate 90% Non-fibrous (Other)	None Detected
B 4-2-Floor Tile 412204008-0013	Stage Stairs Right - 12"x12" Beige-Tan Smear Floor Tile and Mastic	Tan Non-Fibrous Homogeneous		40% Ca Carbonate 60% Non-fibrous (Other)	None Detected
B 4-2-Mastic 412204008-0013A	Stage Stairs Right - 12"x12" Beige-Tan Smear Floor Tile and Mastic	Tan Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
B 4-2-Leveler 412204008-0013B	Stage Stairs Right - 12"x12" Beige-Tan Smear Floor Tile and Mastic	Gray Non-Fibrous Homogeneous		10% Ca Carbonate 90% Non-fibrous (Other)	None Detected
B 4-3-Floor Tile 412204008-0014	Stage Stairs Outside Storage - 12"x12" Beige-Tan Smear Floor Tile and Mastic	Tan Non-Fibrous Homogeneous		35% Ca Carbonate 65% Non-fibrous (Other)	None Detected
B 4-3-Mastic 412204008-0014A	Stage Stairs Outside Storage - 12"x12" Beige-Tan Smear Floor Tile and Mastic	Tan Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
B 4-3-Leveler 412204008-0014B	Stage Stairs Outside Storage - 12"x12" Beige-Tan Smear Floor Tile and Mastic	Gray Non-Fibrous Homogeneous		15% Ca Carbonate 85% Non-fibrous (Other)	None Detected
B 5-1-Floor Tile 412204008-0015	Auditorium North - 12"x12" Green Floor Tile and Mastic	Green Non-Fibrous Homogeneous		40% Ca Carbonate 60% Non-fibrous (Other)	None Detected

Initial report from: 04/29/2022 09:39:58



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EMSL Order: 412204008
Customer ID: TITA52
Customer PO: 71157008
Project ID:

Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

Sample	Description	Appearance	Non-Asbestos		Asbestos
			% Fibrous	% Non-Fibrous	% Type
B 5-1-Mastic 412204008-0015A	Auditorium North - 12"x12" Green Floor Tile and Mastic	Tan Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
B 5-2-Floor Tile 412204008-0016	Auditorium near Stairs - 12"x12" Green Floor Tile and Mastic	Green Non-Fibrous Homogeneous		40% Ca Carbonate 60% Non-fibrous (Other)	None Detected
B 5-2-Mastic 412204008-0016A	Auditorium near Stairs - 12"x12" Green Floor Tile and Mastic	Tan Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
B 5-3-Floor Tile 412204008-0017	Auditorium Stairs - 12"x12" Green Floor Tile and Mastic	Green Non-Fibrous Homogeneous		35% Ca Carbonate 65% Non-fibrous (Other)	None Detected
B 5-3-Mastic 412204008-0017A	Auditorium Stairs - 12"x12" Green Floor Tile and Mastic	Tan Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
B 6-1 412204008-0018	Academy Room - Interior Door Caulk	Tan Non-Fibrous Homogeneous		97% Non-fibrous (Other)	3% Chrysotile
B 6-2 412204008-0019	Guidance Office - Interior Door Caulk	Tan/White Non-Fibrous Homogeneous		98% Non-fibrous (Other)	2% Chrysotile
B 6-3 412204008-0020	Auditorium Entrance - Interior Door Caulk	Tan Non-Fibrous Homogeneous		97% Non-fibrous (Other)	3% Chrysotile
B 7-1-Floor Tile 412204008-0021	Nurses Room - 12"x12" Tan-Brown Smear Floor Tile and Mastic	Gray/White Non-Fibrous Homogeneous		40% Ca Carbonate 60% Non-fibrous (Other)	None Detected
B 7-1-Mastic 412204008-0021A	Nurses Room - 12"x12" Tan-Brown Smear Floor Tile and Mastic	Tan Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
B 7-2-Floor Tile 412204008-0022	Nurses Room - 12"x12" Tan-Brown Smear Floor Tile and Mastic	Gray/White Non-Fibrous Homogeneous		40% Ca Carbonate 60% Non-fibrous (Other)	None Detected
B 7-2-Mastic 412204008-0022A	Nurses Room - 12"x12" Tan-Brown Smear Floor Tile and Mastic	Tan Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
B 7-3-Floor Tile 412204008-0023	Nurses Room - 12"x12" Tan-Brown Smear Floor Tile and Mastic	Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
B 7-3-Mastic 412204008-0023A	Nurses Room - 12"x12" Tan-Brown Smear Floor Tile and Mastic	Tan Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
B 8-1-Cove Base 412204008-0024	Nurses Room - 4" Black Covebase and Mastic	Black Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
B 8-1-Mastic 412204008-0024A	Nurses Room - 4" Black Covebase and Mastic	Beige Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected

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EMSL Order: 412204008
Customer ID: TITA52
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Project ID:

Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

Sample	Description	Appearance	Non-Asbestos		Asbestos
			% Fibrous	% Non-Fibrous	% Type
B 8-2-Cove Base 412204008-0025	Office - 4" Black Covebase and Mastic	Black Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
B 8-2-Mastic 412204008-0025A	Office - 4" Black Covebase and Mastic	Beige Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
B 8-3-Cove Base 412204008-0026	Copier Room - 4" Black Covebase and Mastic	Black Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
B 8-3-Mastic 412204008-0026A	Copier Room - 4" Black Covebase and Mastic	Tan Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
B 9-1-Joint Compound 412204008-0027	Mens Bathroom - Wallboard - Ceiling	White Non-Fibrous Homogeneous		20% Ca Carbonate 80% Non-fibrous (Other)	None Detected
B 9-1-Wallboard 412204008-0027A	Mens Bathroom - Wallboard - Ceiling	Brown/Gray Fibrous Heterogeneous	10% Cellulose 2% Glass	88% Non-fibrous (Other)	None Detected
B 9-2-Joint Compound 412204008-0028	Womens Bathroom - Wallboard - Ceiling	White Non-Fibrous Homogeneous		10% Ca Carbonate 90% Non-fibrous (Other)	None Detected
B 9-2-Wallboard 412204008-0028A	Womens Bathroom - Wallboard - Ceiling	Brown/Gray Fibrous Heterogeneous	10% Cellulose 2% Glass	88% Non-fibrous (Other)	None Detected
B 9-3-Joint Compound 412204008-0029	Facility Restroom - Wallboard - Ceiling	White Non-Fibrous Homogeneous		15% Ca Carbonate 85% Non-fibrous (Other)	None Detected
B 9-3-Wallboard 412204008-0029A	Facility Restroom - Wallboard - Ceiling	Gray Non-Fibrous Homogeneous	5% Cellulose	95% Non-fibrous (Other)	None Detected
B 10-1 412204008-0030	Nurses Room - 2'x2' Pinhole Fissure Ceiling Tile	Gray/White Fibrous Heterogeneous	60% Cellulose 20% Min. Wool	10% Perlite 10% Non-fibrous (Other)	None Detected
B 10-2 412204008-0031	Office - 2'x2' Pinhole Fissure Ceiling Tile	Gray/White Fibrous Heterogeneous	60% Cellulose 20% Min. Wool	10% Perlite 10% Non-fibrous (Other)	None Detected
B 10-3 412204008-0032	Copier Room - 2'x2' Pinhole Fissure Ceiling Tile	Gray/White Non-Fibrous Homogeneous	60% Cellulose 15% Min. Wool	15% Perlite 10% Non-fibrous (Other)	None Detected
B 11-1 412204008-0033	Office - Yellow Carpet Glue	Tan Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
B 11-2 412204008-0034	Office - Yellow Carpet Glue	Tan Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
B 11-3 412204008-0035	Office - Yellow Carpet Glue	Tan Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
B 12-1 412204008-0036	Hallway Outside Office - 6" Canvas Pipe Wrap Hot Water	Various Fibrous Heterogeneous	80% Cellulose 5% Glass	15% Non-fibrous (Other)	None Detected
B 12-2 412204008-0037	Copier Room - 6" Canvas Pipe Wrap Hot Water	Various Fibrous Heterogeneous	60% Cellulose 5% Glass	35% Non-fibrous (Other)	None Detected
B 12-3 412204008-0038	Academy Room - 6" Canvas Pipe Wrap Hot Water	Tan/White Non-Fibrous Homogeneous	75% Cellulose 5% Glass	20% Non-fibrous (Other)	None Detected

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EMSL Order: 412204008
Customer ID: TITA52
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Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

Sample	Description	Appearance	Non-Asbestos		Asbestos
			% Fibrous	% Non-Fibrous	% Type
B 13-1 412204008-0039	Nurses Room - CMU Block Surface Filler	Gray/Yellow Non-Fibrous Homogeneous		5% Quartz 95% Non-fibrous (Other)	None Detected
B 13-2 412204008-0040	Auditorium - CMU Block Surface Filler	Gray/Blue Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
B 13-3 412204008-0041	Copier Room - CMU Block Surface Filler	Gray/White Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
B 14-1-Floor Tile 412204008-0042	Copier Room - 12"x12" White-Multi-Colored Smear Floor Tile	White Non-Fibrous Homogeneous		40% Ca Carbonate 60% Non-fibrous (Other)	None Detected
B 14-1-Mastic 412204008-0042A	Copier Room - 12"x12" White-Multi-Colored Smear Floor Tile	Tan Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
B 14-2-Floor Tile 412204008-0043	Copier Room - 12"x12" White-Multi-Colored Smear Floor Tile	White Non-Fibrous Homogeneous		40% Ca Carbonate 60% Non-fibrous (Other)	None Detected
B 14-2-Mastic 412204008-0043A	Copier Room - 12"x12" White-Multi-Colored Smear Floor Tile	Tan Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
B 14-3-Floor Tile 412204008-0044	Academy Room - 12"x12" White-Multi-Colored Smear Floor Tile	White Non-Fibrous Homogeneous		35% Ca Carbonate 65% Non-fibrous (Other)	None Detected
B 14-3-Mastic 412204008-0044A	Academy Room - 12"x12" White-Multi-Colored Smear Floor Tile	Tan Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
B 15-1 412204008-0045	Stage Storage - 2" Canvas Pipe Wrap Hot Water	Blue Non-Fibrous Homogeneous	2% Glass	98% Non-fibrous (Other)	None Detected
B 15-2 412204008-0046	Stage Storage - 2" Canvas Pipe Wrap Hot Water	Blue Non-Fibrous Homogeneous	2% Glass	98% Non-fibrous (Other)	None Detected
B 15-3 412204008-0047	Stage Storage - 2" Canvas Pipe Wrap Hot Water	White Non-Fibrous Homogeneous	80% Cellulose	20% Non-fibrous (Other)	None Detected
B 16-1 412204008-0048	Entrance Hallway - Interior Window Caulk	Tan Non-Fibrous Homogeneous		97% Non-fibrous (Other)	3% Chrysotile
B 16-2 412204008-0049	Entrance Hallway - Interior Window Caulk	Tan Non-Fibrous Homogeneous		97% Non-fibrous (Other)	3% Chrysotile
B 16-3 412204008-0050	Entrance Hallway - Interior Window Caulk	Tan Non-Fibrous Homogeneous		98% Non-fibrous (Other)	2% Chrysotile
B 17-1-Floor Tile 412204008-0051	Guidance Office - 12"x12" Beige-Dark Brown Smear Floor Tile and Mastic	Beige Non-Fibrous Homogeneous		40% Ca Carbonate 60% Non-fibrous (Other)	None Detected

Initial report from: 04/29/2022 09:39:58



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EMSL Order: 412204008
Customer ID: TITA52
Customer PO: 71157008
Project ID:

Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

Sample	Description	Appearance	Non-Asbestos		Asbestos
			% Fibrous	% Non-Fibrous	% Type
B 17-1-Mastic <i>412204008-0051A</i>	Guidance Office - 12"x12" Beige-Dark Brown Smear Floor Tile and Mastic	Tan Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
B 17-2-Floor Tile <i>412204008-0052</i>	Guidance Office - 12"x12" Beige-Dark Brown Smear Floor Tile and Mastic	Beige Non-Fibrous Homogeneous		40% Ca Carbonate 60% Non-fibrous (Other)	None Detected
B 17-2-Mastic <i>412204008-0052A</i>	Guidance Office - 12"x12" Beige-Dark Brown Smear Floor Tile and Mastic	Tan Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
B 17-3-Floor Tile <i>412204008-0053</i>	Guidance Office - 12"x12" Beige-Dark Brown Smear Floor Tile and Mastic	Beige Non-Fibrous Homogeneous		35% Ca Carbonate 65% Non-fibrous (Other)	None Detected
B 17-3-Mastic <i>412204008-0053A</i>	Guidance Office - 12"x12" Beige-Dark Brown Smear Floor Tile and Mastic	Tan Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
B 18-1-Cove Base <i>412204008-0054</i>	Stage - 4" Grey Covebase and Mastic	Gray/Beige Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
B 18-1-Mastic <i>412204008-0054A</i>	Stage - 4" Grey Covebase and Mastic	Tan Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
B 18-2-Cove Base <i>412204008-0055</i>	Stage - 4" Grey Covebase and Mastic	Gray/Beige Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
B 18-2-Mastic <i>412204008-0055A</i>	Stage - 4" Grey Covebase and Mastic	Tan Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
B 18-3-Cove Base <i>412204008-0056</i>	Stage - 4" Grey Covebase and Mastic	Gray/White Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
B 18-3-Mastic <i>412204008-0056A</i>	Stage - 4" Grey Covebase and Mastic	Tan Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected

Analyst(s) _____

Brant Alyea (32)

Ky Nguyen (62)

Lee Plumley, Laboratory Manager
or Other Approved Signatory

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Samples analyzed by EMSL Analytical, Inc. Pineville, NC NVLAP Lab Code 200841-0, VA 3333 00312

Initial report from: 04/29/2022 09:39:58

Inspector: Chad Chavis
 License: 12929
 Date: 7/27/2022

Job Name: Grier Middle School
 Job Number: 71227143
 Area(s): Building B Additional Sampling

Sample No.	Homogeneous Material Description	Sample Location	Condition	Quantity	Friable/ Non-Friable	Lab Results
B19-1	White Door Caulk	Exterior Auditorium Door	Good	3 Doors	Non-Friable	None Detected
B19-2	White Door Caulk	Exterior Back Door				3% Chrysotile
B19-3	White Door Caulk	Exterior Back Door				4% Chrysotile
B20-1	Exterior Gray Window Caulk	Exterior Front Windows	Good	2 Windows	Non-Friable	None Detected
B20-2	Exterior Gray Window Caulk	Exterior Front Windows				None Detected
B20-3	Exterior Gray Window Caulk	Exterior Front Windows				None Detected
B21-1	Beige Door Frame Caulk	Exterior Side Door	Good	2 Doors	Non-Friable	None Detected
B21-2	Beige Door Frame Caulk	Exterior Side Door				None Detected
B21-3	Beige Door Frame Caulk	Exterior Back Door				None Detected
B22-1	Terrazzo Flooring	Hallway Outside Auditorium	Good		Non-Friable	None Detected
B22-2	Terrazzo Flooring	Hallway Outside Auditorium				None Detected
B22-3	Terrazzo Flooring	Lower Corner of Building B				None Detected
BR 1-1	Roof Membrane	Lower Roof	Good		Non-Friable	None Detected
BR 1-2	Roof Membrane	Upper Roof				None Detected
BR 1-3	Roof Membrane	Upper Roof				None Detected
BR 2-1	Roof Flashing	Lower Roof	Good		Non-Friable	None Detected
BR 2-2	Roof Flashing	Upper Roof				None Detected
BR 2-3	Roof Flashing	Upper Roof				None Detected
BR 3-1	Silver Paint Penetrations	Lower Roof	Good		Non-Friable	None Detected
BR 3-2	Silver Paint Penetrations	Lower Roof				None Detected
BR 3-3	Silver Paint Penetrations	Upper Roof				None Detected
BR 4-1	Silver Paint on Duct	Upper Roof	Good	1 Duct	Non-Friable	None Detected
BR 4-2	Silver Paint on Duct	Upper Roof				None Detected
BR 4-3	Silver Paint on Duct	Upper Roof				None Detected



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EMSL Order: 412207374

Customer ID: TITA52

Customer PO: 71227143

Project ID:

Attention: Chad Chavis
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Phone: (704) 307-3045

Fax: (704) 509-1888

Received Date: 07/29/2022 12:45 PM

Analysis Date: 08/02/2022

Collected Date: 07/27/2022

Project: Grier Middle School Demolition/ 71227143/ Building B Additional Sampling

Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

Sample	Description	Appearance	Non-Asbestos		Asbestos
			% Fibrous	% Non-Fibrous	% Type
B19-1 412207374-0001	Exterior Auditorium Door - White Door Caulk	Tan/White Non-Fibrous Homogeneous		15% Ca Carbonate 85% Non-fibrous (Other)	None Detected
B19-2 412207374-0002	Exterior Back Door - White Door Caulk	Gray/Tan Non-Fibrous Homogeneous		97% Non-fibrous (Other)	3% Chrysotile
B19-3 412207374-0003	Exterior Back Door - White Door Caulk	Gray/Tan Non-Fibrous Homogeneous		96% Non-fibrous (Other)	4% Chrysotile
B20-1 412207374-0004	Exterior Front Windows - Exterior Gray Window Caulk	Gray Non-Fibrous Homogeneous		10% Ca Carbonate 90% Non-fibrous (Other)	None Detected
B20-2 412207374-0005	Exterior Front Windows - Exterior Gray Window Caulk	Gray Non-Fibrous Homogeneous		10% Ca Carbonate 90% Non-fibrous (Other)	None Detected
B20-3 412207374-0006	Exterior Front Windows - Exterior Gray Window Caulk	Gray Non-Fibrous Homogeneous		15% Ca Carbonate 85% Non-fibrous (Other)	None Detected
B21-1 412207374-0007	Exterior Side Door - Beige Door Frame Caulk	Gray/Green/Beige Non-Fibrous Homogeneous	1% Cellulose	5% Ca Carbonate 94% Non-fibrous (Other)	None Detected
B21-2 412207374-0008	Exterior Side Door - Beige Door Frame Caulk	Gray/Green/Beige Non-Fibrous Homogeneous		5% Ca Carbonate 95% Non-fibrous (Other)	None Detected
B21-3 412207374-0009	Exterior Side Door - Beige Door Frame Caulk	Gray/Beige Non-Fibrous Homogeneous		5% Ca Carbonate 95% Non-fibrous (Other)	None Detected
B22-1-Flooring 412207374-0010	Hallway Outside Auditorium - Terrazo Flooring	Tan/White/Black Non-Fibrous Homogeneous		5% Quartz 10% Ca Carbonate 85% Non-fibrous (Other)	None Detected
B22-1-Mortar 412207374-0010A	Hallway Outside Auditorium - Terrazo Flooring	Gray Non-Fibrous Homogeneous		30% Quartz 70% Non-fibrous (Other)	None Detected
B22-2-Flooring 412207374-0011	Hallway Outside Auditorium - Terrazo Flooring	Tan/White/Black Non-Fibrous Homogeneous		5% Quartz 5% Ca Carbonate 90% Non-fibrous (Other)	None Detected
B22-2-Mortar 412207374-0011A	Hallway Outside Auditorium - Terrazo Flooring	Gray Non-Fibrous Homogeneous		30% Quartz 70% Non-fibrous (Other)	None Detected
B22-3-Flooring 412207374-0012	Lower Corner of Building B - Terrazo Flooring	Gray/Various Non-Fibrous Homogeneous		15% Quartz 85% Non-fibrous (Other)	None Detected
B22-3-Mortar 412207374-0012A	Lower Corner of Building B - Terrazo Flooring	Gray/Various Non-Fibrous Homogeneous		30% Quartz 70% Non-fibrous (Other)	None Detected
BR 1-1-Membrane 412207374-0013	Lower Roof - Roof Membrane	Black Fibrous Homogeneous	10% Glass	90% Non-fibrous (Other)	None Detected

Initial report from: 08/03/2022 13:14:06



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EMSL Order: 412207374
Customer ID: TITA52
Customer PO: 71227143
Project ID:

Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

Sample	Description	Appearance	Non-Asbestos		Asbestos
			% Fibrous	% Non-Fibrous	% Type
BR 1-1-Tar 412207374-0013A	Lower Roof - Roof Membrane	Black Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
BR 1-1-Gray Insulation 412207374-0013B	Lower Roof - Roof Membrane	Gray/Yellow Fibrous Homogeneous	85% Cellulose	10% Perlite 5% Non-fibrous (Other)	None Detected
BR 1-1-Yellow Insulation 412207374-0013C	Lower Roof - Roof Membrane	Yellow Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
BR 1-2-Membrane 412207374-0014	Upper Roof - Roof Membrane	Black Fibrous Homogeneous	10% Glass	90% Non-fibrous (Other)	None Detected
BR 1-2-Tar 412207374-0014A	Upper Roof - Roof Membrane	Black Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
BR 1-2-Gray Insulation 412207374-0014B	Upper Roof - Roof Membrane	Gray Fibrous Homogeneous	85% Cellulose	10% Perlite 5% Non-fibrous (Other)	None Detected
BR 1-2-Yellow Insulation 412207374-0014C	Upper Roof - Roof Membrane	Yellow Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
BR 1-3-Membrane 412207374-0015	Upper Roof - Roof Membrane	Black Fibrous Homogeneous	15% Glass	85% Non-fibrous (Other)	None Detected
BR 1-3-Tar 412207374-0015A	Upper Roof - Roof Membrane	Black Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
BR 1-3-Gray Insulation 412207374-0015B	Upper Roof - Roof Membrane	Gray/White Fibrous Homogeneous	85% Cellulose	10% Perlite 5% Non-fibrous (Other)	None Detected
BR 1-3-Yellow Insulation 412207374-0015C	Upper Roof - Roof Membrane	Yellow/Beige Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
BR 2-1-Shingle 412207374-0016	Lower Roof - Roof Flashing	White/Black Fibrous Homogeneous	10% Cellulose	5% Quartz 10% Ca Carbonate 75% Non-fibrous (Other)	None Detected
BR 2-1-Flashing 412207374-0016A	Lower Roof - Roof Flashing	Black Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
BR 2-2-Shingle 412207374-0017	Upper Roof - Roof Flashing	White/Black Fibrous Homogeneous	10% Cellulose 5% Glass	5% Quartz 80% Non-fibrous (Other)	None Detected
BR 2-2-Flashing 412207374-0017A	Upper Roof - Roof Flashing	Black Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
BR 2-3 412207374-0018	Upper Roof - Roof Flashing	Black Fibrous Homogeneous	15% Glass	85% Non-fibrous (Other)	None Detected
BR 3-1 412207374-0019	LOWER Roof - Silver Paint Penetrations	Black/Silver Non-Fibrous Homogeneous	5% Cellulose	95% Non-fibrous (Other)	None Detected
BR 3-2 412207374-0020	LOWER Roof - Silver Paint Penetrations	Red/Black/Silver Non-Fibrous Homogeneous	5% Cellulose	95% Non-fibrous (Other)	None Detected

Initial report from: 08/03/2022 13:14:06



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EMSL Order: 412207374
Customer ID: TITA52
Customer PO: 71227143
Project ID:

Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

Sample	Description	Appearance	Non-Asbestos		Asbestos
			% Fibrous	% Non-Fibrous	% Type
BR 3-3 <small>412207374-0021</small>	Upper Roof - Silver Paint Penetrations	Gray/Silver Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
BR 4-1 <small>412207374-0022</small>	Upper Roof - Silver Paint on Duct	Red/Black/Silver Non-Fibrous Homogeneous	5% Cellulose	95% Non-fibrous (Other)	None Detected
BR 4-2 <small>412207374-0023</small>	Upper Roof - Silver Paint on Duct	Black/Silver Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
BR 4-3 <small>412207374-0024</small>	Upper Roof - Silver Paint on Duct	Red/Silver Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected

Analyst(s)

Jessica Cooper (12)
Madeline Baldelli (26)

Lee Plumley, Laboratory Manager
or Other Approved Signatory

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Samples analyzed by EMSL Analytical, Inc. Pineville, NC NVLAP Lab Code 200841-0, VA 3333 00312

Initial report from: 08/03/2022 13:14:06

Inspector: Erick Hutson
 License: 12849
 Date: 4/15/2022 - 4/21/2022

Job Name: Grier Middle School
 Job Number: 71157008-32
 Area(s): Building C

Sample No.	Homogeneous Material Description	Sample Location	Condition	Quantity	Friable/ Non-Friable	Lab Results
C 1-1	2'x2' Pinhole Hole Fissure Ceiling Tile	Room 300	Good	1,100 ft ²	Friable	None Detected
C 1-2	2'x2' Pinhole Hole Fissure Ceiling Tile	Room 300				None Detected
C 1-3	2'x2' Pinhole Hole Fissure Ceiling Tile	Room 300				None Detected
C 2-1	4" Black Covebase and Mastic	Room 300	Good	800 ft	Non-Friable	Covebase: None Detected Mastic: None Detected
C 2-2	4" Black Covebase and Mastic	Room 305				Covebase: None Detected Mastic: None Detected
C 2-3	4" Black Covebase and Mastic	Room 307				Covebase: None Detected Mastic: None Detected
C 3-1	12"x12" Beige/Tan Smear Floor Tile and Mastic	Room 300	Good	11,000 ft ²	Non-Friable	Floor Tile: None Detected Mastic: None Detected
C 3-2	12"x12" Beige/Tan Smear Floor Tile and Mastic	Room 304				Floor Tile: None Detected Mastic: None Detected
C 3-3	12"x12" Beige/Tan Smear Floor Tile and Mastic	Room 307				Floor Tile: None Detected Mastic: None Detected
C 4-1	CMU Block Surface Filler	Room 300	Good	1,000 ft ²	Friable	None Detected
C 4-2	CMU Block Surface Filler	Room 305				None Detected
C 4-3	CMU Block Surface Filler	Room 309				None Detected
C 5-1	6" Canvas Pipe Wrap Hot Water	Room 300	Good	450 ft	Friable	None Detected
C 5-2	6" Canvas Pipe Wrap Hot Water	Room 303				None Detected
C 5-3	6" Canvas Pipe Wrap Hot Water	Room 304				None Detected
C 6-1	Exterior Door Caulk	Room 300 - Outside	Good	10 doors	Non-Friable	2% Chrysotile
C 6-2	Exterior Door Caulk	Room 309 - Outside				3% Chrysotile
C 6-3	Exterior Door Caulk	Room 307 - Outside				2% Chrysotile
C 7-1	Exterior Window Glazing	Room 301 - Outside	Good	80 windows	Non-Friable	2% Chrysotile
C 7-2	Exterior Window Glazing	Room 305 - Outside				2% Chrysotile
C 7-3	Exterior Window Glazing	Room 308 - Outside				2% Chrysotile
C 8-1	Exterior Window Caulk	Room 305 - Outside	Good	10 window frames	Non-Friable	4% Chrysotile
C 8-2	Exterior Window Caulk	Room 307 - Outside				None Detected
C 8-3	Exterior Window Caulk	Room 300 - Outside				2% Chrysotile



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EMSL Order: 412204032

Customer ID: TITA52

Customer PO: 71157008

Project ID:

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Fax: (704) 509-1888

Received Date: 04/25/2022 9:40 AM

Analysis Date: 04/28/2022

Collected Date: 04/15/2022

Project: Grier Middle School - 71157008 - Building C

Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

Sample	Description	Appearance	Non-Asbestos		Asbestos
			% Fibrous	% Non-Fibrous	% Type
C 1-1 <small>412204032-0001</small>	Room 300 - 2'x2' Pinhole Hole Fissure Ceiling Tile	Gray/White Fibrous Heterogeneous	60% Cellulose 20% Min. Wool	10% Perlite 10% Non-fibrous (Other)	None Detected
C 1-2 <small>412204032-0002</small>	Room 300 - 2'x2' Pinhole Hole Fissure Ceiling Tile	Gray/White Fibrous Heterogeneous	60% Cellulose 20% Min. Wool	10% Perlite 10% Non-fibrous (Other)	None Detected
C 1-3 <small>412204032-0003</small>	Room 300 - 2'x2' Pinhole Hole Fissure Ceiling Tile	Gray/White Fibrous Homogeneous	60% Cellulose 20% Min. Wool	5% Perlite 15% Non-fibrous (Other)	None Detected
C 2-1-Cove Base <small>412204032-0004</small>	Room 300 - 4" Black Covebase and Mastic	Black Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
C 2-1-Mastic <small>412204032-0004A</small>	Room 300 - 4" Black Covebase and Mastic	Beige Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
C 2-2-Cove Base <small>412204032-0005</small>	Room 305 - 4" Black Covebase and Mastic	Black Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
C 2-2-Mastic <small>412204032-0005A</small>	Room 305 - 4" Black Covebase and Mastic	Beige Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
C 2-3-Cove Base <small>412204032-0006</small>	Room 307 - 4" Black Covebase and Mastic	Black Non-Fibrous Homogeneous		5% Ca Carbonate 95% Non-fibrous (Other)	None Detected
C 2-3-Mastic <small>412204032-0006A</small>	Room 307 - 4" Black Covebase and Mastic	Beige Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
C 3-1-Floor Tile <small>412204032-0007</small>	Room 300 - 12"x12" Beige-Tan Smear Floor Tile and Mastic	Tan Non-Fibrous Homogeneous		30% Ca Carbonate 70% Non-fibrous (Other)	None Detected
C 3-1-Mastic <small>412204032-0007A</small>	Room 300 - 12"x12" Beige-Tan Smear Floor Tile and Mastic	Tan Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
C 3-2-Floor Tile <small>412204032-0008</small>	Room 304 - 12"x12" Beige-Tan Smear Floor Tile and Mastic	Tan Non-Fibrous Homogeneous		30% Ca Carbonate 70% Non-fibrous (Other)	None Detected
C 3-2-Mastic <small>412204032-0008A</small>	Room 304 - 12"x12" Beige-Tan Smear Floor Tile and Mastic	Tan Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
C 3-3-Floor Tile <small>412204032-0009</small>	Room 307 - 12"x12" Beige-Tan Smear Floor Tile and Mastic	Tan Non-Fibrous Homogeneous		20% Ca Carbonate 80% Non-fibrous (Other)	None Detected
C 3-3-Mastic/Leveler <small>412204032-0009A</small>	Room 307 - 12"x12" Beige-Tan Smear Floor Tile and Mastic	Gray/Tan Non-Fibrous Heterogeneous		2% Ca Carbonate 98% Non-fibrous (Other)	None Detected
C 4-1 <small>412204032-0010</small>	Room 300 - CMU Block Surface Filler	Gray/Green Non-Fibrous Homogeneous		5% Quartz 95% Non-fibrous (Other)	None Detected

Initial report from: 04/28/2022 14:59:45



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EMSL Order: 412204032
Customer ID: TITA52
Customer PO: 71157008
Project ID:

Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

Sample	Description	Appearance	Non-Asbestos		Asbestos
			% Fibrous	% Non-Fibrous	% Type
C 4-2 412204032-0011	Room 305 - CMU Block Surface Filler	Gray/Green Non-Fibrous Homogeneous		5% Quartz 95% Non-fibrous (Other)	None Detected
C 4-3 412204032-0012	Room 309 - CMU Block Surface Filler	Gray/Green Non-Fibrous Homogeneous		10% Quartz 90% Non-fibrous (Other)	None Detected
C 5-1 412204032-0013	Room 300 - 6" Canvas Pipe Wrap Hot Water	White/Silver Fibrous Heterogeneous	70% Cellulose 5% Glass	25% Non-fibrous (Other)	None Detected
C 5-2 412204032-0014	Room 303 - 6" Canvas Pipe Wrap Hot Water	White/Silver Fibrous Heterogeneous	70% Cellulose 5% Glass	25% Non-fibrous (Other)	None Detected
C 5-3 412204032-0015	Room 304 - 6" Canvas Pipe Wrap Hot Water	White/Silver Fibrous Homogeneous	90% Cellulose	10% Non-fibrous (Other)	None Detected
C 6-1 412204032-0016	Room 300 - Outside - Exterior Door Caulk	Tan/White/Blue Non-Fibrous Homogeneous		98% Non-fibrous (Other)	2% Chrysotile
C 6-2 412204032-0017	Room 309 - Outside - Exterior Door Caulk	Tan Non-Fibrous Homogeneous		97% Non-fibrous (Other)	3% Chrysotile
C 6-3 412204032-0018	Room 307 - Outside - Exterior Door Caulk	Gray/Green/Beige Non-Fibrous Homogeneous		98% Non-fibrous (Other)	2% Chrysotile
C 7-1 412204032-0019	Room 301 - Outside - Exterior Window Glazing	Tan Non-Fibrous Homogeneous		98% Non-fibrous (Other)	2% Chrysotile
C 7-2 412204032-0020	Room 305 - Outside - Exterior Window Glazing	Tan Non-Fibrous Homogeneous		98% Non-fibrous (Other)	2% Chrysotile
C 7-3 412204032-0021	Room 308 - Outside - Exterior Window Glazing	Tan Non-Fibrous Homogeneous		98% Non-fibrous (Other)	2% Chrysotile
C 8-1 412204032-0022	Room 305 - Outside - Exterior Window Caulk	Tan Non-Fibrous Homogeneous		96% Non-fibrous (Other)	4% Chrysotile
C 8-2 412204032-0023	Room 307 - Outside - Exterior Window Caulk	Tan/Red Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
C 8-3 412204032-0024	Room 300 - Outside - Exterior Window Caulk	Gray/Beige Non-Fibrous Homogeneous		98% Non-fibrous (Other)	2% Chrysotile



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EMSL Order: 412204032

Customer ID: TITA52

Customer PO: 71157008

Project ID:

Analyst(s)

Ashley Hill (10)

Ky Nguyen (20)

Lee Plumley, Laboratory Manager
or Other Approved Signatory

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Samples analyzed by EMSL Analytical, Inc. Pineville, NC NVLAP Lab Code 200841-0, VA 3333 00312

Initial report from: 04/28/2022 14:59:45

Inspector: Chad Chavis
 License: 12929
 Date: 7/26/2022

Job Name: Grier Middle School
 Job Number: 71227143
 Area(s): Building C Roof

Sample No.	Homogeneous Material Description	Sample Location	Condition	Quantity	Friable/ Non-Friable	Lab Results
CR 1-1	Roof Membrane	Upper Roof	Good		Non-Friable	None Detected
CR 1-2	Roof Membrane	Upper Roof				None Detected
CR 1-3	Roof Membrane	Lower Roof				None Detected
CR 2-1	Roof Flashing	Upper Roof	Good		Non-Friable	None Detected
CR 2-2	Roof Flashing	Lower Roof				None Detected
CR 2-3	Roof Flashing	Lower Roof				None Detected
CR 3-1	Silver Paint Penetrations	Upper Roof	Good		Non-Friable	None Detected
CR 3-2	Silver Paint Penetrations	Upper Roof				None Detected
CR 3-3	Silver Paint Penetrations	Lower Roof				None Detected
CR 4-1	Gray Roof Caulk	Lower Roof	Good		Non-Friable	None Detected
CR 4-2	Gray Roof Caulk	Lower Roof				None Detected
CR 4-3	Gray Roof Caulk	Lower Roof				None Detected



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EMSL Order: 412207376

Customer ID: TITA52

Customer PO: 71227143

Project ID:

Attention: Chad Chavis
Terracon Consultants, Inc.
2701 Westport Road
Charlotte, NC 28208

Phone: (704) 307-3045
Fax: (704) 509-1888
Received Date: 07/29/2022 12:45 PM
Analysis Date: 08/02/2022
Collected Date: 07/26/2022

Project: Grier Middle School Demolition/ 71227143/ Building C Roof

Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

Sample	Description	Appearance	Non-Asbestos		Asbestos % Type
			% Fibrous	% Non-Fibrous	
CR 1-1-Membrane <small>412207376-0001</small>	Upper Roof - Roof Membrane	Black Fibrous Homogeneous	25% Glass	75% Non-fibrous (Other)	None Detected
CR 1-1-Gray Insulation <small>412207376-0001A</small>	Upper Roof - Roof Membrane	Brown/Gray Fibrous Homogeneous	90% Cellulose	5% Perlite 5% Non-fibrous (Other)	None Detected
CR 1-1-White Insulation <small>412207376-0001B</small>	Upper Roof - Roof Membrane	White/Yellow Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
CR 1-2-Membrane <small>412207376-0002</small>	Upper Roof - Roof Membrane	Black Fibrous Homogeneous	25% Glass	75% Non-fibrous (Other)	None Detected
CR 1-2-Gray Insulation <small>412207376-0002A</small>	Upper Roof - Roof Membrane	Brown/Gray Fibrous Homogeneous	90% Cellulose	5% Perlite 5% Non-fibrous (Other)	None Detected
CR 1-2-White Insulation <small>412207376-0002B</small>	Upper Roof - Roof Membrane	White/Yellow Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
CR 1-3-Membrane <small>412207376-0003</small>	Lower Roof - Roof Membrane	Black Fibrous Homogeneous	30% Glass	70% Non-fibrous (Other)	None Detected
CR 1-3-Gray Insulation <small>412207376-0003A</small>	Lower Roof - Roof Membrane	Brown/Gray/White Fibrous Homogeneous	85% Cellulose	10% Perlite 5% Non-fibrous (Other)	None Detected
CR 1-3-White Insulation <small>412207376-0003B</small>	Lower Roof - Roof Membrane	Yellow/Beige Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
CR 2-1-Silver Paint <small>412207376-0004</small>	Upper Roof - Roof Flashing	Silver Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
CR 2-1-Flashing <small>412207376-0004A</small>	Upper Roof - Roof Flashing	Black Fibrous Homogeneous	10% Cellulose 10% Glass	80% Non-fibrous (Other)	None Detected
CR 2-1-Insulation <small>412207376-0004B</small>	Upper Roof - Roof Flashing	Brown Fibrous Homogeneous	95% Cellulose	5% Non-fibrous (Other)	None Detected
CR 2-2-Silver Paint <small>412207376-0005</small>	Lower Roof - Roof Flashing	Silver Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
CR 2-2-Flashing <small>412207376-0005A</small>	Lower Roof - Roof Flashing	Black Fibrous Homogeneous	10% Cellulose 10% Glass	80% Non-fibrous (Other)	None Detected
CR 2-3-Silver Paint <small>412207376-0006</small>	Lower Roof - Roof Flashing	Silver Non-Fibrous Homogeneous	3% Wollastonite	97% Non-fibrous (Other)	None Detected
CR 2-3-Flashing <small>412207376-0006A</small>	Lower Roof - Roof Flashing	Black Fibrous Homogeneous	15% Glass	85% Non-fibrous (Other)	None Detected

Initial report from: 08/03/2022 13:14:53



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EMSL Order: 412207376
Customer ID: TITA52
Customer PO: 71227143
Project ID:

Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

Sample	Description	Appearance	Non-Asbestos		Asbestos
			% Fibrous	% Non-Fibrous	% Type
CR 3-1 <small>412207376-0007</small>	Upper Roof - Silver Paint Penetrations	Silver Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
CR 3-2 <small>412207376-0008</small>	Upper Roof - Silver Paint Penetrations	Silver Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
CR 3-3 <small>412207376-0009</small>	Lower Roof - Silver Paint Penetrations	Silver Non-Fibrous Homogeneous	3% Wollastonite	97% Non-fibrous (Other)	None Detected
CR 4-1 <small>412207376-0010</small>	Lower Roof - Gray Roof Caulk	Tan Non-Fibrous Homogeneous		10% Ca Carbonate 90% Non-fibrous (Other)	None Detected
CR 4-2 <small>412207376-0011</small>	Lower Roof - Gray Roof Caulk	Tan Non-Fibrous Homogeneous		10% Ca Carbonate 90% Non-fibrous (Other)	None Detected
CR 4-3 <small>412207376-0012</small>	Lower Roof - Gray Roof Caulk	Gray/Tan Non-Fibrous Homogeneous		15% Ca Carbonate 85% Non-fibrous (Other)	None Detected

Analyst(s)

Brant Alyea (15)

Jessica Cooper (7)

Lee Plumley, Laboratory Manager
or Other Approved Signatory

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Samples analyzed by EMSL Analytical, Inc. Pineville, NC NVLAP Lab Code 200841-0, VA 3333 00312

Initial report from: 08/03/2022 13:14:53

Inspector: Erick Hutson
 License: 12849
 Date: 4/15/2022 - 4/21/2022

Job Name: Grier Middle School
 Job Number: 71157008-32
 Area(s): Building D

Sample No.	Homogeneous Material Description	Sample Location	Condition	Quantity	Friable/ Non-Friable	Lab Results
D 1-1	CMU Block Surface Filler	Room 404	Good	4,800 ft ²	Friable	None Detected
D 1-2	CMU Block Surface Filler	Room 402				None Detected
D 1-3	CMU Block Surface Filler	Room 405				None Detected
D 1-4	CMU Block Surface Filler	Mens Restroom				None Detected
D 1-5	CMU Block Surface Filler	Womens Restroom				None Detected
D 2-1	4" Black Covebase Mastic	Room 402	Good	400 ft	Non-Friable	Covebase: None Detected Mastic: None Detected
D 2-2	4" Black Covebase Mastic	Room 404				Covebase: None Detected Mastic: None Detected
D 2-3	4" Black Covebase Mastic	Room 409				Covebase: None Detected Mastic: None Detected
D 3-1	12"x12" Beige/Ten Smear Floor Tile and Mastic	Room 400	Good	11,000 ft ²	Non-Friable	Floor Tile: None Detected Mastic: None Detected
D 3-2	12"x12" Beige/Ten Smear Floor Tile and Mastic	Room 403				Floor Tile: None Detected Mastic: None Detected
D 3-3	12"x12" Beige/Ten Smear Floor Tile and Mastic	Room 408				Floor Tile: None Detected Mastic: None Detected
D 4-1	6" Canvas Pipe Wrap Hot Water	Room 400	Good	250 ft	Friable	None Detected
D 4-2	6" Canvas Pipe Wrap Hot Water	Room 402				None Detected
D 4-3	6" Canvas Pipe Wrap Hot Water	Room 404				None Detected
D 5-1	Plater (Ceiling)	Womens Restroom	Good	500 ft ²	Friable	White Coat: None Detected Grey Coat: None Detected
D 5-2	Plater (Ceiling)	Womens Restroom				White Coat: None Detected Grey Coat: None Detected
D 5-3	Plater (Ceiling)	Mens Restroom				White Coat: None Detected Grey Coat: None Detected
D 6-1	Exterior Window Caulk	Room 400 - Outside	Good	10 window frame	Non-Friable	3% Chrysotile
D 6-2	Exterior Window Caulk	Room 403 - Outside				3% Chrysotile
D 6-3	Exterior Window Caulk	Room 408 - Outside				3% Chrysotile
D 7-1	Exterior Window Glazing	Room 400 - Outside	Good	80 windows	Non-Friable	2% Chrysotile
D 7-2	Exterior Window Glazing	Room 403 - Outside				2% Chrysotile
D 7-3	Exterior Window Glazing	Room 407 - Outside				2% Chrysotile
D 8-1	Exterior Door Caulk	Room 403 - Outside	Good	13 doors	Non-Friable	3% Chrysotile
D 8-2	Exterior Door Caulk	Room 404 - Outside				3% Chrysotile
D 8-3	Exterior Door Caulk	Room 409 - Outside				4% Chrysotile
D 9-1	Black Sink Coating	Room 400 - Storage	Good	1 sink	Non-Friable	4% Chrysotile
D 9-2	Black Sink Coating	Room 400 - Storage				4% Chrysotile
D 9-3	Black Sink Coating	Room 400 - Storage				6% Chrysotile



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EMSL Order: 412204010

Customer ID: TITA52

Customer PO: 71157008-32

Project ID:

Attention: Erick Hutson
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2701 Westport Road
Charlotte, NC 28208

Phone: (803) 984-9498

Fax: (704) 509-1888

Received Date: 04/25/2022 9:40 AM

Analysis Date: 04/28/2022

Collected Date: 04/15/2022

Project: Grier Middle School - 71157008-32 - Building D

Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

Sample	Description	Appearance	Non-Asbestos		Asbestos
			% Fibrous	% Non-Fibrous	% Type
D 1-1 412204010-0001	Room 404 - CMU Block Surface Filler	Yellow/Green Non-Fibrous Homogeneous		5% Quartz 95% Non-fibrous (Other)	None Detected
D 1-2 412204010-0002	Room 402 - CMU Block Surface Filler	Yellow/Beige Non-Fibrous Homogeneous		5% Quartz 95% Non-fibrous (Other)	None Detected
D 1-3 412204010-0003	Room 405 - CMU Block Surface Filler	Yellow/Green Non-Fibrous Homogeneous		5% Quartz 95% Non-fibrous (Other)	None Detected
D 1-4 412204010-0004	Mens Restroom - CMU Block Surface Filler	Gray Non-Fibrous Homogeneous		5% Quartz 95% Non-fibrous (Other)	None Detected
D 1-5 412204010-0005	Womens Restroom - CMU Block Surface Filler	Gray Non-Fibrous Homogeneous		5% Quartz 95% Non-fibrous (Other)	None Detected
D 2-1-Cove Base 412204010-0006	Room 402 - 4" Black Covebase Mastic	Black Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
D 2-1-Mastic 412204010-0006A	Room 402 - 4" Black Covebase Mastic	Tan Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
D 2-2-Cove Base 412204010-0007	Room 404 - 4" Black Covebase Mastic	Black Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
D 2-2-Mastic 412204010-0007A	Room 404 - 4" Black Covebase Mastic	Tan Non-Fibrous Homogeneous	<1% Cellulose	100% Non-fibrous (Other)	None Detected
D 2-3-Cove Base 412204010-0008	Room 409 - 4" Black Covebase Mastic	Black Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
D 2-3-Mastic 412204010-0008A	Room 409 - 4" Black Covebase Mastic	Tan Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
D 3-1-Floor Tile 412204010-0009	Room 400 - 12"x12" Beige-Tan Smear Floor Tile and Mastic	Tan Non-Fibrous Homogeneous		30% Ca Carbonate 70% Non-fibrous (Other)	None Detected
D 3-1-Mastic 412204010-0009A	Room 400 - 12"x12" Beige-Tan Smear Floor Tile and Mastic	Tan Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
D 3-2-Floor Tile 412204010-0010	Room 403 - 12"x12" Beige-Tan Smear Floor Tile and Mastic	Tan Non-Fibrous Homogeneous		30% Ca Carbonate 70% Non-fibrous (Other)	None Detected
D 3-2-Mastic 412204010-0010A	Room 403 - 12"x12" Beige-Tan Smear Floor Tile and Mastic	Tan Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
D 3-3-Floor Tile 412204010-0011	Room 408 - 12"x12" Beige-Tan Smear Floor Tile and Mastic	Tan Non-Fibrous Homogeneous		30% Ca Carbonate 70% Non-fibrous (Other)	None Detected

Initial report from: 04/29/2022 08:19:59



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<http://www.EMSL.com> / charlottelab@emsl.com

EMSL Order: 412204010
Customer ID: TITA52
Customer PO: 71157008-32
Project ID:

Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

Sample	Description	Appearance	Non-Asbestos		Asbestos
			% Fibrous	% Non-Fibrous	% Type
D 3-3-Mastic 412204010-0011A	Room 408 - 12"x12" Beige-Tan Smear Floor Tile and Mastic	Yellow Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
D 4-1 412204010-0012	Room 400 - 6" Canvas Pipe Wrap Hot Water	White/Beige Fibrous Homogeneous	90% Cellulose 2% Glass	8% Non-fibrous (Other)	None Detected
D 4-2 412204010-0013	Room 402 - 6" Canvas Pipe Wrap Hot Water	White/Beige Fibrous Homogeneous	90% Cellulose 2% Glass	8% Non-fibrous (Other)	None Detected
D 4-3 412204010-0014	Room 404 - 6" Canvas Pipe Wrap Hot Water	White Fibrous Homogeneous	90% Cellulose 2% Glass	8% Non-fibrous (Other)	None Detected
D 5-1-White Coat 412204010-0015	Womens Restroom - Plaster - Ceiling	White Non-Fibrous Homogeneous		10% Ca Carbonate 90% Non-fibrous (Other)	None Detected
D 5-1-Gray Coat 412204010-0015A	Womens Restroom - Plaster - Ceiling	Gray Non-Fibrous Homogeneous	<1% Cellulose	30% Quartz 70% Non-fibrous (Other)	None Detected
D 5-2-White Coat 412204010-0016	Womens Restroom - Plaster - Ceiling	White Non-Fibrous Homogeneous		10% Ca Carbonate 90% Non-fibrous (Other)	None Detected
D 5-2-Gray Coat 412204010-0016A	Womens Restroom - Plaster - Ceiling	Gray Non-Fibrous Homogeneous		30% Quartz 70% Non-fibrous (Other)	None Detected
D 5-3-White Coat 412204010-0017	Mens Restroom - Plaster - Ceiling	White Non-Fibrous Homogeneous		5% Ca Carbonate 95% Non-fibrous (Other)	None Detected
D 5-3-Gray Coat 412204010-0017A	Mens Restroom - Plaster - Ceiling	Gray Non-Fibrous Homogeneous		40% Quartz 60% Non-fibrous (Other)	None Detected
D 6-1 412204010-0018	Room 400 - Outside - Exterior Window Caulk	Gray Fibrous Homogeneous		10% Ca Carbonate 87% Non-fibrous (Other)	3% Chrysotile
D 6-2 412204010-0019	Room 403 - Outside - Exterior Window Caulk	Gray Fibrous Homogeneous		10% Ca Carbonate 87% Non-fibrous (Other)	3% Chrysotile
D 6-3 412204010-0020	Room 408 - Outside - Exterior Window Caulk	Gray/Tan Non-Fibrous Homogeneous		97% Non-fibrous (Other)	3% Chrysotile
D 7-1 412204010-0021	Room 400 - Outside - Exterior Window Glazing	Beige Non-Fibrous Homogeneous		10% Ca Carbonate 88% Non-fibrous (Other)	2% Chrysotile
D 7-2 412204010-0022	Room 403 - Outside - Exterior Window Glazing	Beige Non-Fibrous Homogeneous		10% Ca Carbonate 88% Non-fibrous (Other)	2% Chrysotile
D 7-3 412204010-0023	Room 407 - Outside - Exterior Window Glazing	Tan Non-Fibrous Homogeneous		98% Non-fibrous (Other)	2% Chrysotile
D 8-1 412204010-0024	Room 403 - Outside - Exterior Door Caulk	Gray/Tan Fibrous Homogeneous		10% Ca Carbonate 87% Non-fibrous (Other)	3% Chrysotile
D 8-2 412204010-0025	Room 404 - Outside - Exterior Door Caulk	Gray/Tan Fibrous Homogeneous		10% Ca Carbonate 87% Non-fibrous (Other)	3% Chrysotile
D 8-3 412204010-0026	Room 409 - Outside - Exterior Door Caulk	Gray/Tan Non-Fibrous Homogeneous		96% Non-fibrous (Other)	4% Chrysotile

Initial report from: 04/29/2022 08:19:59



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EMSL Order: 412204010
Customer ID: TITA52
Customer PO: 71157008-32
Project ID:

Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

Sample	Description	Appearance	Non-Asbestos		Asbestos
			% Fibrous	% Non-Fibrous	% Type
D 9-1 <small>412204010-0027</small>	Room 400 - Storage - Black Sink Coating	Black Fibrous Homogeneous		96% Non-fibrous (Other)	4% Chrysotile
D 9-2 <small>412204010-0028</small>	Room 400 - Storage - Black Sink Coating	Black Fibrous Homogeneous		96% Non-fibrous (Other)	4% Chrysotile
D 9-3 <small>412204010-0029</small>	Room 400 - Storage - Black Sink Coating	Black Non-Fibrous Homogeneous		94% Non-fibrous (Other)	6% Chrysotile

Analyst(s)

Jessica Cooper (13)

Kristie Elliott (25)

Lee Plumley, Laboratory Manager
or Other Approved Signatory

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Samples analyzed by EMSL Analytical, Inc. Pineville, NC NVLAP Lab Code 200841-0, VA 3333 00312

Initial report from: 04/29/2022 08:19:59



Asbestos Inspection Form

Inspector: Chad Chavis
License: 12929
Date: 7/27/2022

Job Name: Grier Middle School
Job Number: 71227143
Area(s): Building D Roof

Sample No.	Homogeneous Material Description	Sample Location	Condition	Quantity	Friable/ Non-Friable	Lab Results
DR 1-1	Roof Membrane	Lower Roof	Good		Non-Friable	None Detected
DR 1-2	Roof Membrane	Lower Roof				None Detected
DR 1-3	Roof Membrane	Upper Roof				None Detected
DR 2-1	Roof Flashing	Lower Roof	Good		Non-Friable	None Detected
DR 2-2	Roof Flashing	Lower Roof				None Detected
DR 2-3	Roof Flashing	Upper Roof				None Detected
DR 3-1	Silver Paint Penetrations	Lower Roof	Good		Non-Friable	None Detected
DR 3-2	Silver Paint Penetrations	Lower Roof				None Detected
DR 3-3	Silver Paint Penetrations	Upper Roof				None Detected
DR 4-1	Gray Roof Caulk	Lower Roof	Good		Non-Friable	None Detected
DR 4-2	Gray Roof Caulk	Lower Roof				None Detected
DR 4-3	Gray Roof Caulk	Lower Roof				None Detected
DR 5-1	Roof Membrane	Overhang Roof	Good		Non-Friable	None Detected
DR 5-2	Roof Membrane	Overhang Roof				None Detected
DR 5-3	Roof Membrane	Overhang Roof				None Detected
DR 6-1	Roof Flashing	Overhang Roof	Good		Non-Friable	None Detected
DR 6-2	Roof Flashing	Overhang Roof				None Detected
DR 6-3	Roof Flashing	Overhang Roof				None Detected



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EMSL Order: 412207379

Customer ID: TITA52

Customer PO: 71227143

Project ID:

Attention: Chad Chavis
Terracon Consultants, Inc.
2701 Westport Road
Charlotte, NC 28208

Phone: (704) 307-3045

Fax: (704) 509-1888

Received Date: 07/29/2022 12:45 PM

Analysis Date: 08/02/2022 - 08/03/2022

Collected Date: 07/27/2022

Project: Grier Middle School Demolition/ 71227143/ Building D Roof

Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

Sample	Description	Appearance	Non-Asbestos		Asbestos
			% Fibrous	% Non-Fibrous	% Type
DR 1-1-Membrane <small>412207379-0001</small>	Lower Roof - Roof Membrane	Black Non-Fibrous Homogeneous	5% Cellulose 10% Glass	2% Quartz 83% Non-fibrous (Other)	None Detected
DR 1-1-Gray Insulation <small>412207379-0001A</small>	Lower Roof - Roof Membrane	Gray Fibrous Homogeneous	95% Cellulose	2% Perlite 3% Non-fibrous (Other)	None Detected
DR 1-1-Beige Insulation <small>412207379-0001B</small>	Lower Roof - Roof Membrane	Beige Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
DR 1-2-Membrane <small>412207379-0002</small>	Lower Roof - Roof Membrane	Black Non-Fibrous Homogeneous	5% Cellulose 10% Glass	2% Quartz 83% Non-fibrous (Other)	None Detected
DR 1-2-Gray Insulation <small>412207379-0002A</small>	Lower Roof - Roof Membrane	Gray Fibrous Homogeneous	95% Cellulose	2% Perlite 3% Non-fibrous (Other)	None Detected
DR 1-2-Beige Insulation <small>412207379-0002B</small>	Lower Roof - Roof Membrane	Beige Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
DR 1-3-Membrane <small>412207379-0003</small>	Upper Roof - Roof Membrane	Black Fibrous Homogeneous	15% Glass	85% Non-fibrous (Other)	None Detected
DR 1-3-Gray Insulation <small>412207379-0003A</small>	Upper Roof - Roof Membrane	Brown/Gray/White Fibrous Homogeneous	90% Cellulose	5% Perlite 5% Non-fibrous (Other)	None Detected
DR 1-3-Beige Insulation <small>412207379-0003B</small>	Upper Roof - Roof Membrane	Yellow/Beige Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
DR 2-1 <small>412207379-0004</small>	Lower Roof - Roof Flashing	Black Fibrous Homogeneous	10% Glass	2% Quartz 88% Non-fibrous (Other)	None Detected
DR 2-2 <small>412207379-0005</small>	Lower Roof - Roof Flashing	Black Fibrous Homogeneous	<1% Cellulose 10% Glass	2% Quartz 88% Non-fibrous (Other)	None Detected
DR 2-3-Silver Paint <small>412207379-0006</small>	Upper Roof - Roof Flashing	Silver Non-Fibrous Homogeneous	3% Wollastonite	97% Non-fibrous (Other)	None Detected
DR 2-3-Flashing <small>412207379-0006A</small>	Upper Roof - Roof Flashing	Black Fibrous Homogeneous	15% Glass	10% Quartz 15% Ca Carbonate 60% Non-fibrous (Other)	None Detected
DR 3-1-Silver Paint <small>412207379-0007</small>	Lower Roof - Silver Paint Penetrations	Silver Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
DR 3-1-Tar <small>412207379-0007A</small>	Lower Roof - Silver Paint Penetrations	Black Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
DR 3-1-Coating <small>412207379-0007B</small>	Lower Roof - Silver Paint Penetrations	White Non-Fibrous Homogeneous		5% Ca Carbonate 95% Non-fibrous (Other)	None Detected

Initial report from: 08/03/2022 13:15:39



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EMSL Order: 412207379
Customer ID: TITA52
Customer PO: 71227143
Project ID:

Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

Sample	Description	Appearance	Non-Asbestos		Asbestos
			% Fibrous	% Non-Fibrous	% Type
DR 3-2-Silver Paint <small>412207379-0008</small>	Lower Roof - Silver Paint Penetrations	Silver Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
DR 3-2-Tar <small>412207379-0008A</small>	Lower Roof - Silver Paint Penetrations	Black Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
DR 3-3-Coating <small>412207379-0009</small>	Upper Roof - Silver Paint Penetrations	White/Beige Non-Fibrous Homogeneous		5% Ca Carbonate 95% Non-fibrous (Other)	None Detected
DR 3-3-Silver Paint <small>412207379-0009A</small>	Upper Roof - Silver Paint Penetrations	Silver Non-Fibrous Homogeneous	3% Wollastonite	97% Non-fibrous (Other)	None Detected
DR 4-1 <small>412207379-0010</small>	Lower Roof - Gray Roof Caulk	Gray Non-Fibrous Homogeneous		15% Ca Carbonate 85% Non-fibrous (Other)	None Detected
DR 4-2 <small>412207379-0011</small>	Lower Roof - Gray Roof Caulk	Gray Non-Fibrous Homogeneous		15% Ca Carbonate 85% Non-fibrous (Other)	None Detected
DR 4-3 <small>412207379-0012</small>	Lower Roof - Gray Roof Caulk	Gray Non-Fibrous Homogeneous		15% Ca Carbonate 85% Non-fibrous (Other)	None Detected
DR 5-1-Membrane <small>412207379-0013</small>	Overhang Roof - Roof Membrane	Black Non-Fibrous Homogeneous	10% Glass	90% Non-fibrous (Other)	None Detected
DR 5-1-Insulation <small>412207379-0013A</small>	Overhang Roof - Roof Membrane	Gray Fibrous Homogeneous	95% Cellulose	2% Perlite 3% Non-fibrous (Other)	None Detected
DR 5-2-Membrane <small>412207379-0014</small>	Overhang Roof - Roof Membrane	Black Non-Fibrous Homogeneous	10% Glass	90% Non-fibrous (Other)	None Detected
DR 5-2-Insulation <small>412207379-0014A</small>	Overhang Roof - Roof Membrane	Gray Fibrous Homogeneous	95% Cellulose	2% Perlite 3% Non-fibrous (Other)	None Detected
DR 5-3-Membrane <small>412207379-0015</small>	Overhang Roof - Roof Membrane	Black Fibrous Homogeneous	15% Glass	2% Quartz 83% Non-fibrous (Other)	None Detected
DR 5-3-Insulation <small>412207379-0015A</small>	Overhang Roof - Roof Membrane	Brown/Gray/White Fibrous Homogeneous	90% Cellulose	5% Perlite 5% Non-fibrous (Other)	None Detected
DR 6-1-Silver Paint <small>412207379-0016</small>	Overhang Roof - Roof Flashing	Silver Non-Fibrous Homogeneous	<1% Cellulose	100% Non-fibrous (Other)	None Detected
DR 6-1-Flashing <small>412207379-0016A</small>	Overhang Roof - Roof Flashing	Black Non-Fibrous Homogeneous	10% Glass	90% Non-fibrous (Other)	None Detected
DR 6-2-Silver Paint <small>412207379-0017</small>	Overhang Roof - Roof Flashing	Silver Non-Fibrous Homogeneous	<1% Cellulose	100% Non-fibrous (Other)	None Detected
DR 6-2-Flashing <small>412207379-0017A</small>	Overhang Roof - Roof Flashing	Black Non-Fibrous Homogeneous	10% Glass	90% Non-fibrous (Other)	None Detected
DR 6-3-Silver Paint <small>412207379-0018</small>	Overhang Roof - Roof Flashing	Silver Non-Fibrous Homogeneous	3% Wollastonite	97% Non-fibrous (Other)	None Detected
DR 6-3-Flashing <small>412207379-0018A</small>	Overhang Roof - Roof Flashing	Black Fibrous Homogeneous	15% Glass	85% Non-fibrous (Other)	None Detected

Initial report from: 08/03/2022 13:15:39



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EMSL Order: 412207379

Customer ID: TITA52

Customer PO: 71227143

Project ID:

Analyst(s)

Ashley Hill (23)

Jessica Cooper (12)

Lee Plumley, Laboratory Manager
or Other Approved Signatory

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Samples analyzed by EMSL Analytical, Inc. Pineville, NC NVLAP Lab Code 200841-0, VA 3333 00312

Initial report from: 08/03/2022 13:15:39

Inspector: Erick Hutson
 License: 12849
 Date: 4/15/2022 - 4/21/2022

Job Name: Grier Middle School
 Job Number: 71157008
 Area(s): Building E

Sample No.	Homogeneous Material Description	Sample Location	Floor	Condition	Quantity	Friable/ Non-Friable	Lab Results
E 1-1	2'x2' Pinhole Fissure Ceiling Tile	Cafeteria - North	1	Good	4,200 ft ²	Friable	None Detected
E 1-2	2'x2' Pinhole Fissure Ceiling Tile	Cafeteria - South					None Detected
E 1-3	2'x2' Pinhole Fissure Ceiling Tile	Cafeteria - Center					None Detected
E 2-1	CMU Block Surface Filler	Entrance East	1	Good	1,200 ft ²	Friable	None Detected
E 2-2	CMU Block Surface Filler	Entrance West					None Detected
E 2-3	CMU Block Surface Filler	Kitchen North					None Detected
E 2-4	CMU Block Surface Filler	Kitchen South					None Detected
E 2-5	CMU Block Surface Filler	Kitchen East					None Detected
E 3-1	Plaster (Ceiling)	Cooler Hall	1	Good	300 ft ²	Friable	White Coat: None Detected Grey Coat: None Detected
E 3-2	Plaster (Ceiling)	Mens Bathroom - Kitchen					White Coat: None Detected Grey Coat: None Detected
E 3-3	Plaster (Ceiling)	Womens Bathroom					White Coat: None Detected Grey Coat: None Detected
E 4-1	12"x12" Beige/Tan Smear Floor Tile and Mastic	Main Cafeteria Area	1	Good	4,000 ft ²	Non-Friable	Floor Tile: None Detected Mastic : None Detected
E 4-2	12"x12" Beige/Tan Smear Floor Tile and Mastic	Main Cafeteria Area					Floor Tile: None Detected Mastic : None Detected
E 4-3	12"x12" Beige/Tan Smear Floor Tile and Mastic	Main Cafeteria Area					Floor Tile: None Detected Mastic : None Detected
E 5-1	12"x12" Green Floor Tile and Mastic	Main Cafeteria Area	1	Good	100 ft ²	Non-Friable	Floor Tile: None Detected Mastic : None Detected
E 5-2	12"x12" Green Floor Tile and Mastic	Main Cafeteria Area					Floor Tile: None Detected Mastic : None Detected
E 5-3	12"x12" Green Floor Tile and Mastic	Main Cafeteria Area					Floor Tile: None Detected Mastic : None Detected
E 6-1	12"x12" Yellow Floor Tile and Mastic	Main Cafeteria Area	1	Good	100 ft ²	Non-Friable	Floor Tile: None Detected Mastic : None Detected
E 6-2	12"x12" Yellow Floor Tile and Mastic	Main Cafeteria Area					Floor Tile: None Detected Mastic : None Detected
E 6-3	12"x12" Yellow Floor Tile and Mastic	Main Cafeteria Area					Floor Tile: None Detected Mastic : None Detected
E 7-1	6" Black Covebase and Mastic	Main Cafeteria Area	1	Good	300 ft	Non-Friable	Covebase: None Detected Mastic: None Detected
E 7-2	6" Black Covebase and Mastic	Main Cafeteria Area					Covebase: None Detected Mastic: None Detected
E 7-3	6" Black Covebase and Mastic	Main Cafeteria Area					Covebase: None Detected Mastic: None Detected
E 8-1	Exterior Grey Window Frame Caulk	Cafeteria	1	Good	2 windows	Non-Friable	None Detected
E 8-2	Exterior Grey Window Frame Caulk	Cafeteria					None Detected
E 8-3	Exterior Grey Window Frame Caulk	Cafeteria					None Detected
E 9-1	Exterior White Door Caulk	Cafeteria	1	Good	5 doors	Non-Friable	2% Chrysotile
E 9-2	Exterior White Door Caulk	Cafeteria					2% Chrysotile
E 9-3	Exterior White Door Caulk	Cafeteria					5% Chrysotile
E 10-1	Interior Door Caulk	Cafeteria	1	Good	12 doors	Non-Friable	3% Chrysotile

Inspector: Erick Hutson
 License: 12849
 Date: 4/15/2022 - 4/21/2022

 Job Name: Grier Middle School
 Job Number: 71157008
 Area(s): Building E

Sample No.	Homogeneous Material Description	Sample Location	Floor	Condition	Quantity	Friable/ Non-Friable	Lab Results
E 10-2	Interior Door Caulk	Kitchen					None Detected
E 10-3	Interior Door Caulk	Kitchen					5% Chrysotile
E 11-1	2" Pipe Elbow Insulation	Kitchen	1	Good	Unable to Quantify	Friable	Wrap: None Detected Insulation: 50% Chrysotile
E 11-2	2" Pipe Elbow Insulation	Kitchen					Wrap: None Detected Insulation: 50% Chrysotile
E 11-3	2" Pipe Elbow Insulation	Kitchen					Wrap: None Detected Insulation: 60% Chrysotile
E 12-1	2" Canvas Pipe Wrap Hot Water	Kitchen	1	Good	100 ft	Friable	None Detected
E 12-2	2" Canvas Pipe Wrap Hot Water	Kitchen					None Detected
E 12-3	2" Canvas Pipe Wrap Hot Water	Kitchen					None Detected
E 13-1	6" Canvas Paper Pipe Wrap Hot Water	Cafeteria	1	Good	150 ft	Friable	None Detected
E 13-2	6" Canvas Paper Pipe Wrap Hot Water	Cafeteria					None Detected
E 13-3	6" Canvas Paper Pipe Wrap Hot Water	Cafeteria					None Detected
E 14-1	Brown Insulation	Cafeteria	1	Good	300 ft ²	Friable	None Detected
E 14-2	Brown Insulation	Cafeteria					None Detected
E 14-3	Brown Insulation	Cafeteria					None Detected
E 15-1	6" Canvas Pipe Wrap Hot Water	Cafeteria	1	Good	150 ft	Friable	None Detected
E 15-2	6" Canvas Pipe Wrap Hot Water	Cafeteria					None Detected
E 15-3	6" Canvas Pipe Wrap Hot Water	Cafeteria					None Detected
E 16-1	Exterior Window Glazing	Exterior Rear	1	Good	12 windows	Non-Friable	2% Chrysotile
E 16-2	Exterior Window Glazing	Exterior Rear					2% Chrysotile
E 16-3	Exterior Window Glazing	Exterior Rear					2% Chrysotile
E 17-1	Exterior Window Frame Caulk	Exterior Rear	1	Good	12 windows	Non-Friable	3% Chrysotile
E 17-2	Exterior Window Frame Caulk	Exterior Rear					3% Chrysotile
E 17-3	Exterior Window Frame Caulk	Exterior Rear					3% Chrysotile
E 18-1	Duct Insulation	Storage Closet	1	Good	50 ft	Friable	Wrap Insulation: None Detected Insulation: None Detected
E 18-2	Duct Insulation	Storage Closet					Wrap Insulation: None Detected Insulation: None Detected
E 18-3	Duct Insulation	Storage Closet					Wrap Insulation: None Detected Insulation: None Detected



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EMSL Order: 412204024

Customer ID: TITA52

Customer PO: 71157008

Project ID:

Attention: Erick Hutson
Terracon Consultants, Inc.
2701 Westport Road
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Phone: (803) 984-9498

Fax: (704) 509-1888

Received Date: 04/25/2022 9:40 AM

Analysis Date: 04/28/2022 - 04/29/2022

Collected Date:

Project: Grier Middle School - 71157008 - Building E

Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

Sample	Description	Appearance	Non-Asbestos		Asbestos
			% Fibrous	% Non-Fibrous	% Type
E 1-1 412204024-0001	Cafeteria - North - 2'x2' Pinhole Fissure Ceiling Tile	Gray/White Fibrous Homogeneous	60% Cellulose 20% Min. Wool	5% Perlite 15% Non-fibrous (Other)	None Detected
E 1-2 412204024-0002	Cafeteria - South - 2'x2' Pinhole Fissure Ceiling Tile	Gray/White Fibrous Homogeneous	60% Cellulose 20% Min. Wool	5% Perlite 15% Non-fibrous (Other)	None Detected
E 1-3 412204024-0003	Cafeteria - Center - 2'x2' Pinhole Fissure Ceiling Tile	Gray/White Fibrous Homogeneous	60% Cellulose 15% Min. Wool	15% Perlite 10% Non-fibrous (Other)	None Detected
E 2-1 412204024-0004	Entrance East - CMU Block Surface Filler	Gray/White Non-Fibrous Homogeneous		10% Quartz 90% Non-fibrous (Other)	None Detected
E 2-2 412204024-0005	Entrance West - CMU Block Surface Filler	Gray/White Non-Fibrous Homogeneous		10% Quartz 90% Non-fibrous (Other)	None Detected
E 2-3 412204024-0006	Kitchen North - CMU Block Surface Filler	Gray/White Non-Fibrous Homogeneous		10% Quartz 90% Non-fibrous (Other)	None Detected
E 2-4 412204024-0007	Kitchen South - CMU Block Surface Filler	Gray/White Non-Fibrous Homogeneous		15% Quartz 85% Non-fibrous (Other)	None Detected
E 2-5 412204024-0008	Kitchen East - CMU Block Surface Filler	White Non-Fibrous Homogeneous		15% Quartz 85% Non-fibrous (Other)	None Detected
E 3-1-White Coat 412204024-0009	Cooler Hall - Plaster - Ceiling	White Non-Fibrous Homogeneous		10% Ca Carbonate 90% Non-fibrous (Other)	None Detected
E 3-1-Gray Coat 412204024-0009A	Cooler Hall - Plaster - Ceiling	Gray Non-Fibrous Homogeneous		10% Quartz 90% Non-fibrous (Other)	None Detected
E 3-2-White Coat 412204024-0010	Mens Bathroom - Kitchen - Plaster - Ceiling	White Non-Fibrous Homogeneous		10% Ca Carbonate 90% Non-fibrous (Other)	None Detected
E 3-2-Gray Coat 412204024-0010A	Mens Bathroom - Kitchen - Plaster - Ceiling	Gray Non-Fibrous Homogeneous		10% Quartz 90% Non-fibrous (Other)	None Detected
E 3-3-White Coat 412204024-0011	Womens Bathroom - Plaster - Ceiling	White Non-Fibrous Homogeneous		10% Ca Carbonate 90% Non-fibrous (Other)	None Detected
E 3-3-Gray Coat 412204024-0011A	Womens Bathroom - Plaster - Ceiling	Gray Non-Fibrous Homogeneous		10% Quartz 90% Non-fibrous (Other)	None Detected
E 4-1-Floor Tile 412204024-0012	Main Cafeteria Area - 12"x12" Beige-Tan Smear Floor Tile and Mastic	Tan/Beige Non-Fibrous Homogeneous		20% Ca Carbonate 80% Non-fibrous (Other)	None Detected

Initial report from: 04/29/2022 13:58:15



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EMSL Order: 412204024
Customer ID: TITA52
Customer PO: 71157008
Project ID:

Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

Sample	Description	Appearance	Non-Asbestos		Asbestos
			% Fibrous	% Non-Fibrous	% Type
E 4-1-Mastic 412204024-0012A	Main Cafeteria Area - 12"x12" Beige-Tan Smear Floor Tile and Mastic	Tan Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
E 4-2-Floor Tile 412204024-0013	Main Cafeteria Area - 12"x12" Beige-Tan Smear Floor Tile and Mastic	Tan/Beige Non-Fibrous Homogeneous		20% Ca Carbonate 80% Non-fibrous (Other)	None Detected
E 4-2-Mastic 412204024-0013A	Main Cafeteria Area - 12"x12" Beige-Tan Smear Floor Tile and Mastic	Tan Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
E 4-3-Floor Tile 412204024-0014	Main Cafeteria Area - 12"x12" Beige-Tan Smear Floor Tile and Mastic	Tan Non-Fibrous Homogeneous		30% Ca Carbonate 70% Non-fibrous (Other)	None Detected
E 4-3-Mastic 412204024-0014A	Main Cafeteria Area - 12"x12" Beige-Tan Smear Floor Tile and Mastic	Tan Non-Fibrous Homogeneous		5% Ca Carbonate 95% Non-fibrous (Other)	None Detected
E 5-1-Floor Tile 412204024-0015	Main Cafeteria Area - 12"x12" Green Floor Tile and Mastic	Green Non-Fibrous Homogeneous		20% Ca Carbonate 80% Non-fibrous (Other)	None Detected
E 5-1-Mastic 412204024-0015A	Main Cafeteria Area - 12"x12" Green Floor Tile and Mastic	Tan Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
E 5-2-Floor Tile 412204024-0016	Main Cafeteria Area - 12"x12" Green Floor Tile and Mastic	Green Non-Fibrous Homogeneous		20% Ca Carbonate 80% Non-fibrous (Other)	None Detected
E 5-2-Mastic 412204024-0016A	Main Cafeteria Area - 12"x12" Green Floor Tile and Mastic	Tan Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
E 5-3-Floor Tile 412204024-0017	Main Cafeteria Area - 12"x12" Green Floor Tile and Mastic	Green Non-Fibrous Homogeneous		40% Ca Carbonate 60% Non-fibrous (Other)	None Detected
E 5-3-Mastic 412204024-0017A	Main Cafeteria Area - 12"x12" Green Floor Tile and Mastic	Tan Non-Fibrous Homogeneous	<1% Cellulose	100% Non-fibrous (Other)	None Detected
E 6-1-Floor Tile 412204024-0018	Main Cafeteria Area - 12"x12" Yellow Floor Tile and Mastic	Yellow Non-Fibrous Homogeneous		20% Ca Carbonate 80% Non-fibrous (Other)	None Detected
E 6-1-Mastic 412204024-0018A	Main Cafeteria Area - 12"x12" Yellow Floor Tile and Mastic	Tan Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
E 6-2-Floor Tile 412204024-0019	Main Cafeteria Area - 12"x12" Yellow Floor Tile and Mastic	Yellow Non-Fibrous Homogeneous		20% Ca Carbonate 80% Non-fibrous (Other)	None Detected
E 6-2-Mastic 412204024-0019A	Main Cafeteria Area - 12"x12" Yellow Floor Tile and Mastic	Tan Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
E 6-3-Floor Tile 412204024-0020	Main Cafeteria Area - 12"x12" Yellow Floor Tile and Mastic	Yellow Non-Fibrous Homogeneous		40% Ca Carbonate 60% Non-fibrous (Other)	None Detected
E 6-3-Mastic 412204024-0020A	Main Cafeteria Area - 12"x12" Yellow Floor Tile and Mastic	Tan Non-Fibrous Homogeneous		5% Ca Carbonate 95% Non-fibrous (Other)	None Detected

Initial report from: 04/29/2022 13:58:15



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EMSL Order: 412204024
Customer ID: TITA52
Customer PO: 71157008
Project ID:

Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

Sample	Description	Appearance	Non-Asbestos		Asbestos
			% Fibrous	% Non-Fibrous	% Type
E 7-1-Cove Base 412204024-0021	Main Cafeteria Area - 6" Black Covebase and Mastic	Black Non-Fibrous Homogeneous		5% Ca Carbonate 95% Non-fibrous (Other)	None Detected
E 7-1-Mastic 412204024-0021A	Main Cafeteria Area - 6" Black Covebase and Mastic	Beige Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
E 7-2-Cove Base 412204024-0022	Main Cafeteria Area - 6" Black Covebase and Mastic	Black Non-Fibrous Homogeneous		5% Ca Carbonate 95% Non-fibrous (Other)	None Detected
E 7-2-Mastic 412204024-0022A	Main Cafeteria Area - 6" Black Covebase and Mastic	Beige Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
E 7-3-Cove Base 412204024-0023	Main Cafeteria Area - 6" Black Covebase and Mastic	Black Non-Fibrous Homogeneous		5% Ca Carbonate 95% Non-fibrous (Other)	None Detected
E 7-3-Mastic 412204024-0023A	Main Cafeteria Area - 6" Black Covebase and Mastic	Tan Non-Fibrous Homogeneous	<1% Cellulose	100% Non-fibrous (Other)	None Detected
E 8-1 412204024-0024	Cafeteria - Exterior Grey Window Frame Caulk	Gray Non-Fibrous Homogeneous		10% Ca Carbonate 90% Non-fibrous (Other)	None Detected
E 8-2 412204024-0025	Cafeteria - Exterior Grey Window Frame Caulk	Gray Non-Fibrous Homogeneous		10% Ca Carbonate 90% Non-fibrous (Other)	None Detected
E 8-3 412204024-0026	Cafeteria - Exterior Grey Window Frame Caulk	Gray Non-Fibrous Homogeneous		8% Ca Carbonate 92% Non-fibrous (Other)	None Detected
E 9-1 412204024-0027	Cafeteria - Exterior White Door Caulk	Gray Non-Fibrous Homogeneous		98% Non-fibrous (Other)	2% Chrysotile
E 9-2 412204024-0028	Cafeteria - Exterior White Door Caulk	Gray Non-Fibrous Homogeneous		98% Non-fibrous (Other)	2% Chrysotile
E 9-3 412204024-0029	Cafeteria - Exterior White Door Caulk	White Non-Fibrous Homogeneous		25% Ca Carbonate 70% Non-fibrous (Other)	5% Chrysotile
E 10-1 412204024-0030	Cafeteria - Interior Door Caulk	White Non-Fibrous Homogeneous		15% Ca Carbonate 82% Non-fibrous (Other)	3% Chrysotile
E 10-2 412204024-0031	Kitchen - Interior Door Caulk	White Non-Fibrous Homogeneous		15% Ca Carbonate 85% Non-fibrous (Other)	None Detected
E 10-3 412204024-0032	Kitchen - Interior Door Caulk	Gray/White Non-Fibrous Homogeneous	2% Fibrous (Other)	15% Ca Carbonate 78% Non-fibrous (Other)	5% Chrysotile
E 11-1-Wrap 412204024-0033	Kitchen - 2" Pipe Elbow Insulation	White Non-Fibrous Homogeneous	99% Cellulose	1% Non-fibrous (Other)	None Detected
E 11-1-Insulation 412204024-0033A	Kitchen - 2" Pipe Elbow Insulation	Gray Fibrous Homogeneous	20% Min. Wool	30% Non-fibrous (Other)	50% Chrysotile
E 11-2-Wrap 412204024-0034	Kitchen - 2" Pipe Elbow Insulation	White/Beige Fibrous Homogeneous	99% Cellulose	1% Non-fibrous (Other)	None Detected
E 11-2-Insulation 412204024-0034A	Kitchen - 2" Pipe Elbow Insulation	Gray Fibrous Homogeneous	20% Min. Wool	30% Non-fibrous (Other)	50% Chrysotile

Initial report from: 04/29/2022 13:58:15



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EMSL Order: 412204024
Customer ID: TITA52
Customer PO: 71157008
Project ID:

Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

Sample	Description	Appearance	Non-Asbestos		Asbestos
			% Fibrous	% Non-Fibrous	% Type
E 11-3-Wrap 412204024-0035	Kitchen - 2" Pipe Elbow Insulation	Tan Fibrous Homogeneous	60% Glass	40% Non-fibrous (Other)	None Detected
E 11-3-Insulation 412204024-0035A	Kitchen - 2" Pipe Elbow Insulation	Gray Fibrous Homogeneous		40% Non-fibrous (Other)	60% Chrysotile
E 12-1 412204024-0036	Kitchen - 2" Canvas Pipe Wrap Hot Water	Beige Fibrous Homogeneous	99% Cellulose	1% Non-fibrous (Other)	None Detected
E 12-2 412204024-0037	Kitchen - 2" Canvas Pipe Wrap Hot Water	Beige Fibrous Homogeneous	99% Cellulose	1% Non-fibrous (Other)	None Detected
E 12-3 412204024-0038	Kitchen - 2" Canvas Pipe Wrap Hot Water	Tan/White Non-Fibrous Homogeneous	80% Cellulose	20% Non-fibrous (Other)	None Detected
E 13-1 412204024-0039	Cafeteria - 6" Canvas Paper Pipe Wrap Hot Water	White/Silver Fibrous Homogeneous	90% Cellulose 5% Glass	5% Non-fibrous (Other)	None Detected
E 13-2 412204024-0040	Cafeteria - 6" Canvas Paper Pipe Wrap Hot Water	White/Silver Fibrous Homogeneous	90% Cellulose 5% Glass	5% Non-fibrous (Other)	None Detected
E 13-3 412204024-0041	Cafeteria - 6" Canvas Paper Pipe Wrap Hot Water	Gray Non-Fibrous Homogeneous	80% Cellulose	20% Non-fibrous (Other)	None Detected
E 14-1 412204024-0042	Cafeteria - Brown Insulation	Brown Fibrous Homogeneous	30% Cellulose	2% Perlite 68% Non-fibrous (Other)	None Detected
E 14-2 412204024-0043	Cafeteria - Brown Insulation	Brown Fibrous Homogeneous	30% Cellulose	2% Perlite 68% Non-fibrous (Other)	None Detected
E 14-3 412204024-0044	Cafeteria - Brown Insulation	Brown Non-Fibrous Homogeneous	40% Cellulose	20% Perlite 40% Non-fibrous (Other)	None Detected
E 15-1 412204024-0045	Cafeteria - 6" Canvas Pipe Wrap Hot Water	White/Silver Fibrous Homogeneous	99% Cellulose	1% Non-fibrous (Other)	None Detected
E 15-2 412204024-0046	Cafeteria - 6" Canvas Pipe Wrap Hot Water	White/Silver Fibrous Homogeneous	99% Cellulose	1% Non-fibrous (Other)	None Detected
E 15-3 412204024-0047	Cafeteria - 6" Canvas Pipe Wrap Hot Water	White/Silver Fibrous Homogeneous	98% Cellulose	2% Non-fibrous (Other)	None Detected
E 16-1 412204024-0048	Exterior Rear - Exterior Window Glazing	Gray/Beige Non-Fibrous Homogeneous		98% Non-fibrous (Other)	2% Chrysotile
E 16-2 412204024-0049	Exterior Rear - Exterior Window Glazing	Gray/Tan Non-Fibrous Homogeneous		98% Non-fibrous (Other)	2% Chrysotile
E 16-3 412204024-0050	Exterior Rear - Exterior Window Glazing	White Non-Fibrous Homogeneous		20% Ca Carbonate 78% Non-fibrous (Other)	2% Chrysotile
E 17-1 412204024-0051	Exterior Rear - Exterior Window Frame Caulk	Gray/Tan Non-Fibrous Homogeneous		97% Non-fibrous (Other)	3% Chrysotile
E 17-2 412204024-0052	Exterior Rear - Exterior Window Frame Caulk	Gray/Tan Non-Fibrous Homogeneous		97% Non-fibrous (Other)	3% Chrysotile

Initial report from: 04/29/2022 13:58:15



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EMSL Order: 412204024
Customer ID: TITA52
Customer PO: 71157008
Project ID:

Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

Sample	Description	Appearance	Non-Asbestos		Asbestos
			% Fibrous	% Non-Fibrous	% Type
E 17-3 412204024-0053	Exterior Rear - Exterior Window Frame Caulk	White Non-Fibrous Homogeneous		15% Ca Carbonate 83% Non-fibrous (Other)	2% Chrysotile
E 18-1-Wrap 412204024-0054	Storage Closet - Duct Insulation	White Fibrous Homogeneous	90% Cellulose 5% Glass	5% Non-fibrous (Other)	None Detected
E 18-1-Insulation 412204024-0054A	Storage Closet - Duct Insulation	Yellow Fibrous Homogeneous	99% Glass	1% Non-fibrous (Other)	None Detected
E 18-2-Wrap 412204024-0055	Storage Closet - Duct Insulation	White Fibrous Homogeneous	90% Cellulose 5% Glass	5% Non-fibrous (Other)	None Detected
E 18-2-Insulation 412204024-0055A	Storage Closet - Duct Insulation	Yellow Fibrous Homogeneous	99% Glass	1% Non-fibrous (Other)	None Detected
E 18-3-Wrap 412204024-0056	Storage Closet - Duct Insulation	White Non-Fibrous Homogeneous	80% Cellulose 5% Glass	15% Non-fibrous (Other)	None Detected
E 18-3-Insulation 412204024-0056A	Storage Closet - Duct Insulation	Yellow Fibrous Homogeneous	99% Glass	1% Non-fibrous (Other)	None Detected

Analyst(s) _____

Ashley Hill (51)
Sarah Breneman (26)

Lee Plumley, Laboratory Manager
or Other Approved Signatory

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Samples analyzed by EMSL Analytical, Inc. Pineville, NC NVLAP Lab Code 200841-0, VA 3333 00312

Initial report from: 04/29/2022 13:58:15

Inspector: Russell Harrings
 License: 12222
 Date: 7/25/2022

Job Name: Grier Middle School
 Job Number: 71157008
 Area(s): Building E (boiler room)

Sample No.	Homogeneous Material Description	Sample Location	Floor	Condition	Quantity	Friable/ Non-Friable	Lab Results
E 19-1	Tank Insulation Wrap on Fiberglass	Left of Entrance (front)	B	Good	110 ft ²	Non-Friable	None Detected
E 19-2	Tank Insulation Wrap on Fiberglass	Left of Entrance (back)	B				None Detected
E 19-3	Tank Insulation Wrap on Fiberglass	Left of Entrance (middle)	B				None Detected
E 20-1	Pipe Wrap and Mastic on Fiberglass	Front Room, Front Left	B	Good	500 ft	Non-Friable	None Detected
E 20-2	Pipe Wrap and Mastic on Fiberglass	Front Room, Left of Left Boiler	B				None Detected
E 20-3	Pipe Wrap and Mastic on Fiberglass	Front Room, Between Boilers	B				None Detected
E 21-1	Rough, Hard Plaster Ceiling	Front Room, Near Entrance	B	Good	1,950 ft ²	Non-Friable	None Detected
E 21-2	Rough, Hard Plaster Ceiling	Front Room, Back Middle	B				None Detected
E 21-3	Rough, Hard Plaster Ceiling	Front Room, Above Interior Door	B				None Detected
E 21-4	Rough, Hard Plaster Ceiling	Back Room, Middle	B				None Detected
E 21-5	Rough, Hard Plaster Ceiling	Back Room, Above Interior Door	B				None Detected
E 22-1	Plaster Ceiling Patch	Front Room, Middle	B	Good	200 ft ²	Non-Friable	None Detected
E 22-2	Plaster Ceiling Patch	Front Room, Above Interior Door	B				None Detected
E 22-3	Plaster Ceiling Patch	Back Room, Above Interior Door	B				None Detected
E 23-1	Exhaust Duct Insulation (straight)	Behind Left Boiler	B	Good	70 ft	Friable	None Detected
E 23-2	Exhaust Duct Insulation (straight)	Behind Left Boiler	B				None Detected
E 23-3	Exhaust Duct Insulation (straight)	Behind Right Boiler	B				None Detected
E 24-1	Exhaust Duct Insulation (elbow)	Behind Left Boiler	B	Good	4 each	Friable	None Detected
E 24-2	Exhaust Duct Insulation (elbow)	Behind Right Boiler	B				None Detected
E 24-3	Exhaust Duct Insulation (elbow)	Behind Right Boiler	B				None Detected



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EMSL Order: 412207381

Customer ID: TITA52

Customer PO: 71227143

Project ID:

Attention: Chad Chavis
Terracon Consultants, Inc.
2701 Westport Road
Charlotte, NC 28208

Phone: (704) 307-3045

Fax: (704) 509-1888

Received Date: 07/29/2022 12:45 PM

Analysis Date: 08/01/2022 - 08/02/2022

Collected Date: 07/25/2022

Project: Grier Middle School Demolition/ 71227143/ Building E (Boiler Room)

Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

Sample	Description	Appearance	Non-Asbestos		Asbestos
			% Fibrous	% Non-Fibrous	% Type
E 19-1 412207381-0001	Left of Entrance - Front - Tank Insulation Wrap on Fiberglass	White/Yellow Fibrous Homogeneous	70% Cellulose 10% Glass	20% Non-fibrous (Other)	None Detected
<i>Result includes a small amount of inseparable attached insulation.</i>					
E 19-2 412207381-0002	Left of Entrance - Middle - Tank Insulation Wrap on Fiberglass	Brown/White Fibrous Homogeneous	70% Cellulose 10% Glass	20% Non-fibrous (Other)	None Detected
E 19-3 412207381-0003	Left of Entrance - Back - Tank Insulation Wrap on Fiberglass	White Non-Fibrous Homogeneous	80% Cellulose 2% Glass	18% Non-fibrous (Other)	None Detected
E 20-1-Mastic/Wrap 412207381-0004	Front Room, Front Left - Pipe Wrap and Mastic on Fiberglass	White Fibrous Homogeneous	70% Cellulose 10% Glass	20% Non-fibrous (Other)	None Detected
E 20-1-Insulation 412207381-0004A	Front Room, Front Left - Pipe Wrap and Mastic on Fiberglass	Brown Fibrous Homogeneous	99% Glass	1% Non-fibrous (Other)	None Detected
E 20-2-Mastic/Wrap 412207381-0005	Front Room, Left of Left Boiler - Pipe Wrap and Mastic on Fiberglass	White/Beige Fibrous Homogeneous	70% Cellulose 10% Glass	20% Non-fibrous (Other)	None Detected
E 20-2-Insulation 412207381-0005A	Front Room, Left of Left Boiler - Pipe Wrap and Mastic on Fiberglass	Yellow Fibrous Homogeneous	99% Glass	1% Non-fibrous (Other)	None Detected
E 20-3-Mastic/Wrap 412207381-0006	Front Room, Between Boilers - Pipe Wrap and Mastic on Fiberglass	Tan/White/Silver Fibrous Homogeneous	99% Cellulose	1% Non-fibrous (Other)	None Detected
E 20-3-Insulation 412207381-0006A	Front Room, Between Boilers - Pipe Wrap and Mastic on Fiberglass	Yellow Fibrous Homogeneous	99% Glass	1% Non-fibrous (Other)	None Detected
E 21-1 412207381-0007	Front Room, Near Entrance - Rough, Hard Plaster Ceiling	Gray Non-Fibrous Homogeneous		30% Quartz 70% Non-fibrous (Other)	None Detected
E 21-2 412207381-0008	Front Room, Back Middle - Rough, Hard Plaster Ceiling	Gray Non-Fibrous Homogeneous		30% Quartz 70% Non-fibrous (Other)	None Detected
E 21-3 412207381-0009	Front Room, Above Interior Door - Rough, Hard Plaster Ceiling	Gray Non-Fibrous Homogeneous		30% Ca Carbonate 70% Non-fibrous (Other)	None Detected
E 21-4 412207381-0010	Back Room, Middle - Rough, Hard Plaster Ceiling	Gray Non-Fibrous Homogeneous		20% Quartz 80% Non-fibrous (Other)	None Detected
E 21-5 412207381-0011	Back Room, Above Interior Door - Rough, Hard Plaster Ceiling	Gray Non-Fibrous Homogeneous		20% Quartz 80% Non-fibrous (Other)	None Detected

Initial report from: 08/03/2022 14:45:55



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EMSL Order: 412207381
Customer ID: TITA52
Customer PO: 71227143
Project ID:

Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

Sample	Description	Appearance	Non-Asbestos		Asbestos
			% Fibrous	% Non-Fibrous	% Type
E 22-1 <i>412207381-0012</i>	Front Room, Middle - Plaster Ceiling Patch	White Non-Fibrous Homogeneous		15% Ca Carbonate 85% Non-fibrous (Other)	None Detected
E 22-2 <i>412207381-0013</i>	Front Room, Above Interior Door - Plaster Ceiling Patch	White Non-Fibrous Homogeneous		15% Ca Carbonate 85% Non-fibrous (Other)	None Detected
E 22-3 <i>412207381-0014</i>	Back Room, Above Interior Door - Plaster Ceiling Patch	White Non-Fibrous Homogeneous	<1% Glass	15% Ca Carbonate 85% Non-fibrous (Other)	None Detected
E 23-1 <i>412207381-0015</i>	Behind Left Boiler - Exhaust Duct Insulation - Straight	White Fibrous Homogeneous	30% Cellulose	70% Non-fibrous (Other)	None Detected
E 23-2-White Insulation <i>412207381-0016</i>	Behind Left Boiler - Exhaust Duct Insulation - Straight	White Non-Fibrous Homogeneous	30% Cellulose	70% Non-fibrous (Other)	None Detected
E 23-2-Gray Insulation <i>412207381-0016A</i>	Behind Left Boiler - Exhaust Duct Insulation - Straight	Gray Non-Fibrous Homogeneous	5% Min. Wool	10% Ca Carbonate 85% Non-fibrous (Other)	None Detected
E 23-3-Wrap <i>412207381-0017</i>	Behind Right Boiler - Exhaust Duct Insulation - Straight	White Fibrous Homogeneous	99% Cellulose	1% Non-fibrous (Other)	None Detected
E 23-3-Insulation <i>412207381-0017A</i>	Behind Right Boiler - Exhaust Duct Insulation - Straight	White Fibrous Homogeneous	30% Cellulose	70% Non-fibrous (Other)	None Detected
E 24-1-White Insulation <i>412207381-0018</i>	Behind Left Boiler - Exhaust Duct Insulation - Elbow	White Fibrous Homogeneous	30% Cellulose 10% Glass	5% Mica 55% Non-fibrous (Other)	None Detected
E 24-1-Gray Insulation <i>412207381-0018A</i>	Behind Left Boiler - Exhaust Duct Insulation - Elbow	Gray Non-Fibrous Homogeneous	20% Min. Wool	10% Ca Carbonate 5% Mica 65% Non-fibrous (Other)	None Detected
E 24-2-White Insulation <i>412207381-0019</i>	Behind Right Boiler - Exhaust Duct Insulation - Elbow	White Fibrous Homogeneous	30% Cellulose 10% Glass	60% Non-fibrous (Other)	None Detected
E 24-2-Gray Insulation <i>412207381-0019A</i>	Behind Right Boiler - Exhaust Duct Insulation - Elbow	Gray Non-Fibrous Homogeneous	20% Min. Wool	80% Non-fibrous (Other)	None Detected
E 24-3-Wrap <i>412207381-0020</i>	Behind Right Boiler - Exhaust Duct Insulation - Elbow	White Fibrous Homogeneous	99% Cellulose	1% Non-fibrous (Other)	None Detected
E 24-3-White Insulation <i>412207381-0020A</i>	Behind Right Boiler - Exhaust Duct Insulation - Elbow	White Fibrous Homogeneous	30% Cellulose 10% Glass	60% Non-fibrous (Other)	None Detected
E 24-3-Gray Insulation <i>412207381-0020B</i>	Behind Right Boiler - Exhaust Duct Insulation - Elbow	Gray Fibrous Homogeneous	30% Min. Wool	70% Non-fibrous (Other)	None Detected



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EMSL Order: 412207381

Customer ID: TITA52

Customer PO: 71227143

Project ID:

Analyst(s)

Ashley Hill (11)

Madeline Baldelli (18)

Lee Plumley, Laboratory Manager
or Other Approved Signatory

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Samples analyzed by EMSL Analytical, Inc. Pineville, NC NVLAP Lab Code 200841-0, VA 3333 00312

Initial report from: 08/03/2022 14:45:55



Asbestos Inspection Form

Inspector: Chad Chavis
License: 12929
Date: 7/26/2022

Job Name: Grier Middle School
Job Number: 71227143
Area(s): Building E Roof

Sample No.	Homogeneous Material Description	Sample Location	Condition	Quantity	Friable/ Non-Friable	Lab Results
ER 1-1	Roof Membrane	Upper Roof	Good		Non-Friable	None Detected
ER 1-2	Roof Membrane	Upper Roof				None Detected
ER 1-3	Roof Membrane	Lower Roof				None Detected
ER 2-1	Roof Flashing	Upper Roof	Good		Non-Friable	None Detected
ER 2-2	Roof Flashing	Upper Roof				None Detected
ER 2-3	Roof Flashing	Lower Roof				None Detected
ER 3-1	Grey Roof Chimney Caulk	Lower Roof	Good		Non-Friable	None Detected
ER 3-2	Grey Roof Chimney Caulk	Lower Roof				None Detected
ER 3-3	Grey Roof Chimney Caulk	Lower Roof				None Detected



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EMSL Order: 412207380

Customer ID: TITA52

Customer PO: 71227143

Project ID:

Attention: Chad Chavis
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Charlotte, NC 28208

Phone: (704) 307-3045

Fax: (704) 509-1888

Received Date: 07/29/2022 12:45 PM

Analysis Date: 08/01/2022

Collected Date: 07/26/2022

Project: Grier Middle School Demolition/ 71227143/ Building E Roof

Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

Sample	Description	Appearance	Non-Asbestos		Asbestos
			% Fibrous	% Non-Fibrous	% Type
ER 1-1-Membrane <small>412207380-0001</small>	Upper Roof - Roof Membrane	Black Non-Fibrous Homogeneous	2% Cellulose 5% Glass	93% Non-fibrous (Other)	None Detected
ER 1-1-Foam <small>412207380-0001A</small>	Upper Roof - Roof Membrane	Beige Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
ER 1-1-Insulation <small>412207380-0001B</small>	Upper Roof - Roof Membrane	Brown/Gray Fibrous Homogeneous	99% Cellulose	1% Non-fibrous (Other)	None Detected
ER 1-2-Membrane <small>412207380-0002</small>	Upper Roof - Roof Membrane	Black Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
ER 1-2-Foam <small>412207380-0002A</small>	Upper Roof - Roof Membrane	Beige Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
ER 1-2-Insulation <small>412207380-0002B</small>	Upper Roof - Roof Membrane	Brown/Gray Fibrous Homogeneous	99% Cellulose	1% Non-fibrous (Other)	None Detected
ER 1-3-Membrane <small>412207380-0003</small>	Lower Roof - Roof Membrane	Black Non-Fibrous Homogeneous	<1% Cellulose	100% Non-fibrous (Other)	None Detected
ER 1-3-Foam <small>412207380-0003A</small>	Lower Roof - Roof Membrane	Beige Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
ER 1-3-Insulation <small>412207380-0003B</small>	Lower Roof - Roof Membrane	Brown Fibrous Homogeneous	99% Cellulose	1% Non-fibrous (Other)	None Detected
ER 2-1 <small>412207380-0004</small>	Upper Roof - Roof Flashing	Black Fibrous Homogeneous	5% Glass	5% Quartz 90% Non-fibrous (Other)	None Detected
ER 2-2 <small>412207380-0005</small>	Upper Roof - Roof Flashing	Black Non-Fibrous Homogeneous	2% Cellulose 5% Glass	93% Non-fibrous (Other)	None Detected
ER 2-3 <small>412207380-0006</small>	Lower Roof - Roof Flashing	Black Non-Fibrous Homogeneous	2% Cellulose	98% Non-fibrous (Other)	None Detected
ER 3-1 <small>412207380-0007</small>	Lower Roof - Grey Roof Chimney Caulk	Gray Non-Fibrous Homogeneous		5% Ca Carbonate 95% Non-fibrous (Other)	None Detected
ER 3-2 <small>412207380-0008</small>	Lower Roof - Grey Roof Chimney Caulk	Gray Non-Fibrous Homogeneous		5% Ca Carbonate 95% Non-fibrous (Other)	None Detected
ER 3-3 <small>412207380-0009</small>	Lower Roof - Grey Roof Chimney Caulk	Gray Non-Fibrous Homogeneous		15% Ca Carbonate 85% Non-fibrous (Other)	None Detected

Initial report from: 08/03/2022 13:16:20



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EMSL Order: 412207380

Customer ID: TITA52

Customer PO: 71227143

Project ID:

Analyst(s)

Jessica Cooper (5)

Madeline Baldelli (10)

Lee Plumley, Laboratory Manager
or Other Approved Signatory

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Samples analyzed by EMSL Analytical, Inc. Pineville, NC NVLAP Lab Code 200841-0, VA 3333 00312

Initial report from: 08/03/2022 13:16:20

Inspector: Erick Hutson
 License: 12849
 Date: 4/15/2022 - 4/21/2022

Job Name: Grier Middle School
 Job Number: 71157008
 Area(s): Building F

Sample No.	Homogeneous Material Description	Sample Location	Condition	Quantity	Friable/ Non-Friable	Lab Results
F 1-1	Smooth Plaster (Ceiling)	Bathroom	Good	300 ft²	Friable	White Coat: None Detected Brown Coat: None Detected
F 1-2	Smooth Plaster (Ceiling)	Bathroom				White Coat: None Detected Brown Coat: None Detected
F 1-3	Smooth Plaster (Ceiling)	Bathroom				White Coat: None Detected Brown Coat: None Detected
F 2-1	CMU Block Surface Filler	Storage Room	Good	5,500 ft²	Friable	None Detected
F 2-2	CMU Block Surface Filler	Tool Room				None Detected
F 2-3	CMU Block Surface Filler	Main Work Room				None Detected
F 2-4	CMU Block Surface Filler	Storage Room / Class Room				None Detected
F 2-5	CMU Block Surface Filler	Storage Room / Class Room				None Detected
F 3-1	4" Black Covebase and Mastic	Storage Room / Class Room	Good	600 ft	Non-Friable	Covebase: None Detected Mastic: None Detected
F 3-2	4" Black Covebase and Mastic	Storage Room / Class Room				Covebase: None Detected Mastic: None Detected
F 3-3	4" Black Covebase and Mastic	Storage Room / Class Room				Covebase: None Detected Mastic: None Detected
F 4-1	Yellow Carpet Glue	Storage Room / Class Room	Good	400 ft²	Non-Friable	None Detected
F 4-2	Yellow Carpet Glue	Storage Room / Class Room				None Detected
F 4-3	Yellow Carpet Glue	Storage Room / Class Room				None Detected
F 5-1	Diamond Pattern Peel and Stick	Office	Good	300 ft²	Non-Friable	None Detected
F 5-2	Diamond Pattern Peel and Stick	Office				None Detected
F 5-3	Diamond Pattern Peel and Stick	Office				None Detected
F 6-1	Wallboard (Wall)	Classroom	Good	700 ft²	Friable	None Detected
F 6-2	Wallboard (Wall)	Classroom				None Detected
F 6-3	Wallboard (Wall)	Classroom				None Detected
F 7-1	Exterior Window Glazing	Front Entrance	Good	40 windows	Non-Friable	None Detected
F 7-2	Exterior Window Glazing	Rear Of Building				None Detected
F 7-3	Exterior Window Glazing	Side Of Building				None Detected
F 8-1	Exterior Window Frame Caulk	Front Entrance	Good	40 windows	Non-Friable	3% Chrysotile
F 8-2	Exterior Window Frame Caulk	Rear Of Building				3% Chrysotile
F 8-3	Exterior Window Frame Caulk	Side Of Building				2% Chrysotile
F 9-1	Exterior Door Caulk	Front Door	Good	5 doors	Non-Friable	White Caulk: None Detected Tan Caulk: 3% Chrysotile
F 9-2	Exterior Door Caulk	Side Door				White Caulk: None Detected Tan Caulk: 3% Chrysotile
F 9-3	Exterior Door Caulk	Rear Door				White Caulk: None Detected Tan Caulk: 2% Chrysotile



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EMSL Order: 412204012

Customer ID: TITA52

Customer PO: 71157008

Project ID:

Attention: Erick Hutson
Terracon Consultants, Inc.
2701 Westport Road
Charlotte, NC 28208

Phone: (803) 984-9498

Fax: (704) 509-1888

Received Date: 04/25/2022 9:40 AM

Analysis Date: 04/28/2022

Collected Date:

Project: Grier Middle School - 71157008 - Building F

Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

Sample	Description	Appearance	Non-Asbestos		Asbestos
			% Fibrous	% Non-Fibrous	% Type
F1-1-White Coat <small>412204012-0001</small>	Bathroom - Plaster	White Non-Fibrous Homogeneous		10% Ca Carbonate 90% Non-fibrous (Other)	None Detected
F1-1-Brown Coat <small>412204012-0001A</small>	Bathroom - Plaster	Brown Non-Fibrous Homogeneous		30% Quartz 70% Non-fibrous (Other)	None Detected
F1-2-White Coat <small>412204012-0002</small>	Bathroom - Plaster	White Non-Fibrous Homogeneous		10% Ca Carbonate 90% Non-fibrous (Other)	None Detected
F1-2-Brown Coat <small>412204012-0002A</small>	Bathroom - Plaster	Brown Non-Fibrous Homogeneous		30% Quartz 70% Non-fibrous (Other)	None Detected
F1-3-White Coat <small>412204012-0003</small>	Bathroom - Plaster	White Non-Fibrous Homogeneous		10% Ca Carbonate 90% Non-fibrous (Other)	None Detected
F1-3-Brown Coat <small>412204012-0003A</small>	Bathroom - Plaster	Gray/Tan Non-Fibrous Homogeneous		30% Quartz 70% Non-fibrous (Other)	None Detected
F2-1 <small>412204012-0004</small>	Storage Room - CMU Block Surface Filler	Gray/Yellow Non-Fibrous Homogeneous		5% Quartz 95% Non-fibrous (Other)	None Detected
F2-2 <small>412204012-0005</small>	Tool Room - CMU Block Surface Filler	Gray/Beige Non-Fibrous Homogeneous		5% Quartz 95% Non-fibrous (Other)	None Detected
F2-3 <small>412204012-0006</small>	Main Work Room - CMU Block Surface Filler	Gray/Beige Non-Fibrous Homogeneous		5% Quartz 95% Non-fibrous (Other)	None Detected
F2-4 <small>412204012-0007</small>	Storage Room / Class Room - CMU Block Surface Filler	Gray Non-Fibrous Homogeneous		10% Quartz 90% Non-fibrous (Other)	None Detected
F2-5 <small>412204012-0008</small>	Storage Room / Class Room - CMU Block Surface Filler	Gray Non-Fibrous Homogeneous		10% Quartz 90% Non-fibrous (Other)	None Detected
F3-1-Cove Base <small>412204012-0009</small>	Storage Room / Class Room - 4" Black Covebase and Mastic	Black Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
F3-1-Mastic <small>412204012-0009A</small>	Storage Room / Class Room - 4" Black Covebase and Mastic	Beige Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
F3-2-Cove Base <small>412204012-0010</small>	Storage Room / Class Room - 4" Black Covebase and Mastic	Black Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
F3-2-Mastic <small>412204012-0010A</small>	Storage Room / Class Room - 4" Black Covebase and Mastic	Beige Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
F3-3-Cove Base <small>412204012-0011</small>	Storage Room / Class Room - 4" Black Covebase and Mastic	Black Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected

Initial report from: 04/28/2022 15:12:40



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EMSL Order: 412204012
Customer ID: TITA52
Customer PO: 71157008
Project ID:

Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

Sample	Description	Appearance	Non-Asbestos		Asbestos
			% Fibrous	% Non-Fibrous	% Type
F3-3-Mastic 412204012-0011A	Storage Room / Class Room - 4" Black Covebase and Mastic	Tan Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
F4-1 412204012-0012	Storage Room / Class Room - Yellow Carpet Glue	Black/Yellow Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
F4-2 412204012-0013	Storage Room / Class Room - Yellow Carpet Glue	Black/Yellow Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
F4-3 412204012-0014	Storage Room / Class Room - Yellow Carpet Glue	Black/Yellow Non-Fibrous Heterogeneous		100% Non-fibrous (Other)	None Detected
F5-1 412204012-0015	Office - Diamond Pattern Peel and Stick	Black/Beige Non-Fibrous Heterogeneous		30% Ca Carbonate 70% Non-fibrous (Other)	None Detected
F5-2 412204012-0016	Office - Diamond Pattern Peel and Stick	Black/Beige Non-Fibrous Heterogeneous		30% Ca Carbonate 70% Non-fibrous (Other)	None Detected
F5-3 412204012-0017	Office - Diamond Pattern Peel and Stick	Gray/Black Non-Fibrous Homogeneous		30% Ca Carbonate 70% Non-fibrous (Other)	None Detected
F6-1 412204012-0018	Class Room - Wallboard (Wall)	Brown/White Fibrous Heterogeneous		10% Ca Carbonate 90% Non-fibrous (Other)	None Detected
F6-2 412204012-0019	Class Room - Wallboard (Wall)	Brown/White Fibrous Heterogeneous	10% Cellulose	90% Non-fibrous (Other)	None Detected
F6-3 412204012-0020	Class Room - Wallboard (Wall)	White Fibrous Homogeneous	5% Cellulose	95% Non-fibrous (Other)	None Detected
F7-1 412204012-0021	Front Entrance - Exterior Window Glazing	Gray/White Non-Fibrous Homogeneous		20% Ca Carbonate 80% Non-fibrous (Other)	None Detected
F7-2 412204012-0022	Rear Of Building - Exterior Window Glazing	Gray/White Non-Fibrous Homogeneous		20% Ca Carbonate 80% Non-fibrous (Other)	None Detected
F7-3 412204012-0023	Side Of Building - Exterior Window Glazing	Gray/Tan Non-Fibrous Homogeneous		20% Ca Carbonate 80% Non-fibrous (Other)	None Detected
F8-1 412204012-0024	Front Entrance - Exterior Window Frame Caulk	Tan Non-Fibrous Homogeneous		97% Non-fibrous (Other)	3% Chrysotile
F8-2 412204012-0025	Rear Of Building - Exterior Window Frame Caulk	Tan Non-Fibrous Homogeneous		97% Non-fibrous (Other)	3% Chrysotile
F8-3 412204012-0026	Side Of Building - Exterior Window Frame Caulk	Gray/Tan Non-Fibrous Homogeneous		98% Non-fibrous (Other)	2% Chrysotile
F9-1-White Caulk 412204012-0027	Front Door - Exterior Door Caulk	White Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
F9-1-Tan Caulk 412204012-0027A	Front Door - Exterior Door Caulk	Tan Non-Fibrous Homogeneous		97% Non-fibrous (Other)	3% Chrysotile
F9-2-White Caulk 412204012-0028	Side Door - Exterior Door Caulk	White Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected

Initial report from: 04/28/2022 15:12:40



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EMSL Order: 412204012
Customer ID: TITA52
Customer PO: 71157008
Project ID:

Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

Sample	Description	Appearance	Non-Asbestos		Asbestos
			% Fibrous	% Non-Fibrous	% Type
F9-2-Tan Caulk <small>412204012-0028A</small>	Side Door - Exterior Door Caulk	Tan Non-Fibrous Homogeneous		97% Non-fibrous (Other)	3% Chrysotile
F9-3-White Caulk <small>412204012-0029</small>	Rear Door - Exterior Door Caulk	White Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
F9-3-Tan Caulk <small>412204012-0029A</small>	Rear Door - Exterior Door Caulk	Gray/Tan Non-Fibrous Homogeneous	3% Fibrous (Other)	95% Non-fibrous (Other)	2% Chrysotile

Analyst(s)

Jessica Cooper (13)

Ky Nguyen (25)

Lee Plumley, Laboratory Manager
or Other Approved Signatory

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Samples analyzed by EMSL Analytical, Inc. Pineville, NC NVLAP Lab Code 200841-0, VA 3333 00312

Initial report from: 04/28/2022 15:12:40

Inspector: Russell Harrings
 License: 12222
 Date: 7/25/2022

Job Name: Grier Middle School
 Job Number: 71157008
 Area(s): Building F (computer lab)

Sample No.	Homogeneous Material Description	Sample Location	Floor	Condition	Quantity	Friable/ Non-Friable	Lab Results
F 2-6	CMU Block Surface Filler	computer lab, left of air handler	1	Good	5,500 ft ²	Friable	None Detected
F 2-7	CMU Block Surface Filler	computer lab, restroom					None Detected
F 10-1	12"x12" Tan Floor Tile and Mastic	computer lab, near restroom	1	Good	600 ft	Non-Friable	None Detected
F 10-2	12"x12" Tan Floor Tile and Mastic	computer lab, middle					None Detected
F 10-3	12"x12" Tan Floor Tile and Mastic	computer lab, left of air handler					None Detected
F 11-1	Wallboard and Joint Compound	computer lab, front left knee wall	1	Good	400 ft ²	Non-Friable	None Detected
F 11-2	Wallboard and Joint Compound	computer lab, front right knee wall					None Detected
F 11-3	Wallboard and Joint Compound	computer lab, back left knee wall					None Detected



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EMSL Order: 412207383

Customer ID: TITA52

Customer PO: 71227143

Project ID:

Attention: Chad Chavis
Terracon Consultants, Inc.
2701 Westport Road
Charlotte, NC 28208

Phone: (704) 307-3045

Fax: (704) 509-1888

Received Date: 07/29/2022 12:45 PM

Analysis Date: 08/02/2022

Collected Date: 07/25/2022

Project: Grier Middle School Demolition/ 71227143/ Building F (Computer Lab)

Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

Sample	Description	Appearance	Non-Asbestos		Asbestos
			% Fibrous	% Non-Fibrous	% Type
F 2-6 <small>412207383-0001</small>	Computer Lab, Left of Air Handler - CMU Block Surface Filler	Yellow/Beige Non-Fibrous Homogeneous	<1% Fibrous (Other)	10% Ca Carbonate 90% Non-fibrous (Other)	None Detected
F 2-7 <small>412207383-0002</small>	Computer Lab, Restroom - CMU Block Surface Filler	Tan/White/Beige Non-Fibrous Homogeneous		10% Ca Carbonate 90% Non-fibrous (Other)	None Detected
F 10-1-Floor Tile <small>412207383-0003</small>	Computer Lab, Near Restroom - 12"x12" Tan Floor Tile and Mastic	Tan Non-Fibrous Homogeneous		30% Ca Carbonate 70% Non-fibrous (Other)	None Detected
F 10-1-Mastic <small>412207383-0003A</small>	Computer Lab, Near Restroom - 12"x12" Tan Floor Tile and Mastic	Clear Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
F 10-2-Top Mastic <small>412207383-0004</small>	Computer Lab, Middle - 12"x12" Tan Floor Tile and Mastic	Yellow Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
F 10-2-Floor Tile <small>412207383-0004A</small>	Computer Lab, Middle - 12"x12" Tan Floor Tile and Mastic	Tan Non-Fibrous Homogeneous		30% Ca Carbonate 70% Non-fibrous (Other)	None Detected
F 10-2-Bottom Mastic <small>412207383-0004B</small>	Computer Lab, Middle - 12"x12" Tan Floor Tile and Mastic	Brown/Clear Non-Fibrous Homogeneous	2% Cellulose	98% Non-fibrous (Other)	None Detected
F 10-3-Top Mastic <small>412207383-0005</small>	Computer Lab, Left of Air Handler - 12"x12" Tan Floor Tile and Mastic	Yellow Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
F 10-3-Floor Tile <small>412207383-0005A</small>	Computer Lab, Left of Air Handler - 12"x12" Tan Floor Tile and Mastic	Tan Non-Fibrous Homogeneous		20% Ca Carbonate 80% Non-fibrous (Other)	None Detected
F 10-3-Bottom Mastic <small>412207383-0005B</small>	Computer Lab, Left of Air Handler - 12"x12" Tan Floor Tile and Mastic	Brown Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
F 11-1-Joint Compound <small>412207383-0006</small>	Computer Lab, Front Left Knee Wall - Wallboard and Joint Compound	White Non-Fibrous Homogeneous		30% Ca Carbonate 70% Non-fibrous (Other)	None Detected
F 11-1-Drywall <small>412207383-0006A</small>	Computer Lab, Front Left Knee Wall - Wallboard and Joint Compound	Gray Non-Fibrous Homogeneous	5% Cellulose	95% Non-fibrous (Other)	None Detected
F 11-2-Joint Compound <small>412207383-0007</small>	Computer Lab, Front Right Knee Wall - Wallboard and Joint Compound	White Non-Fibrous Homogeneous		30% Ca Carbonate 70% Non-fibrous (Other)	None Detected

Initial report from: 08/03/2022 13:18:41



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EMSL Order: 412207383
Customer ID: TITA52
Customer PO: 71227143
Project ID:

Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

Sample	Description	Appearance	Non-Asbestos		Asbestos
			% Fibrous	% Non-Fibrous	% Type
F 11-2-Drywall 412207383-0007A	Computer Lab, Front Right Knee Wall - Wallboard and Joint Compound	Gray Non-Fibrous Homogeneous	5% Cellulose	95% Non-fibrous (Other)	None Detected
F 11-3-Joint Compound 412207383-0008	Computer Lab, Back Left Knee Wall - Wallboard and Joint Compound	White Non-Fibrous Homogeneous		30% Ca Carbonate 70% Non-fibrous (Other)	None Detected
F 11-3-Drywall 412207383-0008A	Computer Lab, Back Left Knee Wall - Wallboard and Joint Compound	Gray Non-Fibrous Homogeneous	5% Cellulose	95% Non-fibrous (Other)	None Detected

Analyst(s)

Jessica Cooper (10)

Madeline Baldelli (6)

Lee Plumley, Laboratory Manager
or Other Approved Signatory

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Samples analyzed by EMSL Analytical, Inc. Pineville, NC NVLAP Lab Code 200841-0, VA 3333 00312

Initial report from: 08/03/2022 13:18:41

Inspector: Chad Chavis
 License: 12929
 Date: 7/26/2022

Job Name: Grier Middle School
 Job Number: 71227143
 Area(s): Building F Roof

Sample No.	Homogeneous Material Description	Sample Location	Condition	Quantity	Friable/ Non-Friable	Lab Results
FR 1-1	Roof Membrane	Upper Roof F	Good		Non-Friable	None Detected
FR 1-2	Roof Membrane	Upper Roof F				None Detected
FR 1-3	Roof Membrane	Lower Roof F				None Detected
FR 2-1	Roof Flashing	Upper Roof F	Good		Non-Friable	None Detected
FR 2-2	Roof Flashing	Lower Roof F				None Detected
FR 2-3	Roof Flashing	Lower Roof F				None Detected
FR 3-1	Silver Paint Penetrations	Upper Roof F	Good	3 penetrations	Non-Friable	Silver Paint: None Detected Tar: 2% Chrysotile
FR 3-2	Silver Paint Penetrations	Lower Roof F				None Detected
FR 3-3	Silver Paint Penetrations	Lower Roof F				None Detected



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EMSL Order: 412207382

Customer ID: TITA52

Customer PO: 71227143

Project ID:

Attention: Chad Chavis
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Phone: (704) 307-3045

Fax: (704) 509-1888

Received Date: 07/29/2022 12:45 PM

Analysis Date: 08/02/2022

Collected Date: 07/26/2022

Project: Grier Middle School Demolition/ 71227143/ Building F Roof

Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

Sample	Description	Appearance	Non-Asbestos		Asbestos
			% Fibrous	% Non-Fibrous	% Type
FR 1-1-Membrane <small>412207382-0001</small>	Upper Roof F - Roof Membrane	Black Fibrous Homogeneous	2% Cellulose 10% Glass	88% Non-fibrous (Other)	None Detected
FR 1-1-Tar <small>412207382-0001A</small>	Upper Roof F - Roof Membrane	Black Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
FR 1-1-Insulation <small>412207382-0001B</small>	Upper Roof F - Roof Membrane	Gray/Beige Fibrous Homogeneous	95% Cellulose	2% Perlite 3% Non-fibrous (Other)	None Detected
FR 1-2-Membrane <small>412207382-0002</small>	Upper Roof F - Roof Membrane	Black Fibrous Homogeneous	<1% Cellulose 10% Glass	90% Non-fibrous (Other)	None Detected
FR 1-2-Tar <small>412207382-0002A</small>	Upper Roof F - Roof Membrane	Black Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
FR 1-2-Gray Insulation <small>412207382-0002B</small>	Upper Roof F - Roof Membrane	Gray/Beige Fibrous Homogeneous	95% Cellulose	2% Perlite 3% Non-fibrous (Other)	None Detected
FR 1-2-Tar <small>412207382-0002C</small>	Upper Roof F - Roof Membrane	Black Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
FR 1-2-Felt <small>412207382-0002D</small>	Upper Roof F - Roof Membrane	Gray/Black Fibrous Homogeneous	99% Cellulose	1% Non-fibrous (Other)	None Detected
FR 1-2-White Insulation <small>412207382-0002E</small>	Upper Roof F - Roof Membrane	White Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
FR 1-3-Membrane <small>412207382-0003</small>	Lower Roof F - Roof Membrane	Black Fibrous Homogeneous	15% Glass	85% Non-fibrous (Other)	None Detected
FR 1-3-Tar <small>412207382-0003A</small>	Lower Roof F - Roof Membrane	Black Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
FR 1-3-Insulation <small>412207382-0003B</small>	Lower Roof F - Roof Membrane	Gray Fibrous Homogeneous	90% Cellulose	5% Perlite 5% Non-fibrous (Other)	None Detected
FR 2-1 <small>412207382-0004</small>	Upper Roof F - Roof Flashing	Black Non-Fibrous Homogeneous	10% Glass	90% Non-fibrous (Other)	None Detected
FR 2-2 <small>412207382-0005</small>	Lower Roof F - Roof Flashing	Black Non-Fibrous Homogeneous	10% Glass	90% Non-fibrous (Other)	None Detected
FR 2-3 <small>412207382-0006</small>	Lower Roof F - Roof Flashing	Black Non-Fibrous Homogeneous	10% Glass	5% Quartz 85% Non-fibrous (Other)	None Detected
FR 3-1-Silver Paint <small>412207382-0007</small>	Upper Roof F - Silver Paint Penetrations	Silver Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected

Initial report from: 08/03/2022 13:18:00



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EMSL Order: 412207382
Customer ID: TITA52
Customer PO: 71227143
Project ID:

Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

Sample	Description	Appearance	Non-Asbestos		Asbestos
			% Fibrous	% Non-Fibrous	% Type
FR 3-1-Tar <small>412207382-0007A</small>	Upper Roof F - Silver Paint Penetrations	Black Non-Fibrous Homogeneous	10% Cellulose	88% Non-fibrous (Other)	2% Chrysotile
FR 3-2-Silver Paint <small>412207382-0008</small>	Lower Roof F - Silver Paint Penetrations	Silver Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
FR 3-2-Tar <small>412207382-0008A</small>	Lower Roof F - Silver Paint Penetrations	Black Non-Fibrous Homogeneous	10% Cellulose	5% Quartz 85% Non-fibrous (Other)	None Detected
FR 3-3 <small>412207382-0009</small>	Lower Roof F - Silver Paint Penetrations	Silver Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected

Analyst(s)

 Ashley Hill (15)
 Brant Alyea (5)



 Lee Plumley, Laboratory Manager
 or Other Approved Signatory

EMSL maintains liability limited to cost of analysis. Interpretation and use of test results are the responsibility of the client. This report relates only to the samples reported above, and may not be reproduced, except in full, without written approval by EMSL. EMSL bears no responsibility for sample collection activities or analytical method limitations. The report reflects the samples as received. Results are generated from the field sampling data (sampling volumes and areas, locations, etc.) provided by the client on the Chain of Custody. Samples are within quality control criteria and met method specifications unless otherwise noted. The above analyses were performed in general compliance with Appendix E to Subpart E of 40 CFR (previously EPA 600/M4-82-020 "Interim Method") but augmented with procedures outlined in the 1993 ("final") version of the method. This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST or any agency of the federal government. Non-friable organically bound materials present a problem matrix and therefore EMSL recommends gravimetric reduction prior to analysis. Unless requested by the client, building materials manufactured with multiple layers (i.e. linoleum, wallboard, etc.) are reported as a single sample. Estimation of uncertainty is available on request.

Samples analyzed by EMSL Analytical, Inc. Pineville, NC NVLAP Lab Code 200841-0, VA 3333 00312

Initial report from: 08/03/2022 13:18:00

Inspector: Erick Hutson
 License: 12849
 Date: 4/15/2022 - 4/21/2022

Job Name: Grier Middle School
 Job Number: 71157008
 Area(s): Building H

Sample No.	Homogeneous Material Description	Sample Location	Condition	Quantity	Friable/ Non-Friable	Lab Results
H 1-1	Textured Plaster (Ceiling)	Teachers Room	Good	12,000 ft ²	Friable	White Coat: None Detected Grey Coat: None Detected
H 1-2	Textured Plaster (Ceiling)	Room 502				White Coat: None Detected Grey Coat: None Detected
H 1-3	Textured Plaster (Ceiling)	Room 503				White Coat: None Detected Grey Coat: None Detected
H 1-4	Textured Plaster (Ceiling)	Room 504				White Coat: None Detected Grey Coat: None Detected
H 1-5	Textured Plaster (Ceiling)	Room 507				White Coat: None Detected Grey Coat: None Detected
H 1-6	Textured Plaster (Ceiling)	Room 505				White Coat: None Detected Grey Coat: None Detected
H 1-7	Textured Plaster (Ceiling)	Room 507				White Coat: None Detected Grey Coat: None Detected
H 2-1	CMU Block Surface Filler	Room 504	Good	1,200 ft ²	Friable	None Detected
H 2-2	CMU Block Surface Filler	Room 500				None Detected
H 2-3	CMU Block Surface Filler	Room 507				None Detected
H 2-4	CMU Block Surface Filler	Room 503				None Detected
H 2-5	CMU Block Surface Filler	Room 504				None Detected
H 3-1	4" Black Covebase and Mastic	Room 501	Good	400 ft	Non-Friable	Covebase: None Detected Mastic: None Detected
H 3-2	4" Black Covebase and Mastic	Room 503				Covebase: None Detected Mastic: None Detected
H 3-3	4" Black Covebase and Mastic	Room 505				Covebase: None Detected Mastic: None Detected
H 4-1	12"x12" Beige/Tan Smear Floor Tile and Mastic	Rom 501	Good	11,000 ft ²	Non-Friable	Floor Tile: None Detected Mastic: None Detected
H 4-2	12"x12" Beige/Tan Smear Floor Tile and Mastic	Room 503				Floor Tile: None Detected Mastic: None Detected
H 4-3	12"x12" Beige/Tan Smear Floor Tile and Mastic	Rom 505				Floor Tile: None Detected Mastic: None Detected
H 5-1	6" Pipe Insulation Wrap Dual Temp	Room 500	Good	150 ft	Friable	None Detected
H 5-2	6" Pipe Insulation Wrap Dual Temp	Room 502				None Detected
H 5-3	6" Pipe Insulation Wrap Dual Temp	Room 503				None Detected
H 6-1	Exterior Window Glazing	Room 502	Good	80 windows	Non-Friable	2% Chrysotile
H 6-2	Exterior Window Glazing	Room 504				2% Chrysotile
H 6-3	Exterior Window Glazing	Room 507				2% Chrysotile
H 7-1	Exterior Window Frame Caulk	Room 500	Good	10 windows	Non-Friable	2% Chrysotile
H 7-2	Exterior Window Frame Caulk	Room 505				2% Chrysotile
H 7-3	Exterior Window Frame Caulk	Room 507				2% Chrysotile
H 8-1	Exterior Door Caulk	Room 500	Good	8 door	Non-Friable	2% Chrysotile

Inspector: Erick Hutson
License: 12849
Date: 4/15/2022 - 4/21/2022

Job Name: Grier Middle School
Job Number: 71157008
Area(s): Building H

Sample No.	Homogeneous Material Description	Sample Location	Condition	Quantity	Friable/ Non-Friable	Lab Results
H 8-2	Exterior Door Caulk	Room 504				2% Chrysotile
H 8-3	Exterior Door Caulk	Room 503				2% Chrysotile



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<http://www.EMSL.com/charlottelab@emsl.com>

EMSL Order: 412204009

Customer ID: TITA52

Customer PO: 71157008

Project ID:

Attention: Erick Hutson
Terracon Consultants, Inc.
2701 Westport Road
Charlotte, NC 28208

Phone: (803) 984-9498

Fax: (704) 509-1888

Received Date: 04/25/2022 9:40 AM

Analysis Date: 04/27/2022 - 04/28/2022

Collected Date:

Project: Grier Middle School - 71157008 - Building H

Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

Sample	Description	Appearance	Non-Asbestos		Asbestos
			% Fibrous	% Non-Fibrous	% Type
H 1-1-White Coat <small>412204009-0001</small>	Teachers Room - Texture Plaster (Ceiling)	White Non-Fibrous Homogeneous		10% Ca Carbonate 10% Perlite 80% Non-fibrous (Other)	None Detected
H 1-1-Gray Coat <small>412204009-0001A</small>	Teachers Room - Texture Plaster (Ceiling)	Gray Non-Fibrous Homogeneous		5% Ca Carbonate 15% Perlite 80% Non-fibrous (Other)	None Detected
H 1-2-White Coat <small>412204009-0002</small>	Room 502 - Texture Plaster (Ceiling)	White Non-Fibrous Homogeneous		15% Ca Carbonate 5% Perlite 80% Non-fibrous (Other)	None Detected
H 1-2-Gray Coat <small>412204009-0002A</small>	Room 502 - Texture Plaster (Ceiling)	Gray Non-Fibrous Homogeneous		15% Ca Carbonate 10% Perlite 75% Non-fibrous (Other)	None Detected
H 1-3-White Coat <small>412204009-0003</small>	Room 503 - Texture Plaster (Ceiling)	White Non-Fibrous Homogeneous		10% Ca Carbonate 10% Perlite 80% Non-fibrous (Other)	None Detected
H 1-3-Gray Coat <small>412204009-0003A</small>	Room 503 - Texture Plaster (Ceiling)	Gray Non-Fibrous Homogeneous		10% Ca Carbonate 25% Perlite 65% Non-fibrous (Other)	None Detected
H 1-4-White Coat <small>412204009-0004</small>	Room 504 - Texture Plaster (Ceiling)	White Non-Fibrous Homogeneous		10% Ca Carbonate 10% Perlite 80% Non-fibrous (Other)	None Detected
H 1-4-Gray Coat <small>412204009-0004A</small>	Room 504 - Texture Plaster (Ceiling)	Gray Non-Fibrous Homogeneous		15% Ca Carbonate 20% Perlite 65% Non-fibrous (Other)	None Detected
H 1-5-White Coat <small>412204009-0005</small>	Room 507 - Texture Plaster (Ceiling)	White Non-Fibrous Homogeneous		15% Ca Carbonate 5% Perlite 80% Non-fibrous (Other)	None Detected
H 1-5-Gray Coat <small>412204009-0005A</small>	Room 507 - Texture Plaster (Ceiling)	Gray Non-Fibrous Homogeneous		20% Quartz 10% Perlite 70% Non-fibrous (Other)	None Detected
H 2-1 <small>412204009-0006</small>	Room 504 - CMU Block Surface Filler	Tan Non-Fibrous Homogeneous		10% Ca Carbonate 90% Non-fibrous (Other)	None Detected
H 2-2 <small>412204009-0007</small>	Room 500 - CMU Block Surface Filler	Tan Non-Fibrous Homogeneous		8% Ca Carbonate 92% Non-fibrous (Other)	None Detected
H 2-3 <small>412204009-0008</small>	Room 507 - CMU Block Surface Filler	Tan Non-Fibrous Homogeneous		8% Ca Carbonate 92% Non-fibrous (Other)	None Detected
H 2-4 <small>412204009-0009</small>	Room 503 - CMU Block Surface Filler	Tan/White Non-Fibrous Homogeneous		5% Ca Carbonate 95% Non-fibrous (Other)	None Detected
H 2-5 <small>412204009-0010</small>	Room 504 - CMU Block Surface Filler	Tan/White Non-Fibrous Homogeneous		5% Ca Carbonate 95% Non-fibrous (Other)	None Detected
H 3-1-Cove Base <small>412204009-0011</small>	Room 501 - 4" Black Cove Base and Mastic	Black Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected

Initial report from: 04/28/2022 14:56:55



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EMSL Order: 412204009
Customer ID: TITA52
Customer PO: 71157008
Project ID:

Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

Sample	Description	Appearance	Non-Asbestos		Asbestos
			% Fibrous	% Non-Fibrous	% Type
H 3-1-Mastic 412204009-0011A	Room 501 - 4" Black Cove Base and Mastic	Tan Non-Fibrous Homogeneous		5% Ca Carbonate 95% Non-fibrous (Other)	None Detected
H 3-2-Cove Base 412204009-0012	Room 503 - 4" Black Cove Base and Mastic	Black Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
H 3-2-Mastic 412204009-0012A	Room 503 - 4" Black Cove Base and Mastic	Tan Non-Fibrous Homogeneous		5% Ca Carbonate 95% Non-fibrous (Other)	None Detected
H 3-3-Cove Base 412204009-0013	Room 505 - 4" Black Cove Base and Mastic	Black Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
H 3-3-Mastic 412204009-0013A	Room 505 - 4" Black Cove Base and Mastic	Tan Non-Fibrous Homogeneous	3% Cellulose	97% Non-fibrous (Other)	None Detected
H 4-1-Floor Tile 412204009-0014	Room 501 - 12"x12" Beige / Tan Smear Floor Tile and Mastic	Brown Non-Fibrous Homogeneous		40% Ca Carbonate 60% Non-fibrous (Other)	None Detected
H 4-1-Mastic 412204009-0014A	Room 501 - 12"x12" Beige / Tan Smear Floor Tile and Mastic	Tan Non-Fibrous Homogeneous		5% Ca Carbonate 95% Non-fibrous (Other)	None Detected
H 4-2-Floor Tile 412204009-0015	Room 503 - 12"x12" Beige / Tan Smear Floor Tile and Mastic	Brown Non-Fibrous Homogeneous		40% Ca Carbonate 60% Non-fibrous (Other)	None Detected
H 4-2-Mastic 412204009-0015A	Room 503 - 12"x12" Beige / Tan Smear Floor Tile and Mastic	Tan Non-Fibrous Homogeneous	1% Cellulose	99% Non-fibrous (Other)	None Detected
H 4-3-Floor Tile 412204009-0016	Room 505 - 12"x12" Beige / Tan Smear Floor Tile and Mastic	Brown Non-Fibrous Homogeneous		30% Ca Carbonate 70% Non-fibrous (Other)	None Detected
H 4-3-Mastic 412204009-0016A	Room 505 - 12"x12" Beige / Tan Smear Floor Tile and Mastic	Tan Non-Fibrous Homogeneous		5% Ca Carbonate 95% Non-fibrous (Other)	None Detected
H 5-1 412204009-0017	Room 500 - 6" Pipe Insulation Wrap Dual Temp	Tan/Silver Fibrous Homogeneous	80% Cellulose	20% Non-fibrous (Other)	None Detected
H 5-2 412204009-0018	Room 502 - 6" Pipe Insulation Wrap Dual Temp	Tan/Silver Fibrous Homogeneous	80% Cellulose	20% Non-fibrous (Other)	None Detected
H 5-3 412204009-0019	Room 503 - 6" Pipe Insulation Wrap Dual Temp	Tan/Silver Fibrous Homogeneous	85% Cellulose	15% Non-fibrous (Other)	None Detected
H 6-1 412204009-0020	Room 502 - Exterior Window Glazing	Tan Non-Fibrous Homogeneous		15% Ca Carbonate 83% Non-fibrous (Other)	2% Chrysotile
H 6-2 412204009-0021	Room 504 - Exterior Window Glazing	White Non-Fibrous Homogeneous		15% Ca Carbonate 83% Non-fibrous (Other)	2% Chrysotile
H 6-3 412204009-0022	Room 507 - Exterior Window Glazing	Gray/Tan/White Non-Fibrous Homogeneous		15% Ca Carbonate 83% Non-fibrous (Other)	2% Chrysotile
H 7-1 412204009-0023	Room 500 - Exterior Window Frame Caulk	Gray/Tan Non-Fibrous Homogeneous		98% Non-fibrous (Other)	2% Chrysotile
H 7-2 412204009-0024	Room 505 - Exterior Window Frame Caulk	Gray/Tan/White Non-Fibrous Homogeneous		98% Non-fibrous (Other)	2% Chrysotile

Initial report from: 04/28/2022 14:56:55



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EMSL Order: 412204009
Customer ID: TITA52
Customer PO: 71157008
Project ID:

Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

Sample	Description	Appearance	Non-Asbestos		Asbestos
			% Fibrous	% Non-Fibrous	% Type
H 7-3 <small>412204009-0025</small>	Room 507 - Exterior Window Frame Caulk	Gray/Tan Non-Fibrous Homogeneous		15% Ca Carbonate 83% Non-fibrous (Other)	2% Chrysotile
H 8-1 <small>412204009-0026</small>	Room 500 - Exterior Door Caulk	Gray/Tan/Blue Non-Fibrous Homogeneous		15% Ca Carbonate 83% Non-fibrous (Other)	2% Chrysotile
H 8-2 <small>412204009-0027</small>	Room 504 - Exterior Door Caulk	Gray/Tan/Blue Non-Fibrous Homogeneous		98% Non-fibrous (Other)	2% Chrysotile
H 8-3 <small>412204009-0028</small>	Room 503 - Exterior Door Caulk	Tan Non-Fibrous Homogeneous		98% Non-fibrous (Other)	2% Chrysotile
1-6-White Coat <small>412204009-0029</small>		White Non-Fibrous Homogeneous		15% Ca Carbonate 5% Perlite 80% Non-fibrous (Other)	None Detected
1-6-Gray Coat <small>412204009-0029A</small>		Gray Non-Fibrous Homogeneous		10% Quartz 10% Perlite 80% Non-fibrous (Other)	None Detected
1-7-White Coat <small>412204009-0030</small>		White Non-Fibrous Homogeneous		15% Ca Carbonate 5% Perlite 80% Non-fibrous (Other)	None Detected
1-7-Gray Coat <small>412204009-0030A</small>		Gray Non-Fibrous Homogeneous		10% Quartz 10% Perlite 80% Non-fibrous (Other)	None Detected

Analyst(s)

Madeline Baldelli (18)

Sarah Breneman (25)

Lee Plumley, Laboratory Manager
or Other Approved Signatory

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Samples analyzed by EMSL Analytical, Inc. Pineville, NC NVLAP Lab Code 200841-0, VA 3333 00312

Initial report from: 04/28/2022 14:56:55

Inspector: Chad Chavis
 License: 12929
 Date: 7/26/2022

Job Name: Grier Middle School
 Job Number: 71227143
 Area(s): Building H Roof

Sample No.	Homogeneous Material Description	Sample Location	Condition	Quantity	Friable/ Non-Friable	Lab Results
HR 1-1	Roof Membrane	Upper Roof	Good		Non-Friable	None Detected
HR 1-2	Roof Membrane	Upper Roof				None Detected
HR 1-3	Roof Membrane	Lower Roof				None Detected
HR 2-1	Roof Flashing	Upper Roof	Good		Non-Friable	None Detected
HR 2-2	Roof Flashing	Upper Roof				None Detected
HR 2-3	Roof Flashing	Lower Roof				None Detected
HR 3-1	Silver Paint Penetrations	Upper Roof	Good		Non-Friable	None Detected
HR 3-2	Silver Paint Penetrations	Upper Roof				None Detected
HR 3-3	Silver Paint Penetrations	Lower Roof				None Detected
HR 4-1	Green Roof Caulk	Lower Roof	Good		Non-Friable	None Detected
HR 4-2	Green Roof Caulk	Lower Roof				None Detected
HR 4-3	Green Roof Caulk	Lower Roof				None Detected



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EMSL Order: 412207385

Customer ID: TITA52

Customer PO: 71227143

Project ID:

Attention: Chad Chavis
Terracon Consultants, Inc.
2701 Westport Road
Charlotte, NC 28208

Phone: (704) 307-3045

Fax: (704) 509-1888

Received Date: 07/29/2022 12:45 PM

Analysis Date: 08/01/2022

Collected Date: 07/26/2022

Project: Grier Middle School Demolition/ 71227143/ Building H Roof

Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

Sample	Description	Appearance	Non-Asbestos		Asbestos
			% Fibrous	% Non-Fibrous	% Type
HR 1-1-Membrane <small>412207385-0001</small>	Upper Roof - Roof Membrane	Black Fibrous Homogeneous	15% Cellulose 5% Glass	80% Non-fibrous (Other)	None Detected
HR 1-1-Tan Insulation <small>412207385-0001A</small>	Upper Roof - Roof Membrane	Tan Fibrous Homogeneous	95% Cellulose	5% Non-fibrous (Other)	None Detected
HR 1-1-Tar <small>412207385-0001B</small>	Upper Roof - Roof Membrane	Black Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
HR 1-1-Felt <small>412207385-0001C</small>	Upper Roof - Roof Membrane	Black Fibrous Homogeneous	90% Cellulose	10% Non-fibrous (Other)	None Detected
HR 1-1-White Insulation <small>412207385-0001D</small>	Upper Roof - Roof Membrane	White/Yellow Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
HR 1-2-Membrane <small>412207385-0002</small>	Upper Roof - Roof Membrane	Gray/Black Non-Fibrous Homogeneous	5% Glass	95% Non-fibrous (Other)	None Detected
HR 1-2-Tar <small>412207385-0002A</small>	Upper Roof - Roof Membrane	Black Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
HR 1-2-Felt <small>412207385-0002B</small>	Upper Roof - Roof Membrane	Black Fibrous Homogeneous	10% Glass	90% Non-fibrous (Other)	None Detected
HR 1-2-Gray Insulation <small>412207385-0002C</small>	Upper Roof - Roof Membrane	Gray/White Fibrous Homogeneous	90% Cellulose	5% Perlite 5% Non-fibrous (Other)	None Detected
HR 1-3-Membrane <small>412207385-0003</small>	Lower Roof - Roof Membrane	Black Fibrous Homogeneous	5% Glass	95% Non-fibrous (Other)	None Detected
HR 1-3-Tar <small>412207385-0003A</small>	Lower Roof - Roof Membrane	Black Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
HR 1-3-Felt <small>412207385-0003B</small>	Lower Roof - Roof Membrane	Black Fibrous Homogeneous	80% Cellulose	20% Non-fibrous (Other)	None Detected
HR 1-3-Gray Insulation <small>412207385-0003C</small>	Lower Roof - Roof Membrane	Gray Fibrous Homogeneous	80% Cellulose	15% Perlite 5% Non-fibrous (Other)	None Detected
HR 2-1-Flashing <small>412207385-0004</small>	Upper Roof - Roof Flashing	Black Fibrous Homogeneous	5% Cellulose 5% Glass	90% Non-fibrous (Other)	None Detected
HR 2-1-Tar <small>412207385-0004A</small>	Upper Roof - Roof Flashing	Black Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
HR 2-2-Silver Paint <small>412207385-0005</small>	Upper Roof - Roof Flashing	Silver Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected

Initial report from: 08/03/2022 13:20:09



EMSL Analytical, Inc.

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EMSL Order: 412207385
Customer ID: TITA52
Customer PO: 71227143
Project ID:

Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

Sample	Description	Appearance	Non-Asbestos		Asbestos
			% Fibrous	% Non-Fibrous	% Type
HR 2-2-Flashing <i>412207385-0005A</i>	Upper Roof - Roof Flashing	Black Fibrous Homogeneous	15% Glass	5% Quartz 80% Non-fibrous (Other)	None Detected
HR 2-2-Tar <i>412207385-0005B</i>	Upper Roof - Roof Flashing	Black Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
HR 2-3-Flashing <i>412207385-0006</i>	Lower Roof - Roof Flashing	Black Fibrous Homogeneous	5% Cellulose 10% Glass	85% Non-fibrous (Other)	None Detected
HR 2-3-Tar <i>412207385-0006A</i>	Lower Roof - Roof Flashing	Black Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
HR 3-1-Silver Paint <i>412207385-0007</i>	Upper Roof - Silver Paint Penetrations	Black/Silver Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
HR 3-1-Tar <i>412207385-0007A</i>	Upper Roof - Silver Paint Penetrations	Black Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
HR 3-2-Silver Paint <i>412207385-0008</i>	Upper Roof - Silver Paint Penetrations	Silver Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
HR 3-2-Tar <i>412207385-0008A</i>	Upper Roof - Silver Paint Penetrations	Black Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
HR 3-3-Silver Paint <i>412207385-0009</i>	Lower Roof - Silver Paint Penetrations	Black/Silver Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
HR 3-3-Tar <i>412207385-0009A</i>	Lower Roof - Silver Paint Penetrations	Black Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
HR 4-1 <i>412207385-0010</i>	Lower Roof - Green Roof Caulk	Green Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
HR 4-2 <i>412207385-0011</i>	Lower Roof - Green Roof Caulk	Green Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
HR 4-3 <i>412207385-0012</i>	Lower Roof - Green Roof Caulk	Green Non-Fibrous Homogeneous		5% Ca Carbonate 95% Non-fibrous (Other)	None Detected

Analyst(s) _____
 Brant Alyea (20)
 Madeline Baldelli (9)



Lee Plumley, Laboratory Manager
 or Other Approved Signatory

EMSL maintains liability limited to cost of analysis. Interpretation and use of test results are the responsibility of the client. This report relates only to the samples reported above, and may not be reproduced, except in full, without written approval by EMSL. EMSL bears no responsibility for sample collection activities or analytical method limitations. The report reflects the samples as received. Results are generated from the field sampling data (sampling volumes and areas, locations, etc.) provided by the client on the Chain of Custody. Samples are within quality control criteria and met method specifications unless otherwise noted. The above analyses were performed in general compliance with Appendix E to Subpart E of 40 CFR (previously EPA 600/M4-82-020 "Interim Method") but augmented with procedures outlined in the 1993 ("final") version of the method. This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST or any agency of the federal government. Non-friable organically bound materials present a problem matrix and therefore EMSL recommends gravimetric reduction prior to analysis. Unless requested by the client, building materials manufactured with multiple layers (i.e. linoleum, wallboard, etc.) are reported as a single sample. Estimation of uncertainty is available on request.

Samples analyzed by EMSL Analytical, Inc. Pineville, NC NVLAP Lab Code 200841-0, VA 3333 00312

Initial report from: 08/03/2022 13:20:09

Inspector: Erick Hutson
 License: 12849
 Date: 4/15/2022 - 4/21/2022

Job Name: Grier Middle School
 Job Number: 71157008
 Area(s): Building I

Sample No.	Homogeneous Material Description	Sample Location	Floor	Condition	Quantity	Friable/ Non-Friable	Lab Results
I 1-1	2'x2' Pinhole Fissure Ceiling Tile	Main Office Hallway	U	Good	6,500 ft ²	Friable	None Detected
I 1-2	2'x2' Pinhole Fissure Ceiling Tile	Upper - Hallway Near Bleacher	U				None Detected
I 1-3	2'x2' Pinhole Fissure Ceiling Tile	Lower - Locker Room	L				None Detected
I 2-1	CMU Block Surface Filler	Lower - Mens locker Room	L	Good	20,000 ft ²	Friable	None Detected
I 2-2	CMU Block Surface Filler	Lower - Outside Janitor Closet	L				None Detected
I 2-3	CMU Block Surface Filler	Upper - Band Room	U				None Detected
I 2-4	CMU Block Surface Filler	Upper - Hallway Near Bleachers	U				None Detected
I 2-5	CMU Block Surface Filler	Upper - Outside Restroom	U				None Detected
I 2-6	CMU Block Surface Filler	Upper - Main Office	U				None Detected
I 2-7	CMU Block Surface Filler	Upper - Womens Restroom	U				None Detected
I 3-1	12"x12" Brown/Brown Smear Floor Tile and Mastic	Lower - Outside Locker Room	L	Good	3,500 ft ²	Non-Friable	Floor Tile: None Detected Mastic: None Detected Leveler: None Detected
I 3-2	12"x12" Brown/Brown Smear Floor Tile and Mastic	Upper - Outside Ms. Davis Band Room	U				Floor Tile: None Detected Mastic: None Detected
I 3-3	12"x12" Brown/Brown Smear Floor Tile and Mastic	Upper - Behind Door to Gym	U				Floor Tile: None Detected Mastic: None Detected
I 4-1	4" Black Covebase and Mastic	Upper - Hallway Near Means	U	Good	500 ft	Non-Friable	Covebase: None Detected Mastic: None Detected
I 4-2	4" Black Covebase and Mastic	Upper - Outside Band Room	U				Covebase: None Detected Mastic: None Detected
I 4-3	4" Black Covebase and Mastic	Lower - Outside Locker Rooms	L				Covebase: None Detected Mastic: None Detected
I 5-1	12"x12" Green/Green Smear Floor Tile and Mastic	Upper - Building I Hallway (End)	U	Good	300 ft	Non-Friable	Floor Tile: None Detected Mastic/Leveler: None Detected
I 5-2	12"x12" Green/Green Smear Floor Tile and Mastic	Upper - Building Main Entrance Hallway	U				Floor Tile: None Detected Mastic/Leveler: None Detected
I 5-3	12"x12" Green/Green Smear Floor Tile and Mastic	Upper - Building I Hallway (Start)	U				Floor Tile: None Detected Mastic/Leveler: None Detected
I 6-1	12"x12" White/Grey Smear Floor Tile and Mastic	Upper - Building I Hallway (End)	U	Good	1,000 ft ²	Non-Friable	Floor Tile: None Detected Mastic/Leveler: None Detected
I 6-2	12"x12" White/Grey Smear Floor Tile and Mastic	Upper - Next to Gym Door	U				Floor Tile: None Detected Mastic/Leveler: None Detected
I 6-3	12"x12" White/Grey Smear Floor Tile and Mastic	Upper - Building I Hallway (Start)	U				Floor Tile: None Detected Mastic/Leveler: None Detected
I 7-1	12"x12" Yellow/White Smear Floor Tile and Mastic	Upper - Building I Hallway (End)	U	Good	50 ft ²	Non-Friable	Floor Tile: None Detected Mastic/Leveler: None Detected
I 7-2	12"x12" Yellow/White Smear Floor Tile and Mastic	Upper - Building I Hallway (Start)	U				Floor Tile: None Detected Mastic/Leveler: None Detected
I 7-3	12"x12" Yellow/White Smear Floor Tile and Mastic	Upper - Main Entrance Area	U				Floor Tile: None Detected Mastic/Leveler: None Detected
I 8-1	Yellow Carpet Glue	Upper - Band Room	U	Good	4,000 ft ²	Non-Friable	None Detected
I 8-2	Yellow Carpet Glue	Upper - Chorus Room	U				None Detected
I 8-3	Yellow Carpet Glue	Upper - Main Office	U				None Detected
I 9-1	Grey Fire Proofing	Lower - Hallway West	L	Good	10,000 ft ²	Friable	None Detected
I 9-2	Grey Fire Proofing	Lower - Washer and Dryer Room	L				None Detected
I 9-3	Grey Fire Proofing	Lower - Janitor Closet	L				None Detected

Inspector: Erick Hutson
 License: 12849
 Date: 4/15/2022 - 4/21/2022

Job Name: Grier Middle School
 Job Number: 71157008
 Area(s): Building I

Sample No.	Homogeneous Material Description	Sample Location	Floor	Condition	Quantity	Friable/ Non-Friable	Lab Results
I 9-4	Grey Fire Proofing	Lower - Hallway East	L				None Detected
I 9-5	Grey Fire Proofing	Lower - Washer and Dryer Room	L				None Detected
I 9-6	Grey Fire Proofing	Upper - Band Room	U				None Detected
I 9-7	Grey Fire Proofing	Upper - Chorus Room	U				None Detected
I 10-1	Interior Door Caulk	Band Room	U	Good	65 Door	Non-Friable	None Detected
I 10-2	Interior Door Caulk	Coaches Office - PE Teacher Door	L				None Detected
I 10-3	Interior Door Caulk	Stairwell Door	L				None Detected
I 11-1	Interior Window Caulk	East Front Entrance to Gym	U	Good	15 Window	Non-Friable	None Detected
I 11-2	Interior Window Caulk	Hallway Chorus Room	U				None Detected
I 11-3	Interior Window Caulk	West Front Entrance to Gym	U				None Detected
I 12-1	4" Paper pipe Insulation Wrap Dual Temp	Main Office Hallway	U	Good	400 ft	Friable	None Detected
I 12-2	4" Paper pipe Insulation Wrap Dual Temp	Upper - Hallway Near Bleachers	U				None Detected
I 12-3	4" Paper pipe Insulation Wrap Dual Temp	Lower - Washer and Dryer Room	L				None Detected
I 13-1	Wallboard (Wall) (No Joint Compound)	Upper - Main Office Above Drop Ceiling	U	Good	300 ft ²	Friable	None Detected
I 13-2	Wallboard (Wall) (No Joint Compound)	Upper - Main Office Above Drop Ceiling	U				None Detected
I 13-3	Wallboard (Wall) (No Joint Compound)	Upper - Main Office Above Drop Ceiling	U				None Detected
I 14-1	Red Fire Stop	Lower - Hallway	L	Good	50 ft ²	Non-Friable	None Detected
I 14-2	Red Fire Stop	Upper - Outside Main Office	U				None Detected
I 14-3	Red Fire Stop	Upper - Hallway Outside Mens Restroom	U				None Detected
I 15-1	White Sheet Flooring and Mastic	Upper - Main Office	U	Good	100 ft ²	Non-Friable	Sheet Flooring: None Detected Mastic/Leveler: None Detected
I 15-2	White Sheet Flooring and Mastic	Upper - Main Office	U				Sheet Flooring: None Detected Mastic/Leveler: None Detected
I 15-3	White Sheet Flooring and Mastic	Upper - Main Office	U				Sheet Flooring: None Detected Mastic/Leveler: None Detected
I 16-1	12"x12" Light Blue Floor Tile and Mastic	Upper - Band Room Right Side Back Door	U	Good	10 ft ²	Non-Friable	Floor Tile: None Detected Mastic: None Detected
I 16-2	12"x12" Light Blue Floor Tile and Mastic	Upper - Band Room Right Side Back Door	U				Floor Tile: None Detected Mastic: None Detected
I 16-3	12"x12" Light Blue Floor Tile and Mastic	Upper - Band Room Right Side Back Door	U				Floor Tile: None Detected Mastic: None Detected
I 17-1	Grey Sink Coating	Upper - Band Room Break Room	U	Good	1 sink	Non-Friable	2% Chrysotile
I 17-2	Grey Sink Coating	Upper - Band Room Break Room	U				2% Chrysotile
I 17-3	Grey Sink Coating	Upper - Band Room Break Room	U				3% Chrysotile



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<http://www.EMSL.com/charlottelab@emsl.com>

EMSL Order: 412204011

Customer ID: TITA52

Customer PO: 71157008

Project ID:

Attention: Erick Hutson
Terracon Consultants, Inc.
2701 Westport Road
Charlotte, NC 28208

Phone: (803) 984-9498

Fax: (704) 509-1888

Received Date: 04/25/2022 9:40 AM

Analysis Date: 04/28/2022

Collected Date: 04/15/2022

Project: Grier Middle School - 71157008 - Building I

Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

Sample	Description	Appearance	Non-Asbestos		Asbestos
			% Fibrous	% Non-Fibrous	% Type
I 1-1 412204011-0001	Main Office Hallway - 2'x2' Pinhole Fissure Ceiling Tile	Gray/White Fibrous Homogeneous	60% Cellulose 20% Min. Wool	5% Perlite 15% Non-fibrous (Other)	None Detected
I 1-2 412204011-0002	Upper - Hallway near Bleacher - 2'x2' Pinhole Fissure Ceiling Tile	Gray/White Fibrous Homogeneous	60% Cellulose 20% Min. Wool	5% Perlite 15% Non-fibrous (Other)	None Detected
I 1-3 412204011-0003	Lower - Locker Room - 2'x2' Pinhole Fissure Ceiling Tile	Gray/White Fibrous Homogeneous	60% Cellulose 15% Min. Wool	15% Perlite 10% Non-fibrous (Other)	None Detected
I 2-1 412204011-0004	Lower - Mens Locker Room - CMU Block Surface Filler	Gray/White Non-Fibrous Homogeneous		20% Quartz 80% Non-fibrous (Other)	None Detected
I 2-2 412204011-0005	Lower - Outside Janitor Closet - CMU Block Surface Filler	Gray/White Non-Fibrous Homogeneous		20% Quartz 80% Non-fibrous (Other)	None Detected
I 2-3 412204011-0006	Upper - Band Room - CMU Block Surface Filler	Gray/White Non-Fibrous Homogeneous		20% Quartz 80% Non-fibrous (Other)	None Detected
I 2-4 412204011-0007	Upper - Hallway near Bleachers - CMU Block Surface Filler	Gray/White Non-Fibrous Homogeneous		20% Quartz 80% Non-fibrous (Other)	None Detected
I 2-5 412204011-0008	Upper - Outside Restroom - CMU Block Surface Filler	Gray/White Non-Fibrous Homogeneous		20% Quartz 80% Non-fibrous (Other)	None Detected
I 2-6 412204011-0009	Upper - Main Office - CMU Block Surface Filler	Gray/White Non-Fibrous Homogeneous		15% Quartz 85% Non-fibrous (Other)	None Detected
I 2-7 412204011-0010	Upper - Womens Restroom - CMU Block Surface Filler	Gray/White Non-Fibrous Homogeneous		5% Quartz 95% Non-fibrous (Other)	None Detected
I 3-1-Floor Tile 412204011-0011	Lower - Outside Locker Room - 12"x12" Brown-Brown Smear Floor Tile and Mastic	Tan Non-Fibrous Homogeneous		20% Ca Carbonate 80% Non-fibrous (Other)	None Detected
I 3-1-Mastic 412204011-0011A	Lower - Outside Locker Room - 12"x12" Brown-Brown Smear Floor Tile and Mastic	Black Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
I 3-1-Leveler 412204011-0011B	Lower - Outside Locker Room - 12"x12" Brown-Brown Smear Floor Tile and Mastic	Brown Non-Fibrous Homogeneous		5% Ca Carbonate 95% Non-fibrous (Other)	None Detected

Initial report from: 04/28/2022 14:58:02



EMSL Analytical, Inc.

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<http://www.EMSL.com> / charlottelab@emsl.com

EMSL Order: 412204011
Customer ID: TITA52
Customer PO: 71157008
Project ID:

Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

Sample	Description	Appearance	Non-Asbestos		Asbestos
			% Fibrous	% Non-Fibrous	% Type
I 3-2-Floor Tile 412204011-0012	Upper - Outside Ms. Davis Band Room - 12"x12" Brown-Brown Smear Floor Tile and Mastic	Tan Non-Fibrous Homogeneous		20% Ca Carbonate 80% Non-fibrous (Other)	None Detected
I 3-2-Mastic 412204011-0012A	Upper - Outside Ms. Davis Band Room - 12"x12" Brown-Brown Smear Floor Tile and Mastic	Brown/Tan Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
I 3-3-Floor Tile 412204011-0013	Upper - Behind Door to Gym - 12"x12" Brown-Brown Smear Floor Tile and Mastic	Tan Non-Fibrous Homogeneous		40% Ca Carbonate 60% Non-fibrous (Other)	None Detected
I 3-3-Mastic 412204011-0013A	Upper - Behind Door to Gym - 12"x12" Brown-Brown Smear Floor Tile and Mastic	Black Non-Fibrous Homogeneous	2% Cellulose	98% Non-fibrous (Other)	None Detected
I 4-1-Cove Base 412204011-0014	Upper - Hallway near Means - 4" Black Covebase and Mastic	Black Non-Fibrous Homogeneous		5% Ca Carbonate 95% Non-fibrous (Other)	None Detected
I 4-1-Mastic 412204011-0014A	Upper - Hallway near Means - 4" Black Covebase and Mastic	Tan Non-Fibrous Homogeneous	2% Cellulose	98% Non-fibrous (Other)	None Detected
I 4-2-Cove Base 412204011-0015	Upper - Outside Band Room - 4" Black Covebase and Mastic	Black Non-Fibrous Homogeneous		5% Ca Carbonate 95% Non-fibrous (Other)	None Detected
I 4-2-Mastic 412204011-0015A	Upper - Outside Band Room - 4" Black Covebase and Mastic	Tan Non-Fibrous Homogeneous	<1% Cellulose	100% Non-fibrous (Other)	None Detected
I 4-3-Cove Base 412204011-0016	Lower - Outside Locker Rooms - 4" Black Covebase and Mastic	Brown/Black Non-Fibrous Homogeneous		5% Ca Carbonate 95% Non-fibrous (Other)	None Detected
I 4-3-Mastic 412204011-0016A	Lower - Outside Locker Rooms - 4" Black Covebase and Mastic	Tan Non-Fibrous Homogeneous		5% Ca Carbonate 95% Non-fibrous (Other)	None Detected
I 5-1-Floor Tile 412204011-0017	Upper - Building I Hallway - End - 12"x12" Green-Green Smear Floor Tile and Mastic	Green Non-Fibrous Homogeneous		20% Ca Carbonate 80% Non-fibrous (Other)	None Detected
I 5-1-Mastic/Leveler 412204011-0017A	Upper - Building I Hallway - End - 12"x12" Green-Green Smear Floor Tile and Mastic	Gray/Beige Non-Fibrous Heterogeneous		2% Ca Carbonate 98% Non-fibrous (Other)	None Detected
I 5-2-Floor Tile 412204011-0018	Upper - Building Main Entrance Hallway - 12"x12" Green-Green Smear Floor Tile and Mastic	Green Non-Fibrous Homogeneous		20% Ca Carbonate 80% Non-fibrous (Other)	None Detected
I 5-2-Mastic/Leveler 412204011-0018A	Upper - Building Main Entrance Hallway - 12"x12" Green-Green Smear Floor Tile and Mastic	Gray/Beige Non-Fibrous Heterogeneous		2% Ca Carbonate 98% Non-fibrous (Other)	None Detected

Initial report from: 04/28/2022 14:58:02



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EMSL Order: 412204011
Customer ID: TITA52
Customer PO: 71157008
Project ID:

Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

Sample	Description	Appearance	Non-Asbestos		Asbestos
			% Fibrous	% Non-Fibrous	% Type
I 5-3-Floor Tile 412204011-0019	Upper - Building I Hallway - Start - 12"x12" Green-Green Smear Floor Tile and Mastic	Green Non-Fibrous Homogeneous		30% Ca Carbonate 70% Non-fibrous (Other)	None Detected
I 5-3-Mastic/Leveler 412204011-0019A	Upper - Building I Hallway - Start - 12"x12" Green-Green Smear Floor Tile and Mastic	Gray/Tan Non-Fibrous Homogeneous		5% Quartz 5% Ca Carbonate 90% Non-fibrous (Other)	None Detected
I 6-1-Floor Tile 412204011-0020	Upper - Building I Hallway - End - 12"x12" White-Grey Smear Floor Tile and Mastic	White Non-Fibrous Homogeneous		20% Ca Carbonate 80% Non-fibrous (Other)	None Detected
I 6-1-Mastic/Leveler 412204011-0020A	Upper - Building I Hallway - End - 12"x12" White-Grey Smear Floor Tile and Mastic	Gray/Beige Non-Fibrous Heterogeneous		<1% Quartz 100% Non-fibrous (Other)	None Detected
I 6-2-Floor Tile 412204011-0021	Upper - Next to Gym Door - 12"x12" White-Grey Smear Floor Tile and Mastic	White Non-Fibrous Homogeneous		20% Ca Carbonate 80% Non-fibrous (Other)	None Detected
I 6-2-Mastic/Leveler 412204011-0021A	Upper - Next to Gym Door - 12"x12" White-Grey Smear Floor Tile and Mastic	Gray/Beige Non-Fibrous Heterogeneous		<1% Quartz 100% Non-fibrous (Other)	None Detected
I 6-3-Floor Tile 412204011-0022	Upper - Building I Hallway - Start - 12"x12" White-Grey Smear Floor Tile and Mastic	White Non-Fibrous Homogeneous		30% Ca Carbonate 70% Non-fibrous (Other)	None Detected
I 6-3-Mastic/Leveler 412204011-0022A	Upper - Building I Hallway - Start - 12"x12" White-Grey Smear Floor Tile and Mastic	Tan Non-Fibrous Homogeneous		5% Quartz 95% Non-fibrous (Other)	None Detected
I 7-1-Floor Tile 412204011-0023	Upper - Building I Hallway - End - 12"x12" Yellow-White Smear Floor Tile and Mastic	Yellow Non-Fibrous Homogeneous		20% Ca Carbonate 80% Non-fibrous (Other)	None Detected
I 7-1-Mastic/Leveler 412204011-0023A	Upper - Building I Hallway - End - 12"x12" Yellow-White Smear Floor Tile and Mastic	Gray/Beige Non-Fibrous Heterogeneous		<1% Quartz 2% Ca Carbonate 98% Non-fibrous (Other)	None Detected
I 7-2-Floor Tile 412204011-0024	Upper - Building I Hallway - Start - 12"x12" Yellow-White Smear Floor Tile and Mastic	Yellow Non-Fibrous Homogeneous		20% Ca Carbonate 80% Non-fibrous (Other)	None Detected
I 7-2-Mastic/Leveler 412204011-0024A	Upper - Building I Hallway - Start - 12"x12" Yellow-White Smear Floor Tile and Mastic	Gray/Beige Non-Fibrous Heterogeneous		<1% Quartz 2% Ca Carbonate 98% Non-fibrous (Other)	None Detected

Initial report from: 04/28/2022 14:58:02



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EMSL Order: 412204011
Customer ID: TITA52
Customer PO: 71157008
Project ID:

Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

Sample	Description	Appearance	Non-Asbestos		Asbestos
			% Fibrous	% Non-Fibrous	% Type
I 7-3-Floor Tile 412204011-0025	Upper - Main Entrance Area - 12"x12" Yellow-White Smear Floor Tile and Mastic	Tan Non-Fibrous Homogeneous		40% Ca Carbonate 60% Non-fibrous (Other)	None Detected
I 7-3-Mastic/Leveler 412204011-0025A	Upper - Main Entrance Area - 12"x12" Yellow-White Smear Floor Tile and Mastic	Gray/Tan Non-Fibrous Homogeneous		5% Quartz 5% Ca Carbonate 90% Non-fibrous (Other)	None Detected
I 8-1 412204011-0026	Upper - Band Room - Yellow Carpet Glue	Yellow Non-Fibrous Homogeneous		<1% Quartz 100% Non-fibrous (Other)	None Detected
I 8-2 412204011-0027	Upper - Chorus Room - Yellow Carpet Glue	Yellow Non-Fibrous Homogeneous		<1% Quartz 100% Non-fibrous (Other)	None Detected
I 8-3 412204011-0028	Upper - Main Office - Yellow Carpet Glue	Tan Non-Fibrous Homogeneous		5% Ca Carbonate 95% Non-fibrous (Other)	None Detected
I 9-1 412204011-0029	Lower - Hallway West - Grey Fireproofing	Gray Fibrous Homogeneous	95% Min. Wool	5% Non-fibrous (Other)	None Detected
I 9-2 412204011-0030	Lower - Washer and Dryer Room - Grey Fireproofing	Gray Fibrous Homogeneous	95% Min. Wool	5% Non-fibrous (Other)	None Detected
I 9-3 412204011-0031	Lower - Janitor Closet - Grey Fireproofing	Gray Fibrous Homogeneous	95% Min. Wool	5% Non-fibrous (Other)	None Detected
I 9-4 412204011-0032	Lower - Hallway East - Grey Fireproofing	Gray Fibrous Homogeneous	95% Min. Wool	5% Non-fibrous (Other)	None Detected
I 9-5 412204011-0033	Lower - Washer and Dryer Room - Grey Fireproofing	Gray Fibrous Homogeneous	98% Min. Wool	2% Non-fibrous (Other)	None Detected
I 9-6 412204011-0034	Upper - Band Room - Grey Fireproofing	Gray Fibrous Homogeneous	98% Min. Wool	2% Non-fibrous (Other)	None Detected
I 9-7 412204011-0035	Upper - Chorus Room - Grey Fireproofing	Gray Non-Fibrous Homogeneous	98% Min. Wool	2% Non-fibrous (Other)	None Detected
I 10-1 412204011-0036	Band Room - Interior Door Caulk	White Non-Fibrous Homogeneous		15% Ca Carbonate 85% Non-fibrous (Other)	None Detected
I 10-2 412204011-0037	Coaches Office - PE Teacher Door - Interior Door Caulk	White Non-Fibrous Homogeneous		15% Ca Carbonate 85% Non-fibrous (Other)	None Detected
I 10-3 412204011-0038	Stairwell Door - Interior Door Caulk	White Non-Fibrous Homogeneous		15% Ca Carbonate 85% Non-fibrous (Other)	None Detected
I 11-1 412204011-0039	East Front Entrance to Gym - Interior Window Caulk	White Non-Fibrous Homogeneous		15% Ca Carbonate 85% Non-fibrous (Other)	None Detected
I 11-2 412204011-0040	Hallway Chorus Room - Interior Window Caulk	White Non-Fibrous Homogeneous		15% Ca Carbonate 85% Non-fibrous (Other)	None Detected
I 11-3 412204011-0041	West Front Entrance to Gym - Interior Window Caulk	White Non-Fibrous Homogeneous		15% Ca Carbonate 85% Non-fibrous (Other)	None Detected

Initial report from: 04/28/2022 14:58:02



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EMSL Order: 412204011
Customer ID: TITA52
Customer PO: 71157008
Project ID:

Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

Sample	Description	Appearance	Non-Asbestos		Asbestos
			% Fibrous	% Non-Fibrous	% Type
I 12-1 412204011-0042	Main Office Hallway - 4" Paper Pipe Insulation Wrap Dual Temp	Silver/Beige Fibrous Homogeneous	90% Cellulose	10% Non-fibrous (Other)	None Detected
I 12-2 412204011-0043	Upper - Hallway near Bleachers - 4" Paper Pipe Insulation Wrap Dual Temp	Silver/Beige Fibrous Homogeneous	90% Cellulose	10% Non-fibrous (Other)	None Detected
I 12-3 412204011-0044	Lower - Washer and Dryer Room - 4" Paper Pipe Insulation Wrap Dual Temp	Tan/Silver Non-Fibrous Homogeneous	80% Cellulose	20% Non-fibrous (Other)	None Detected
I 13-1 412204011-0045	Upper - Main Office above Drop Ceiling - Wallboard - Wall, No Joint Compound	White Non-Fibrous Homogeneous	5% Cellulose 2% Glass	93% Non-fibrous (Other)	None Detected
I 13-2 412204011-0046	Upper - Main Office above Drop Ceiling - Wallboard - Wall, No Joint Compound	White Non-Fibrous Homogeneous	5% Cellulose 2% Glass	93% Non-fibrous (Other)	None Detected
I 13-3 412204011-0047	Upper - Main Office above Drop Ceiling - Wallboard - Wall, No Joint Compound	Gray Non-Fibrous Homogeneous	10% Cellulose	90% Non-fibrous (Other)	None Detected
I 14-1 412204011-0048	Lower - Hallway - Red Fire Stop	Red Non-Fibrous Homogeneous	2% Cellulose	15% Ca Carbonate 83% Non-fibrous (Other)	None Detected
I 14-2 412204011-0049	Upper - Outside Main Office - Red Fire Stop	Red Non-Fibrous Homogeneous	2% Cellulose	15% Ca Carbonate 83% Non-fibrous (Other)	None Detected
I 14-3 412204011-0050	Upper - Hallway Outside Mens Restroom - Red Fire Stop	Red Non-Fibrous Homogeneous	10% Cellulose 2% Synthetic	10% Ca Carbonate 78% Non-fibrous (Other)	None Detected
I 15-1-Sheet Flooring 412204011-0051	Upper - Main Office - White Sheet Flooring and Mastic	White Fibrous Homogeneous	15% Cellulose	85% Non-fibrous (Other)	None Detected
I 15-1-Mastic/Leveler 412204011-0051A	Upper - Main Office - White Sheet Flooring and Mastic	Gray/Tan Non-Fibrous Heterogeneous	2% Cellulose	<1% Quartz 98% Non-fibrous (Other)	None Detected
I 15-2-Sheet Flooring 412204011-0052	Upper - Main Office - White Sheet Flooring and Mastic	White Fibrous Homogeneous	15% Cellulose	85% Non-fibrous (Other)	None Detected
I 15-2-Mastic/Leveler 412204011-0052A	Upper - Main Office - White Sheet Flooring and Mastic	Gray/Tan Non-Fibrous Heterogeneous	2% Cellulose	<1% Quartz 98% Non-fibrous (Other)	None Detected
I 15-3-Sheet Flooring 412204011-0053	Upper - Main Office - White Sheet Flooring and Mastic	White Non-Fibrous Homogeneous	15% Cellulose	85% Non-fibrous (Other)	None Detected
I 15-3-Mastic 412204011-0053A	Upper - Main Office - White Sheet Flooring and Mastic	Gray/Tan Non-Fibrous Homogeneous	1% Cellulose	2% Ca Carbonate 97% Non-fibrous (Other)	None Detected
I 16-1-Floor Tile 412204011-0054	Upper - Band Room Right Side Back Door - 12"x12" Light Blue Floor Tile and Mastic	Blue Non-Fibrous Homogeneous		20% Ca Carbonate 80% Non-fibrous (Other)	None Detected

Initial report from: 04/28/2022 14:58:02



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EMSL Order: 412204011
Customer ID: TITA52
Customer PO: 71157008
Project ID:

Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

Sample	Description	Appearance	Non-Asbestos		Asbestos
			% Fibrous	% Non-Fibrous	% Type
I 16-1-Mastic <small>412204011-0054A</small>	Upper - Band Room Right Side Back Door - 12"x12" Light Blue Floor Tile and Mastic	Tan Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
I 16-2-Floor Tile <small>412204011-0055</small>	Upper - Band Room Right Side Back Door - 12"x12" Light Blue Floor Tile and Mastic	Blue Non-Fibrous Homogeneous		20% Ca Carbonate 80% Non-fibrous (Other)	None Detected
I 16-2-Mastic <small>412204011-0055A</small>	Upper - Band Room Right Side Back Door - 12"x12" Light Blue Floor Tile and Mastic	Tan Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
I 16-3-Floor Tile <small>412204011-0056</small>	Upper - Band Room Right Side Back Door - 12"x12" Light Blue Floor Tile and Mastic	Green Non-Fibrous Homogeneous		40% Ca Carbonate 60% Non-fibrous (Other)	None Detected
I 16-3-Mastic <small>412204011-0056A</small>	Upper - Band Room Right Side Back Door - 12"x12" Light Blue Floor Tile and Mastic	Tan Non-Fibrous Homogeneous	1% Cellulose	5% Quartz 94% Non-fibrous (Other)	None Detected
I 17-1 <small>412204011-0057</small>	Upper - Band Room Break Room - Grey Sink Coating	Gray Non-Fibrous Homogeneous		98% Non-fibrous (Other)	2% Chrysotile
I 17-2 <small>412204011-0058</small>	Upper - Band Room Break Room - Grey Sink Coating	Gray Non-Fibrous Homogeneous		98% Non-fibrous (Other)	2% Chrysotile
I 17-3 <small>412204011-0059</small>	Upper - Band Room Break Room - Grey Sink Coating	Gray/Pink Non-Fibrous Homogeneous		97% Non-fibrous (Other)	3% Chrysotile

Analyst(s)

Ashley Hill (54)
Sarah Breneman (27)

Lee Plumley, Laboratory Manager
or Other Approved Signatory

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Samples analyzed by EMSL Analytical, Inc. Pineville, NC NVLAP Lab Code 200841-0, VA 3333 00312

Initial report from: 04/28/2022 14:58:02

Inspector: Chad Chavis
 License: 12929
 Date: 7/27/2022

Job Name: Grier Middle School
 Job Number: 71227143
 Area(s): I Building Exterior and Roof

Sample No.	Homogeneous Material Description	Sample Location	Condition	Quantity	Friable/ Non-Friable	Lab Results
I18-1	Green Door Caulk	Back of Building	Good	7 Doors	Non-Friable	None Detected
I18-2	Green Door Caulk	Back of Building				None Detected
I18-3	Green Door Caulk	Back of Building				None Detected
I19-1	Beige Caulk	Front Entrance Window/Door	Good	4 Windows / 2 Doors	Non-Friable	None Detected
I19-2	Beige Caulk	Front Left Window				None Detected
I19-3	Beige Caulk	Side Door				None Detected
I20-1	Gray Brick Seam Caulk	Exterior	Good	500 ft	Non-Friable	None Detected
I20-2	Gray Brick Seam Caulk	Exterior				None Detected
I20-3	Gray Brick Seam Caulk	Exterior				None Detected
IR1-1	Green Roof Caulk	Lower Roof	Good		Non-Friable	None Detected
IR1-2	Green Roof Caulk	Lower Roof				None Detected
IR1-3	Green Roof Caulk	Lower Roof				None Detected



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EMSL Order: 412207386

Customer ID: TITA52

Customer PO: 71227143

Project ID:

Attention: Chad Chavis
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Received Date: 07/29/2022 12:45 PM

Analysis Date: 08/01/2022 - 08/02/2022

Collected Date: 07/27/2022

Project: Grier Middle School Demolition/ 71227143/ Building I Exterior and Roof

Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

Sample	Description	Appearance	Non-Asbestos		Asbestos
			% Fibrous	% Non-Fibrous	% Type
118-1 <small>412207386-0001</small>	Back of Building - Green Door Caulk	Brown/Green Non-Fibrous Homogeneous		5% Ca Carbonate 95% Non-fibrous (Other)	None Detected
118-2 <small>412207386-0002</small>	Back of Building - Green Door Caulk	Brown/Green Non-Fibrous Homogeneous		5% Ca Carbonate 95% Non-fibrous (Other)	None Detected
118-3 <small>412207386-0003</small>	Back of Building - Green Door Caulk	Brown Non-Fibrous Homogeneous		15% Ca Carbonate 85% Non-fibrous (Other)	None Detected
119-1 <small>412207386-0004</small>	Front Entrance Window-Door - Beige Caulk	Brown/Gray Non-Fibrous Homogeneous		5% Ca Carbonate 95% Non-fibrous (Other)	None Detected
119-2 <small>412207386-0005</small>	Front Left Window - Beige Caulk	Gray/White Non-Fibrous Homogeneous		10% Ca Carbonate 90% Non-fibrous (Other)	None Detected
119-3 <small>412207386-0006</small>	Side Door - Beige Caulk	Brown Non-Fibrous Homogeneous		15% Ca Carbonate 85% Non-fibrous (Other)	None Detected
120-1 <small>412207386-0007</small>	Exterior - Gray Brick Seam Caulk	Gray Non-Fibrous Homogeneous		10% Ca Carbonate 90% Non-fibrous (Other)	None Detected
120-2 <small>412207386-0008</small>	Exterior - Gray Brick Seam Caulk	Gray/Tan Non-Fibrous Homogeneous		15% Ca Carbonate 85% Non-fibrous (Other)	None Detected
120-3 <small>412207386-0009</small>	Exterior - Gray Brick Seam Caulk	Gray Non-Fibrous Homogeneous		15% Ca Carbonate 85% Non-fibrous (Other)	None Detected
IR1-1 <small>412207386-0010</small>	Lower Roof - Green Roof Caulk	Green Non-Fibrous Homogeneous		5% Ca Carbonate 95% Non-fibrous (Other)	None Detected
IR1-2 <small>412207386-0011</small>	Lower Roof - Green Roof Caulk	Green Non-Fibrous Homogeneous		5% Ca Carbonate 95% Non-fibrous (Other)	None Detected
IR1-3 <small>412207386-0012</small>	Lower Roof - Green Roof Caulk	Green Non-Fibrous Homogeneous		5% Ca Carbonate 95% Non-fibrous (Other)	None Detected

Initial report from: 08/03/2022 13:20:53



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EMSL Order: 412207386

Customer ID: TITA52

Customer PO: 71227143

Project ID:

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or Other Approved Signatory

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Samples analyzed by EMSL Analytical, Inc. Pineville, NC NVLAP Lab Code 200841-0, VA 3333 00312

Initial report from: 08/03/2022 13:20:53

Inspector: Erick Hutson
 License: 12849
 Date: 4/15/2022 - 4/21/2022

Job Name: Grier Middle School
 Job Number: 71157008-32
 Area(s): Building MC

Sample No.	Homogeneous Material Description	Sample Location	Condition	Quantity	Friable/ Non-Friable	Lab Results
MC 1-1	2'x2' Pinhole Fissure Ceiling Tile	Office	Good	5,000 ft ²	Friable	None Detected
MC 1-2	2'x2' Pinhole Fissure Ceiling Tile	Check Out Area				None Detected
MC 1-3	2'x2' Pinhole Fissure Ceiling Tile	Main Area				None Detected
MC 2-1	Wallboard and Joint Compound	Ramp Near Main Entrance	Good	1,200 ft ²	Friable	Wallboard: None Detected Joint Compound: None Detected
MC 2-2	Wallboard and Joint Compound	Main Area				Wallboard: None Detected Joint Compound: None Detected
MC 2-3	Wallboard and Joint Compound	Rear of Main Area				Wallboard: None Detected Joint Compound: None Detected
MC 2-4	Wallboard and Joint Compound	Office				Wallboard: None Detected Joint Compound: None Detected
MC 2-5	Wallboard and Joint Compound	Storage				Wallboard: None Detected Joint Compound: None Detected
MC 3-1	CMU Block Surface Filler	Near Entrance	Good	4,000 ft ²	Friable	None Detected
MC 3-2	CMU Block Surface Filler	Main Area				None Detected
MC 3-3	CMU Block Surface Filler	Storage				None Detected
MC 4-1	4" Black Covebase and Mastic	Main Area	Good	300 ft ²	Non-Friable	Covebase: None Detected Mastic: None Detected
MC 4-2	4" Black Covebase and Mastic	Near Bathroom				Covebase: None Detected Mastic: None Detected
MC 4-3	4" Black Covebase and Mastic	Office				Covebase: None Detected Mastic: None Detected
MC 5-1	Yellow Carpet Glue	Main Are North	Good	5,500 ft ²	Non-Friable	None Detected
MC 5-2	Yellow Carpet Glue	Main Are South				None Detected
MC 5-3	Yellow Carpet Glue	Main Are East				None Detected
MC 6-1	12"x12" White/Tan Smear Floor Tile and Mastic	Work Room	Good	2,500 ft ²	Non-Friable	Floor Tile: None Detected Mastic: None Detected
MC 6-2	12"x12" White/Tan Smear Floor Tile and Mastic	Office				Floor Tile: None Detected Mastic: None Detected
MC 6-3	12"x12" White/Tan Smear Floor Tile and Mastic	Work Room				Floor Tile: None Detected Mastic: None Detected
MC 7-1	Black Sink Coating	Work Room	Good	2 sinks	Non-Friable	None Detected
MC 7-2	Black Sink Coating	Work Room				None Detected
MC 7-3	Black Sink Coating	Work Room				None Detected
MC 8-1	Grey Interior Door and Window Caulk	Entrance Door	Good	20 windows 7 doors	Non-Friable	None Detected
MC 8-2	Grey Interior Door and Window Caulk	Rear of Main Area				None Detected
MC 8-3	Grey Interior Door and Window Caulk	Media Center Exit				None Detected
MC 9-1	Grey Duct Mastic	Mechanical Room	Good	200 ft	Non-Friable	None Detected
MC 9-2	Grey Duct Mastic	Mechanical Room				None Detected
MC 9-3	Grey Duct Mastic	Mechanical Room				None Detected



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EMSL Order: 412204029

Customer ID: TITA52

Customer PO: 71157008

Project ID:

Attention: Erick Hutson
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Phone: (803) 984-9498

Fax: (704) 509-1888

Received Date: 04/25/2022 9:40 AM

Analysis Date: 04/28/2022

Collected Date: 04/15/2022

Project: Grier Middle School - 71157008 - Building MC

Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

Sample	Description	Appearance	Non-Asbestos		Asbestos % Type
			% Fibrous	% Non-Fibrous	
MC 1-1 <small>412204029-0001</small>	Office - 2'x2' Pinhole Fissure Ceiling Tile	Gray/White Fibrous Homogeneous	60% Cellulose 20% Min. Wool	5% Perlite 15% Non-fibrous (Other)	None Detected
MC 1-2 <small>412204029-0002</small>	Check Out Area - 2'x2' Pinhole Fissure Ceiling Tile	Gray/White Fibrous Homogeneous	60% Cellulose 20% Min. Wool	5% Perlite 15% Non-fibrous (Other)	None Detected
MC 1-3 <small>412204029-0003</small>	Main Area - 2'x2' Pinhole Fissure Ceiling Tile	Gray Fibrous Homogeneous	60% Cellulose 20% Min. Wool	5% Perlite 15% Non-fibrous (Other)	None Detected
MC 2-1-Joint Compound <small>412204029-0004</small>	Ramp near Main Entrance - Wallboard and Joint Compound	White Non-Fibrous Homogeneous		40% Ca Carbonate 60% Non-fibrous (Other)	None Detected
MC 2-1-Wallboard <small>412204029-0004A</small>	Ramp near Main Entrance - Wallboard and Joint Compound	White Non-Fibrous Homogeneous	5% Cellulose	95% Non-fibrous (Other)	None Detected
MC 2-2-Joint Compound <small>412204029-0005</small>	Main Area - Wallboard and Joint Compound	White Non-Fibrous Homogeneous		40% Ca Carbonate 60% Non-fibrous (Other)	None Detected
MC 2-2-Wallboard <small>412204029-0005A</small>	Main Area - Wallboard and Joint Compound	White Non-Fibrous Homogeneous	5% Cellulose	95% Non-fibrous (Other)	None Detected
MC 2-3-Joint Compound <small>412204029-0006</small>	Rear of Main Area - Wallboard and Joint Compound	White Non-Fibrous Homogeneous		40% Ca Carbonate 60% Non-fibrous (Other)	None Detected
MC 2-3-Wallboard <small>412204029-0006A</small>	Rear of Main Area - Wallboard and Joint Compound	White Non-Fibrous Homogeneous	5% Cellulose	95% Non-fibrous (Other)	None Detected
MC 2-4-Joint Compound <small>412204029-0007</small>	Office - Wallboard and Joint Compound	White Non-Fibrous Homogeneous		30% Ca Carbonate 70% Non-fibrous (Other)	None Detected
MC 2-4-Wallboard <small>412204029-0007A</small>	Office - Wallboard and Joint Compound	Gray Fibrous Homogeneous	5% Cellulose	95% Non-fibrous (Other)	None Detected
MC 2-5-Tape <small>412204029-0008</small>	Storage - Wallboard and Joint Compound	White Fibrous Homogeneous	99% Cellulose	1% Non-fibrous (Other)	None Detected
MC 2-5-Joint Compound <small>412204029-0008A</small>	Storage - Wallboard and Joint Compound	White Non-Fibrous Homogeneous		30% Ca Carbonate 70% Non-fibrous (Other)	None Detected
MC 2-5-Wallboard <small>412204029-0008B</small>	Storage - Wallboard and Joint Compound	Gray Fibrous Homogeneous	5% Cellulose	95% Non-fibrous (Other)	None Detected
MC 3-1 <small>412204029-0009</small>	Near Entrance - CMU Block Surface Filler	Gray/White Non-Fibrous Homogeneous		20% Quartz 80% Non-fibrous (Other)	None Detected
MC 3-2 <small>412204029-0010</small>	Main Area - CMU Block Surface Filler	Gray/White Non-Fibrous Homogeneous		20% Quartz 80% Non-fibrous (Other)	None Detected

Initial report from: 04/28/2022 14:58:56



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EMSL Order: 412204029
Customer ID: TITA52
Customer PO: 71157008
Project ID:

Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

Sample	Description	Appearance	Non-Asbestos		Asbestos
			% Fibrous	% Non-Fibrous	% Type
MC 3-3 412204029-0011	Storage - CMU Block Surface Filler	White Non-Fibrous Homogeneous		5% Quartz 10% Ca Carbonate 85% Non-fibrous (Other)	None Detected
MC 4-1-Cove Base 412204029-0012	Main Area - 4" Black Covebase and Mastic	Black Non-Fibrous Homogeneous		5% Ca Carbonate 95% Non-fibrous (Other)	None Detected
MC 4-1-Mastic 412204029-0012A	Main Area - 4" Black Covebase and Mastic	Beige Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
MC 4-2-Cove Base 412204029-0013	Near Bathroom - 4" Black Covebase and Mastic	Black Non-Fibrous Homogeneous		5% Ca Carbonate 95% Non-fibrous (Other)	None Detected
MC 4-2-Mastic 412204029-0013A	Near Bathroom - 4" Black Covebase and Mastic	Beige Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
MC 4-3-Cove Base 412204029-0014	Office - 4" Black Covebase and Mastic	Gray/Black Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
MC 4-3-Mastic 412204029-0014A	Office - 4" Black Covebase and Mastic	Tan Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
MC 5-1 412204029-0015	Main Area North - Yellow Carpet Glue	Yellow Non-Fibrous Homogeneous	<1% Synthetic	100% Non-fibrous (Other)	None Detected
MC 5-2 412204029-0016	Main Area South - Yellow Carpet Glue	Yellow Non-Fibrous Homogeneous	2% Synthetic	98% Non-fibrous (Other)	None Detected
MC 5-3 412204029-0017	Main Area East - Yellow Carpet Glue	Yellow Non-Fibrous Homogeneous	2% Synthetic	98% Non-fibrous (Other)	None Detected
MC 6-1-Floor Tile 412204029-0018	Work Room - 12"x12" White-Tan Smear Floor Tile and Mastic	Beige Non-Fibrous Homogeneous		20% Ca Carbonate 80% Non-fibrous (Other)	None Detected
MC 6-1-Mastic 412204029-0018A	Work Room - 12"x12" White-Tan Smear Floor Tile and Mastic	Tan Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
MC 6-2-Floor Tile 412204029-0019	Office - 12"x12" White-Tan Smear Floor Tile and Mastic	Beige Non-Fibrous Homogeneous		20% Ca Carbonate 80% Non-fibrous (Other)	None Detected
MC 6-2-Mastic 412204029-0019A	Office - 12"x12" White-Tan Smear Floor Tile and Mastic	Tan Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
MC 6-3-Floor Tile 412204029-0020	Work Room - 12"x12" White-Tan Smear Floor Tile and Mastic	Beige Non-Fibrous Homogeneous		30% Ca Carbonate 70% Non-fibrous (Other)	None Detected
MC 6-3-Mastic 412204029-0020A	Work Room - 12"x12" White-Tan Smear Floor Tile and Mastic	Gray/Yellow Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
MC 7-1 412204029-0021	Work Room - Black Sink Coating	Black Non-Fibrous Homogeneous		10% Ca Carbonate 90% Non-fibrous (Other)	None Detected
MC 7-2 412204029-0022	Work Room - Black Sink Coating	Black Non-Fibrous Homogeneous		10% Ca Carbonate 90% Non-fibrous (Other)	None Detected
MC 7-3 412204029-0023	Work Room - Black Sink Coating	Black Non-Fibrous Homogeneous		10% Ca Carbonate 90% Non-fibrous (Other)	None Detected

Initial report from: 04/28/2022 14:58:56



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EMSL Order: 412204029
Customer ID: TITA52
Customer PO: 71157008
Project ID:

Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

Sample	Description	Appearance	Non-Asbestos		Asbestos
			% Fibrous	% Non-Fibrous	% Type
MC 8-1 412204029-0024	Entrance Door - Grey Interior Door and Window Caulk	Gray Non-Fibrous Homogeneous		15% Ca Carbonate 85% Non-fibrous (Other)	None Detected
MC 8-2 412204029-0025	Rear of Main Area - Grey Interior Door and Window Caulk	Gray Non-Fibrous Homogeneous		15% Ca Carbonate 85% Non-fibrous (Other)	None Detected
MC 8-3 412204029-0026	Media Center Exit - Grey Interior Door and Window Caulk	Gray Non-Fibrous Homogeneous		15% Ca Carbonate 85% Non-fibrous (Other)	None Detected
MC 9-1 412204029-0027	Mechanical Room - Grey Duct Mastic	Gray/Silver Non-Fibrous Homogeneous	2% Cellulose	15% Ca Carbonate 83% Non-fibrous (Other)	None Detected
MC 9-2 412204029-0028	Mechanical Room - Grey Duct Mastic	Gray/Silver Non-Fibrous Homogeneous	2% Cellulose	15% Ca Carbonate 83% Non-fibrous (Other)	None Detected
MC 9-3 412204029-0029	Mechanical Room - Grey Duct Mastic	Gray Non-Fibrous Homogeneous	2% Cellulose	15% Ca Carbonate 83% Non-fibrous (Other)	None Detected

Analyst(s)

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Jessica Cooper (15)

Lee Plumley, Laboratory Manager
or Other Approved Signatory

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Samples analyzed by EMSL Analytical, Inc. Pineville, NC NVLAP Lab Code 200841-0, VA 3333 00312

Initial report from: 04/28/2022 14:58:56



Asbestos Inspection Form

Inspector: Chad Chavis
License: 12929
Date: 7/27/2022

Job Name: Grier Middle School
Job Number: 71227143
Area(s): Media Center Additional Sampling

Sample No.	Homogeneous Material Description	Sample Location	Condition	Quantity	Friable/ Non-Friable	Lab Results
MC3-4	CMU Block Surface Filler	Workroom	Good		Friable	None Detected
MC3-5	CMU Block Surface Filler	North Wall				None Detected
MC10-1	Gray Window Caulk	Exterior	Good	10 Windows	Non-Friable	None Detected
MC10-2	Gray Window Caulk	Exterior				None Detected
MC10-3	Gray Window Caulk	Exterior				None Detected
MC11-1	Gray Brick Seam Caulk	Exterior	Good	100 ft	Non-Friable	None Detected
MC11-2	Gray Brick Seam Caulk	Exterior				None Detected
MC11-3	Gray Brick Seam Caulk	Exterior				None Detected
MCR 1-1	Roof Membrane	Media Center Roof	Good		Non-Friable	None Detected
MCR 1-2	Roof Membrane	Media Center Roof				None Detected
MCR 1-3	Roof Membrane	Media Center Roof				None Detected
MCR 2-1	Roof Flashing	Media Center Roof	Good		Non-Friable	None Detected
MCR 2-2	Roof Flashing	Media Center Roof				None Detected
MCR 2-3	Roof Flashing	Media Center Roof				None Detected
MCR 3-1	Silver Paint Penetrations	Media Center Roof	Good		Non-Friable	None Detected
MCR 3-2	Silver Paint Penetrations	Media Center Roof				None Detected
MCR 3-3	Silver Paint Penetrations	Media Center Roof				None Detected
MCR 4-1	Tan Building Seam Caulk	Media Center Wall	Good		Non-Friable	None Detected
MCR 4-2	Tan Building Seam Caulk	Media Center Wall				None Detected
MCR 4-3	Tan Building Seam Caulk	Media Center Wall				None Detected



EMSL Analytical, Inc.

10801 Southern Loop Blvd Pineville, NC 28134

Tel/Fax: (704) 525-2205 / (704) 525-2382

<http://www.EMSL.com> / charlottelab@emsl.com

EMSL Order: 412207388

Customer ID: TITA52

Customer PO: 71227143

Project ID:

Attention: Chad Chavis
Terracon Consultants, Inc.
2701 Westport Road
Charlotte, NC 28208

Phone: (704) 307-3045

Fax: (704) 509-1888

Received Date: 07/29/2022 12:45 PM

Analysis Date: 08/02/2022

Collected Date: 07/27/2022

Project: Grier Middle School/ 71227143/ Media Center Additional Sampling

Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

Sample	Description	Appearance	Non-Asbestos		Asbestos
			% Fibrous	% Non-Fibrous	% Type
MC3-4 <small>412207388-0001</small>	Workroom - CMU Block Surface Filler	Tan/White Non-Fibrous Homogeneous		15% Ca Carbonate 85% Non-fibrous (Other)	None Detected
MC3-5 <small>412207388-0002</small>	North Wall - CMU Block Surface Filler	Beige Non-Fibrous Homogeneous		15% Ca Carbonate 85% Non-fibrous (Other)	None Detected
MC10-1 <small>412207388-0003</small>	Exterior - Gray Window Caulk	Gray Non-Fibrous Homogeneous		10% Ca Carbonate 90% Non-fibrous (Other)	None Detected
MC10-2 <small>412207388-0004</small>	Exterior - Gray Window Caulk	Gray Non-Fibrous Homogeneous		10% Ca Carbonate 90% Non-fibrous (Other)	None Detected
MC10-3 <small>412207388-0005</small>	Exterior - Gray Window Caulk	Gray Non-Fibrous Homogeneous		15% Ca Carbonate 85% Non-fibrous (Other)	None Detected
MC11-1 <small>412207388-0006</small>	Exterior - Gray Brick Seam Caulk	Gray/White Non-Fibrous Homogeneous		10% Ca Carbonate 90% Non-fibrous (Other)	None Detected
MC11-2 <small>412207388-0007</small>	Exterior - Gray Brick Seam Caulk	Gray/White Non-Fibrous Homogeneous		10% Ca Carbonate 90% Non-fibrous (Other)	None Detected
MC11-3 <small>412207388-0008</small>	Exterior - Gray Brick Seam Caulk	Gray/White Non-Fibrous Homogeneous		15% Ca Carbonate 85% Non-fibrous (Other)	None Detected
MCR 1-1-Membrane <small>412207388-0009</small>	Media Center Roof - Roof Membrane	Black Fibrous Homogeneous	5% Cellulose 10% Glass	85% Non-fibrous (Other)	None Detected
MCR 1-1-Gray Insulation <small>412207388-0009A</small>	Media Center Roof - Roof Membrane	Gray Fibrous Homogeneous	90% Cellulose	5% Perlite 5% Non-fibrous (Other)	None Detected
MCR 1-1-White Insulation <small>412207388-0009B</small>	Media Center Roof - Roof Membrane	White/Yellow Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
MCR 1-2-Membrane <small>412207388-0010</small>	Media Center Roof - Roof Membrane	Black Fibrous Homogeneous	5% Cellulose 10% Glass	85% Non-fibrous (Other)	None Detected
MCR 1-2-Gray Insulation <small>412207388-0010A</small>	Media Center Roof - Roof Membrane	Brown/Gray Fibrous Homogeneous	90% Cellulose	5% Perlite 5% Non-fibrous (Other)	None Detected
MCR 1-2-White Insulation <small>412207388-0010B</small>	Media Center Roof - Roof Membrane	White/Yellow Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
MCR 1-3-Membrane <small>412207388-0011</small>	Media Center Roof - Roof Membrane	Black Fibrous Homogeneous	30% Glass	70% Non-fibrous (Other)	None Detected

Initial report from: 08/03/2022 13:22:27



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EMSL Order: 412207388
Customer ID: TITA52
Customer PO: 71227143
Project ID:

Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

Sample	Description	Appearance	Non-Asbestos		Asbestos
			% Fibrous	% Non-Fibrous	% Type
MCR 1-3-Gray Insulation <small>412207388-0011A</small>	Media Center Roof - Roof Membrane	Gray Fibrous Homogeneous	85% Cellulose	5% Perlite 10% Non-fibrous (Other)	None Detected
MCR 1-3-White Insulation <small>412207388-0011B</small>	Media Center Roof - Roof Membrane	White/Beige Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
MCR 2-1 <small>412207388-0012</small>	Media Center Roof - Roof Flashing	White/Black Non-Fibrous Homogeneous	10% Glass	5% Quartz 85% Non-fibrous (Other)	None Detected
MCR 2-2-Flashing <small>412207388-0013</small>	Media Center Roof - Roof Flashing	Black Fibrous Homogeneous	10% Glass	5% Quartz 85% Non-fibrous (Other)	None Detected
MCR 2-2-Tar <small>412207388-0013A</small>	Media Center Roof - Roof Flashing	Black Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
MCR 2-3-Flashing <small>412207388-0014</small>	Media Center Roof - Roof Flashing	White/Black Fibrous Homogeneous	10% Glass	10% Quartz 80% Non-fibrous (Other)	None Detected
MCR 2-3-Tar <small>412207388-0014A</small>	Media Center Roof - Roof Flashing	Black Non-Fibrous Homogeneous	<1% Cellulose	100% Non-fibrous (Other)	None Detected
MCR 3-1 <small>412207388-0015</small>	Media Center Roof - Silver Paint Penetrations	Gray/Silver Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
MCR 3-2 <small>412207388-0016</small>	Media Center Roof - Silver Paint Penetrations	Gray/Silver Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
MCR 3-3 <small>412207388-0017</small>	Media Center Roof - Silver Paint Penetrations	Gray/Silver Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
MCR 4-1 <small>412207388-0018</small>	Media Center Wall - Tan Building Seam Caulk	Tan Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
MCR 4-2 <small>412207388-0019</small>	Media Center Wall - Tan Building Seam Caulk	Tan Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
MCR 4-3 <small>412207388-0020</small>	Media Center Wall - Tan Building Seam Caulk	Tan/Beige Non-Fibrous Homogeneous		15% Ca Carbonate 85% Non-fibrous (Other)	None Detected

Analyst(s) _____

Brant Alyea (18)

Jessica Cooper (10)

Lee Plumley, Laboratory Manager
or Other Approved Signatory

EMSL maintains liability limited to cost of analysis. Interpretation and use of test results are the responsibility of the client. This report relates only to the samples reported above, and may not be reproduced, except in full, without written approval by EMSL. EMSL bears no responsibility for sample collection activities or analytical method limitations. The report reflects the samples as received. Results are generated from the field sampling data (sampling volumes and areas, locations, etc.) provided by the client on the Chain of Custody. Samples are within quality control criteria and met method specifications unless otherwise noted. The above analyses were performed in general compliance with Appendix E to Subpart E of 40 CFR (previously EPA 600/M4-82-020 "Interim Method") but augmented with procedures outlined in the 1993 ("final") version of the method. This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST or any agency of the federal government. Non-friable organically bound materials present a problem matrix and therefore EMSL recommends gravimetric reduction prior to analysis. Unless requested by the client, building materials manufactured with multiple layers (i.e. linoleum, wallboard, etc.) are reported as a single sample. Estimation of uncertainty is available on request.

Samples analyzed by EMSL Analytical, Inc. Pineville, NC NVLAP Lab Code 200841-0, VA 3333 00312

Initial report from: 08/03/2022 13:22:27

APPENDIX D

EXCERPT FROM AHERA MANAGEMENT PLAN

INVENTORY OF ACBM

BUILDING & ADDRESS	HOMOGENEOUS AREA	TYPE OF MATERIAL OR NO ACBM	TYPE AND % OF ASBESTOS OR ASSUMED	ASSESSMENT CATEGORY	AMOUNT OF MATERIAL	LOCATIONS	COMMENTS
Grier Jr. High 1622 E. Garrison Blvd. Gastonia, NC 28054							
Building Area A	Acoustical Plaster Ceiling	Surfacing Materials	10% Chrysotile	5	17,000 SF	Acoustical Plaster Ceilings in Classrooms, Corridors & Library	Good Condition
	Vinyl Floor Tile	Misc. Non-Friable Material	5% Chrysotile	5	15,000 SF	Vinyl Floor Tile in Classrooms & Classroom Corridors	Good Condition
	Heating Cabinet Liner Panel	Misc. Non-Friable Material	Assumed Asbestos	5	1,500 SF	Liner Panel in Heating Cabinets	Good Condition
Building Area B	Acoustical Plaster	Surfacing Materials	10% Chrysotile	5	5,000 SF	Acoustical Ceiling in Auditorium & Corridor	Good Condition
	Vinyl Floor tile	Misc. Non-Friable Material	5% Chrysotile	5	5,000 SF	Vinyl Floor Tile in Auditorium & Portion of Stage	Good Condition
	Cement Pipe Fitting Insulation System in Rooms of Stage Insulation	Thermal Insulation	Assumed Asbestos	5	10 Each	Pipe Fitting Cement in Dressing Rooms Off Stage	Good Condition
Building Area C	Acoustical Plaster Ceilings	Surfacing Materials	10% Chrysotile	5	13,000 SF	Acoustical Plaster Ceilings Throughout Building	Good Condition
	Vinyl Floor Tile	Misc. Non-Friable Material	5% Chrysotile	5	15,000 SF	Vinyl Floor Tile Throughout Building	Good Condition
	Heating Cabinet Liner Panel	Misc. Non-Friable Material	Assumed Asbestos	5	1,000 SF	Liner Panel in Heating Cabinets	Good Condition
Building Area D	Acoustical Plaster Ceilings	Surfacing Materials	10% Chrysotile	5	8,000 SF	Acoustical Plaster Ceilings Throughout Building	Good Condition

INSPECTOR Name John E. Daves
 Accreditation # 10210

Signature John E. Daves
 Agency The Georgia Institute of Technology

INVENTORY OF ACBM

BUILDING & ADDRESS	HOMOGENEOUS AREA	TYPE OF MATERIAL OR NO ACBM	TYPE AND % OF ASBESTOS OR ASSUMED	ASSESSMENT CATEGORY	AMOUNT OF MATERIAL	LOCATIONS	COMMENTS
Building Area D (Continued)	Vinyl Floor Tile	Misc. Non-Friable Material	5% Chrysotile	(Abated) 5	8,500 SF	Vinyl Floor Tile Throughout Building	Good Condition
	Heating Cabinet Liner Panel	Misc. Non-Friable Material	Assumed Asbestos	5	900 SF	Liner Panel in Heating Cabinets	Good Condition
Building Area E	Acoustical Plaster Ceiling	Surfacing Material	5% Chrysotile	5	900 SF	Plaster Ceiling	Good
	Vinyl Floor Tile	Misc. Non-Friable Material	5% Chrysotile	(Abated) 5	8,500 SF	Vinyl Tile Throughout the Building	Good Condition
	Boiler Jacket, Hot Water Storage Tank & Boiler Breaching	Thermal Insulation	50% Amosite 50% Chrysotile	1	1,000 SF	Boiler Jackets, Hot Water Tank & Boiler Breaching in Boiler Room	Damaged Insulation
	Acoustical Plaster Ceiling	Surfacing Material	10% Chrysotile	5	900 SF	Acoustical Plaster Ceiling in Home Ec. Area	Good Condition
	Vinyl Floor Tile	Misc. Non-Friable Material	5% Chrysotile	5	1,000 SF	Vinyl Floor Tile in Home Ec. Area & Shop Office	Good Condition
	Insulation on Hot Water Storage Tank	Thermal Insulation	5% Chrysotile 25% Amosite	1	200 SF	Insulation Jacket on Hot Water Storage Tank	Damaged Insulation
	Cement Pipe Fitting	Thermal Insulation	25% Chrysotile	5	50 SF	Cement Pipe Fitting in Gym & Mechanical Room	Good Condition
	Vinyl Floor Tile	Misc. Non-Friable Material	2% Chrysotile	5	6,000 SF	Vinyl Floor Tile in Gym	Good Condition
Building Area H	Vinyl Floor Tile	Misc. Non-Friable Material	5% Chrysotile	(Abated) 5	7,500 SF	Vinyl Floor Tile Throughout Building	Good Condition

INSPECTOR Name John E. Daves
 Accreditation # 10210

Signature John E. Daves
 Agency The Georgia Institute of Technology

INVENTORY OF ACBM

BUILDING & ADDRESS	HOMOGENEOUS AREA	TYPE OF MATERIAL OR NO ACBM	TYPE AND % OF ASBESTOS OR ASSUMED	ASSESSMENT CATEGORY	AMOUNT OF MATERIAL	LOCATIONS	COMMENTS
Building Area H (Continued)	Heating Cabinet Liner Panel	Misc. Non-Friable Material	Assumed Asbestos	5	800 SF	Liner Panel in Heating Cabinets	Good Condition
Building Area I		NO ACBM					
Concession Building at Football Field		NO ACBM					
Exterior Covered Walkways		Misc. Non-Friable Material	Assumed Asbestos	5	2,000 SF	Covered Walkway Roof System Between Buildings	Good Condition
Mobile Unit 85-35		NO ACBM	<i>moved</i>				
Mobile Unit 85-35		NO ACBM					
Mobile Unit 85-35		NO ACBM					

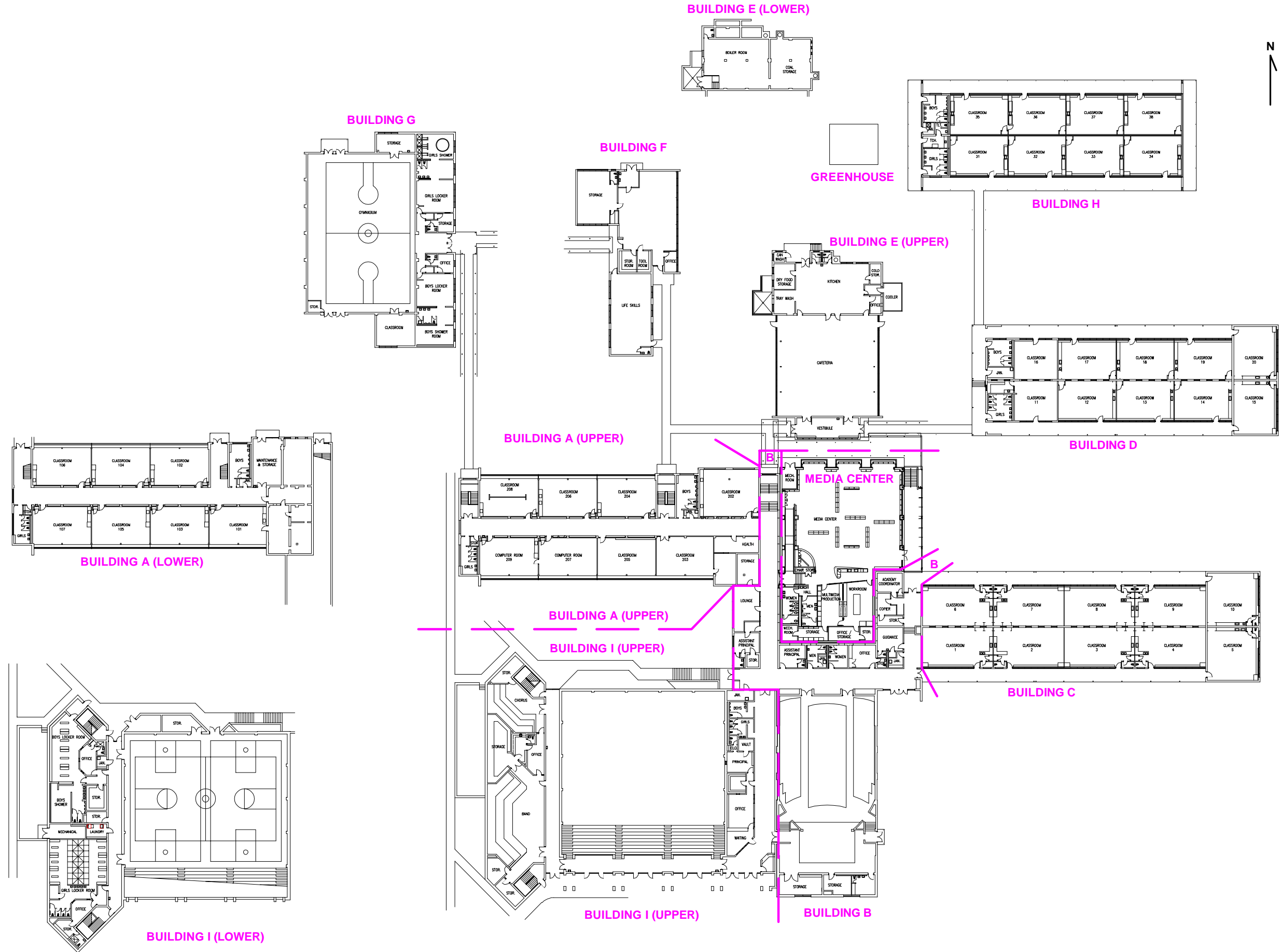
INSPECTOR Name John E. Daves
 Accreditation # 10210

Signature John E. Daves
 Agency The Georgia Institute of Technology

APPENDIX E

DRAWINGS FROM SITE

SITE MAP



Terracon
 2701 WESTPORT ROAD
 CHARLOTTE, NORTH CAROLINA 28208

GRIER MIDDLE SCHOOL
 1622 EAST GARRISON BOULEVARD
 GASTONIA, NORTH CAROLINA

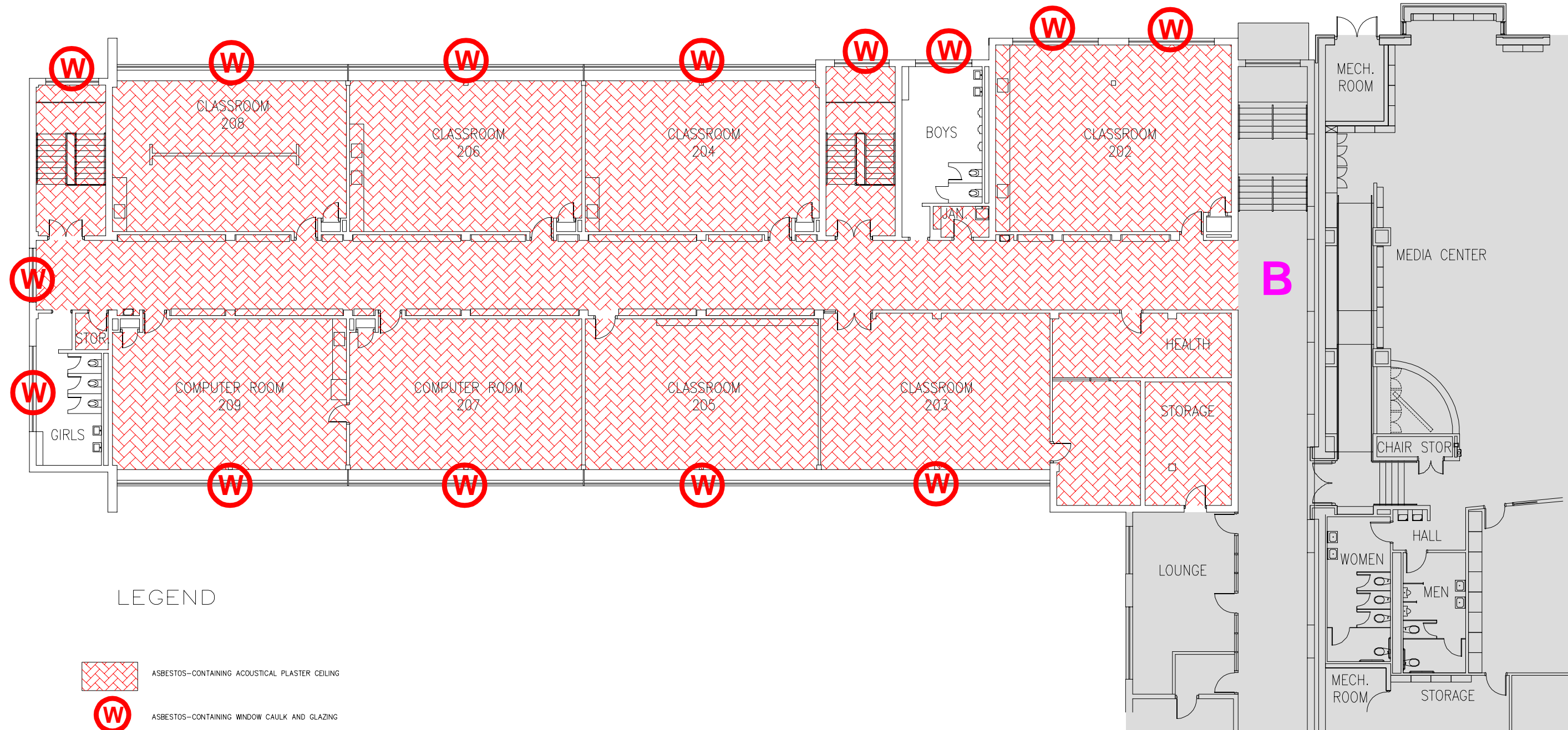
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DATE	SCALE
AUG 2022	NONE
DRAWN BY	CHECKED BY
RTH	RTH

REVISIONS

PROJECT NUMBER
71227143
SHEET
1

**IDENTIFIED ASBESTOS-CONTAINING MATERIALS
BUILDING A (UPPER)**



LEGEND

- ASBESTOS-CONTAINING ACOUSTICAL PLASTER CEILING
- ASBESTOS-CONTAINING WINDOW CAULK AND GLAZING

ASBESTOS-CONTAINING HEATER CABINET LINER PANELS BELOW EXTERIOR WINDOWS
 REMNANT ASBESTOS-CONTAINING FLOOR TILE AND ASBESTOS-CONTAINING MASTIC MAY BE PRESENT BELOW CABINETS AND BOOKSHELVES
 ASSUMED ASBESTOS-CONTAINING FIRE DOORS PRESENT THROUGHOUT

Terracon
 2701 WESTPORT ROAD
 CHARLOTTE, NORTH CAROLINA 28208

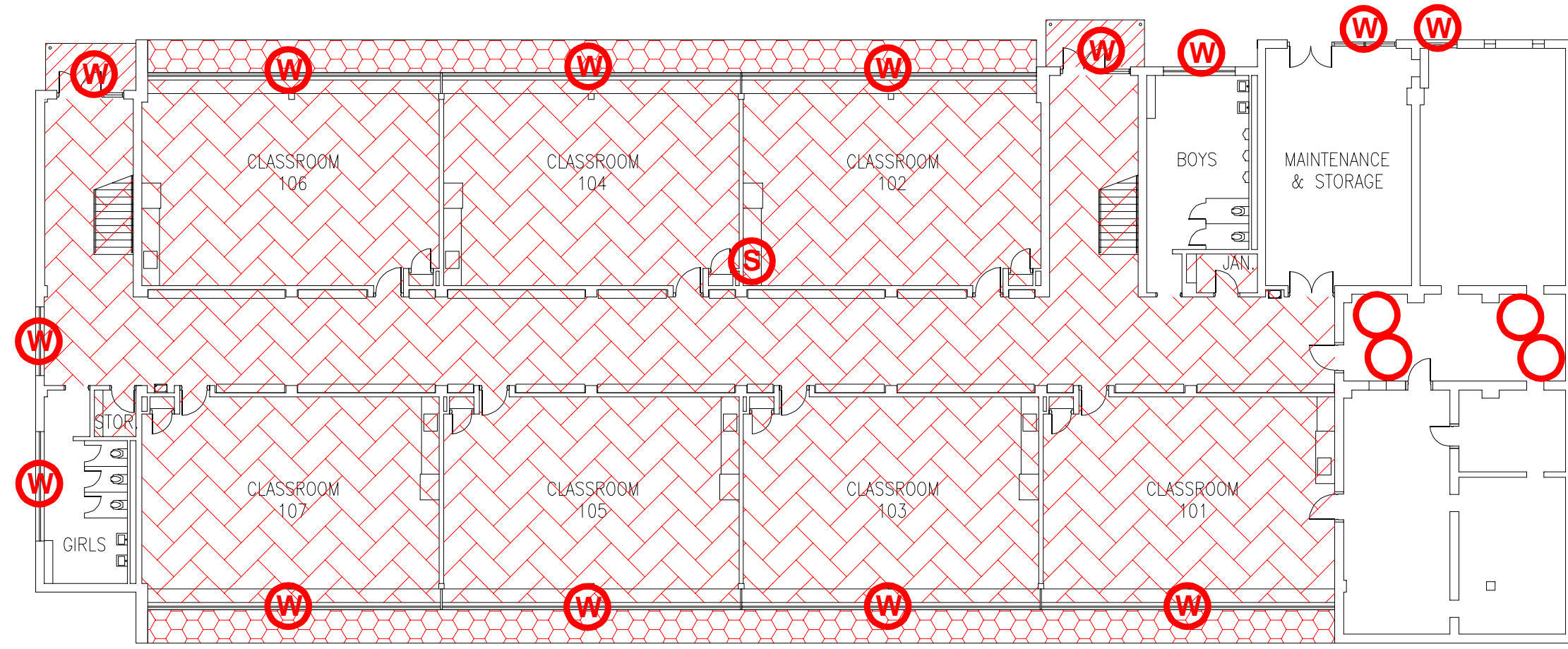
GRIER MIDDLE SCHOOL
 1622 EAST GARRISON BOULEVARD
 GASTONIA, NORTH CAROLINA

DESCRIPTION







DATE	SCALE
AUG 2022	NONE
DRAWN BY	CHECKED BY
RTH	RTH
REVISIONS	

PROJECT NUMBER	71227143
SHEET	A1

IDENTIFIED ASBESTOS-CONTAINING MATERIALS BUILDING A (LOWER)



LEGEND

-  ASBESTOS-CONTAINING ACOUSTICAL PLASTER CEILING
-  ASBESTOS-CONTAINING CEMENTITIOUS PANELS
-  ASBESTOS-CONTAINING ROOF FLASHING AND GRAY ROOF CAULK
-  ASBESTOS-CONTAINING WINDOW CAULK AND GLAZING
-  ASBESTOS-CONTAINING SINK MASTIC
-  ASBESTOS-CONTAINING PIPE ELBOW INSULATION

ASBESTOS-CONTAINING HEATER CABINET LINER PANELS BELOW EXTERIOR WINDOWS
 REMNANT ASBESTOS-CONTAINING FLOOR TILE AND MASTIC MAY BE PRESENT BELOW CABINETS AND BOOKSHELVES
 ASSUMED ASBESTOS-CONTAINING FIRE DOORS PRESENT THROUGHOUT

Terracon
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 CHARLOTTE, NORTH CAROLINA 28208

GRIER MIDDLE SCHOOL
 1622 EAST GARRISON BOULEVARD
 GASTONIA, NORTH CAROLINA

DESCRIPTION

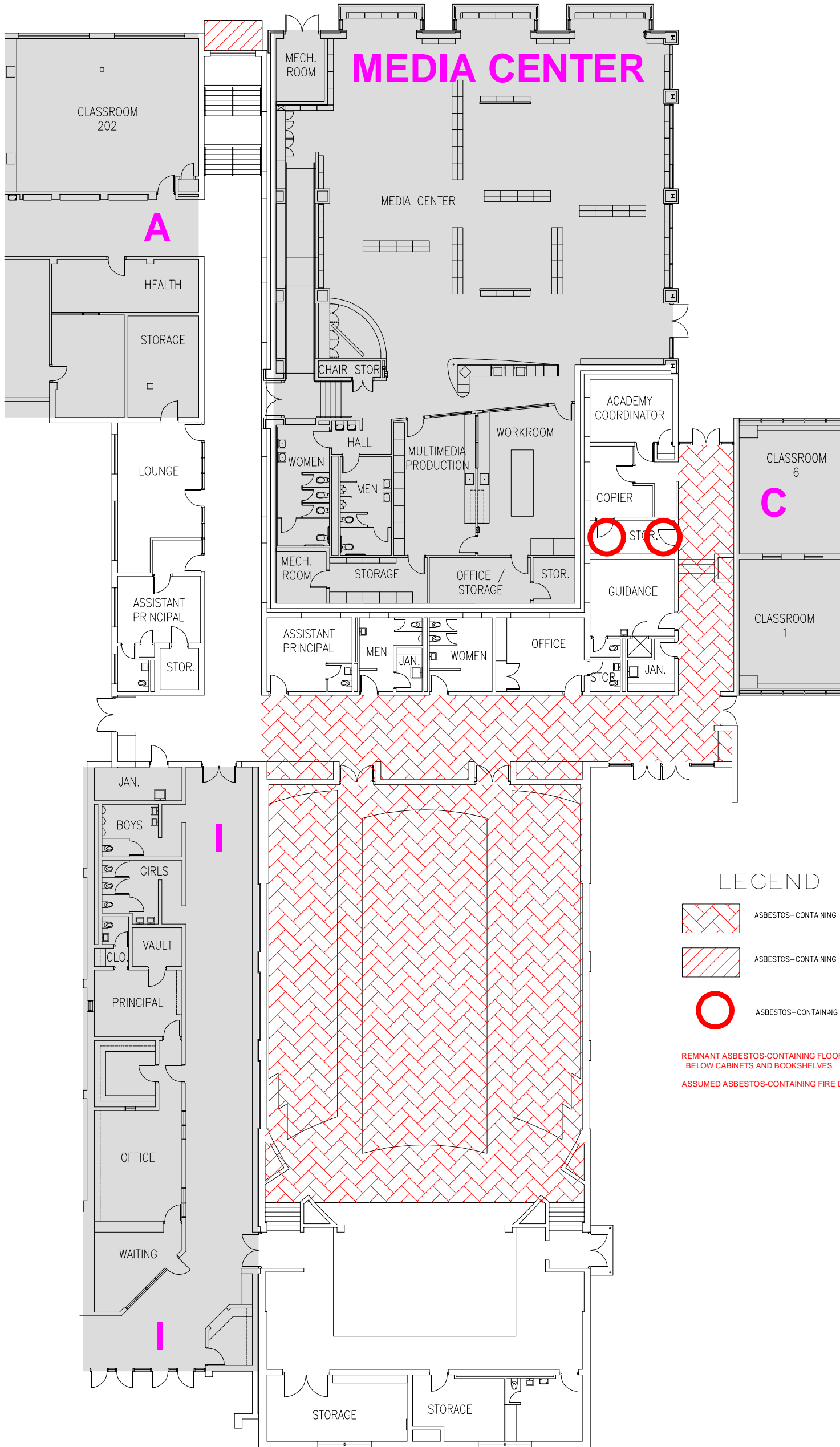
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DRAWN BY	CHECKED BY
RTH	RTH

REVISIONS




PROJECT NUMBER
71227143

SHEET
A2

**IDENTIFIED ASBESTOS-CONTAINING MATERIALS
BUILDING B - CEILINGS**



LEGEND

-  ASBESTOS-CONTAINING ACOUSTICAL PLASTER CEILING
-  ASBESTOS-CONTAINING CEMENTITIOUS PANELS
-  ASBESTOS-CONTAINING PIPE ELBOW INSULATION

REMNANT ASBESTOS-CONTAINING FLOOR TILE AND MASTIC MAY BE PRESENT
BELOW CABINETS AND BOOKSHELVES

ASSUMED ASBESTOS-CONTAINING FIRE DOORS PRESENT THROUGHOUT

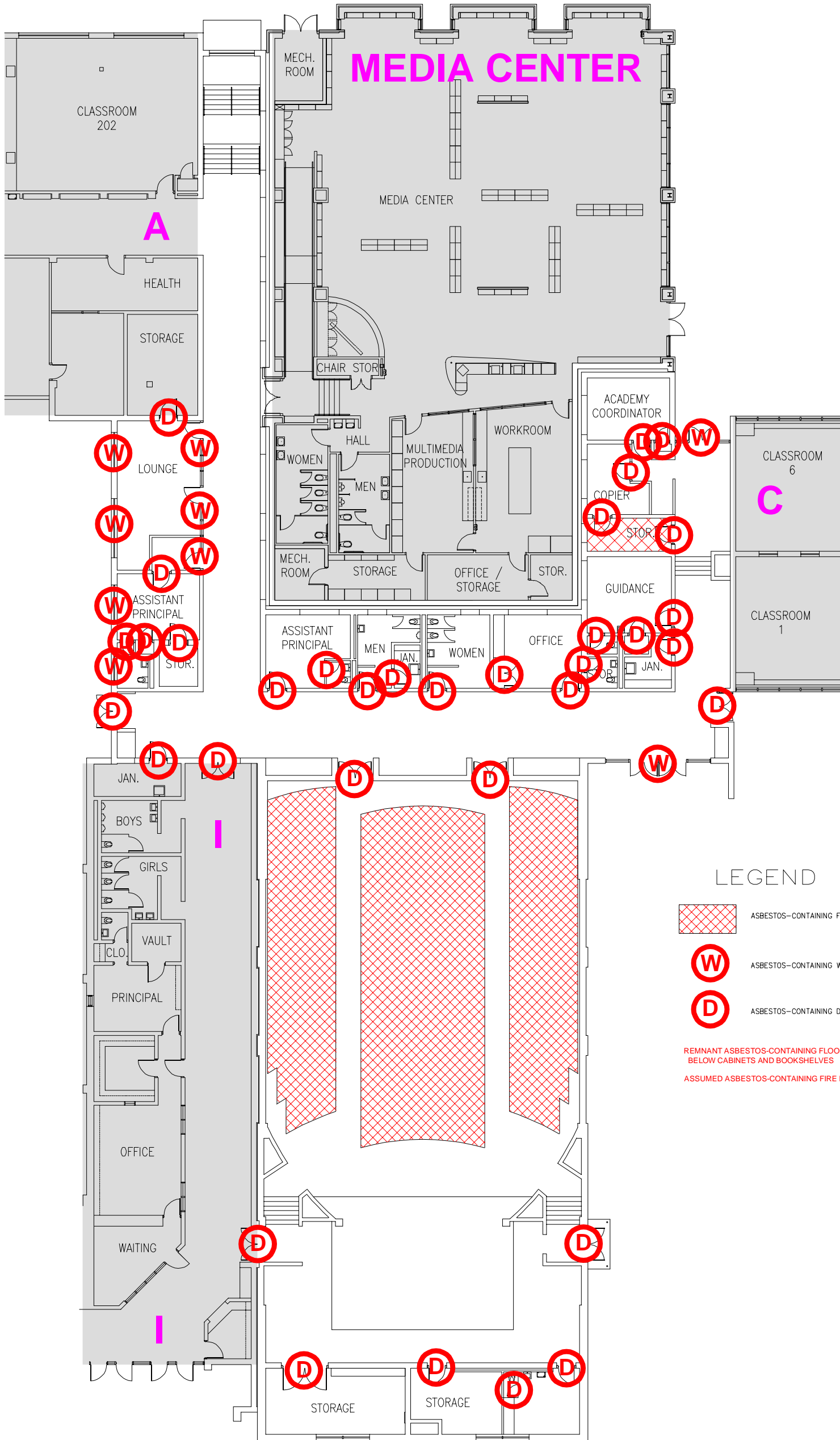
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REVISIONS		

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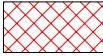


GRIER MIDDLE SCHOOL
1622 EAST GARRISON BOULEVARD
GASTONIA, NORTH CAROLINA

Terracon
2701 WESTPORT ROAD
CHARLOTTE, NORTH CAROLINA 28208

**IDENTIFIED ASBESTOS-CONTAINING MATERIALS
BUILDING B - OTHER THAN CEILINGS**



LEGEND

-  ASBESTOS-CONTAINING FLOOR TILE AND MASTIC
-  ASBESTOS-CONTAINING WINDOW CAULK AND GLAZING
-  ASBESTOS-CONTAINING DOOR FRAME CAULK

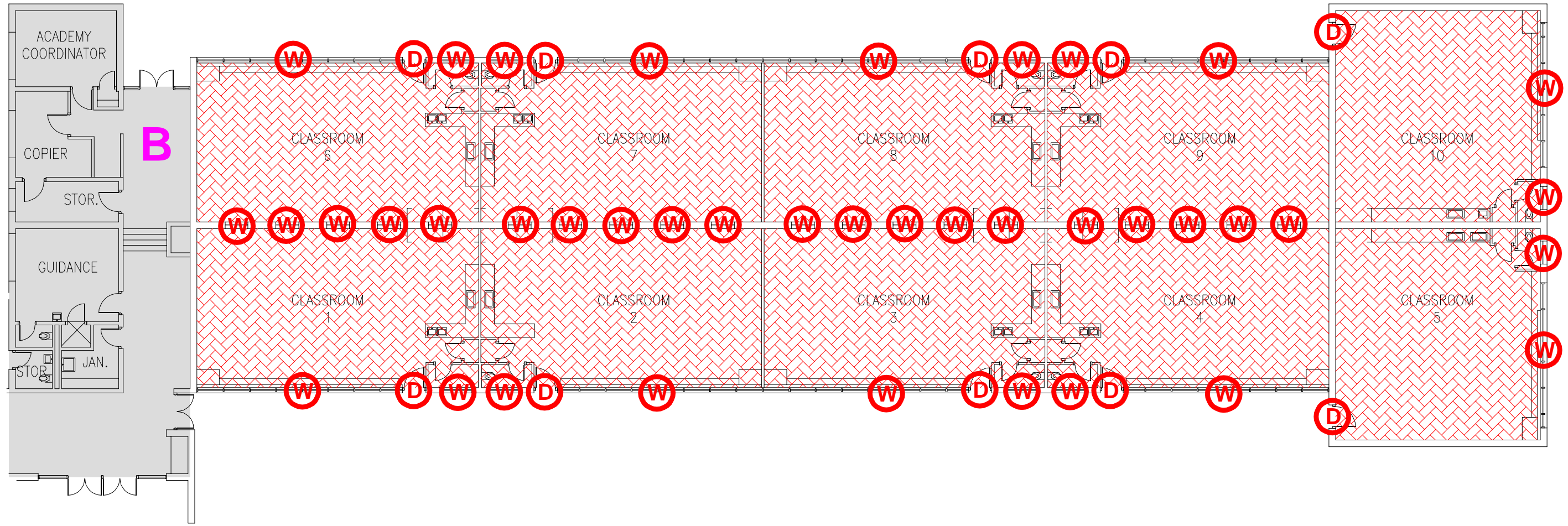
REMNANT ASBESTOS-CONTAINING FLOOR TILE AND MASTIC MAY BE PRESENT BELOW CABINETS AND BOOKSHELVES
ASSUMED ASBESTOS-CONTAINING FIRE DOORS PRESENT THROUGHOUT

PROJECT NUMBER 71227143	DATE AUG 2022	SCALE NONE
SHEET B1	DESIGNED BY RTH	CHECKED BY RTH
REVISIONS		




DESCRIPTION
GRIER MIDDLE SCHOOL 1622 EAST GARRISON BOULEVARD GASTONIA, NORTH CAROLINA

Terracon
2701 WESTPORT ROAD
CHARLOTTE, NORTH CAROLINA 28208

IDENTIFIED ASBESTOS-CONTAINING MATERIALS BUILDING C



LEGEND

-  ASBESTOS-CONTAINING ACOUSTICAL PLASTER CEILING
-  ASBESTOS-CONTAINING WINDOW CAULK AND GLAZING
-  ASBESTOS-CONTAINING DOOR FRAME CAULK

ASBESTOS-CONTAINING HEATER CABINET LINER PANELS BELOW EXTERIOR WINDOWS
 REMNANT ASBESTOS-CONTAINING FLOOR TILE AND MASTIC MAY BE PRESENT BELOW CABINETS AND BOOKSHELVES
 ASSUMED ASBESTOS-CONTAINING FIRE DOORS PRESENT THROUGHOUT

Terracon
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 CHARLOTTE, NORTH CAROLINA 28208

GRIER MIDDLE SCHOOL
 1622 EAST GARRISON BOULEVARD
 GASTONIA, NORTH CAROLINA

DESCRIPTION

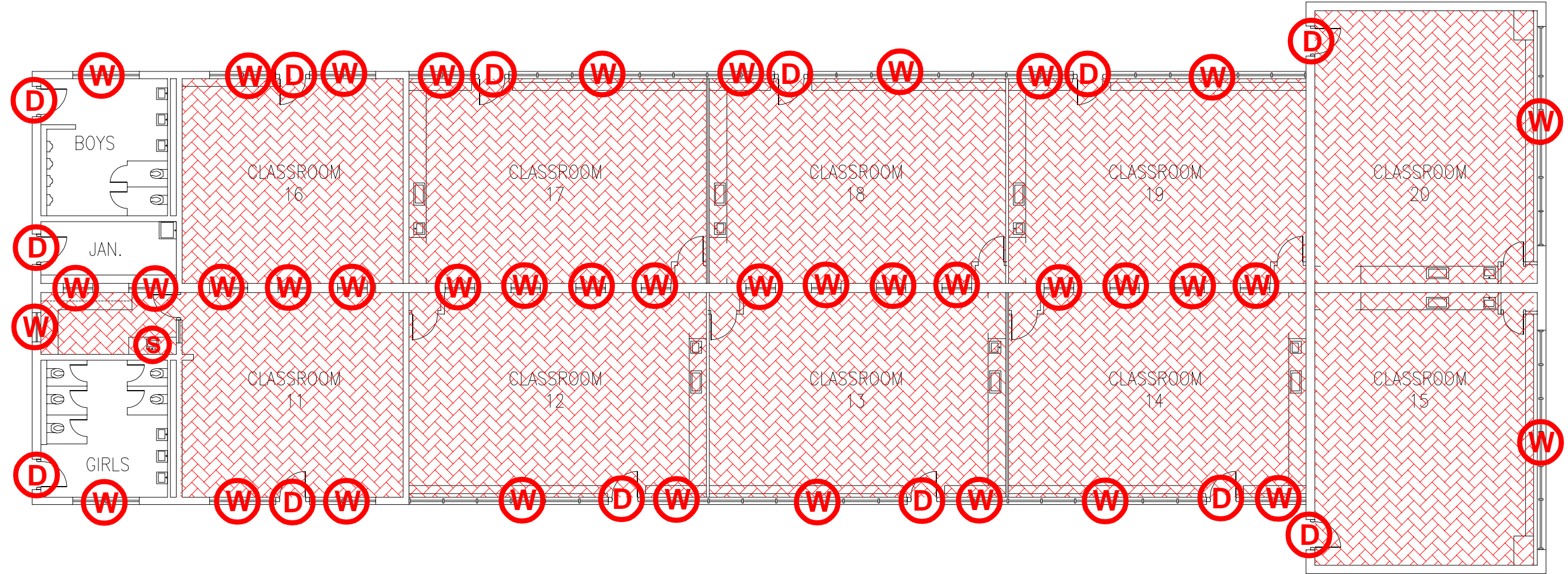
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RTH	RTH

REVISIONS





PROJECT NUMBER
71227143

SHEET
C

**IDENTIFIED ASBESTOS-CONTAINING MATERIALS
BUILDING D**



LEGEND

-  ASBESTOS-CONTAINING ACOUSTICAL PLASTER CEILING
-  ASBESTOS-CONTAINING WINDOW CAULK AND GLAZING
-  ASBESTOS-CONTAINING DOOR FRAME CAULK
-  ASBESTOS-CONTAINING SINK COATING

ASBESTOS-CONTAINING HEATER CABINET LINER PANELS BELOW EXTERIOR WINDOWS
 REMNANT ASBESTOS-CONTAINING FLOOR TILE AND MASTIC MAY BE PRESENT BELOW CABINETS AND BOOKSHELVES
 ASSUMED ASBESTOS-CONTAINING FIRE DOORS PRESENT THROUGHOUT

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GRIER MIDDLE SCHOOL
 1622 EAST GARRISON BOULEVARD
 GASTONIA, NORTH CAROLINA

DESCRIPTION

DATE	SCALE
AUG 2022	NONE
DRAWN BY	CHECKED BY
RTH	RTH

REVISIONS




PROJECT NUMBER
71227143

SHEET
D

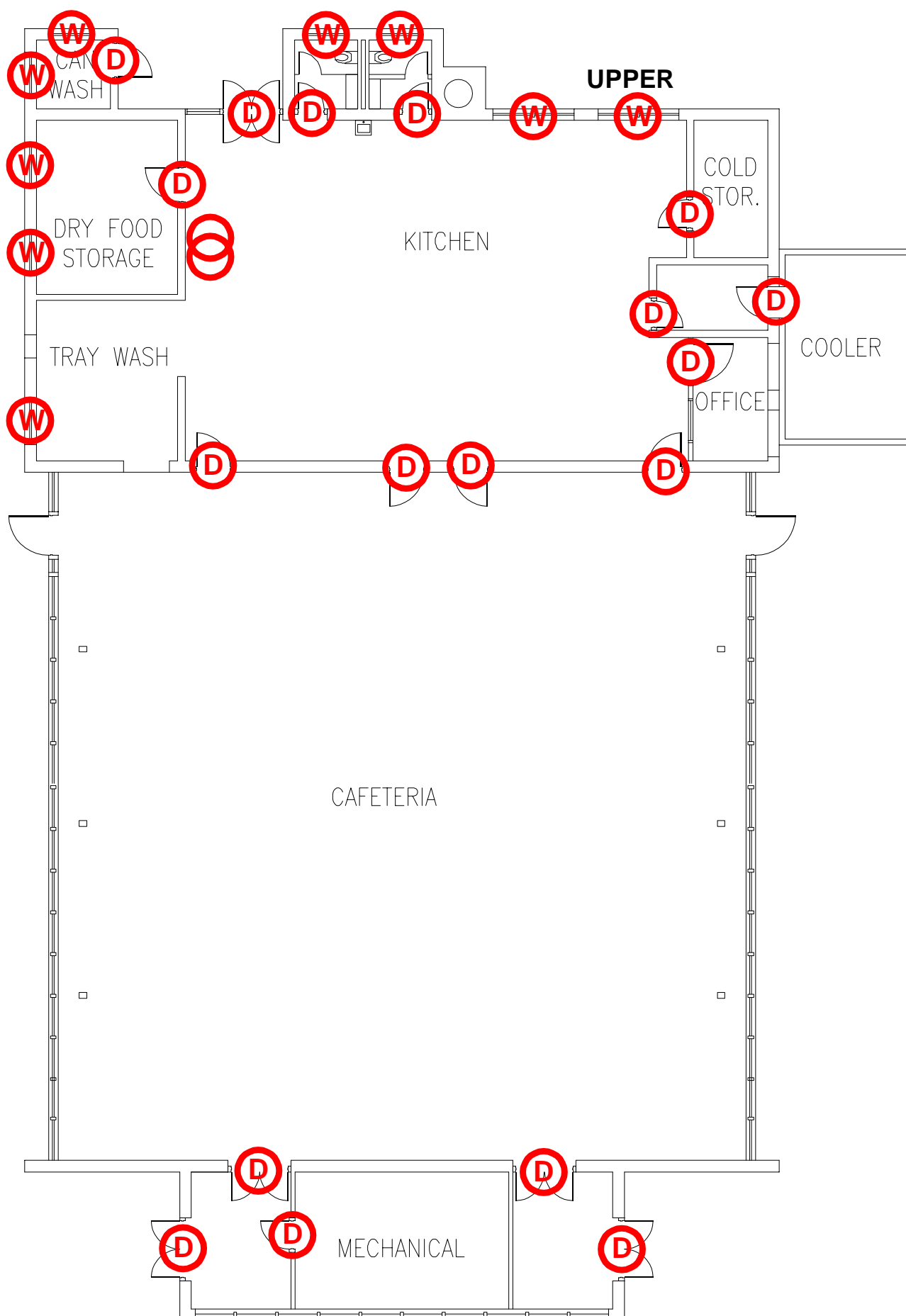
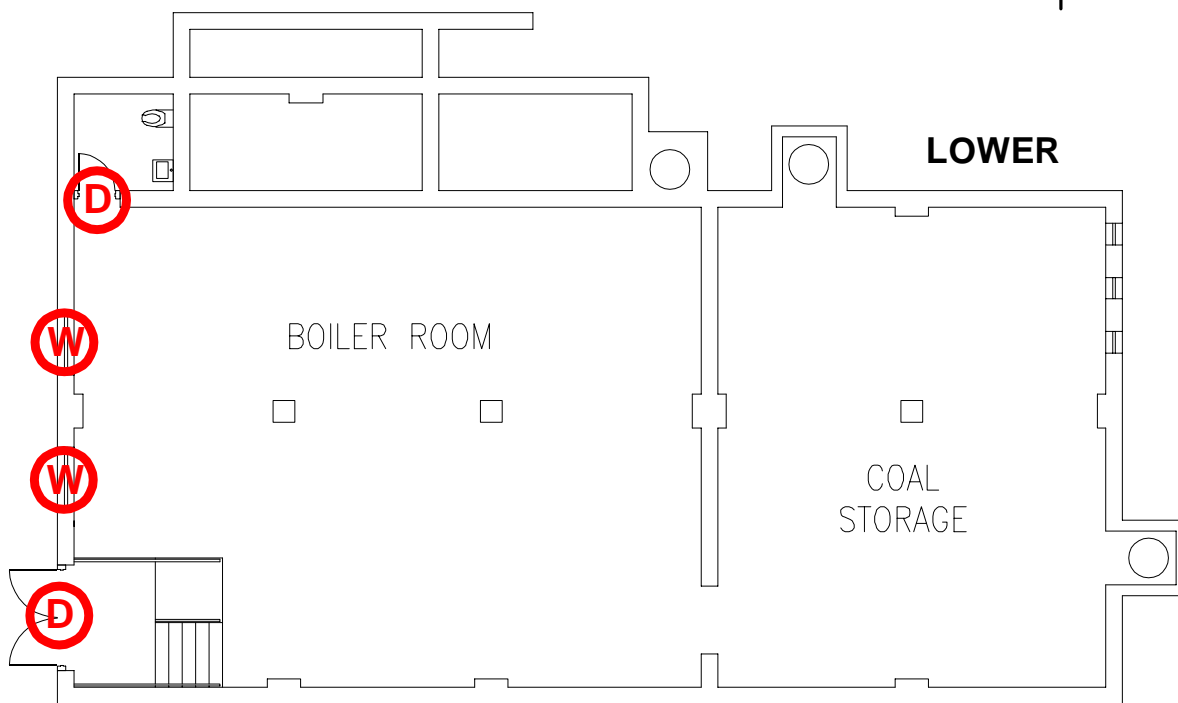
IDENTIFIED ASBESTOS-CONTAINING MATERIALS BUILDING E



LEGEND

-  ASBESTOS-CONTAINING WINDOW CAULK AND GLAZING
-  ASBESTOS-CONTAINING DOOR FRAME CAULK
-  ASBESTOS-CONTAINING PIPE ELBOW INSULATION

ASSUMED ASBESTOS-CONTAINING FIRE DOORS PRESENT THROUGHOUT



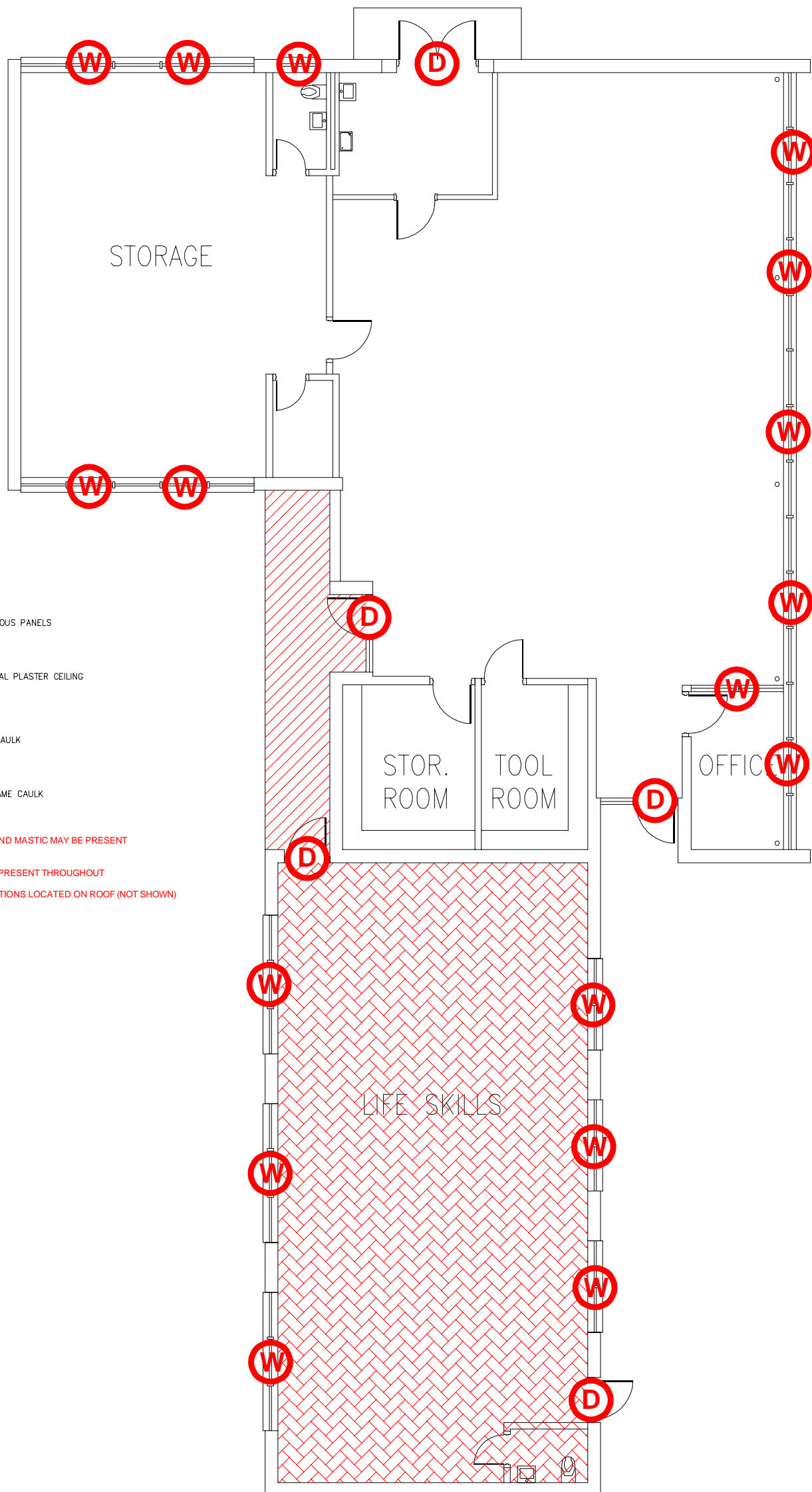
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DESIGNED BY RTH	CHECKED BY RTH	DRAWN BY RTH	DATE AUG 2022
REVISIONS			

DESCRIPTION	

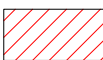



GRIER MIDDLE SCHOOL
1622 EAST GARRISON BOULEVARD
GASTONIA, NORTH CAROLINA

Terracon
2701 WESTPORT ROAD
CHARLOTTE, NORTH CAROLINA 28208

IDENTIFIED ASBESTOS-CONTAINING MATERIALS BUILDING F



LEGEND

-  ASBESTOS-CONTAINING CEMENTITIOUS PANELS
-  ASBESTOS-CONTAINING ACOUSTICAL PLASTER CEILING
-  ASBESTOS-CONTAINING WINDOW CAULK
-  ASBESTOS-CONTAINING DOOR FRAME CAULK

REMNANT ASBESTOS-CONTAINING FLOOR TILE AND MASTIC MAY BE PRESENT BELOW CABINETS AND BOOKSHELVES

ASSUMED ASBESTOS-CONTAINING FIRE DOORS PRESENT THROUGHOUT

ASBESTOS-CONTAINING SILVER PAINT PENETRATIONS LOCATED ON ROOF (NOT SHOWN)

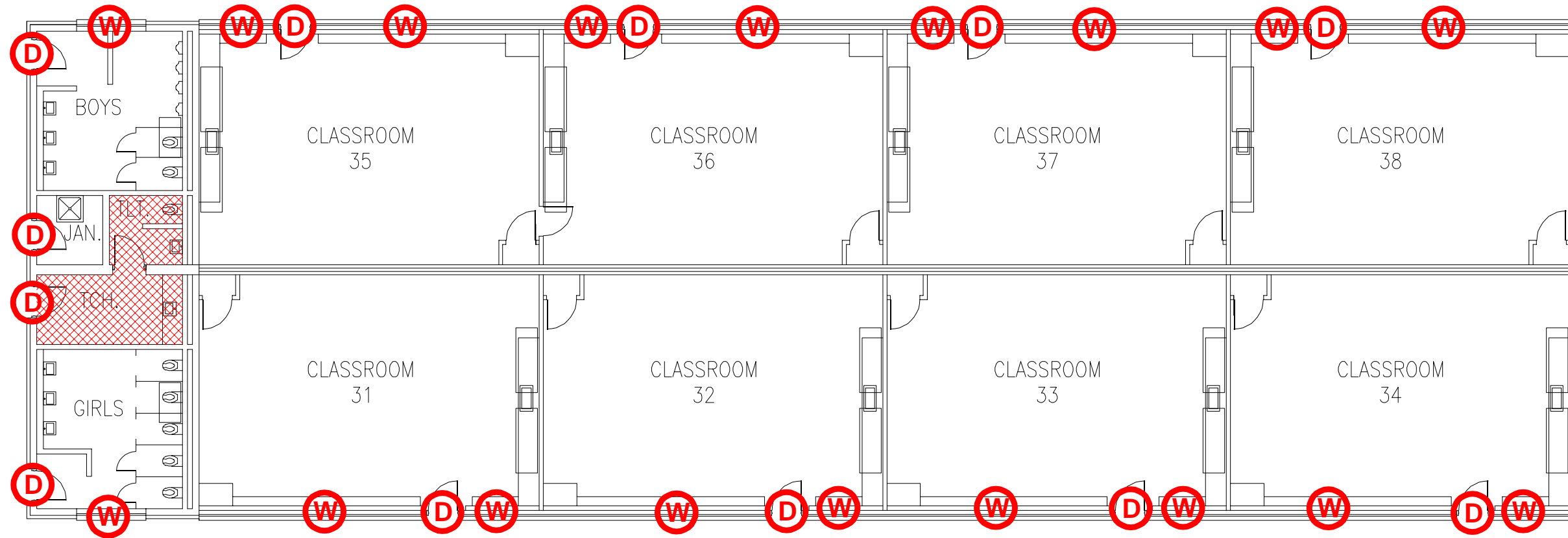
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SHEET F	DESIGNED BY RTH	CHECKED BY RTH
REVISIONS		

DESCRIPTION

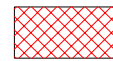
GRIER MIDDLE SCHOOL
1622 EAST GARRISON BOULEVARD
GASTONIA, NORTH CAROLINA


Terracon
2701 WESTPORT ROAD
CHARLOTTE, NORTH CAROLINA 28208


**IDENTIFIED ASBESTOS-CONTAINING MATERIALS
BUILDING H**



LEGEND

 ASBESTOS-CONTAINING FLOOR TILE AND MASTIC

 ASBESTOS-CONTAINING WINDOW CAULK AND GLAZING

 ASBESTOS-CONTAINING DOOR FRAME CAULK

REMNANT ASBESTOS-CONTAINING FLOOR TILE AND MASTIC MAY BE PRESENT BELOW CABINETS AND BOOKSHELVES

ASSUMED ASBESTOS-CONTAINING FIRE DOORS PRESENT THROUGHOUT

Terracon
2701 WESTPORT ROAD
CHARLOTTE, NORTH CAROLINA 28208

GRIER MIDDLE SCHOOL
1622 EAST GARRISON BOULEVARD
GASTONIA, NORTH CAROLINA

DESCRIPTION

DATE AUG 2022	SCALE NONE
DRAWN BY RTH	CHECKED BY RTH
REVISIONS	

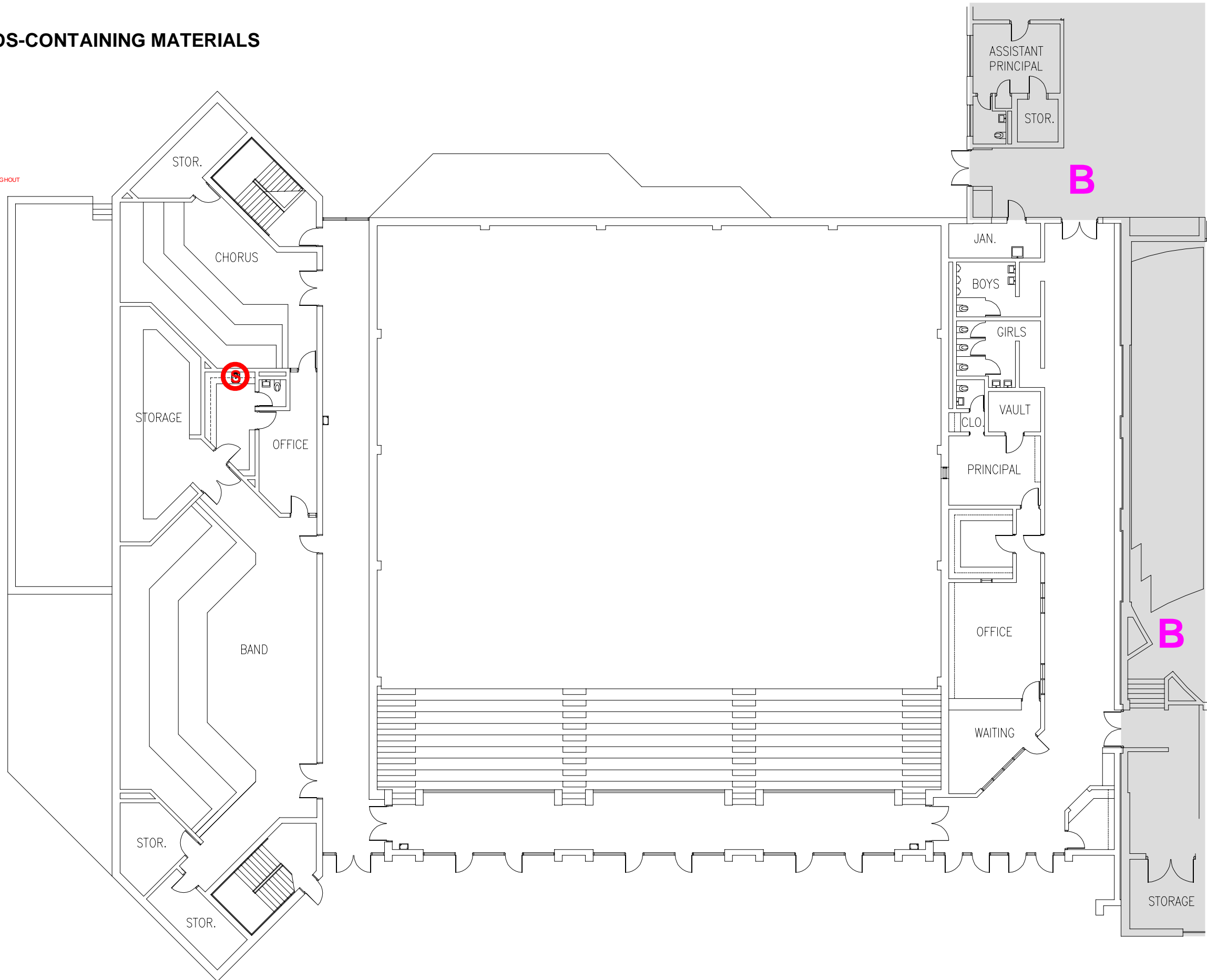
PROJECT NUMBER 71227143
SHEET H

IDENTIFIED ASBESTOS-CONTAINING MATERIALS BUILDING I (UPPER)

LEGEND

S ASBESTOS-CONTAINING SINK COATING

ASSUMED ASBESTOS-CONTAINING FIRE DOORS PRESENT THROUGHOUT



Terracon
2701 WESTPORT ROAD
CHARLOTTE, NORTH CAROLINA 28208

GRIER MIDDLE SCHOOL
1622 EAST GARRISON BOULEVARD
GASTONIA, NORTH CAROLINA

DESCRIPTION

DATE	SCALE
AUG 2022	NONE
DRAWN BY	CHECKED BY
RTH	RTH

REVISIONS

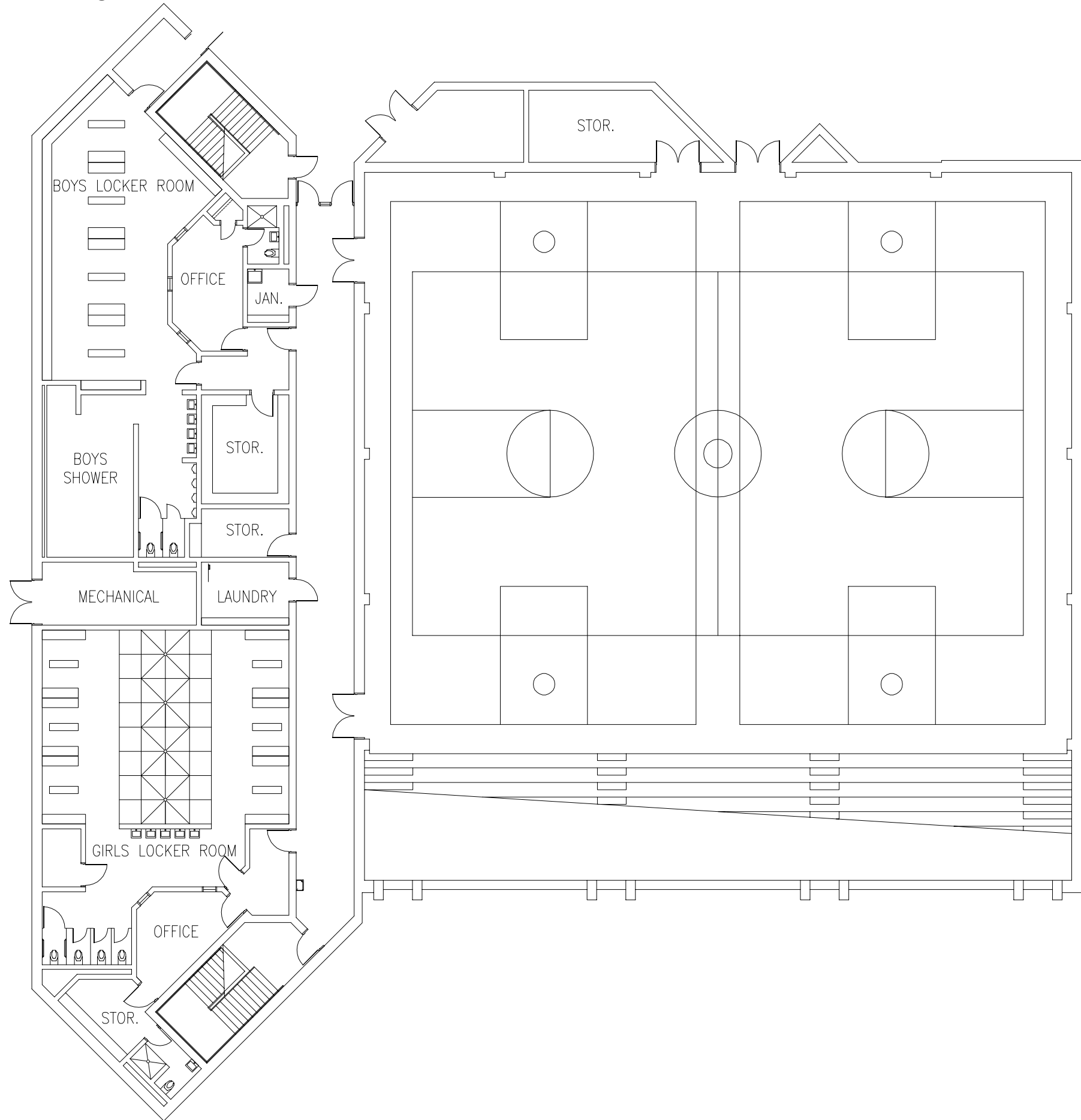
PROJECT NUMBER
71227143

SHEET
11

IDENTIFIED ASBESTOS-CONTAINING MATERIALS BUILDING I (LOWER)

LEGEND

ASSUMED ASBESTOS-CONTAINING FIRE DOORS PRESENT THROUGHOUT



Terracon
2701 WESTPORT ROAD
CHARLOTTE, NORTH CAROLINA 28208

GRIER MIDDLE SCHOOL
1622 EAST GARRISON BOULEVARD
GASTONIA, NORTH CAROLINA

DESCRIPTION

DATE	SCALE
AUG 2022	NONE
DRAWN BY	CHECKED BY
RTH	RTH

REVISIONS

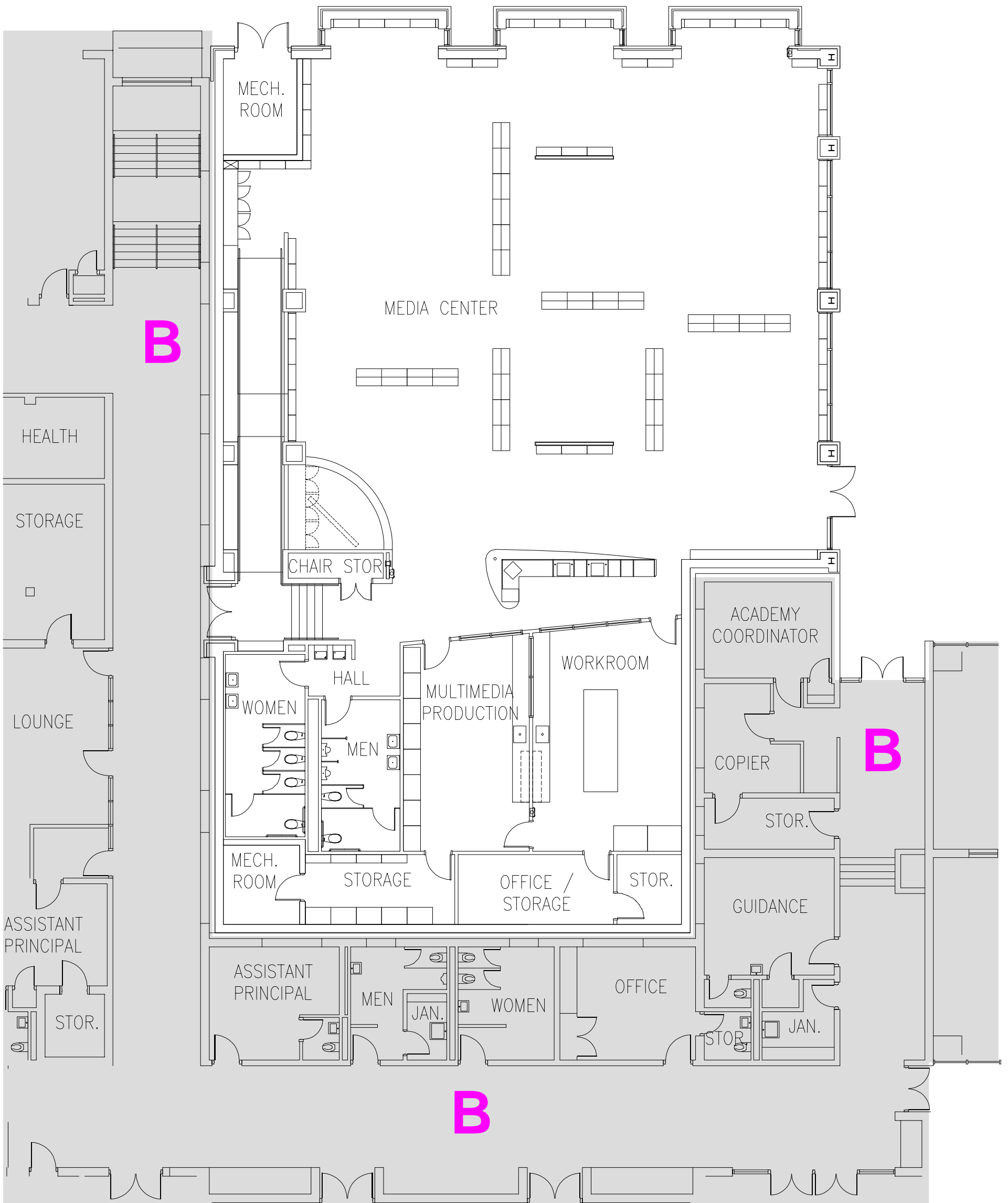
PROJECT NUMBER
71227143
SHEET
12

IDENTIFIED ASBESTOS-CONTAINING MATERIALS MEDIA CENTER BUILDING



LEGEND

ASSUMED ASBESTOS-CONTAINING FIRE DOORS PRESENT THROUGHOUT



PROJECT NUMBER 71227143	DATE AUG 2022	SCALE NONE
SHEET MC	DESIGNED BY RTH	CHECKED BY RTH
REVISIONS		

DESCRIPTION

GRIER MIDDLE SCHOOL
1622 EAST GARRISON BOULEVARD
GASTONIA, NORTH CAROLINA

Terracon
2701 WESTPORT ROAD
CHARLOTTE, NORTH CAROLINA 28208

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DOCUMENT 003132 - GEOTECHNICAL DATA

1.1 GEOTECHNICAL DATA

- A. This Document with its referenced attachments is part of the Procurement and Contracting Requirements for Project. They provide Owner's information for Bidders' convenience and are intended to supplement rather than serve in lieu of Bidders' own investigations. They are made available for Bidders' convenience and information. This Document and its attachments are not part of the Contract Documents.
- B. Because subsurface conditions indicated by the soil borings are a sampling in relation to the entire construction area, and for other reasons, the Owner, the Architect, the Architect's consultants, and the firm reporting the subsurface conditions do not warranty the conditions below the depths of the borings or that the strata logged from the borings are necessarily typical of the entire site. Any party using the information described in the soil borings and geotechnical report shall accept full responsibility for its use.
- C. A geotechnical investigation report for Project, prepared by ECS Southeast, LLP, dated November 4, 2021, is available for viewing as appended to this Document.
 - 1. The opinions expressed in this report are those of a geotechnical engineer and represent interpretations of subsoil conditions, tests, and results of analyses conducted by a geotechnical engineer. Owner is not responsible for interpretations or conclusions drawn from the data.
 - 2. Any party using information described in the geotechnical report shall make additional test borings and conduct other exploratory operations that may be required to determine the character of subsurface materials that may be encountered.

END OF DOCUMENT 003132

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ECS Southeast, LLP

Report of Preliminary Subsurface Exploration

Garrison Tract

Gastonia, Gaston County, North Carolina

ECS Project No. 08:14851

November 4, 2021





November 4, 2021

Mr. Paul Nault
Gaston County Schools
943 Osceola Street
Gastonia, North Carolina 28054

ECS Project No. 08:14851

Reference: Report of Preliminary Subsurface Exploration
Garrison Tract
Gastonia, Gaston County, North Carolina

Dear Mr. Nault:

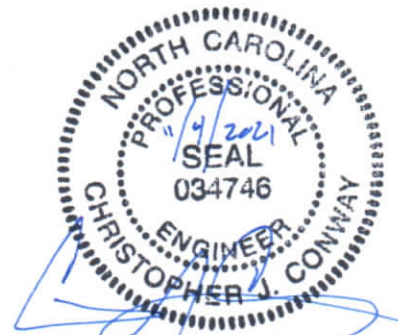
ECS Southeast, LLP (ECS) has completed the preliminary subsurface exploration, laboratory testing, and geotechnical engineering recommendations for the above-referenced project. Our services were performed in general accordance with our agreed to scope of work. This report presents our understanding of the geotechnical aspects of the project along with the results of the field exploration and laboratory testing conducted, and our design and construction recommendations.

It has been our pleasure to be of service to Gaston County Schools during the design phase of this project. We would appreciate the opportunity to remain involved during the continuation of the design and construction phase to confirm subsurface conditions assumed for this report. Should you have any questions concerning the information contained in this report, or if we can be of further assistance to you, please contact us.

Respectfully submitted,

ECS Southeast, LLP

Alexander W. Tax, E.I.
Geotechnical Project Manager
ATax@ecslimited.com



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CConway@ecslimited.com
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TABLE OF CONTENTS

EXECUTIVE SUMMARY	2
1.0 INTRODUCTION	3
2.0 PROJECT INFORMATION	3
2.1 Project Location/Current Site Use/Past Site Use	3
2.2 Proposed Construction.....	4
3.0 FIELD EXPLORATION AND LABORATORY TESTING	4
3.1 Subsurface Characterization.....	4
3.2 Groundwater Observations	5
3.3 Laboratory Testing.....	5
4.0 PRELIMINARY DESIGN RECOMMENDATIONS.....	6
4.1 Foundations.....	6
4.1.1 Remediation of Existing Fill.....	6
4.1.2 Shallow Foundations.....	7
4.2 Slabs On Grade	7
4.3 Seismic Design Considerations	8
4.4 Below Grade Walls	9
4.5 Pavements	9
4.6 Cut and Fill Slopes.....	10
5.0 SITE CONSTRUCTION RECOMMENDATIONS.....	11
5.1 Subgrade Preparation.....	11
5.1.1 Stripping and Grubbing.....	11
5.1.2 Proofrolling	11
5.1.3 Site Temporary Dewatering	12
5.2 Earthwork Operations	12
5.2.1 Existing Man-Placed Fill	12
5.2.2 Expansive and Moisture Sensitive Soils	13
5.2.3 Lower-Consistency/Loose Subgrade Soils.....	13
5.2.4 Partially Weathered Rock and Rock.....	13
5.2.5 Structural Fill.....	14
5.2.6 General Construction Considerations.....	16
5.3 Utility Installations.....	17
6.0 CLOSING.....	17

APPENDICES

Appendix A – Drawings & Reports

- Site Location Diagram
- Boring Location Diagram
- Subsurface Soil Profiles A-A' through C-C'

Appendix B – Field Operations

- Reference Notes for Boring Logs
- Subsurface Exploration Procedure: Standard Penetration Testing (SPT)
- Boring Logs

Appendix C – Laboratory Testing

- Laboratory Testing Summary

EXECUTIVE SUMMARY

This report contains the results of our subsurface exploration and preliminary geotechnical engineering recommendations for the proposed school development located in Gastonia, Gaston County, North Carolina.

- Existing fill soils were encountered at Borings B-1 through B-6 and B-9 through B-13 and extended to depths ranging from approximately 3 to 12 feet below existing grades. Elevated SPT N-values ($N > 20$ bpf) were observed at several boring locations and is typically indicative of possible debris inclusions within the fill matrix. Records of the fill placement were not provided to us; therefore, the fill is considered undocumented. ECS does not recommend supporting building foundations, slabs, or pavements on existing undocumented fill. Remediation options of the existing undocumented fill include undercut and replacement with Structural Fill. Existing fill free of organic and/or deleterious materials can be re-used (i.e. undercut and re-worked) provided it meets the requirements for Structural Fill. As an alternative to full depth removal and replacement/re-working of existing fill, ground improvement (i.e. aggregate piers or rigid inclusions) may be considered.
- Potentially expansive and moisture sensitive Elastic SILT (MH) and/or Fat CLAY (CH) soils were encountered at Borings B-1, B-3, B-8, and B-15 to depths ranging from approximately 3 to 17 feet below existing grades. Moisture sensitive soils will degrade quickly when disturbed and/or with elevated moisture. A minimum separation of 2 feet should be provided between expansive soils (MH with Plasticity Index greater than 30 and CH) and the bottom of foundations, and slab and pavement subgrade elevations. Depending on final site grades, we anticipate the recommended separation can be provided through selective undercut and replacement, or the addition of new Structural Fill.
- Partially Weathered Rock (PWR) was encountered at Borings B-2, B-5, B-7, and B-11 through B-14 at depths beginning from approximately 3 to 12 feet below existing grades. Auger refusal (i.e. possible rock) was encountered at Borings B-2, B-4, B-5, B-7, and B-11 through B-14 at depths ranging from approximately 5 to 14.5 feet below existing grades. Based on the PWR/auger refusal depths and depending on final site grades, difficult excavation may be encountered during mass grading, utility installation, and/or foundation excavation. The site civil engineer should take the PWR material depths into consideration when determining site, pavement, and utility elevations. Once site grading plans and utility locations/depths are finalized, additional exploration including test pits can be performed to explore the excavation characteristics of the subsurface materials.
- Due to presence of undocumented existing fill, the following conventional shallow foundation options may be considered for support of the structure:
 - Full depth removal of the existing fill and replacement with Structural Fill.
 - Implementation of a ground improvement system such as aggregate piers within the existing fill areas.

The above information summarizes the main findings of the exploration, particularly those that may have a cost impact on the planned development. Further, our principal foundation recommendations are summarized. Information gleaned from the Executive Summary should not be utilized in lieu of reading the entire geotechnical report.

1.0 INTRODUCTION

The purpose of this study was to provide preliminary geotechnical information for the design of the proposed school development located in Gastonia, Gaston County, North Carolina. The recommendations developed for this report are based on the project information supplied by Gaston County Schools. Our services were provided in accordance with our Proposal No. 08:26494P, as authorized by the Client, and includes the Terms and Conditions of Service outlined within the agreement.

This report contains the procedures and results of our preliminary subsurface exploration and laboratory testing programs, review of existing site conditions, engineering analyses, and recommendations for the design and construction of the geotechnical aspects of the project. The report includes the following items.

- Information on current site conditions including surface drainage, geologic information, and special site features.
- Description of the field exploration and laboratory tests performed.
- Final logs of the soil borings and records of the field exploration and laboratory tests performed.
- Preliminary recommendations regarding foundation options for the structure and settlement potential.
- Preliminary recommendations regarding slab-on-grade construction and design.
- Seismic site classification per the North Carolina Building Code (NCBC) using the average N-value method.
- Preliminary lateral earth pressure coefficients for below grade walls.
- Preliminary light and heavy-duty flexible and rigid pavement section recommendations.
- Evaluation of the on-site soil characteristics encountered in the soil borings with respect to the suitability of the on-site materials for reuse as Structural Fill.
- Recommendations for minimum soil cover during frost heaving, compaction requirements for fill and backfill areas, and slab-on-grade construction.
- Recommendations regarding site preparation and construction observations and testing.

2.0 PROJECT INFORMATION

2.1 PROJECT LOCATION/CURRENT SITE USE/PAST SITE USE

The project site is located at 1622 East Garrison Boulevard in Gastonia, Gaston County, North Carolina. The approximate 24.69-acre project site is identified as Gaston County Parcel ID number 110018. Existing site conditions includes the William P. Grier Middle School, which is comprised of multiple structures, associated paved parking and drive areas, an outdoor track and field facility, and baseball field.



Based on our review of available historical imagery, it appears the school was originally constructed between 1951 and 1956, prior to which the site primarily consisted of open/agricultural land. Between 1956 and 1997, it appears that several building additions to the school structure were constructed. The site has remained generally similar to its present condition since at least 1997 with wooded areas maturing. Based on Gaston County GIS topographic information, the site topography is highly variable with existing site grade elevations ranging from approximately 820 feet in the southeastern portion of the site to approximately 754 feet within the northwestern portion of the site. The previous use discussion is not considered a comprehensive or in-depth review of the site history, rather a quick overview of available aerial imagery.

2.2 PROPOSED CONSTRUCTION

According to the provided preliminary conceptual site sketch, we understand the site may be redeveloped with a school campus consisting of 1 to 2-story structures, paved parking and drive areas, and assorted amenities similar to the existing development. A formal site layout plan grading plan was not provided to us at the time of this report. No other information has been provided at this time. The following table explains our preliminary assumptions for the anticipated structures.

PROJECT UNDERSTANDING	
Subject	Design Information/Assumptions
# of Stories	One to Two-Story
Framing	Concrete, Masonry, and/or Steel
Column Loads	250 kips maximum
Wall Loads	6 kips per linear foot (klf) maximum

3.0 FIELD EXPLORATION AND LABORATORY TESTING

Our exploration procedures are explained in greater detail in Appendix B including the insert titled Subsurface Exploration Procedure. Our scope of work included drilling fifteen (15) soil borings. The borings were located using GPS technology and their approximate locations are shown on the Boring Location Diagram in Appendix A. The topographic data and elevations referenced in this report and on the included exploration records were estimated from Google Earth and are not certified correct by ECS. The users of the reported elevations do so at their own risk.

3.1 SUBSURFACE CHARACTERIZATION

The site is located in the Piedmont Physiographic Province of North Carolina. The native soils in the Piedmont Province consist mainly of residuum with underlying saprolites weathered from the parent bedrock, which can be found in both weathered and unweathered states. In a mature weathering profile of the Piedmont Province, the soils are generally found to be finer grained at the surface where more extensive weathering has occurred. The particle size of the soils generally becomes more granular with increasing depth and gradually changes first to weathered and finally to unweathered parent bedrock.

The natural geology within portions of the site has been modified in the past by grading that included the placement of fill materials. The quality of man-made fills can vary significantly, and it is often difficult to assess the engineering properties of existing fills. Furthermore, there is no specific correlation between N-values from standard penetration tests performed in soil test borings and the degree of compaction of existing fill soils; however, a qualitative assessment of existing fills can sometimes be made based on the N-values obtained and observations of the materials sampled in the test borings.

The following sections provide generalized characterizations of the subsurface materials. Please refer to the subsurface soil profiles in Appendix A and boring logs in Appendix B for more detailed information.

GENERALIZED SUBSURFACE CONDITIONS			
Approximate Depth (ft)	Stratum	Description	Ranges of SPT ⁽¹⁾ N-values (bpf)
0 to 1	N/A	Organic laden surficial material. ⁽²⁾	N/A
0 to 12	I	FILL – Elastic SILT (MH), Sandy SILT (ML), Lean CLAY (CL), Silty SAND (SM), and Clayey SAND (SC). ⁽³⁾	3 to 50/5”
0 to 20	II	RESIDUAL – Lean CLAY (CL), Elastic SILT (MH), Sandy SILT (ML), and Silty SAND (SM).	6 to 35
3 to 14.5	III	PARTIALLY WEATHERED ROCK (PWR) - Sampled as Silty SAND and Clayey SAND. ⁽⁴⁾⁽⁵⁾⁽⁶⁾	100+ (50/5” to 50/0”)

Notes:

- (1) Standard Penetration Testing in blows per foot (bpf).
- (2) Surficial materials are driller reported; therefore, they should not be used in surficial material removal takeoffs.
- (3) Existing fill was encountered at Borings B-1 through B-6, and B-9 through B-13 to depths ranging from approximately 3 to 12 feet below existing grades. Elevated SPT N-values (N > 20 bpf) observed within the fill are typically indicative of possible debris inclusions within the fill matrix.
- (4) Partially Weathered Rock (PWR) is defined as residual material exhibiting SPT N-Values greater than 100 bpf.
- (5) PWR was encountered at Borings B-2, B-5, B-7, and B-11 through B-14 beginning at depths ranging from approximately 3 to 12 feet below existing grades.
- (6) Auger refusal (i.e. possible rock) materials were encountered at Borings B-2, B-4, B-5, B-7, and B-11 through B-14 at depths ranging from approximately 5 to 14.5 feet below existing grades.

3.2 GROUNDWATER OBSERVATIONS

Groundwater measurements were attempted at the termination of drilling and prior to demobilization from the site. Groundwater was not encountered at the boring locations at the time of drilling within the explored depths. Cave-in depths were measured at each of the boring locations and ranged from approximately 4.2 to 17 feet. Cave-in of a soil test boring can be caused by groundwater hydrostatic pressure, weak soil layers, and/or drilling activities. Variations in the long-term water table may occur as a result of changes in precipitation, evaporation, surface water runoff, construction activities, and other factors.

3.3 LABORATORY TESTING

The laboratory testing consisted of selected tests performed on samples obtained during our field exploration. Classification, moisture content, percent fines, and Atterberg limit tests were performed.

Each sample was visually classified on the basis of texture and plasticity in accordance with ASTM D2488 Standard Practice for Description and Identification of Soils (Visual-Manual Procedures) and including USCS classification symbols, and ASTM D2487 Standard Practice for Classification for Engineering Purposes (Unified Soil Classification System, USCS). After classification, the samples were grouped in the major zones noted on the boring logs in Appendix B. The group symbols for each soil type are indicated in parentheses along with the soil descriptions. The stratification lines between strata on the logs are approximate; in situ, the transitions may be gradual.

4.0 PRELIMINARY DESIGN RECOMMENDATIONS

4.1 FOUNDATIONS

4.1.1 Remediation of Existing Fill

The foundation design at this site requires special consideration to address the presence of undocumented existing fill. As previously noted, existing fill was encountered at Borings B-1 through B-6, and B-9 through B-13. The SPT N-values in the existing fill were highly variable and generally ranged from 3 to 17 blows per foot (bpf) with occasional elevated values ranging from 23 bpf to 50/5". The following sections present preliminary foundation support options for the structures.

- Option 1: Shallow foundations after full depth removal and replacement of existing fill.
- Option 2: Shallow foundations with the installation of a ground improvement system (i.e. aggregate piers).

The selection of the most appropriate remediation option and/or foundation system should weigh the financial cost of the system with the intended use, settlement tolerances of the structure, and level of risk.

Option 1 – Full Depth Removal and Replacement of Existing Fill

Full depth removal and replacement of existing fill soils could be considered for the structure. With the full depth undercut, the excavation should be oversized a minimum of 5 feet outside the building footprint or laterally one foot for every foot of excavation below bottom of footing level (whichever is greater). After removal of the existing fill, the excavation should be backfilled with Structural Fill in accordance with section 5.2.5 of this report. Existing fill free from deleterious materials and meeting the requirements for Structural Fill can be re-used.

Option 2 – Ground Improvement

If the Owner is not willing to accept the risks associated with the undocumented fill soils, and full depth removal of existing fill is impractical or economical undesirable, an alternate approach is to incorporate a ground improvement system to reinforce existing fill soils. For this project we recommend the ground improvement be placed below foundations and floor slabs and consist of aggregate piers extended through the existing fill into residual soils.

After installation of the aggregate piers, conventional spread footing foundations and slab areas are constructed on the improved soil and aggregate piers. Aggregate piers are typically installed by a design/build contractor. Should this option be pursued, the bid documents should specify a minimum allowable bearing pressure and allowable total and differential settlement tolerances. The design of the ground improvement system should account for differential settlements between un-reinforced and reinforced soils. If ground improvement is selected, the contract documents should specify a maximum allowable total and differential settlement of the ground improvement system. These values will depend on the structural tolerances of the building.

The aggregate pier system should be designed by a design-build contractor and the proposed soil improvement plan should be reviewed by ECS before construction begins. While design of this system would be performed by others, the design should be such that total settlements are limited to 1 inch and differential settlements are limited to ½ inch. The design-build contractor should also be made aware of changes in site grades required to achieve final site grades and should plan construction sequencing accordingly.

4.1.2 Shallow Foundations

Provided subgrades and structural fills are prepared as discussed herein, and existing fill soils are remediated, the proposed structures can be supported by conventional shallow foundations bearing on undisturbed low plasticity residual soil, PWR or newly-placed Structural Fill. ECS does not recommend supporting the structures on existing fill soils. The design of the foundation shall utilize the following parameters:

PRELIMINARY FOUNDATION RECOMMENDATIONS		
Design Parameter	Column Footing	Wall Footing
Net Allowable Bearing Pressure ⁽¹⁾⁽²⁾⁽³⁾	2,000 psf	
Acceptable Bearing Soil Material ⁽⁴⁾	Low Plasticity Residual Soils, PWR Or Newly-Placed Structural Fill	
Minimum Width	24 inches	18 inches
Minimum Footing Embedment Depth (below slab or finished grade) ⁽⁵⁾	18 inches	18 inches
Minimum Exterior Frost Depth (below final exterior grade)	12 inches	12 inches
Estimated Total Settlement ⁽⁶⁾	1 inch or less	1 inch or less
Estimated Differential Settlement	½ inch or less between columns	½ inch or less between columns

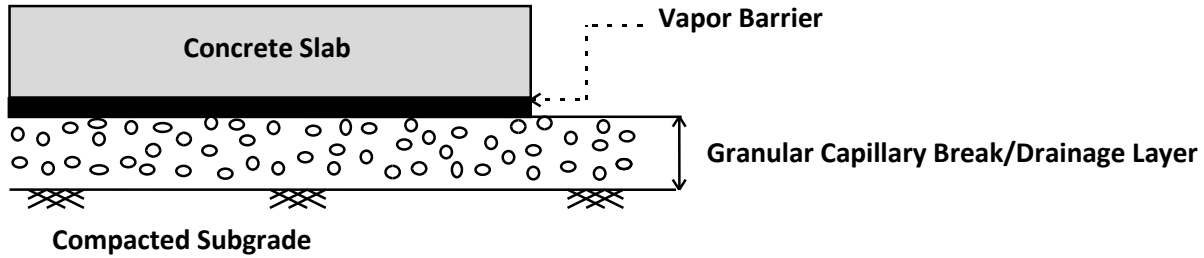
Notes:

- (1) Net allowable bearing pressure is the applied pressure in excess of the surrounding overburden soils above the base of the foundation.
- (2) Higher allowable bearing pressures may be available depending on final structure location and foundation elevations and can be evaluated once site and grading plans are available.
- (3) An allowable bearing pressure on the order of 4,000 to 5,000 psf is anticipated after the installation of a ground improvement system, if selected.
- (4) Footings should not bear on existing undocumented fill soils.
- (5) For bearing considerations.
- (6) Based on assumed structural loads. If final loads are different, ECS must be contacted to update foundation recommendations and settlement calculations.

Expansive, high plasticity, moisture sensitive soils (MH with a PI > 30 and CH soils) within proposed structure areas should be undercut and replaced with low plasticity Structural Fill to a minimum depth of 2 feet below foundations and slab-on-grade subgrade elevations during mass grading. Undercut areas (including high plasticity soils) identified during footing excavation should be backfilled with lean concrete ($f'_c \geq 1,000$ psi at 28 days) up to the original design bottom of footing elevation.

4.2 SLABS ON GRADE

Provided subgrades and structural fills are prepared as discussed herein, and existing fill soils are remediated, the proposed floor slabs can be constructed as Ground Support Slabs (or slab-on-grade). We assume that the slabs will bear on low plasticity residual soils, PWR, newly-placed Structural Fill, or a ground improvement system such as aggregate piers. The following graphic depicts our soil-supported slab recommendations:



1. Drainage Layer Thickness: 4 inches, minimum
2. Drainage Layer Material: GRAVEL (GP, GW), SAND (SP, SW)
3. Subgrade compacted to **100%** maximum dry density per ASTM D698

Soft or yielding soils may be encountered at the slab subgrade elevation in some areas. Those soils should be removed and replaced with compacted Structural Fill in accordance with the recommendations included in this report.

Subgrade Modulus: Provided the Structural Fill and Granular Drainage Layer are constructed in accordance with our recommendations, the slab may be designed assuming a modulus of subgrade reaction, k_1 of 100 pci (lbs per cubic inch). The modulus of subgrade reaction value is based on a 1 foot by 1 foot plate load test basis.

Vapor Barrier: Before the placement of concrete, a vapor barrier may be placed on top of the granular drainage layer to provide additional protection against moisture penetration through the floor slab. When a vapor barrier is used, special attention should be given to surface curing of the slab to reduce the potential for uneven drying, curling and/or cracking of the slab. Depending on proposed flooring material types, the Structural Engineer and/or the Architect may choose to eliminate the vapor barrier.

Slab Isolation: Soil-supported slabs should be isolated from the foundations and foundation-supported elements of the structure so that differential movement between the foundations and slab will not induce excessive shear and bending stresses in the floor slab. Where the structural configuration prevents the use of a free-floating slab such as in a turn down footing/monolithic slab configuration, the slab should be designed with suitable reinforcement and load transfer devices to preclude overstressing of the slab.

4.3 SEISMIC DESIGN CONSIDERATIONS

Seismic Site Classification: The North Carolina Building Code (NCBC) requires site classification for seismic design based on the upper 100 feet of a soil profile. The SPT N-value method was used in classifying this site.

The seismic site class definitions for the weighted average of SPT N-values in the upper 100 feet of the soil profile are shown in the following table:

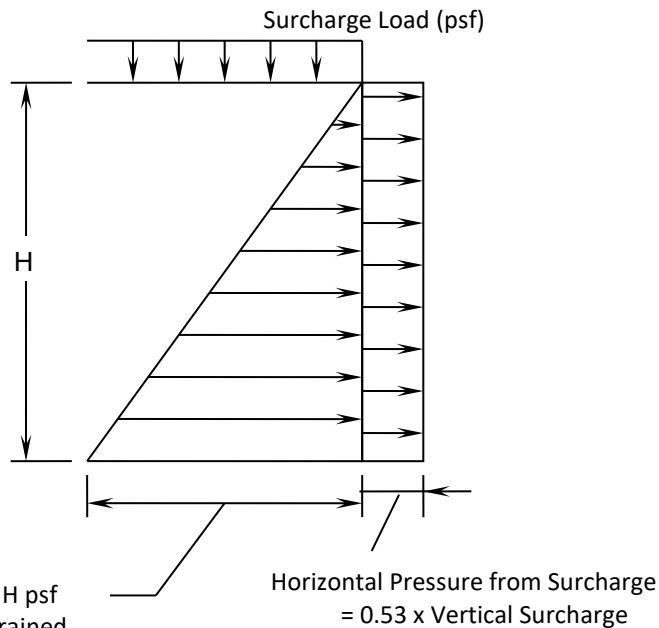
SEISMIC SITE CLASSIFICATION		
Site Class	Soil Profile Name	\bar{N} value (bpf)
A	Hard Rock	N/A
B	Rock	N/A
C	Very dense soil and soft rock	>50
D	Stiff Soil Profile	15 to 50
E	Soft Soil Profile	<15

Based upon our interpretation of the subsurface conditions, the appropriate Seismic Site Class is “C” as shown in the preceding table.

4.4 BELOW GRADE WALLS

We recommend that permanent below grade walls integral to the structure (i.e. stemwall foundation walls) be designed to withstand lateral earth pressures and surcharge loads from soil, adjacent building foundations, or pavement areas. These recommendations apply to a “drained” condition which is where there is drainage material behind below grade walls that prevents hydrostatic water pressures on the back of the below grade wall. To accomplish a drained condition, drainage materials such as free draining gravel, geocomposite drainage panels, weep holes and an underslab drainage system should be used. We recommend that walls that are restrained from movement at the top be designed for a linearly increasing lateral earth pressure. The following Figure depicts the suggested lateral earth pressure condition for a “drained below-grade wall” with restrained wall tops:

This diagram is not suitable for the design of Support of Excavation or temporary shoring systems.



Lateral Earth Pressure = $61 H$ psf
(For below grade walls restrained from movement at top and bottom, drained conditions presumed)

Surcharge loads imposed within a 45-degree slope of the base of the wall should be considered in the below grade wall design. The influence of these surcharge loads on the below grade walls should be based on an at-rest pressure coefficient, k_0 , of 0.53 in the case of restrained walls.

4.5 PAVEMENTS

Based on our past experience with similar developments and subsurface conditions, we present the following preliminary design pavement sections, provided the recommendations contained in this report are implemented and pavements are supported on low plasticity residual soils or newly placed Structural Fill. We have developed the pavement sections recommended below using AASHTO guidelines with an assumed CBR value of 4. ECS has estimated the provided pavement sections based upon a 20 year life, with equivalent single axle loadings of approximately 10,000 and 100,000 ESALs for light duty and heavy-duty pavements, respectively.

ECS should be allowed to review these recommendations and make appropriate revisions based upon the formulation of site plans and the final traffic design criteria for the project. It is important to note that the design sections do not account for construction traffic loading. The preliminary pavement sections below are guidelines that may or may not comply with local jurisdictional minimums.

PRELIMINARY RECOMMENDED PAVEMENT SECTIONS			
MATERIAL	FLEXIBLE PAVEMENT		Portland Cement Concrete (PCC) Pavement
	Heavy-Duty	Light Duty	
Portland Cement Concrete ($f'_c = 4000$ psi)	-	-	6 inches
Asphaltic Surface Course (S 9.5B)	1 ½ inches	2 inches*	-
Asphaltic Intermediate Course (I19.0C)	2 ½ inches	-	-
Aggregate Base Course	8 inches	6 inches	6 inches

*Note: Multiple lifts required to achieve noted thicknesses.

In general, heavy duty sections are areas that will be subjected to delivery trucks, buses, garbage trucks, or other similar vehicles including main drive lanes of the development. Light duty sections are appropriate for automobile parking areas and passenger vehicular traffic.

Front-loading trash dumpsters frequently impose concentrated front-wheel loads on pavements during loading. This type of loading typically results in rutting of bituminous pavements and ultimate pavement failures and costly repairs. Therefore, we suggest that the pavements in centralized trash pickup areas, if provided, utilize the aforementioned Portland Cement Concrete (PCC) pavement section. It may be prudent to use rigid pavement sections in all areas planned for heavy traffic. Such a PCC section would typically consist of 6 inches of 4,000 psi, air entrained concrete over not less than 6 inches of compacted aggregate base course. Appropriate steel reinforcing and jointing should also be incorporated into the design of PCC pavements.

We emphasize that good base course drainage is essential for successful pavement performance. Water buildup in the base course may result in premature pavement failures. The subgrade and pavement should be graded to provide effective runoff to either the outer limits of the paved area or to catch basins so that standing water will not accumulate on the subgrade or pavement.

It should be noted that these design recommendations may not satisfy local jurisdictional or North Carolina Department of Transportation traffic guidelines. Roadways constructed for public use and to be dedicated to the State or local jurisdiction for repair and maintenance must be designed in accordance with the appropriate jurisdictional requirements.

4.6 CUT AND FILL SLOPES

Grading plans were not available at the time of this report; however, we anticipate that cut and/or fill slopes may be included as part of the site grading. Once grading plans are finalized, ECS should be provided the opportunity to review the drawings and revise our recommendations, if needed.

We recommend that permanent cut slopes with less than 15 feet crest height through undisturbed residual soils be constructed at 2:1 (horizontal: vertical) or flatter. Permanent fill slopes less than 15 feet

tall may be constructed using Structural Fill at a slope of 2.5:1 or flatter. However, a slope of 3:1 or flatter may be desirable to permit establishment of vegetation, safe mowing, and maintenance. The surface of cut and fill slopes should be adequately compacted. Permanent slopes should be protected using vegetation or other means to prevent erosion.

Slope stability analyses should be performed on cut and fill slopes exceeding 15 feet in height to determine a slope inclination resulting in a factor of safety greater than 1.3. Upon finalization of site civil drawings, ECS should be contacted to perform slope stability analysis and determine if further exploration is necessary.

The outside face of building foundations and the edges of pavements placed near slopes should be located an approximate distance from the slope. Buildings or pavements placed at the top of fill slopes should be placed a distance equal to at least 1/2 of the height of the slope behind the crest of the slope. Buildings or pavements near the bottom of the slope should be located at least 1/3 of the height of the slope from the toe of the slope. Slopes with structures located closer than these limits or slopes taller than the height limits indicated should be specifically evaluated by ECS and may require approval from the building code official.

Temporary slopes in confined or open excavations should perform satisfactorily at inclinations of 2:1. Excavations should conform to applicable OSHA regulations. Appropriately sized ditches or other approximate storm water controls should run above and parallel to the crest of permanent slopes to divert surface runoff away from the slope face. To aid in obtaining proper compaction on the slope face, the fill slopes should be overbuilt with properly compacted structural fill and then excavated back to the proposed grades.

5.0 SITE CONSTRUCTION RECOMMENDATIONS

5.1 SUBGRADE PREPARATION

5.1.1 Stripping and Grubbing

The subgrade preparation should consist of stripping vegetation, rootmat, topsoil, razing existing pavements and structures, abandoning and removing or grouting underground utilities, removing foundations and remnants of previous construction, and other soft or unsuitable materials from the 10-foot expanded building and 5-foot expanded pavement limits, and 5 feet beyond the toe of structural fills. ECS should be retained to observe that topsoil and unsuitable surficial materials have been removed prior to the placement of Structural Fill or construction of structures.

5.1.2 Proofrolling

Prior to fill placement or other construction on subgrades, the subgrades should be observed by ECS. The exposed subgrade should be thoroughly proofrolled with construction equipment having a minimum axle load of 10 tons [e.g. fully loaded tandem-axle dump truck]. Proofrolling should be traversed in two perpendicular directions with overlapping passes of the vehicle under the observation of ECS. This procedure is intended to assist in identifying localized yielding materials.

Where proofrolling identifies areas that are unstable or “pumping”, those areas should be repaired prior to the placement of any subsequent Structural Fill or other construction materials. Methods of stabilization include undercutting, moisture conditioning, or chemical stabilization. The situation should be discussed with ECS to determine the appropriate procedure. Test pits may be excavated to explore the shallow subsurface materials to help in determining the cause of the observed unstable materials, and to assist in selecting appropriate remedial actions to stabilize the subgrade.

5.1.3 Site Temporary Dewatering

Limited Excavation Dewatering: Based upon our subsurface exploration and experience on sites in nearby areas of similar geologic setting, we believe construction dewatering at this site will be mainly limited to removing accumulated rainwater and/or perched/laterally flowing water infiltration from footing and below grade excavations. Additionally, temporary dewatering may be required within low-lying and ravine areas within the site to facilitate site preparation and fill placement.

We anticipate that temporary dewatering operations, if required, can be handled by the use of conventional submersible pumps directly in the excavation or temporary trenches to direct the flow of water and to remove water from excavations and drainage features. If temporary sump pits are used, we recommend they be established at an elevation 2 to 4 feet below the bottom of the working surface, excavation subgrade, or bottom of footing. A perforated 55-gallon drum or other temporary structure could be used to house the pump. For deeper and mass excavations, trenches, well points, and/or French drains may be necessary. Groundwater, if encountered, should be controlled a minimum of 2 feet below the exposed working surface.

If dewatering operations are performed at the site, ECS recommends that the dewatering operations be performed in accordance with Local, State and Federal Government regulatory requirements for surface water discharges. ECS would be pleased to be consulted by the Client on those requirements, if requested.

5.2 EARTHWORK OPERATIONS

5.2.1 Existing Man-Placed Fill

Existing fill soils were encountered at Borings B-1 through B-6 and B-9 through B-13 and extended to depths ranging from approximately 3 to 12 feet below existing grades. ECS has not been provided with test records (such as proofrolling, compaction testing, etc.) at the time of this report; therefore, the existing fill is considered to be undocumented. The soil types and variable SPT N-values indicate that the fill material was likely not placed in a controlled manner and may contain inclusions of debris materials. ECS does not recommend supporting the structure on the existing fill. Existing fill materials can be re-used as Structural Fill provided it is free from deleterious materials and meets the criteria outlined in this report.

Undocumented fill poses risks associated with undetected deleterious inclusions within the fill and/or deleterious materials at the virgin ground/fill interface that are covered by the fill. Deleterious materials can consist of significant amounts of organics derived from organic rich strippings, rubbish, construction or demolition debris, stumps and roots and logs. If these materials are covered over by or are within undocumented fill, the organic materials tend to decompose slowly in the anaerobic conditions in or under the fill. Decomposition can occur over periods ranging from several years to several decades. As the organic materials decompose, a void is created which can create soft conditions and even subsidence in areas above the organics. Where these types of conditions exist under or within undocumented fill, they are sometimes in discreet pockets that can go undetected by normal subsurface exploration techniques, i.e. soil test borings and test pits.

Based on elevated SPT N-values observed within portions, debris materials may be present within the fill matrix. We recommend that additional subsurface exploration including test pit excavations be performed to further explore the composition and extents of the existing fill.

ECS does not recommend supporting the structures and slabs on existing fill. Bearing the pavements on the existing fill soils is a business decision that only the Owner can make. We cannot be responsible for potential settlement of the pavements if the Owner elects to support the development on these soils.

5.2.2 Expansive and Moisture Sensitive Soils

Potentially expansive, high plasticity, moisture sensitive soils are those materials classified as Elastic SILT (MH) and Fat CLAY (CH). Elastic SILT (MH) and/or Fat CLAY (CH) soils were encountered at Borings B-1, B-3, B-8, and B-15 to depths ranging from approximately 3 to 17 feet below existing grades. Moisture sensitive soils will degrade quickly when disturbed and/or with elevated moisture content.

Expansive, highly plasticity, moisture sensitive soils consisting of MH soils ($PI > 30$) and CH soils should not be used for direct support of foundations or slabs-on-grade, or pavements. Depending on their expansive properties, MH soils ($PI > 30$) or CH soils encountered within proposed structural areas may require undercutting and replacement with low plasticity Structural Fill to a minimum depth of 2 feet below foundations and subgrade elevations in slab, foundation, or pavement areas. Upon completion of the undercut, the resulting subgrade soils should be evaluated for stability prior to the placement of Structural Fill. The recommended separation of 2 feet can also be provided through the addition of new Structural Fill.

Based on the limited laboratory testing performed, the on-site MH soils tested have PI values ranging from 8 to 43; therefore, depending on final site grades, remediation of high plasticity soils should be anticipated within portions of the site. Alternatively, chemical (i.e. lime) treatment may be considered to modify/improve high plasticity soils in lieu of undercut and replacement.

5.2.3 Lower-Consistency/Loose Subgrade Soils

Lower-consistency/loose subgrade soils and deeper soft zones, with an N-value of 6 bpf or less, were encountered at Borings B-3, B-4, B-9, B-10, and B-13 and extend to depths ranging from approximately 3 to 12 feet below existing ground surface. In their present condition, these soils are generally considered marginally suitable for the direct support of new Structural Fill, foundations, slabs and pavements. Depending on final site grades, existing fill remediation selected, and construction phase evaluations (i.e. proofrolling, Dynamic Cone Penetrometer testing), lower-consistency/loose soils may require selective undercutting, moisture conditioning and/or compaction prior to fill placement or construction of pavements and structures.

5.2.4 Partially Weathered Rock and Rock

Based on the results of the soil test borings, Partially Weathered Rock (PWR) was encountered at Borings B-2, B-5, B-7, and B-11 through B-14 at depths beginning from approximately 3 to 12 feet below existing grades. Auger refusal (i.e. possible rock) was encountered at Borings B-2, B-4, B-5, B-7, and B-11 through B-14 at depths ranging from approximately 5 to 14.5 feet below existing grades. Depending on final site grades, difficult excavation may be encountered during mass grading, utility installation, and/or foundation excavation. The site civil designer should consider PWR depths when determining site grades and utility depths/locations. Once site grading plans and utility locations/depths are finalized, additional exploration including test pits can be performed to explore the excavation characteristics of the subsurface materials.

As noted in the subsurface characterization section of this report, the weathering process in the Piedmont can be erratic and significant variations of the depths of the more dense materials can occur in relatively short distances. In some cases, isolated boulders or thin rock seams may be present in the soil matrix.

In mass excavation for general site work, dense soils and PWR can usually be removed by ripping with a single-tooth ripper attached to a large crawler tractor or by breaking it out with large front-end loader. In confined excavations such as foundations, utility trenches, etc., removal of PWR may require use of heavy-duty backhoes, pneumatic spades, or blasting. Blasting and/or hammering should be anticipated for materials where auger refusal was encountered at the boring locations.

As a general guide, we recommend the following definitions be used to define rock:

General Excavation

Rip Rock: Material that cannot be removed by scrapers, loaders, pans, dozers, or graders; and requires the use of a single-tooth ripper mounted on a crawler tractor having a minimum draw bar pull rated at not less than 56,000 pounds.

Blast Rock: Material which cannot be excavated with a single-tooth ripper mounted on a crawler tractor having a minimum draw bar pull rated at not less than 56,000 pounds (Caterpillar D-8 or equivalent) or by a Caterpillar 977 frontend loader or equivalent; and occupying an original volume of at least one (1) cubic yard.

Trench Excavation

Blast Rock: Material which cannot be excavated with a backhoe having a bucket curling force rated at not less than 25,700 pounds (Caterpillar Model 225 or equivalent) and occupying an original volume of at least one-half (1/2) cubic yard.

5.2.5 Structural Fill

Prior to placement of Structural Fill, representative bulk samples (about 50 pounds) of on-site and/or off-site borrow should be submitted to ECS for laboratory testing, which will typically include Atterberg limits, natural moisture content, grain-size distribution, and moisture-density relationships (i.e., Proctors) for compaction. Import materials should be tested prior to being hauled to the site to determine if they meet project specifications.

Structural Fill Materials: Materials for use as Structural Fill should consist of inorganic soils classified as CL, ML, SM, SC, SW, SP, GM, or GC, or a combination of these group symbols, per ASTM D2487. These materials should not contain organic matter or debris and should contain no particle sizes greater than 4 inches in the largest diameter. Open graded materials and gravels (GW and GP), which contain void space in their mass, should not be used in Structural Fills unless properly encapsulated with filter fabric. Suitable Structural Fill material should have the index properties in the table below:

STRUCTURAL FILL INDEX PROPERTIES	
Subject	Property
Building and Pavement Areas	LL < 50, PI < 30
Maximum Particle Size	4 inches
Maximum Organic Content	5% by dry weight
Minimum Dry Unit Weight (ASTM D698)	90 pounds per cubic foot

STRUCTURAL FILL COMPACTION REQUIREMENTS	
Subject	Requirement
Compaction Standard	Standard Proctor, ASTM D698
Required Compaction (greater than 24 inches below finished soil subgrade)	95% of Maximum Dry Density
Required Compaction (within 24 inches of finished soil subgrade)	100% of Maximum Dry Density
Moisture Content	-3 to +3 % points of the soil's optimum value
Loose Thickness (maximum)*	8 inches prior to compaction

*Note: Thinner loose lifts may be necessary depending on the compaction equipment utilized.

Unsatisfactory Materials: Unsatisfactory fill materials include materials which do not satisfy the requirements for suitable materials, as well as topsoil and organic materials (OH, OL), Elastic SILT (MH), and Fat CLAY (CH.)

On-Site Borrow Suitability: Natural deposits of soils that meet the definition of satisfactory Structural Fill are present on-site including Sandy SILT (ML), Lean CLAY (CL), and Silty SAND (SM); however, selective mining (i.e. soil exchange) may be necessary to obtain these soils based on the depths they were encountered. Excavated partially weathered rock (PWR) and/or rock materials may require processing (i.e. crushing and/or screening) to use as site Structural Fill depending on the resulting fragment size (i.e. greater than 4 inches nominal diameter) and ability of compaction equipment to break down the PWR/rock materials.

Given the presence of moisture sensitive MH and/or CH soils on this site, and to reduce the amount of import material to the site, the Owner can consider allowing soils with a maximum Liquid Limit of 65 and maximum Plasticity Index of 30 to be used as Structural Fill at depths greater than 4 feet below pavement subgrades outside the expanded building limits and within non-structural areas. Chemical (lime) treatment of on-site MH and/or CH soils may also be considered to improve/modify sensitive soils for re-use as Structural Fill.

Fill Compaction Control: The expanded limits of the proposed construction areas should be well defined, including the limits of the fill zones for buildings, pavements, and slopes, etc., at the time of fill placement. Grade controls should be maintained throughout the filling operations. Filling operations should be observed on a full-time basis by ECS to determine that the minimum compaction requirements are being achieved.

Compaction Equipment: Compaction equipment suitable to the soil type being compacted should be used to compact the subgrades and fill materials. Sheepsfoot compaction equipment should be suitable for the fine-grained soils (Clays and Silts). A vibratory steel drum roller should be used for compaction of coarse-grained soils (Sands) as well as for sealing compacted surfaces.

Fill Placement: Fill materials should not be placed on frozen soils, on frost-heaved soils, and/or on excessively wet soils. Borrow fill materials should not contain frozen materials at the time of placement, and frozen or frost-heaved soils should be removed prior to placement of Structural Fill or other fill soils and aggregates. Excessively wet soils or aggregates should be scarified, aerated, and moisture conditioned. Where fill materials will be placed to widen existing embankment fills, or placed up against sloping ground, the soil subgrade should be scarified, and the new fill benched or keyed into the existing material. Fill material should be placed in horizontal lifts.

5.2.6 General Construction Considerations

Moisture Conditioning: During the cooler and wetter periods of the year, delays and additional costs should be anticipated. At these times, reduction of soil moisture may need to be accomplished by a combination of mechanical manipulation and the use of chemical additives, such as lime or cement, in order to lower moisture contents to levels appropriate for compaction. Alternatively, during the drier times of the year, such as the summer months, moisture may need to be added to the soil to provide adequate moisture for successful compaction according to the project requirements.

Subgrade Protection: Measures should also be taken to limit site disturbance, especially from rubber-tired heavy construction equipment, and to control and remove surface water from development areas, including structural and pavement areas. It would be advisable to designate a haul road and construction staging area to limit the areas of disturbance and to prevent construction traffic from excessively degrading sensitive subgrade soils and existing pavement areas. Haul roads and construction staging areas could be covered with excess depths of aggregate to protect those subgrades. The aggregate can later be removed and used as Structural Fill provided it meets project specifications.

Surface Drainage: Surface drainage conditions should be properly maintained. Surface water should be directed away from the construction area, and the work area should be sloped away from the construction area at a gradient of 1 percent or greater to reduce the potential of ponding water and the subsequent saturation of the surface soils. At the end of each workday, the subgrade soils should be sealed by rolling the surface with a smooth drum roller to minimize infiltration of surface water.

Excavation Safety: Excavations and slopes should be constructed and maintained in accordance with OSHA excavation safety standards. The Contractor is solely responsible for designing, constructing, and maintaining stable temporary excavations and slopes. The Contractor's responsible person, as defined in 29 CFR Part 1926, should evaluate the soil exposed in the excavations as part of the Contractor's safety procedures. In no case should slope height, slope inclination, or excavation depth, including utility trench excavation depth, exceed those specified in local, state, and federal safety regulations. ECS is providing this information solely as a service to our Client. ECS is not assuming responsibility for construction site safety or the Contractor's activities; such responsibility is not being implied and should not be inferred.

5.3 UTILITY INSTALLATIONS

Utility Subgrades: The soils encountered in our exploration are expected to be generally suitable for support of utility pipes; however, due to shallow PWR and auger refusal (i.e. possible rock), difficult excavation may be encountered at utility excavation. PWR and/or rock materials encountered at utility subgrade excavations should be undercut an additional 6-inches and replaced with bedding material to reduce potential point load stress. The pipe subgrades should be observed and probed for stability by ECS. Loose or unsuitable materials encountered should be removed and replaced with suitable compacted Structural Fill, or pipe stone bedding materials.

Utility Backfilling: Granular bedding material should be at least 4 inches thick, but not less than that specified by the civil engineer's project drawings and specifications. We recommend that the bedding materials be placed up to the springline of the pipe. Fill placed for support of the utilities, as well as backfill over the utilities, should satisfy the requirements for Structural Fill and Fill Placement.

6.0 CLOSING

ECS has prepared this preliminary report to guide the geotechnical-related design and construction aspects of the project. We performed these services in accordance with the standard of care expected of professionals in the industry performing similar services on projects of like size and complexity at this time in the region. No other representation expressed or implied, and no warranty or guarantee is included or intended in this report.

The description of the proposed project is based on information provided to ECS by the Client. If any of this information is inaccurate or changes, either because of our interpretation of the documents provided or site or design changes that may occur later, ECS should be contacted so we can review our recommendations and provide additional or alternate recommendations that reflect the proposed construction.

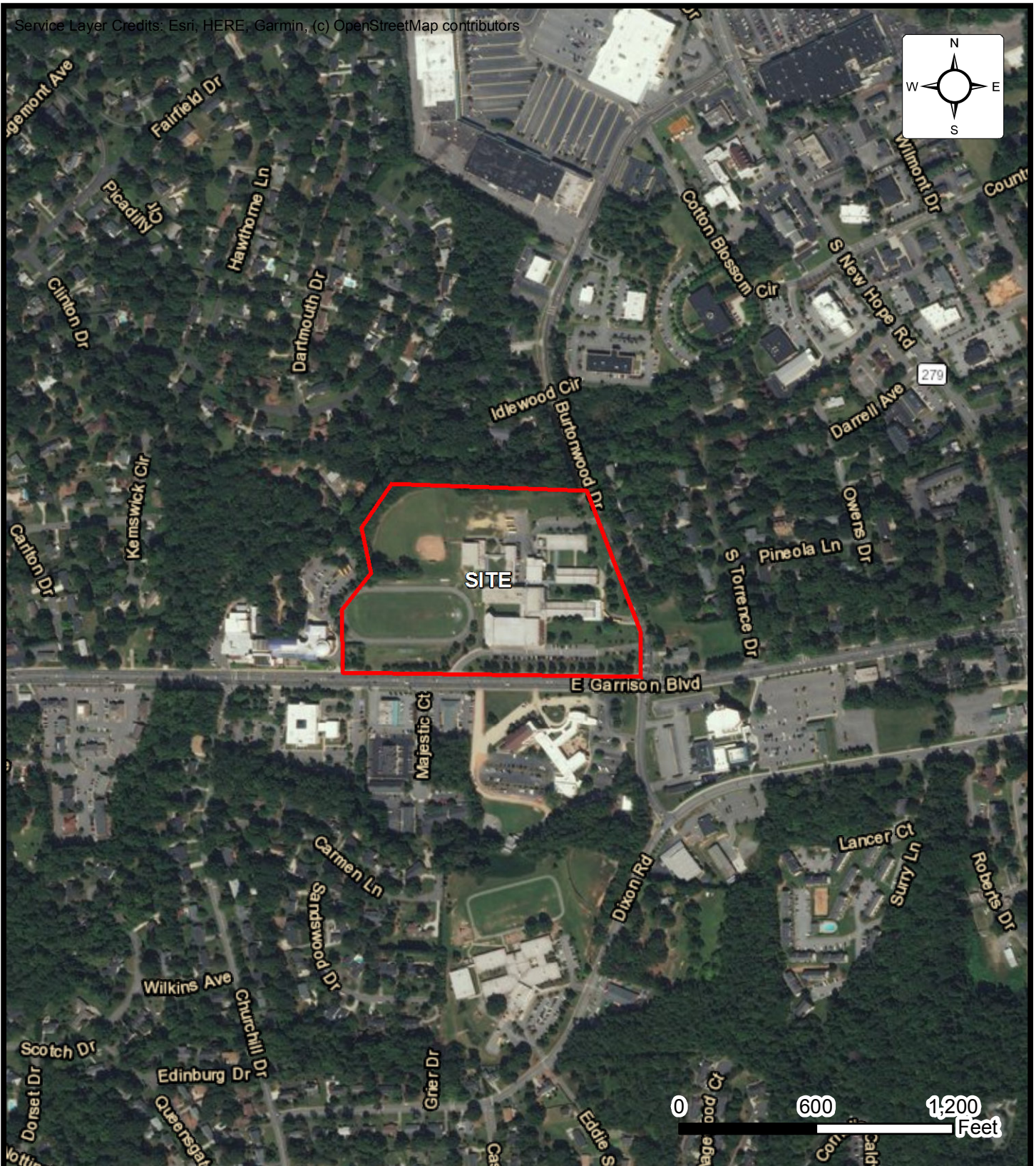
We recommend that ECS review the project plans and specifications so we can confirm that those plans/specifications are in accordance with the recommendations of this geotechnical report.

Field observations, and quality assurance testing during earthwork and foundation installation are an extension of, and integral to, the geotechnical design. We recommend that ECS be retained to apply our expertise throughout the geotechnical phases of construction, and to provide consultation and recommendation should issues arise.

ECS is not responsible for the conclusions, opinions, or recommendations of others based on the data in this report.

APPENDIX A – Diagrams & Reports

Site Location Diagram
Boring Location Diagram
Subsurface Soil Profiles A-A' through C-C'



SITE LOCATION DIAGRAM
GARRISON TRACT

GASTONIA, NORTH CAROLINA



GASTON COUNTY SCHOOLS

ENGINEER CJC
SCALE AS NOTED
PROJECT NO. 08:14851
FIGURE 1
DATE 11/4/2021

Service Layer Credits: Esri, HERE, Garmin, (c) OpenStreetMap contributors



Legend

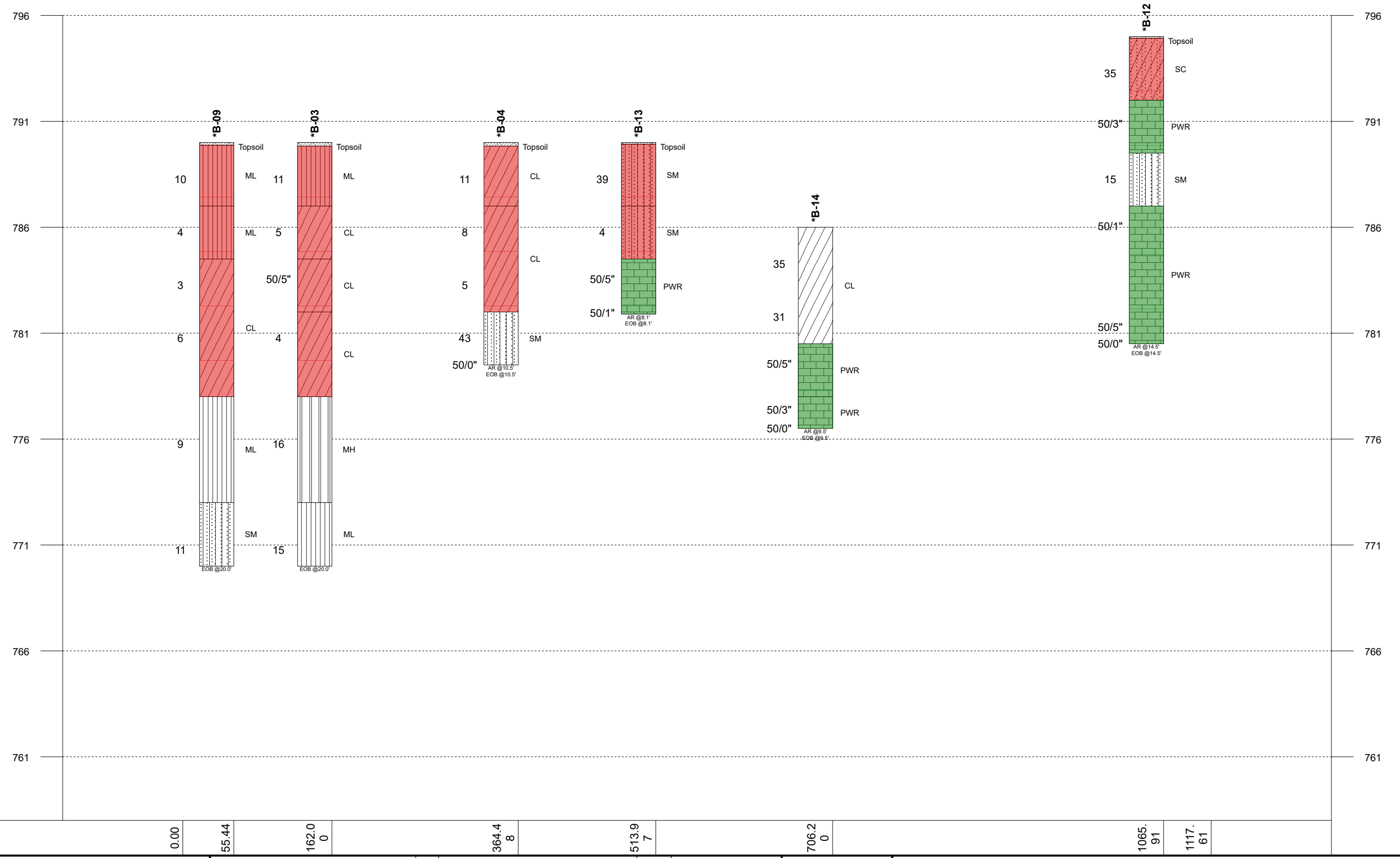
-  Approximate Boring Location
-  Approximate Subsurface Soil Profile Location



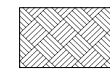

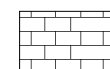
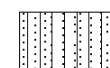



BORING LOCATION DIAGRAM GARRISON TRACT

GASTONIA, NORTH CAROLINA
GASTON COUNTY SCHOOLS

ENGINEER CJC
SCALE AS NOTED
PROJECT NO. 08:14851
FIGURE 2
DATE 11/4/2021



Legend Key

-  Topsoil
-  CLAYEY SAND
-  PWR
-  SILTY SAND
-  SILT
-  Lean CLAY
-  Elastic SILTY

758.00

Notes:
 1- EOB: END OF BORING AR: AUGER REFUSAL SR: SAMPLER REFUSAL.
 2- THE NUMBER BELOW THE STRIPS IS THE DISTANCE ALONG THE BASELINE.
 3- SEE INDIVIDUAL BORING LOG AND GEOTECHNICAL INFORMATION.
 4- STANDARD PENETRATION TEST RESISTANCE (LEFT OF BORING) IN BLOWS PER FOOT (ASTM D1586).

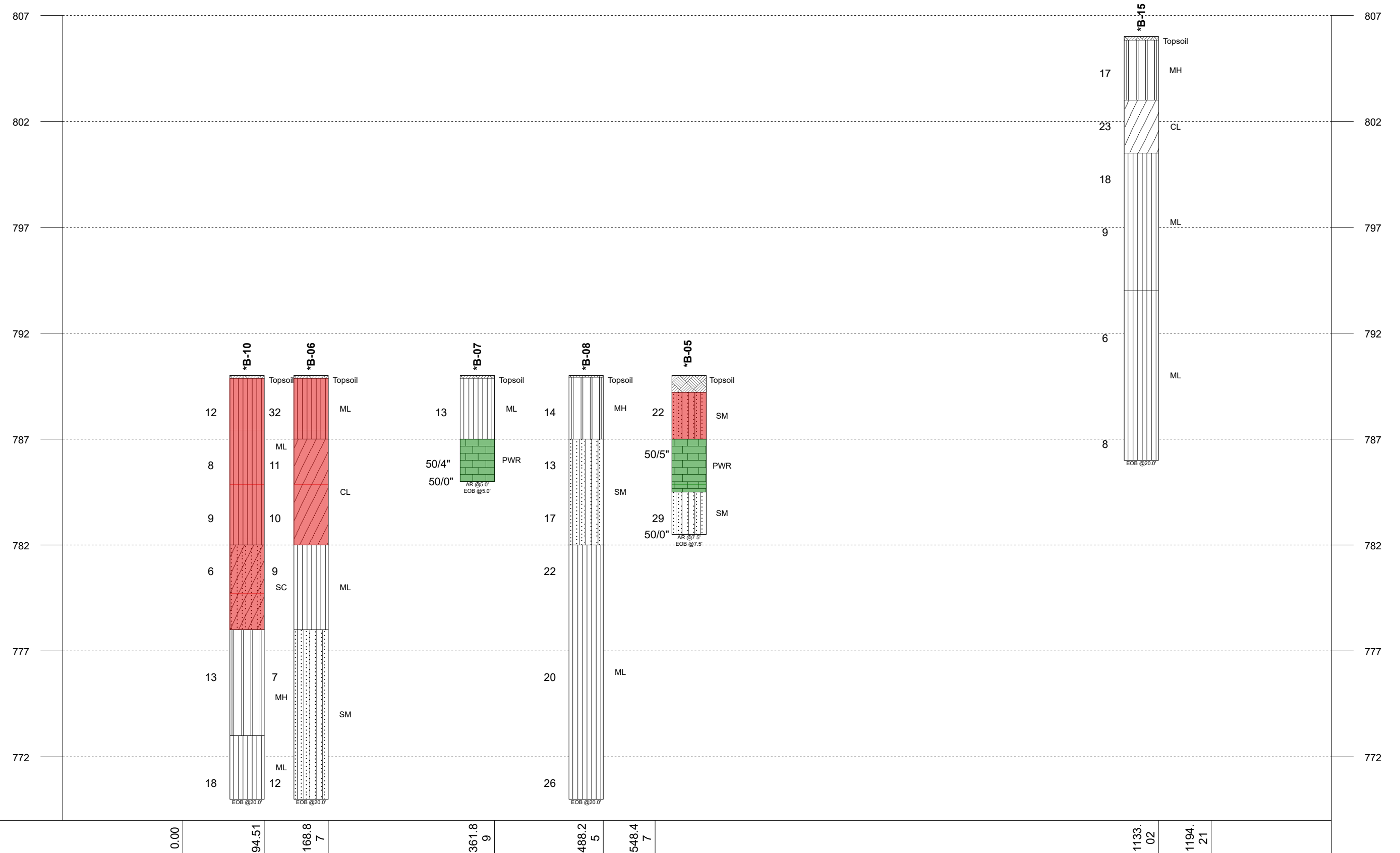
Plastic Limit	Water Content	Liquid Limit	▽ WL (First Encountered)	■ Fill
X	●	△	▼ WL (Completion)	■ Possible Fill
[FINES CONTENT %]			▽ WL (Seasonal High Water)	■ Probable Fill
▣ BOTTOM OF CASING			▽ WL (Stabilized)	■ Rock
▣ LOSS OF CIRCULATION				



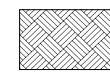
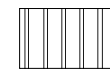
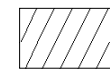
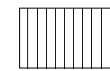
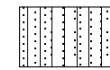
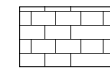
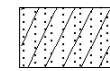
SUBSURFACE SOIL PROFILE A-A'

Garrison Tract
Gaston County Schools
1622 East Garrison Boulevard, Gastonia, North Carolina 28054

Project No: 08.14851 Date: 11/04/2021



Legend Key

-  Topsoil
-  Elastic SILT
-  Lean CLAY
-  SILT
-  SILTY SAND
-  PWR
-  CLAYEY SAND

769.00

Notes:
 1- EOB: END OF BORING AR: AUGER REFUSAL SR: SAMPLER REFUSAL.
 2- THE NUMBER BELOW THE STRIPS IS THE DISTANCE ALONG THE BASELINE.
 3- SEE INDIVIDUAL BORING LOG AND GEOTECHNICAL INFORMATION.
 4- STANDARD PENETRATION TEST RESISTANCE (LEFT OF BORING) IN BLOWS PER FOOT (ASTM D1586).

Plastic Limit	Water Content	Liquid Limit	▽ WL (First Encountered)	Fill
X	●	△	▽ WL (Completion)	Possible Fill
[FINES CONTENT %]			▽ WL (Seasonal High Water)	Probable Fill
◀	BOTTOM OF CASING	▽ WL (Stabilized)	▽	Rock
⊗	LOSS OF CIRCULATION			






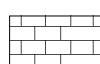
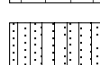

SUBSURFACE SOIL PROFILE B-B'

Garrison Tract
Gaston County Schools
1622 East Garrison Boulevard, Gastonia, North Carolina 28054

Project No: 08:14851 Date: 11/04/2021



Legend Key

-  Topsoil
-  SILT
-  Lean CLAY
-  PWR
-  SILTY SAND
-  CLAYEY SAND

Notes:
 1- EOB: END OF BORING AR: AUGER REFUSAL SR: SAMPLER REFUSAL.
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Plastic Limit	Water Content	Liquid Limit	W	WL (First Encountered)
X	●	△	▽	WL (Completion)
[FINES CONTENT %]			▽	WL (Seasonal High Water)
◀			▽	WL (Stabilized)
⊗				

	Fill
	Possible Fill
	Probable Fill
	Rock



SUBSURFACE SOIL PROFILE C-C'

Garrison Tract
Gaston County Schools
1622 East Garrison Boulevard, Gastonia, North Carolina 28054

Project No: 08:14851 Date: 11/04/2021

APPENDIX B – Field Operations

Reference Notes for Boring Logs

Subsurface Exploration Procedure: Standard Penetration Testing (SPT)

Boring Logs

REFERENCE NOTES FOR BORING LOGS

MATERIAL ^{1,2}	
	ASPHALT
	CONCRETE
	GRAVEL
	TOPSOIL
	VOID
	BRICK
	AGGREGATE BASE COURSE
	GW WELL-GRADED GRAVEL gravel-sand mixtures, little or no fines
	GP POORLY-GRADED GRAVEL gravel-sand mixtures, little or no fines
	GM SILTY GRAVEL gravel-sand-silt mixtures
	GC CLAYEY GRAVEL gravel-sand-clay mixtures
	SW WELL-GRADED SAND gravelly sand, little or no fines
	SP POORLY-GRADED SAND gravelly sand, little or no fines
	SM SILTY SAND sand-silt mixtures
	SC CLAYEY SAND sand-clay mixtures
	ML SILT non-plastic to medium plasticity
	MH ELASTIC SILT high plasticity
	CL LEAN CLAY low to medium plasticity
	CH FAT CLAY high plasticity
	OL ORGANIC SILT or CLAY non-plastic to low plasticity
	OH ORGANIC SILT or CLAY high plasticity
	PT PEAT highly organic soils

DRILLING SAMPLING SYMBOLS & ABBREVIATIONS			
SS	Split Spoon Sampler	PM	Pressuremeter Test
ST	Shelby Tube Sampler	RD	Rock Bit Drilling
WS	Wash Sample	RC	Rock Core, NX, BX, AX
BS	Bulk Sample of Cuttings	REC	Rock Sample Recovery %
PA	Power Auger (no sample)	RQD	Rock Quality Designation %
HSA	Hollow Stem Auger		

PARTICLE SIZE IDENTIFICATION		
DESIGNATION	PARTICLE SIZES	
Boulders	12 inches (300 mm) or larger	
Cobbles	3 inches to 12 inches (75 mm to 300 mm)	
Gravel:	Coarse	¾ inch to 3 inches (19 mm to 75 mm)
	Fine	4.75 mm to 19 mm (No. 4 sieve to ¾ inch)
Sand:	Coarse	2.00 mm to 4.75 mm (No. 10 to No. 4 sieve)
	Medium	0.425 mm to 2.00 mm (No. 40 to No. 10 sieve)
	Fine	0.074 mm to 0.425 mm (No. 200 to No. 40 sieve)
Silt & Clay ("Fines")	<0.074 mm (smaller than a No. 200 sieve)	

COHESIVE SILTS & CLAYS		
UNCONFINED COMPRESSIVE STRENGTH, QP ⁴	SPT ⁵ (BPF)	CONSISTENCY ⁷ (COHESIVE)
<0.25	<2	Very Soft
0.25 - <0.50	2 - 4	Soft
0.50 - <1.00	5 - 8	Firm
1.00 - <2.00	9 - 15	Stiff
2.00 - <4.00	16 - 30	Very Stiff
4.00 - 8.00	31 - 50	Hard
>8.00	>50	Very Hard

RELATIVE AMOUNT ⁷	COARSE GRAINED (%) ⁸	FINE GRAINED (%) ⁸
Trace	≤5	≤5
With	10 - 20	10 - 25
Adjective (ex: "Silty")	25 - 45	30 - 45

GRAVELS, SANDS & NON-COHESIVE SILTS	
SPT ⁵	DENSITY
<5	Very Loose
5 - 10	Loose
11 - 30	Medium Dense
31 - 50	Dense
>50	Very Dense

WATER LEVELS ⁶	
	WL (First Encountered)
	WL (Completion)
	WL (Seasonal High Water)
	WL (Stabilized)

FILL AND ROCK			
FILL	POSSIBLE FILL	PROBABLE FILL	ROCK

¹Classifications and symbols per ASTM D 2488-17 (Visual-Manual Procedure) unless noted otherwise.

²To be consistent with general practice, "POORLY GRADED" has been removed from GP, GP-GM, GP-GC, SP, SP-SM, SP-SC soil types on the boring logs.

³Non-ASTM designations are included in soil descriptions and symbols along with ASTM symbol [Ex: (SM-FILL)].

⁴Typically estimated via pocket penetrometer or Torvane shear test and expressed in tons per square foot (tsf).

⁵Standard Penetration Test (SPT) refers to the number of hammer blows (blow count) of a 140 lb. hammer falling 30 inches on a 2 inch OD split spoon sampler required to drive the sampler 12 inches (ASTM D 1586). "N-value" is another term for "blow count" and is expressed in blows per foot (bpf). SPT correlations per 7.4.2 Method B and need to be corrected if using an auto hammer.

⁶The water levels are those levels actually measured in the borehole at the times indicated by the symbol. The measurements are relatively reliable when augering, without adding fluids, in granular soils. In clay and cohesive silts, the determination of water levels may require several days for the water level to stabilize. In such cases, additional methods of measurement are generally employed.

⁷Minor deviation from ASTM D 2488-17 Note 14.

⁸Percentages are estimated to the nearest 5% per ASTM D 2488-17.



SUBSURFACE EXPLORATION PROCEDURE: STANDARD PENETRATION TESTING (SPT) ASTM D 1586 Split-Barrel Sampling

Standard Penetration Testing, or **SPT**, is the most frequently used subsurface exploration test performed worldwide. This test provides samples for identification purposes, as well as a measure of penetration resistance, or N-value. The N-Value, or blow counts, when corrected and correlated, can approximate engineering properties of soils used for geotechnical design and engineering purposes.

SPT Procedure:

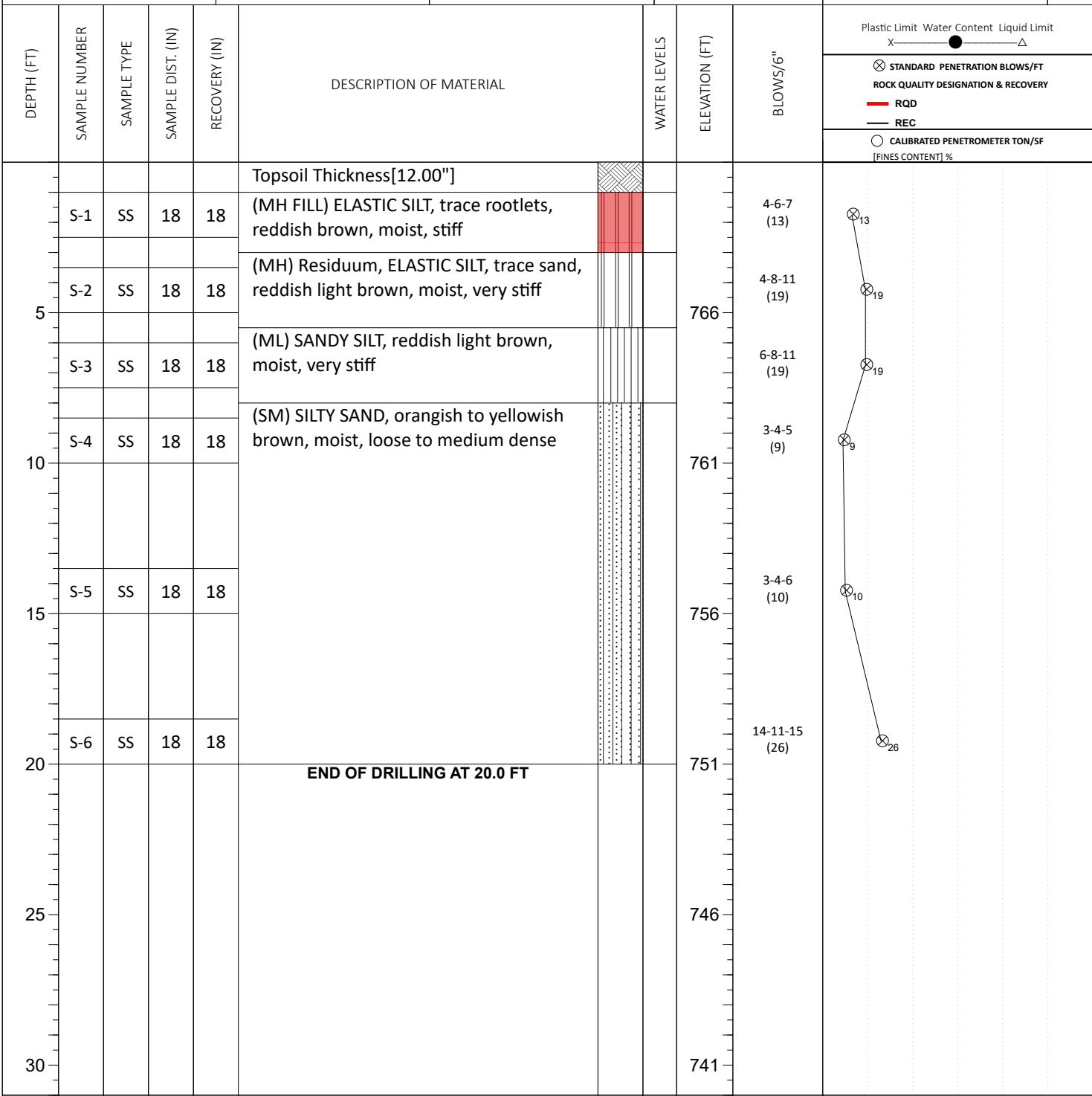
- Involves driving a hollow tube (split-spoon) into the ground by dropping a 140-lb hammer a height of 30-inches at desired depth
- Recording the number of hammer blows required to drive split-spoon a distance of 12 inches (in 3 or 4 Increments of 6 inches each)
- Auger is advanced* and an additional SPT is performed
- One SPT test is typically performed for every two to five feet
- Obtain two-inch diameter soil sample



**Drilling Methods May Vary*— The predominant drilling methods used for SPT are open hole fluid rotary drilling and hollow-stem auger drilling.

SITE LOCATION:
1622 East Garrison Boulevard, Gastonia, North Carolina 28054

NORTHING: 554532.1	EASTING: 1356154.1	STATION:	SURFACE ELEVATION: 771.0	LOSS OF CIRCULATION
				BOTTOM OF CASING



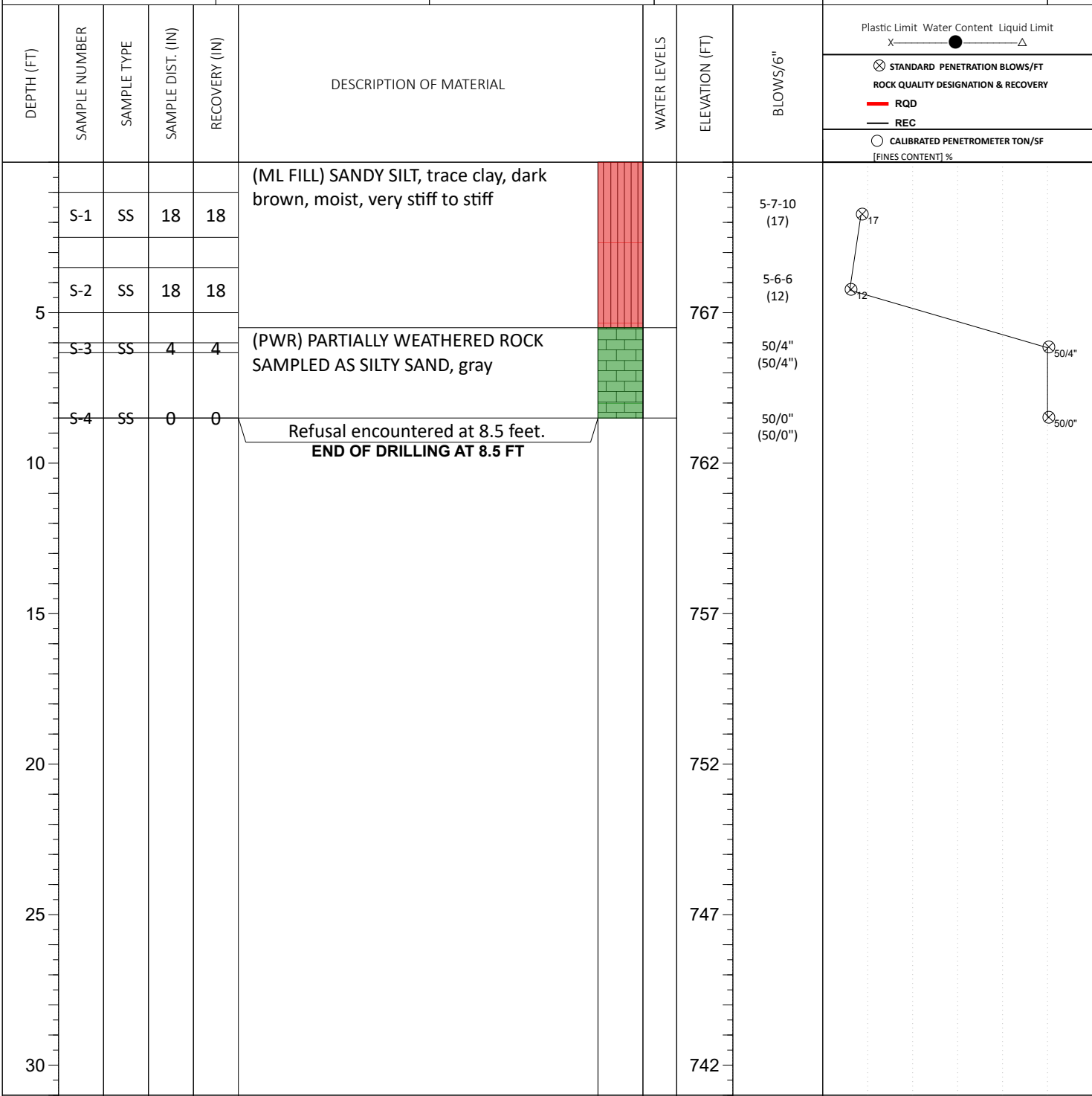
THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL

▽ WL (First Encountered) ▼ WL (Completion) GNE ▽ WL (Seasonal High Water) ▽ WL (Stabilized)	BORING STARTED: Oct 08 2021 BORING COMPLETED: Oct 08 2021 EQUIPMENT: ATV Simco 2800	CAVE IN DEPTH: 16.20 HAMMER TYPE: Manual DRILLING METHOD: 2.25 HSA
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GEOTECHNICAL BOREHOLE LOG

SITE LOCATION:
1622 East Garrison Boulevard, Gastonia, North Carolina 28054

NORTHING: 554530.8	EASTING: 1356325.5	STATION:	SURFACE ELEVATION: 772.0	LOSS OF CIRCULATION
				BOTTOM OF CASING



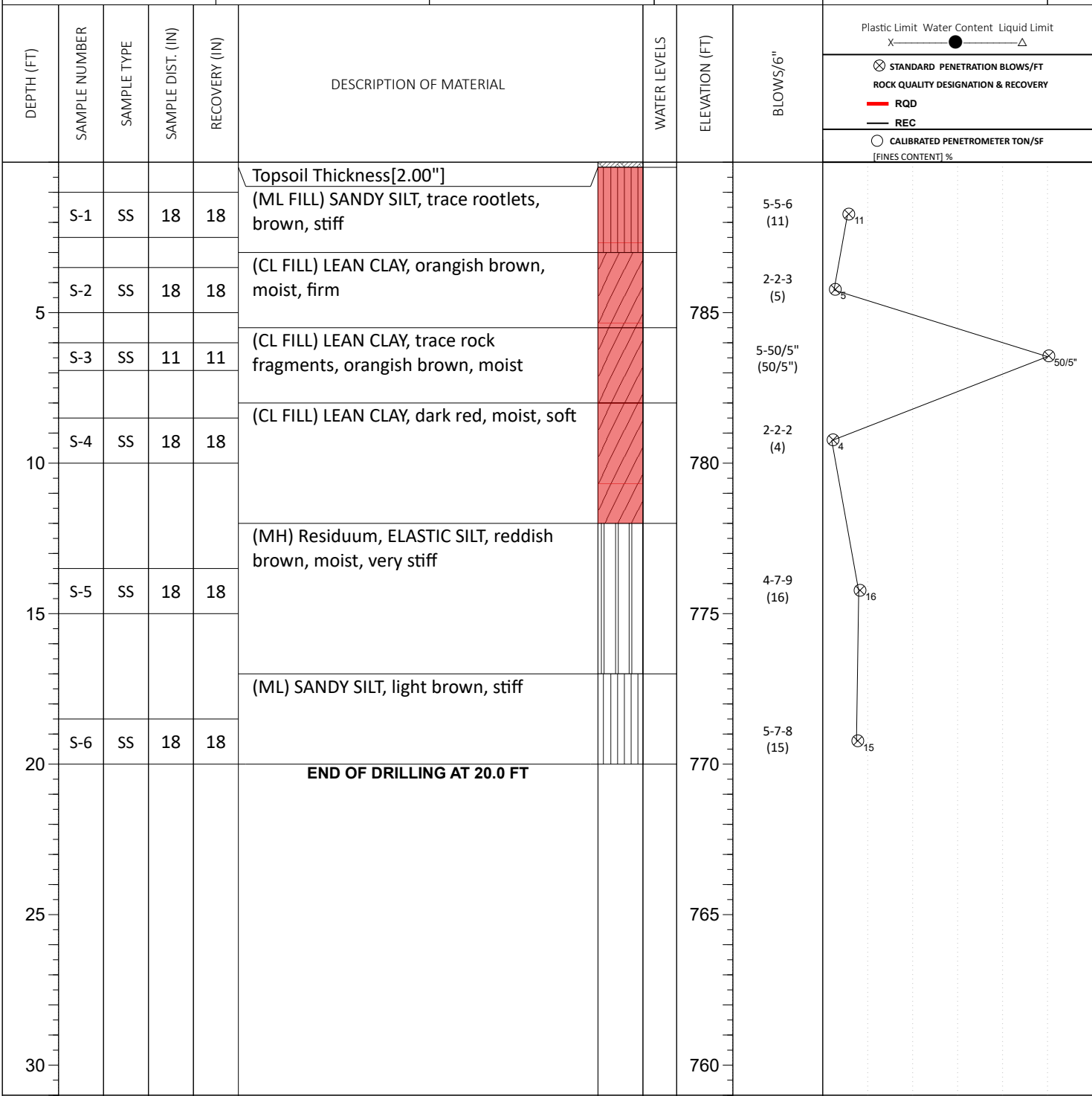
THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL

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<input checked="" type="checkbox"/> WL (Completion) GNE	BORING COMPLETED: Oct 08 2021	HAMMER TYPE: Manual
<input checked="" type="checkbox"/> WL (Seasonal High Water)	EQUIPMENT: ATV Simco 2800	LOGGED BY:
<input checked="" type="checkbox"/> WL (Stabilized)		DRILLING METHOD: 2.25 HSA

GEOTECHNICAL BOREHOLE LOG

SITE LOCATION:
1622 East Garrison Boulevard, Gastonia, North Carolina 28054

NORTHING: 554325.2	EASTING: 1356138.4	STATION:	SURFACE ELEVATION: 790.0	LOSS OF CIRCULATION
				BOTTOM OF CASING



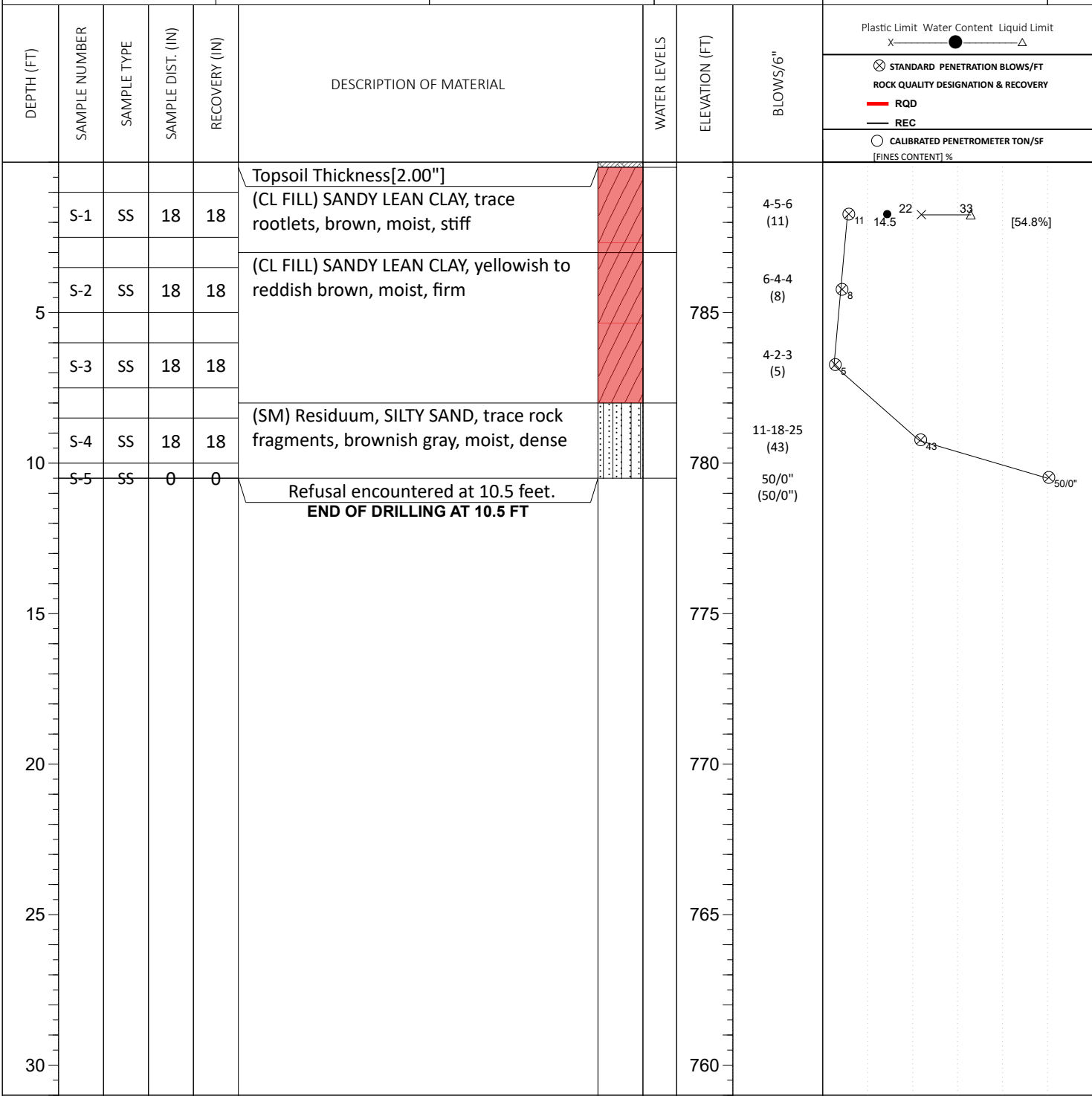
THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL

<input checked="" type="checkbox"/> WL (First Encountered) <input checked="" type="checkbox"/> WL (Completion) GNE <input checked="" type="checkbox"/> WL (Seasonal High Water) <input checked="" type="checkbox"/> WL (Stabilized)	BORING STARTED: Oct 07 2021 BORING COMPLETED: Oct 07 2021 EQUIPMENT: ATV Simco 2800	CAVE IN DEPTH: 16.40 HAMMER TYPE: Manual DRILLING METHOD: 2.25 HSA	
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GEOTECHNICAL BOREHOLE LOG

SITE LOCATION:
1622 East Garrison Boulevard, Gastonia, North Carolina 28054

NORTHING: 554327.6	EASTING: 1356359.5	STATION:	SURFACE ELEVATION: 790.0	LOSS OF CIRCULATION
				BOTTOM OF CASING



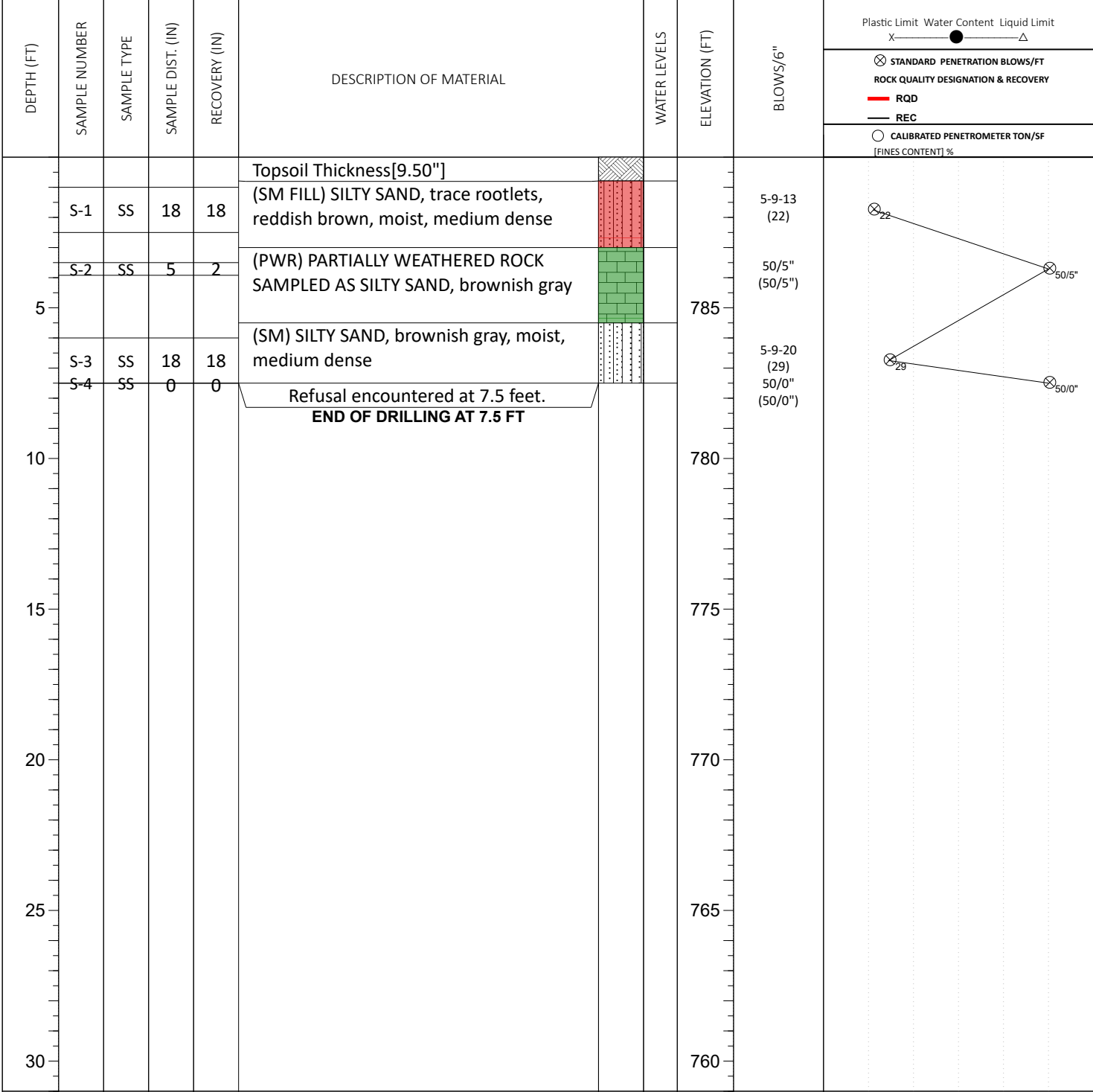
THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL

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<input checked="" type="checkbox"/> WL (Completion) GNE	BORING COMPLETED: Oct 07 2021	HAMMER TYPE: Manual
<input checked="" type="checkbox"/> WL (Seasonal High Water)	EQUIPMENT: ATV Simco 2800	LOGGED BY:
<input checked="" type="checkbox"/> WL (Stabilized)		DRILLING METHOD: 2.25 HSA

GEOTECHNICAL BOREHOLE LOG

SITE LOCATION:
1622 East Garrison Boulevard, Gastonia, North Carolina 28054

NORTHING: 554235.7	EASTING: 1356512.9	STATION:	SURFACE ELEVATION: 790.0	LOSS OF CIRCULATION
				BOTTOM OF CASING



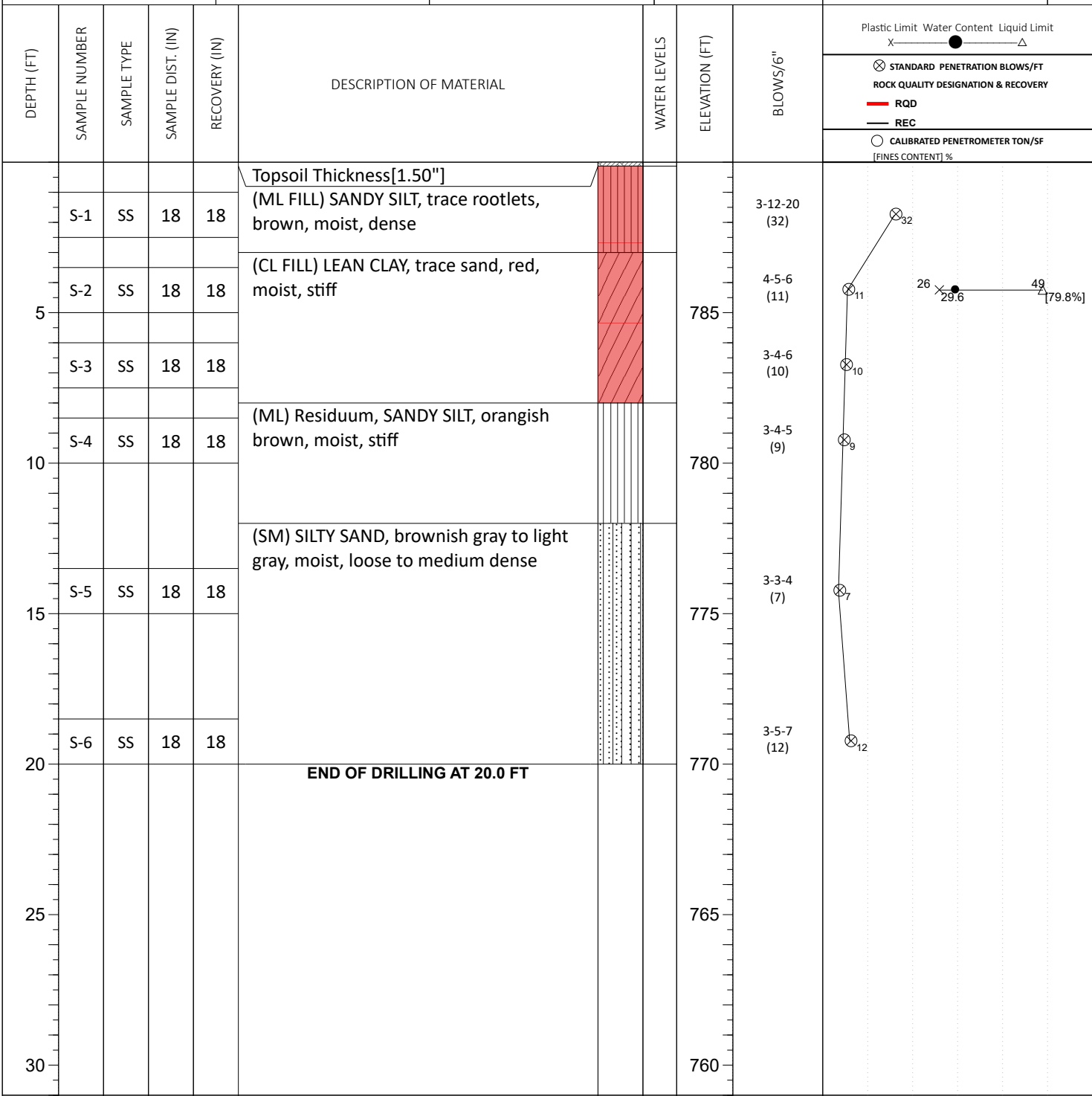
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<input checked="" type="checkbox"/> WL (First Encountered)	BORING STARTED: Oct 08 2021	CAVE IN DEPTH: 7.00
<input checked="" type="checkbox"/> WL (Completion) GNE	BORING COMPLETED: Oct 08 2021	HAMMER TYPE: Manual
<input checked="" type="checkbox"/> WL (Seasonal High Water)	EQUIPMENT: ATV Simco 2800	LOGGED BY:
<input checked="" type="checkbox"/> WL (Stabilized)		DRILLING METHOD: 2.25 HSA

GEOTECHNICAL BOREHOLE LOG

SITE LOCATION:
1622 East Garrison Boulevard, Gastonia, North Carolina 28054

NORTHING: 554137.9	EASTING: 1356132.8	STATION:	SURFACE ELEVATION: 790.0	LOSS OF CIRCULATION
				BOTTOM OF CASING



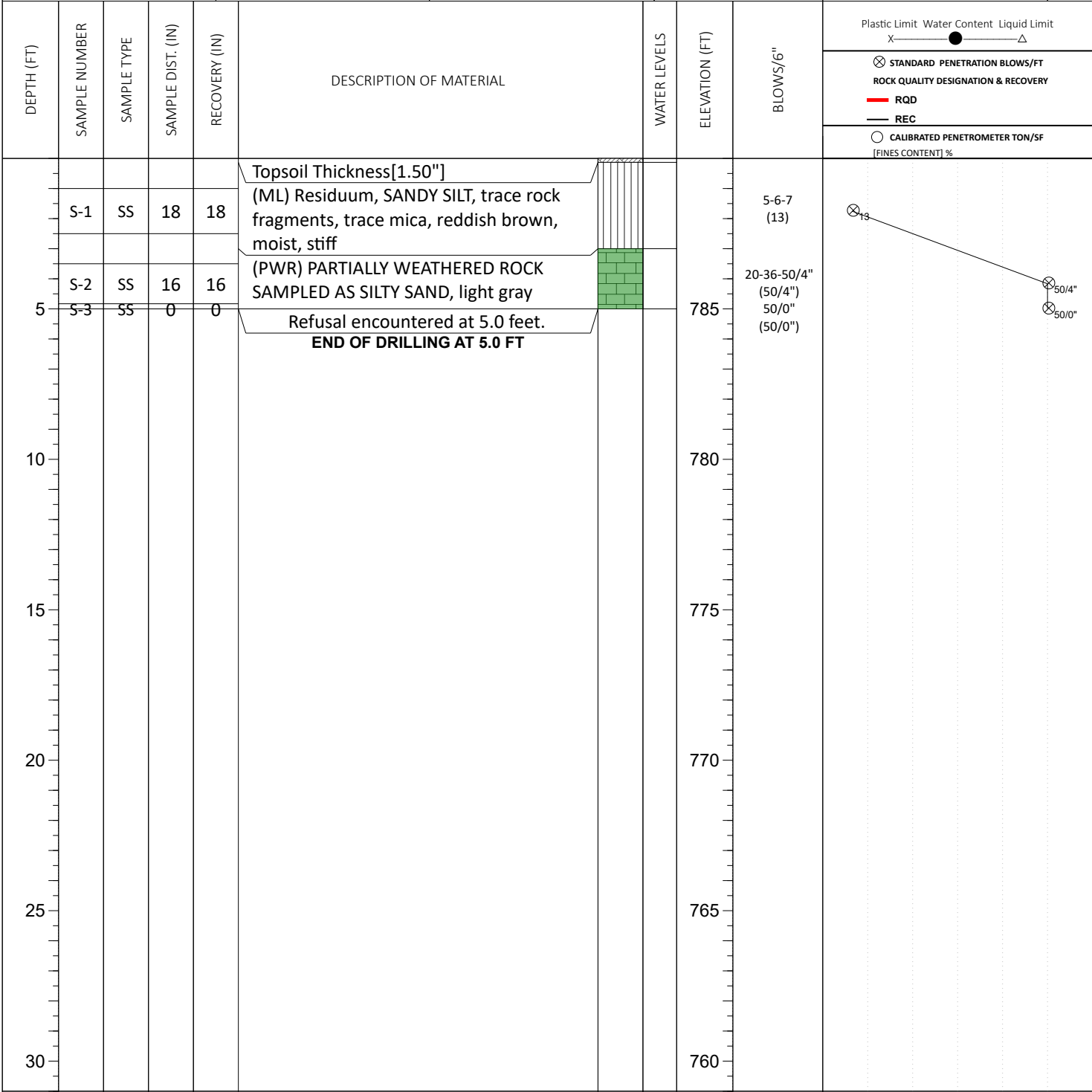
THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL

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<input checked="" type="checkbox"/> WL (Completion) GNE	BORING COMPLETED: Oct 07 2021	HAMMER TYPE: Manual
<input checked="" type="checkbox"/> WL (Seasonal High Water)	EQUIPMENT: ATV Simco 2800	DRILLING METHOD: 2.25 HSA
<input checked="" type="checkbox"/> WL (Stabilized)	LOGGED BY:	

GEOTECHNICAL BOREHOLE LOG

SITE LOCATION:
1622 East Garrison Boulevard, Gastonia, North Carolina 28054

NORTHING: 554137.7	EASTING: 1356325.8	STATION:	SURFACE ELEVATION: 790.0	LOSS OF CIRCULATION
				BOTTOM OF CASING



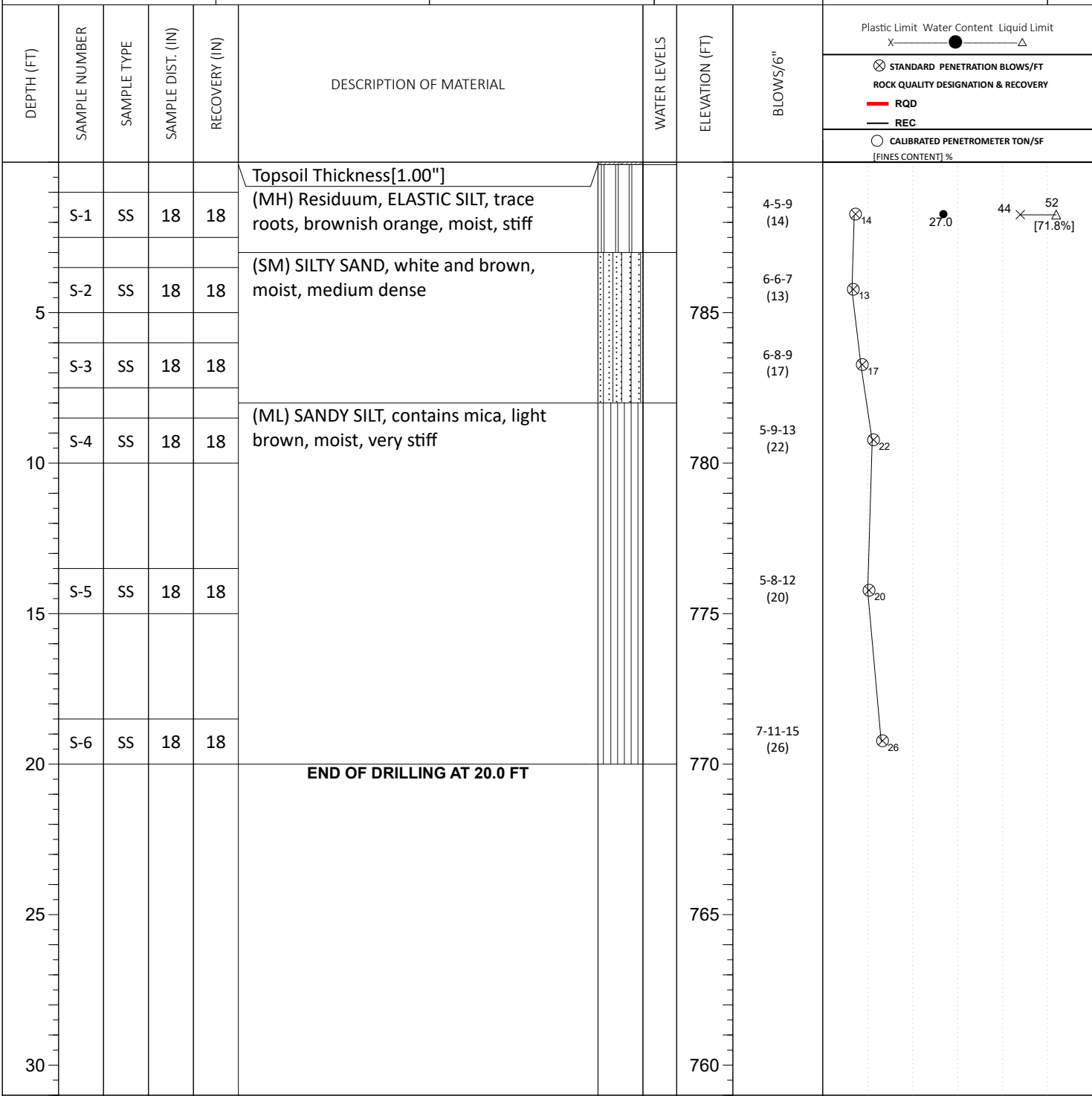
THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL

∇ WL (First Encountered) ▼ WL (Completion) GNE ∇ WL (Seasonal High Water) ∇ WL (Stabilized)	BORING STARTED: Oct 08 2021 BORING COMPLETED: Oct 08 2021 EQUIPMENT: ATV Simco 2800	CAVE IN DEPTH: 4.20 HAMMER TYPE: Manual DRILLING METHOD: 2.25 HSA
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GEOTECHNICAL BOREHOLE LOG

SITE LOCATION:
1622 East Garrison Boulevard, Gastonia, North Carolina 28054

NORTHING: 554176.4	EASTING: 1356452.4	STATION:	SURFACE ELEVATION: 790.0	LOSS OF CIRCULATION
				BOTTOM OF CASING



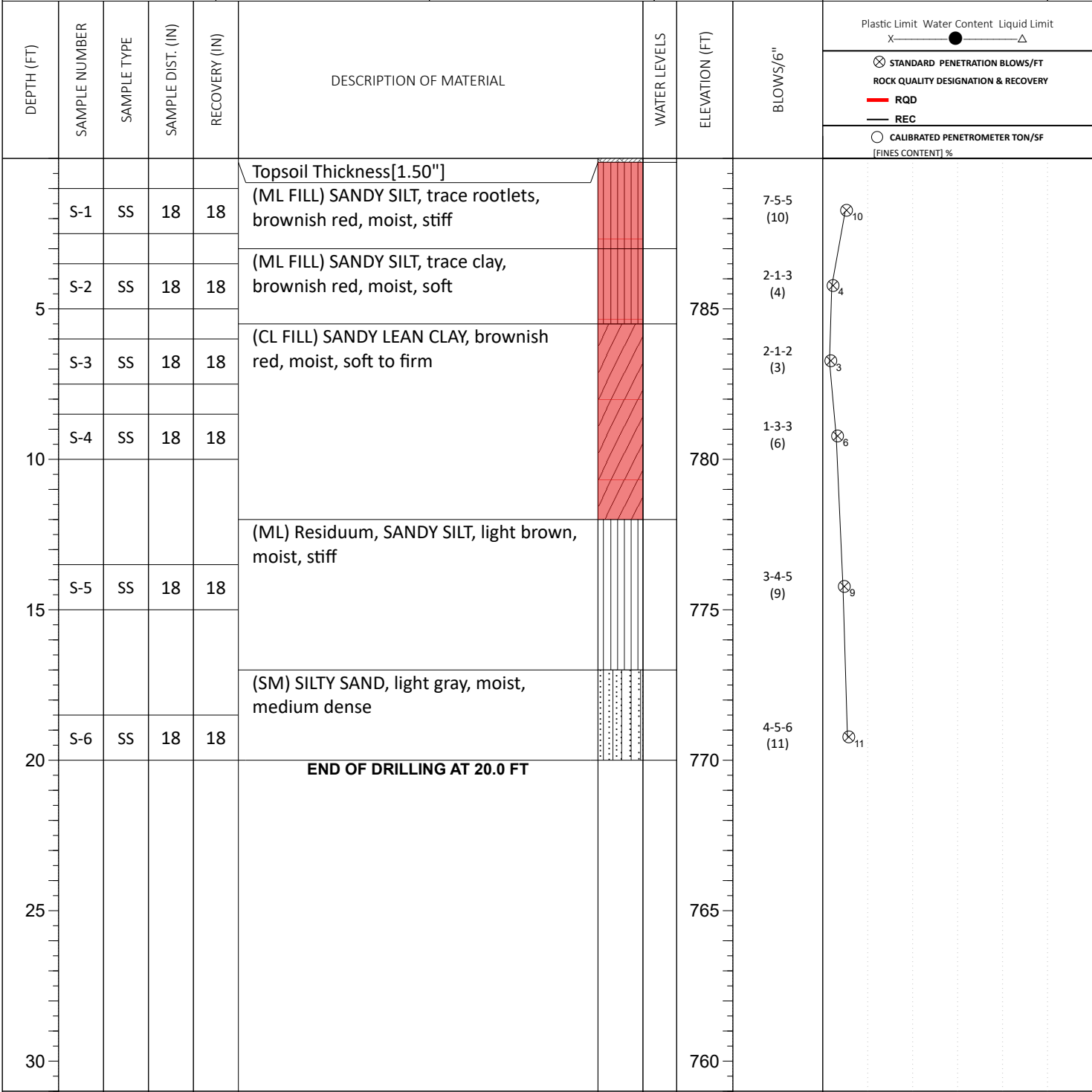
THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL

<input checked="" type="checkbox"/> WL (First Encountered)	BORING STARTED: Oct 08 2021	CAVE IN DEPTH: 16.00
<input checked="" type="checkbox"/> WL (Completion) GNE	BORING COMPLETED: Oct 08 2021	HAMMER TYPE: Manual
<input checked="" type="checkbox"/> WL (Seasonal High Water)	EQUIPMENT: ATV Simco 2800	LOGGED BY:
<input checked="" type="checkbox"/> WL (Stabilized)		DRILLING METHOD: 2.25 HSA

GEOTECHNICAL BOREHOLE LOG

SITE LOCATION:
1622 East Garrison Boulevard, Gastonia, North Carolina 28054

NORTHING: 554311.6	EASTING: 1356027.6	STATION:	SURFACE ELEVATION: 790.0	LOSS OF CIRCULATION
				BOTTOM OF CASING



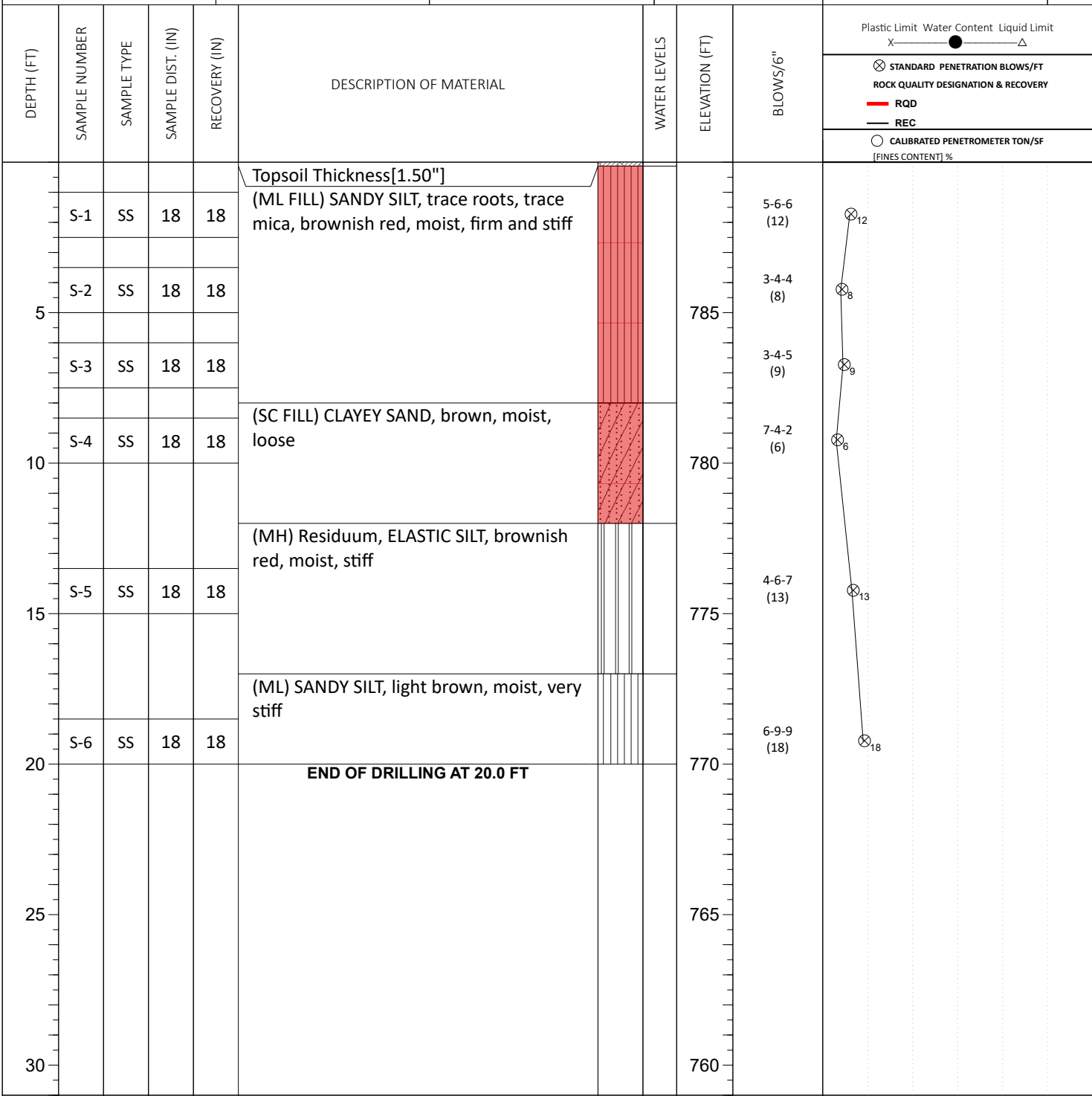
THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL

∇ WL (First Encountered) ▼ WL (Completion) GNE ∇ WL (Seasonal High Water) ∇ WL (Stabilized)	BORING STARTED: Oct 07 2021 BORING COMPLETED: Oct 07 2021 EQUIPMENT: ATV Simco 2800	CAVE IN DEPTH: 15.10 HAMMER TYPE: Manual DRILLING METHOD: 2.25 HSA
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GEOTECHNICAL BOREHOLE LOG

SITE LOCATION:
1622 East Garrison Boulevard, Gastonia, North Carolina 28054

NORTHING: 554145.9	EASTING: 1356058.4	STATION:	SURFACE ELEVATION: 790.0	LOSS OF CIRCULATION
				BOTTOM OF CASING



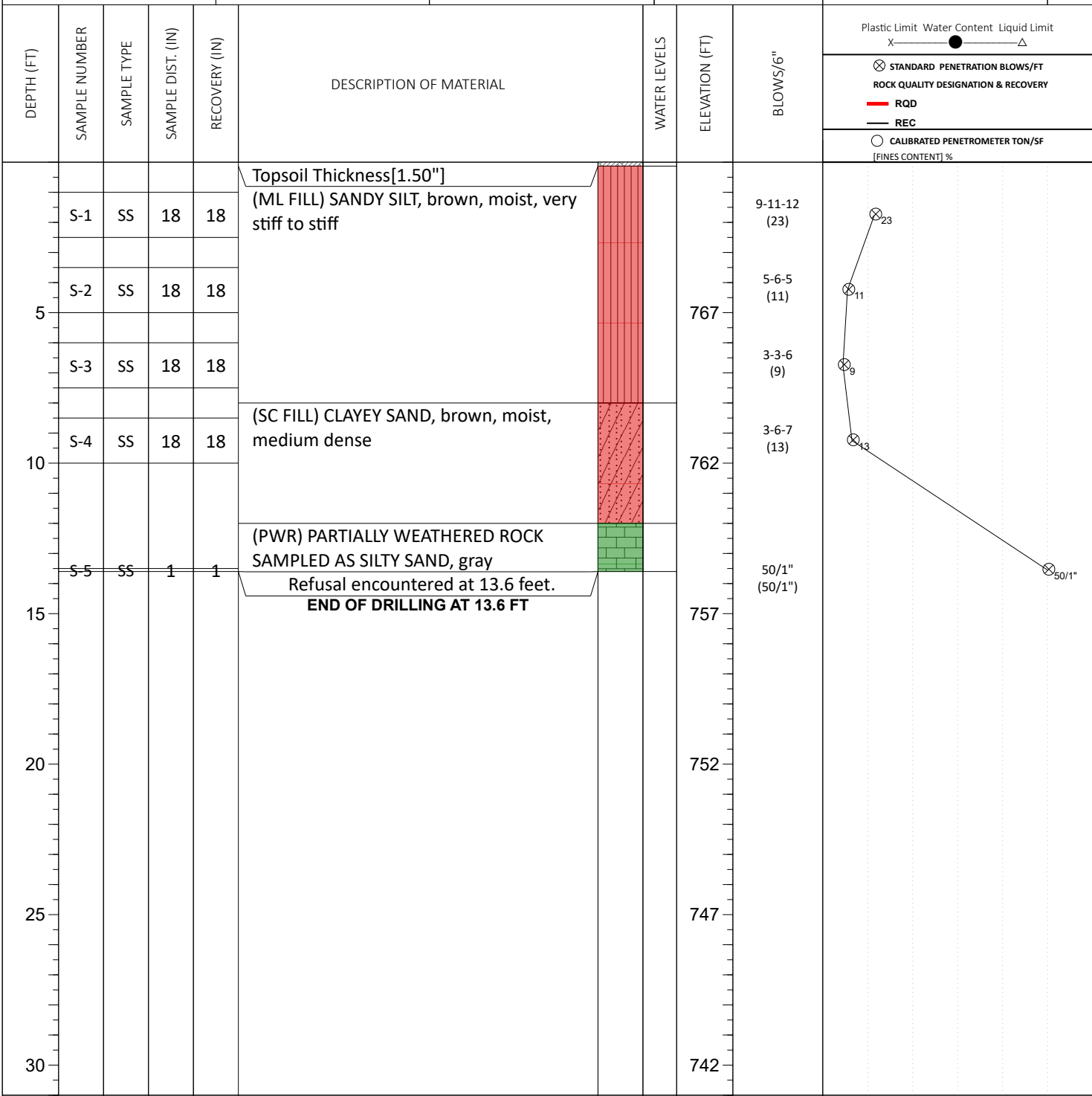
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∇ WL (First Encountered) ▼ WL (Completion) GNE ∇ WL (Seasonal High Water) ∇ WL (Stabilized)	BORING STARTED: Oct 07 2021 BORING COMPLETED: Oct 07 2021 EQUIPMENT: ATV Simco 2800	CAVE IN DEPTH: 15.70 HAMMER TYPE: Manual DRILLING METHOD: 2.25 HSA	
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GEOTECHNICAL BOREHOLE LOG

SITE LOCATION:
1622 East Garrison Boulevard, Gastonia, North Carolina 28054

NORTHING: 554691.3	EASTING: 1356280.9	STATION:	SURFACE ELEVATION: 772.0	LOSS OF CIRCULATION
				BOTTOM OF CASING



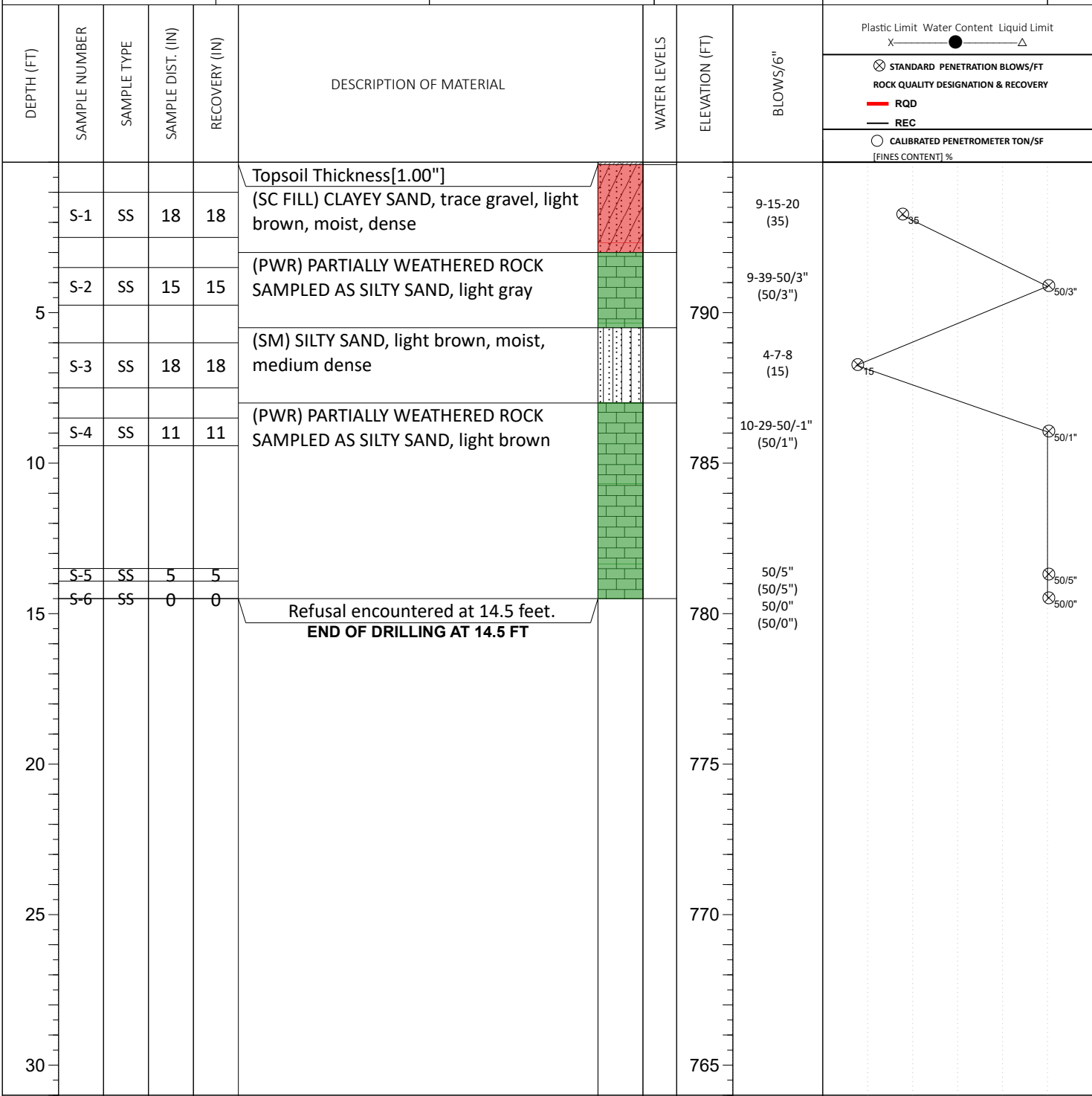
THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL

∇ WL (First Encountered) ▼ WL (Completion) GNE ∇ WL (Seasonal High Water) ∇ WL (Stabilized)	BORING STARTED: Oct 08 2021 BORING COMPLETED: Oct 08 2021 EQUIPMENT: ATV Simco 2800	CAVE IN DEPTH: 11.70 HAMMER TYPE: ATV Simco 2800 DRILLING METHOD: 2.25 HSA
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GEOTECHNICAL BOREHOLE LOG

SITE LOCATION:
1622 East Garrison Boulevard, Gastonia, North Carolina 28054

NORTHING: 554664.2	EASTING: 1356977.1	STATION:	SURFACE ELEVATION: 795.0	LOSS OF CIRCULATION
				BOTTOM OF CASING



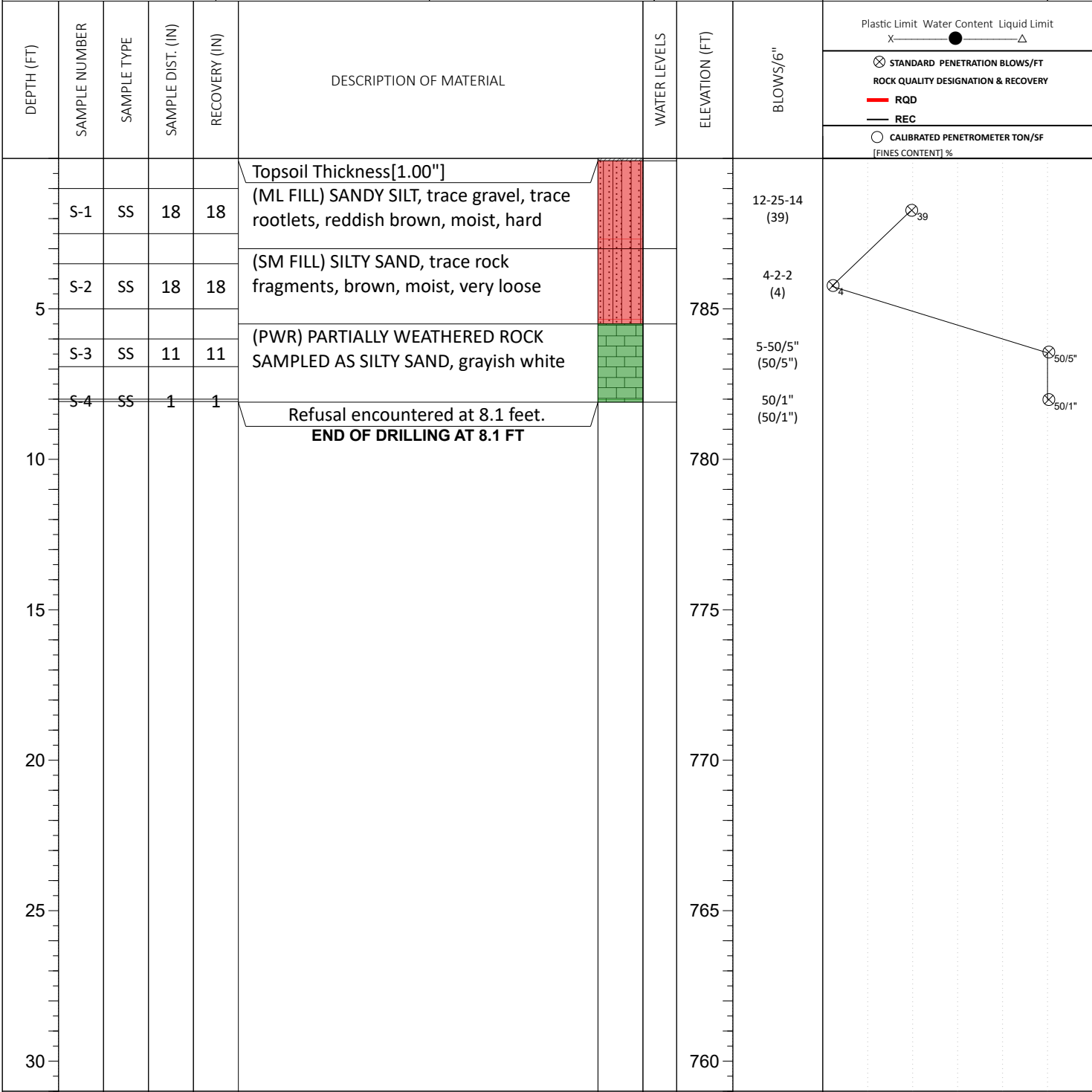
THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL

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<input checked="" type="checkbox"/> WL (Completion) GNE	BORING COMPLETED: Oct 08 2021	HAMMER TYPE: Manual
<input checked="" type="checkbox"/> WL (Seasonal High Water)	EQUIPMENT: ATV Simco 2800	DRILLING METHOD: 2.25 HSA
<input checked="" type="checkbox"/> WL (Stabilized)	LOGGED BY:	

GEOTECHNICAL BOREHOLE LOG

SITE LOCATION:
1622 East Garrison Boulevard, Gastonia, North Carolina 28054

NORTHING: 554427.0	EASTING: 1356478.6	STATION:	SURFACE ELEVATION: 790.0	LOSS OF CIRCULATION
				BOTTOM OF CASING



THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL

∇ WL (First Encountered) ▼ WL (Completion) GNE ∇ WL (Seasonal High Water) ∇ WL (Stabilized)	BORING STARTED: Oct 08 2021 BORING COMPLETED: Oct 08 2021 EQUIPMENT: ATV Simco 2800	CAVE IN DEPTH: 6.10 HAMMER TYPE: Manual DRILLING METHOD: 2.25 HSA
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GEOTECHNICAL BOREHOLE LOG

SITE LOCATION:
1622 East Garrison Boulevard, Gastonia, North Carolina 28054

NORTHING: 554620.5	EASTING: 1356602.2	STATION:	SURFACE ELEVATION: 786.0	LOSS OF CIRCULATION
				BOTTOM OF CASING

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6"	Plastic Limit Water Content Liquid Limit X ● ——— Δ		
									⊗ STANDARD PENETRATION BLOWS/FT	ROCK QUALITY DESIGNATION & RECOVERY	○ CALIBRATED PENETROMETER TON/SF
5	S-1	SS	18	18	(CL) Residuum, SANDY LEAN CLAY, brownish red, moist, hard		781	10-15-20 (35)	16.8	27	48
	S-2	SS	18	18				7-13-18 (31)			[60.9%]
	S-3	SS	11	11	(PWR) PARTIALLY WEATHERED ROCK SAMPLED AS CLAYEY SAND, yellowish brown			9-50/5" (50/5")			
	S-4	SS	3	3	(PWR) PARTIALLY WEATHERED ROCK SAMPLED AS SILTY SAND, grayish white			50/3" (50/3")			
10	S-5	SS	0	0	Refusal encountered at 9.5 feet. END OF DRILLING AT 9.5 FT		776	50/0" (50/0")			
15							771				
20							766				
25							761				
30							756				

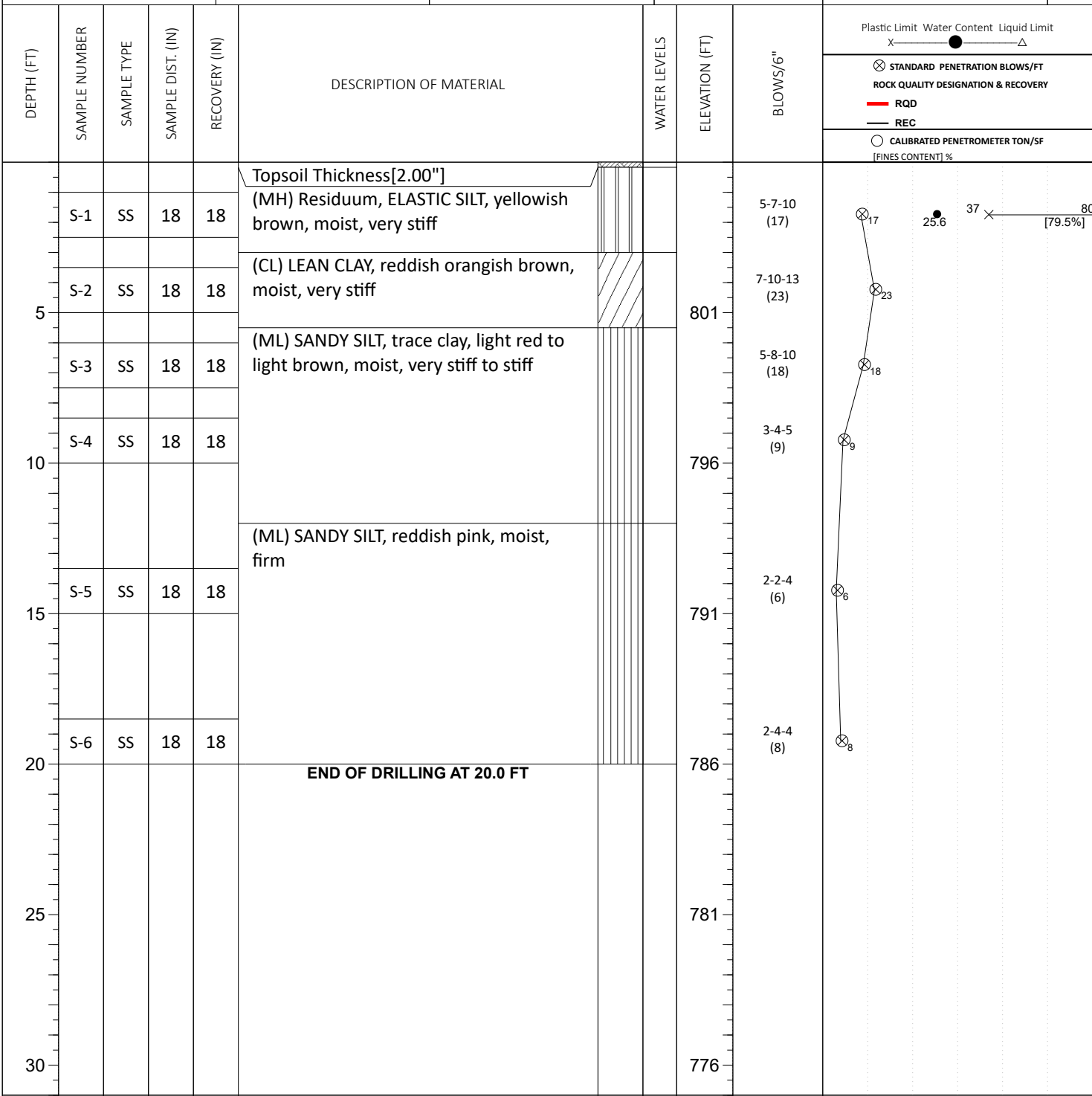
THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL

<input checked="" type="checkbox"/> WL (First Encountered) <input checked="" type="checkbox"/> WL (Completion) GNE <input checked="" type="checkbox"/> WL (Seasonal High Water) <input checked="" type="checkbox"/> WL (Stabilized)	BORING STARTED: Oct 08 2021 BORING COMPLETED: Oct 08 2021 EQUIPMENT: ATV Simco 2800	CAVE IN DEPTH: 8.10 HAMMER TYPE: Manual DRILLING METHOD: 2.25 HSA	LOGGED BY:
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GEOTECHNICAL BOREHOLE LOG

SITE LOCATION:
1622 East Garrison Boulevard, Gastonia, North Carolina 28054

NORTHING: 554178.4	EASTING: 1357097.2	STATION:	SURFACE ELEVATION: 806.0	LOSS OF CIRCULATION
				BOTTOM OF CASING



THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL

∇ WL (First Encountered) ▼ WL (Completion) GNE ∇ WL (Seasonal High Water) ∇ WL (Stabilized)	BORING STARTED: Oct 08 2021 BORING COMPLETED: Oct 08 2021 EQUIPMENT: ATV Simco 2800	CAVE IN DEPTH: 17.00 HAMMER TYPE: Manual DRILLING METHOD: 2.25 HSA
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GEOTECHNICAL BOREHOLE LOG

APPENDIX C – Laboratory Testing

Laboratory Testing Summary

Laboratory Testing Summary

Sample Location	Sample Number	Depth (feet)	^MC (%)	Soil Type	Atterberg Limits			**Percent Passing No. 200 Sieve	Moisture - Density		CBR (%)		#Organic Content (%)
					LL	PL	PI		<Maximum Density (pcf)	<Optimum Moisture (%)	0.1 in.	0.2 in.	
B-04	S-1	1-2.5	14.5	CL	33	22	11	54.8					
B-06	S-2	3.5-5	29.6	CL	49	26	23	79.8					
B-08	S-1	1-2.5	27	MH	52	44	8	71.8					
B-14	S-1	1-2.5	16.8	CL	48	27	21	60.9					
B-15	S-1	1-2.5	25.6	MH	80	37	43	79.5					

Notes: See test reports for test method, ^ASTM D2216-19, *ASTM D2488, **ASTM D1140-17, #ASTM D2974-20e1 < See test report for D4718 corrected values

Definitions: MC: Moisture Content, Soil Type: USCS (Unified Soil Classification System), LL: Liquid Limit, PL: Plastic Limit, PI: Plasticity Index, CBR: California Bearing Ratio, OC: Organic Content

Project: Garrison Tract
 Client: Gaston County Schools

Project No.: 08:14851
 Date Reported: 11/4/2021



Office / Lab
 ECS Southeast LLP - Charlotte

Address
 1812 Center Park Drive
 Suite D
 Charlotte, NC 28217

Office Number / Fax
 (704)525-5152
 (704)357-0023

Important Information about This

Geotechnical-Engineering Report

Subsurface problems are a principal cause of construction delays, cost overruns, claims, and disputes.

While you cannot eliminate all such risks, you can manage them. The following information is provided to help.

The Geoprofessional Business Association (GBA) has prepared this advisory to help you – assumedly a client representative – interpret and apply this geotechnical-engineering report as effectively as possible. In that way, clients can benefit from a lowered exposure to the subsurface problems that, for decades, have been a principal cause of construction delays, cost overruns, claims, and disputes. If you have questions or want more information about any of the issues discussed below, contact your GBA-member geotechnical engineer. Active involvement in the Geoprofessional Business Association exposes geotechnical engineers to a wide array of risk-confrontation techniques that can be of genuine benefit for everyone involved with a construction project.

Geotechnical-Engineering Services Are Performed for Specific Purposes, Persons, and Projects

Geotechnical engineers structure their services to meet the specific needs of their clients. A geotechnical-engineering study conducted for a given civil engineer will not likely meet the needs of a civil-works constructor or even a different civil engineer. Because each geotechnical-engineering study is unique, each geotechnical-engineering report is unique, prepared *solely* for the client. *Those who rely on a geotechnical-engineering report prepared for a different client can be seriously misled.* No one except authorized client representatives should rely on this geotechnical-engineering report without first conferring with the geotechnical engineer who prepared it. *And no one – not even you – should apply this report for any purpose or project except the one originally contemplated.*

Read this Report in Full

Costly problems have occurred because those relying on a geotechnical-engineering report did not read it *in its entirety*. Do not rely on an executive summary. Do not read selected elements only. *Read this report in full.*

You Need to Inform Your Geotechnical Engineer about Change

Your geotechnical engineer considered unique, project-specific factors when designing the study behind this report and developing the confirmation-dependent recommendations the report conveys. A few typical factors include:

- the client's goals, objectives, budget, schedule, and risk-management preferences;
- the general nature of the structure involved, its size, configuration, and performance criteria;
- the structure's location and orientation on the site; and
- other planned or existing site improvements, such as retaining walls, access roads, parking lots, and underground utilities.

Typical changes that could erode the reliability of this report include those that affect:

- the site's size or shape;
- the function of the proposed structure, as when it's changed from a parking garage to an office building, or from a light-industrial plant to a refrigerated warehouse;
- the elevation, configuration, location, orientation, or weight of the proposed structure;
- the composition of the design team; or
- project ownership.

As a general rule, *always* inform your geotechnical engineer of project changes – even minor ones – and request an assessment of their impact. *The geotechnical engineer who prepared this report cannot accept responsibility or liability for problems that arise because the geotechnical engineer was not informed about developments the engineer otherwise would have considered.*

This Report May Not Be Reliable

Do not rely on this report if your geotechnical engineer prepared it:

- for a different client;
- for a different project;
- for a different site (that may or may not include all or a portion of the original site); or
- before important events occurred at the site or adjacent to it; e.g., man-made events like construction or environmental remediation, or natural events like floods, droughts, earthquakes, or groundwater fluctuations.

Note, too, that it could be unwise to rely on a geotechnical-engineering report whose reliability may have been affected by the passage of time, because of factors like changed subsurface conditions; new or modified codes, standards, or regulations; or new techniques or tools. *If your geotechnical engineer has not indicated an "apply-by" date on the report, ask what it should be, and, in general, if you are the least bit uncertain about the continued reliability of this report, contact your geotechnical engineer before applying it.* A minor amount of additional testing or analysis – if any is required at all – could prevent major problems.

Most of the "Findings" Related in This Report Are Professional Opinions

Before construction begins, geotechnical engineers explore a site's subsurface through various sampling and testing procedures. *Geotechnical engineers can observe actual subsurface conditions only at those specific locations where sampling and testing were performed.* The data derived from that sampling and testing were reviewed by your geotechnical engineer, who then applied professional judgment to form opinions about subsurface conditions throughout the site. Actual sitewide-subsurface conditions may differ – maybe significantly – from those indicated in this report. Confront that risk by retaining your geotechnical engineer to serve on the design team from project start to project finish, so the individual can provide informed guidance quickly, whenever needed.

This Report's Recommendations Are Confirmation-Dependent

The recommendations included in this report – including any options or alternatives – are confirmation-dependent. In other words, *they are not final*, because the geotechnical engineer who developed them relied heavily on judgment and opinion to do so. Your geotechnical engineer can finalize the recommendations *only after observing actual subsurface conditions* revealed during construction. If through observation your geotechnical engineer confirms that the conditions assumed to exist actually do exist, the recommendations can be relied upon, assuming no other changes have occurred. *The geotechnical engineer who prepared this report cannot assume responsibility or liability for confirmation-dependent recommendations if you fail to retain that engineer to perform construction observation.*

This Report Could Be Misinterpreted

Other design professionals' misinterpretation of geotechnical-engineering reports has resulted in costly problems. Confront that risk by having your geotechnical engineer serve as a full-time member of the design team, to:

- confer with other design-team members,
- help develop specifications,
- review pertinent elements of other design professionals' plans and specifications, and
- be on hand quickly whenever geotechnical-engineering guidance is needed.

You should also confront the risk of constructors misinterpreting this report. Do so by retaining your geotechnical engineer to participate in prebid and preconstruction conferences and to perform construction observation.

Give Constructors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can shift unanticipated-subsurface-conditions liability to constructors by limiting the information they provide for bid preparation. To help prevent the costly, contentious problems this practice has caused, include the complete geotechnical-engineering report, along with any attachments or appendices, with your contract documents, *but be certain to note conspicuously that you've included the material for informational purposes only*. To avoid misunderstanding, you may also want to note that "informational purposes" means constructors have no right to rely on the interpretations, opinions, conclusions, or recommendations in the report, but they may rely on the factual data relative to the specific times, locations, and depths/elevations referenced. Be certain that constructors know they may learn about specific project requirements, including options selected from the report, *only* from the design drawings and specifications. Remind constructors that they may

perform their own studies if they want to, and *be sure to allow enough time* to permit them to do so. Only then might you be in a position to give constructors the information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions. Conducting prebid and preconstruction conferences can also be valuable in this respect.

Read Responsibility Provisions Closely

Some client representatives, design professionals, and constructors do not realize that geotechnical engineering is far less exact than other engineering disciplines. That lack of understanding has nurtured unrealistic expectations that have resulted in disappointments, delays, cost overruns, claims, and disputes. To confront that risk, geotechnical engineers commonly include explanatory provisions in their reports. Sometimes labeled "limitations," many of these provisions indicate where geotechnical engineers' responsibilities begin and end, to help others recognize their own responsibilities and risks. *Read these provisions closely*. Ask questions. Your geotechnical engineer should respond fully and frankly.

Geoenvironmental Concerns Are Not Covered

The personnel, equipment, and techniques used to perform an environmental study – e.g., a "phase-one" or "phase-two" environmental site assessment – differ significantly from those used to perform a geotechnical-engineering study. For that reason, a geotechnical-engineering report does not usually relate any environmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated subsurface environmental problems have led to project failures*. If you have not yet obtained your own environmental information, ask your geotechnical consultant for risk-management guidance. As a general rule, *do not rely on an environmental report prepared for a different client, site, or project, or that is more than six months old*.

Obtain Professional Assistance to Deal with Moisture Infiltration and Mold

While your geotechnical engineer may have addressed groundwater, water infiltration, or similar issues in this report, none of the engineer's services were designed, conducted, or intended to prevent uncontrolled migration of moisture – including water vapor – from the soil through building slabs and walls and into the building interior, where it can cause mold growth and material-performance deficiencies. Accordingly, *proper implementation of the geotechnical engineer's recommendations will not of itself be sufficient to prevent moisture infiltration*. Confront the risk of moisture infiltration by including building-envelope or mold specialists on the design team. *Geotechnical engineers are not building-envelope or mold specialists*.



Telephone: 301/565-2733

e-mail: info@geoprofessional.org www.geoprofessional.org

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DOCUMENT 004113 – BID FORM - STIPULATED SUM

1.1 BID INFORMATION

- A. Date: _____
- B. Bidder: _____.
- C. Bidder’s Contractor License Number: _____
- D. Bidder: _____
 (Name of firm or company submitting Bid)

 (Address of firm or company submitting Bid)

 (City, State, Zip Code)

 (Contact Person, Telephone Number, Fax Number)
- E. Project Name: Gaston County Schools - Grier Middle School.
 - 1. Project Location: 1622 Garrison Boulevard, Gastonia, NC 28054.
- F. Owner: Gaston County Schools, 943 Osceola Street, Gastonia, NC 28053.
 - 1. Owner Contact: Paul Nault.
- G. Architect: LS3P ASSOCIATES LTD, 227 West Trade Street, Suite 700, Charlotte, NC 28202.
- H. Architect’s Project Number: 9201-218240.

1.2 CERTIFICATIONS AND BASE BID

- A. Base Bid, Single-Prime (All Trades) Contract: The undersigned Bidder, having carefully examined Procurement and Contracting Requirements, Conditions of the Contract, Drawings, Specifications, and subsequent Addenda, as prepared by LS3P and LS3P's consultants, and being familiar with all conditions and requirements of Work, hereby agrees to furnish all material, labor, equipment, and services necessary to complete construction of above-named Project, per requirements of Procurement and Contracting Documents, for stipulated Sum of:
 _____ Dollars (\$ _____).
- 1. The above amount may be modified by amounts indicated by the Bidder on the attached Document 004322 – Unit Prices Form and Document 004323 – Alternates Form.

Bid Set

- B. Bidder, in submitting this Bid, understands that Owner reserves the right to reject any or all Bids, to waive any informality or irregularity in any Bid received.

1.3 BID GUARANTEE

- A. The undersigned Bidder agrees to execute a contract for this Work in the above amount and to furnish surety as specified within 10 days after a written Notice of Award, if offered within 90 days after receipt of Bids, and on failure to do so agrees to forfeit to Owner the attached cashier's check, certified check, U.S. money order, or bid bond, as liquidated damages for such failure, in the following amount constituting five percent (5%) of the Base Bid amount above:

_____ Dollars (\$_____).

- B. In the event Owner does not offer Notice of Award within the time limits stated above, Owner will return to the undersigned the cashier's check, certified check, U.S. money order, or bid bond.

1.4 SUBCONTRACTORS AND SUPPLIERS

- A. The following companies shall execute subcontracts for the portions of the Work indicated:

	<u>Name of Company</u>	<u>License No.</u>
Masonry Subcontractor:	_____	_____
Roofing Subcontractor:	_____	_____
Plumbing Subcontractor:	_____	_____
HVAC Subcontractor:	_____	_____
Electrical Subcontractor:	_____	_____

- B. The Contractor shall act as Project Expediter.

1.5 TIME OF COMPLETION

- A. Work of this Contract will commence upon execution of Contract, and will be Substantially Complete no later than the following dates:
- B. The undersigned Bidder proposes and agrees hereby to commence Work of Contract Documents on the date specified in a written Notice to Proceed to be issued by Architect, and shall fully complete Work by end of June 2025 for Phase 1 – construction of the new school building, and end of November 2026 for Phase 2 – demolition of existing buildings and Phase 3 – new athletic fields

Bid Set

1.6 ACKNOWLEDGEMENT OF ADDENDA

A. The undersigned Bidder acknowledges receipt of and use of the following Addenda in the preparation of this Bid:

- 1. Addendum No. 1, dated _____.
- 2. Addendum No. 2, dated _____.
- 3. Addendum No. 3, dated _____.
- 4. Addendum No. 4, dated _____.

1.7 BID FORM SUPPLEMENTS

A. The following supplements are a part of this Bid Form and are attached hereto.

- 1. Document 004321 – Unit Prices Form.
- 2. Document 004322 – Allowances Form.
- 3. Document 004323 - Alternates Form.

1.8 CONTRACTOR'S LICENSE

A. The undersigned further states that it is a duly licensed contractor, for type of work proposed, in the State of North Carolina, and that all fees, permits, etc., pursuant to submitting this proposal have been paid in full.

Bid Set

1.9 SUBMISSION OF BID

Respectfully submitted this ____ day of _____, 2023.

Submitted By: _____
(Name of bidding firm or corporation)

Authorized Signature: _____
(Handwritten signature)

Signed By: _____
(Type or print name)

Title: _____
(Owner/Partner/President/Vice President)

Witness By: _____
(Handwritten signature)

Attest: _____
(Handwritten signature)

By: _____
(Type or print name)

Title: _____
(Corporate Secretary or Assistant Secretary)

Street Address: _____

City, State, Zip: _____

Phone: _____

License No.: _____

Federal ID No.: _____ (Affix Corporate Seal Here)

END OF DOCUMENT 004113

DOCUMENT 004321 – ALLOWANCE FORM

1.1 BID INFORMATION

- A. Bidder: _____
 (Name of firm or company submitting Bid)

 (Address of firm or company submitting Bid)

 (City, State, Zip Code)

 (Contact Person, Telephone Number, Fax Number)
- B. Project Name: Gaston County Schools - Grier Middle School.
- C. Project Location: 1622 Garrison Boulevard, Gastonia, NC 28054.
- D. Owner: Gaston County Schools, 943 Osceola Street, Gastonia, NC 28053.
 - 1. Owner Contact: Paul Nault.
- E. Architect: LS3P Associates, Ltd., 227 West Trade Street, Suite 700, Charlotte, NC 28202.
- F. Architect’s Project Number: 9201-218240.

1.2 BID FORM SUPPLEMENT

- A. This form is required to be attached to the Bid Form.
- B. The undersigned Bidder certifies that Base Bid submission to which this Bid Supplement is attached includes those allowances described in the Contract Documents and scheduled in Section 012100 –Allowances.

1.3 SUBMISSION OF BID SUPPLEMENT

Respectfully submitted this ____ day of _____

Submitted By: _____
(Name of bidding firm or corporation)

Authorized Signature: _____
(Handwritten signature)

Signed By: _____
(Type or print name)

Title: _____
(Owner/Partner/President/Vice President)

END OF DOCUMENT 004321

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DOCUMENT 004322 – UNIT PRICES FORM

1.1 BID INFORMATION

- A. Bidder: _____
 (Name of firm or company submitting Bid)

 (Address of firm or company submitting Bid)

 (City, State, Zip Code)

 (Contact Person, Telephone Number, Fax Number)
- B. Project Name: Gaston County Schools – Grier Middle School.
 - 1. Project Location: 1622 Garrison Boulevard, Gastonia, NC 28054.
- C. Owner: Gaston County Schools, 943 Osceola Street, Gastonia, NC 28053.
 - 1. Owner Contact: Mr. Paul Nault.
- D. Architect: LS3P Associates, Ltd., 227 West Trade Street, Suite 700, Charlotte, NC 28202.
- E. Architect’s Project Number: 9201-218240.

1.2 BID FORM SUPPLEMENT

- A. This form is required to be attached to the Bid Form.
- B. Undersigned Bidder proposes amounts below be added to or deducted from Contract Sum on performance and measurement of individual items of Work.
- C. If unit price does not affect Work of this Contract, Bidder shall indicate "NOT APPLICABLE."

1.3 UNIT PRICES

- A. Unit-Price No. 1: General Mass Rock Excavation and Disposal Off-Site.
 - 1. _____ dollars (\$ _____) per unit.
- B. Unit-Price No. 2: Utility Trench Rock Excavation and Disposal Off-Site.
 - 1. _____ dollars (\$ _____) per unit.
- C. Unit-Price No. 3: Structural Fill/Backfill (Imported) In-Place On-Site.
 - 1. _____ dollars (\$ _____) per unit.

D. Unit-Price No. 4: Unsuitable Soil Removal and Disposal Off-Site.

1. _____ dollars (\$ _____) per unit.

E. Unit-Price No. 5: No. 57 Washed Crushed Stone for Foundation Bridging of Alluvial Soils.

1. _____ dollars (\$ _____) per unit.

1.4 SUBMISSION OF BID SUPPLEMENT

Respectfully submitted this ____ day of _____

Submitted By: _____
(Name of bidding firm or corporation)

Authorized Signature: _____
(Handwritten signature)

Signed By: _____
(Type or print name)

Title: _____
(Owner/Partner/President/Vice President)

END OF DOCUMENT 004322

DOCUMENT 004323 – ALTERNATES FORM

1.1 BID INFORMATION

- A. Bidder: _____
 (Name of firm or company submitting Bid)

 (Address of firm or company submitting Bid)

 (City, State, Zip Code)

 (Contact Person, Telephone Number, Fax Number)
- B. Project Name: Gaston County Schools – Grier Middle School.
 - 1. Project Location: 1622 Garrison Boulevard, Gastonia, NC 28054.
- C. Owner: Gaston County Schools, 943 Osceola Street, Gastonia, NC 28053.
 - 1. Owner Contact: Mr. Paul Nault.
- D. Architect: LS3P Associates, Ltd., 227 West Trade Street, Suite 700, Charlotte, NC 28202.
- E. Architect’s Project Number: 9201-218240.

1.2 BID FORM SUPPLEMENT

- A. This form is required to be attached to the Bid Form.

1.3 DESCRIPTION

- A. Undersigned Bidder proposes the amount below be added to or deducted from the Base Bid if particular alternates are accepted by Owner. Amounts listed for each alternate include costs of related coordination, modification, or adjustment.
 - 1. If the alternate does not affect the Contract Sum, the Bidder shall indicate "NO CHANGE."
 - 2. If the alternate does not affect the Work of this Contract, the Bidder shall indicate "NOT APPLICABLE."
- B. Bidder shall be responsible for determining from the Contract Documents the effects of each alternate on the Contract Time and the Contract Sum.
- C. Owner reserves the right to accept or reject any alternate, in any order, and to award or amend the Contract accordingly within 60 days of the Notice of Award unless otherwise indicated in the Contract Documents.

D. Acceptance or non-acceptance of any alternates by the Owner shall have no effect on the Contract Time unless the "Schedule of Alternates" Article below provides a formatted space for the adjustment of the Contract Time.

1.4 SCHEDULE OF ALTERNATES

A. Refer to Section 012300 for complete description of Alternates.

- 1. Alternate No. 1. Add ___ Deduct ___ No Change ___ Not Applicable ____.
_____ Dollars (\$ _____).
a. Add ___ Deduct ___ calendar days to adjust Contract Time for this alternate.
- 2. Alternate No. 2. Add ___ Deduct ___ No Change ___ Not Applicable ____.
_____ Dollars (\$ _____).
a. Add ___ Deduct ___ calendar days to adjust Contract Time for this alternate.
- 3. Alternate No. 3. Add ___ Deduct ___ No Change ___ Not Applicable ____.
_____ Dollars (\$ _____).
a. Add ___ Deduct ___ calendar days to adjust Contract Time for this alternate.
- 4. Alternate No. 4. Add ___ Deduct ___ No Change ___ Not Applicable ____.
_____ Dollars (\$ _____).
a. Add ___ Deduct ___ calendar days to adjust Contract Time for this alternate.
- 5. Alternate No. 5. Add ___ Deduct ___ No Change ___ Not Applicable ____.
_____ Dollars (\$ _____).
a. Add ___ Deduct ___ calendar days to adjust Contract Time for this alternate.
- 6. Alternate No. 6. Add ___ Deduct ___ No Change ___ Not Applicable ____.
_____ Dollars (\$ _____).
a. Add ___ Deduct ___ calendar days to adjust Contract Time for this alternate.
- 7. Alternate No. 7. Add ___ Deduct ___ No Change ___ Not Applicable ____.
_____ Dollars (\$ _____).
a. Add ___ Deduct ___ calendar days to adjust Contract Time for this alternate.
- 8. Alternate No. 8. Add ___ Deduct ___ No Change ___ Not Applicable ____.
_____ Dollars (\$ _____).
a. Add ___ Deduct ___ calendar days to adjust Contract Time for this alternate.

1.5 SUBMISSION OF BID SUPPLEMENT

Respectfully submitted this ____ day of _____

Submitted By: _____
(Name of bidding firm or corporation)

Authorized Signature: _____
(Handwritten signature)

Signed By: _____
(Type or print name)

Title: _____
(Owner/Partner/President/Vice President)

END OF DOCUMENT 004323

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DOCUMENT 006000 – PROJECT FORMS

PART 1 - GENERAL

1.1 FORM OF AGREEMENT AND GENERAL CONDITIONS

- A. The following form of Owner/Contractor Agreement and form of the General Conditions shall be used for Project:
 - 1. AIA Document A101–2017, Standard Form of Agreement between Owner and Contractor, Stipulated Sum.
 - a. The General Conditions for Project are AIA Document A201–2017, General Conditions of the Contract for Construction.
- B. Contractor is hereby specifically directed, as a condition of the Contract, to obtain necessary number of copies of AIA Document A201–2017 to acquaint themselves with the Articles contained therein and to notify and apprise Subcontractors, suppliers, and other parties to the Contract or individuals or agencies engaged on Work as to its contents.
- C. No contractual adjustment shall be due or requested as a result of failure on part of Contractor to fully acquaint themselves and other parties to the Contract with conditions of AIA Document A201.

1.2 ADMINISTRATIVE FORMS

- A. Administrative Forms: Additional administrative forms are specified in Division 01 General Requirements.
- B. Copies of AIA Documents may be reviewed at Architect’s office or obtained by one of the following methods:
 - 1. AIA website: <http://www.aia.org/contractdocs/index.htm>.
- C. Preconstruction Forms:
 - 1. Form of Bid Bond: AIA Document A310–2010, Bid Bond.
 - 2. Form of Performance Bond and Labor and Material Bond: AIA Document A312–2010, Performance Bond and Payment Bond.
 - 3. Form of Certificate of Insurance: AIA Document G715–2017, Supplemental Attachment for ACORD Certificate of Insurance 25-S.
- D. Information and Modification Forms:
 - 1. Form for Requests for Information (RFIs): Document 006313 – Request for Information Form, included in these Specifications, or AIA Document G716–2004, Request for Information (RFI).

2. Form of Request for Proposal: AIA Document G709–2018, Work Changes Proposal Request.
3. Change Order Form: AIA Document G701–2017, Change Order.
4. Form of Architect's Memorandum for Minor Changes in the Work: AIA Document G710–2017, Architect's Supplemental Instructions.
5. Form of Change Directive: AIA Document G714–2017, Construction Change Directive.

E. Payment Forms:

1. Schedule of Values Form: AIA Document G703–1992, Continuation Sheet.
2. Payment Application: AIA Document G702/703–1992, Application and Certificate for Payment and Continuation Sheet.
3. Form of Contractor's Affidavit: AIA Document G706–1994, Contractor's Affidavit of Payment of Debts and Claims.
4. Form of Affidavit of Release of Liens: AIA Document G706A–1994, Contractor's Affidavit of Payment of Release of Liens.
5. Form of Consent of Surety: AIA Document G707–1994, Consent of Surety to Final Payment.
6. Form of Consent of Surety: AIA Document G707A–1994, Consent of Surety to Final Reduction in or Partial Release of Retainage.

F. Substantial Completion Forms:

1. Form of Substantial Completion: AIA Document G704–2017, Certificate of Substantial Completion.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF DOCUMENT 000600

DOCUMENT 006211 – SUBMITTAL TRANSMITTAL FORM

Project: Gaston Co. Schools – Grier Middle School Date: _____
To: LS3P ASSOCIATES LTD., 227 W. Trade Street, Suite 700, Charlotte, NC 28202
Project No.: 9201-218240

Use this Submittal Form to detail and document items that comply with requirements of Contract Documents.
Do not send substitutions in the form of a submittal. Use Document 006325 –Request for Substitution Form instead.

A FROM SUBCONTRACTOR

To (Contractor): _____ Date Trnsmt'd: by Subcontractor: _____
From (SubContractor): _____ Signed: _____

Qty.	Reference / Number	Title / Description / Manufacturer	Spec. Section Title - Paragraph / Drawing Detail Reference

- Submitted for review and approval
 - Resubmitted for review and approval
 - If substitution involved, submission includes point-by-point comparative data or preliminary details
 - Items included in submission will be ordered immediately upon receipt of approval
 - Will be available to meet construction schedule
 - Substitution involved - Substitution request attached
 - Complies with contract requirements
 - A/E review time included in construction schedule
- Other remarks on above submission: _____ One copy retained by sender

B FROM CONTRACTOR

To (A/E): LS3P Attn: _____ Date Rec'd by Contractor: _____
From (Contractor): _____ By: _____ Date Trnsmt'd: by Contractor _____
 Approved Revise / Resubmit Approved as noted Rejected / Resubmit

Other remarks on above submission: _____ One copy retained by sender

C FROM A/E

To (Contractor): _____ Attn: _____ Date Rec'd by A/E: _____
From (A/E): LS3P By: _____ Date Trnsmt'd: by A/E _____

- Approved Approved as noted Provide file copy with corrections identified
- Sepia copies only returned Point-by-point comparative data required to complete approval process
- Not subject to review No action required Revise / Resubmit Rejected / Resubmit
- Approved as noted / Resubmit Submission Incomplete / Resubmit

Other remarks on above submission: _____ One copy retained by sender

D FROM CONTRACTOR

To (SubContractor): _____ Attn: _____ Date Rec'd by Contractor: _____
From (Contractor): _____ By: _____ Date Trnsmt'd: by Contractor _____

Copies: Owner Consultants _____ _____ _____
 One copy retained by sender

END OF DOCUMENT 006313

CONTINUATION SHEET

APPLICATION AND CERTIFICATE FOR PAYMENT, containing Contractor's signed Certification, is attached. In tabulations below, amounts are stated to the nearest dollar. Use Column I on Contracts where variable retainage for line items may apply.

APPLICATION NO.:
 APPLICATION DATE:
 PERIOD TO:
 ARCHITECT'S PROJECT NO.:

A	B	C	D	E	F1	F2	G		H	I
ITEM NO.	DESCRIPTION OF WORK	SCHEDULED VALUE	WORK COMPLETED		MATERIALS PREVIOUSLY STORED (NOT IN D OR E)	MATERIALS STORED THIS MONTH (NOT IN D OR E)	TOTAL COMPLETED AND STORED TO DATE (D + E + F1 + F2)	%	BALANCE TO FINISH (C - G)	RETAINAGE (IF VARIABLE RATE)
			FROM PREVIOUS APPLICATION (D + E)	THIS PERIOD						

CERTIFICATE OF STATE AND COUNTY SALES/USE TAX

Contractor: _____

Payment Application No.: _____

Sheet No. _____

Project Name: _____

For Sales Taxes Paid from: _____ to _____

Invoice No.	Invoice Date	Vendor	Type of Materials	Invoice Total	NC Tax (4-1/2 %)	County	County Tax (2-1/2 %)	Tax Total
1					\$ -		\$ -	\$ -
2					\$ -		\$ -	\$ -
3					\$ -		\$ -	\$ -
4					\$ -		\$ -	\$ -
5					\$ -		\$ -	\$ -
6					\$ -		\$ -	\$ -
7					\$ -		\$ -	\$ -
8					\$ -		\$ -	\$ -
9					\$ -		\$ -	\$ -
10					\$ -		\$ -	\$ -
11					\$ -		\$ -	\$ -
12					\$ -		\$ -	\$ -
13					\$ -		\$ -	\$ -
14					\$ -		\$ -	\$ -
15					\$ -		\$ -	\$ -
16					\$ -		\$ -	\$ -
17					\$ -		\$ -	\$ -
18					\$ -		\$ -	\$ -
19					\$ -		\$ -	\$ -
20					\$ -		\$ -	\$ -
				Total this sheet	\$ -		\$ -	\$ -

I certify that the above listing includes all materials purchased by us and incorporated into the above referenced project for the period stated, became a permanent part of the project, and that the sales tax shown has been paid. The above represents a complete listing of the sales taxes paid for this pay application.

SWORN AND SUBSCRIBED BEFORE ME THIS _____
DAY OF _____, 20__

By: _____

CERTIFICATE OF STATE AND COUNTY SALES/USE TAX

Title: _____

NOTARY PUBLIC

MY COMMISSION EXPIRES _____

(Ser-AT-BF)

DOCUMENT 006313 – REQUEST FOR INTERPRETATION FORM

Project:	Grier Middle School Gaston County Schools	Project No.:	9201-218240	Date:	_____
To:	LS3P ASSOCIATES LTD. 227 W. Trade Street, Suite 700 Charlotte, NC 28202	RFI No.:	_____	Contractor:	_____
Attn:	Goran Pogarcic	Requested by:	_____	Phone:	_____
Phone:	704.333.6686	Fax:	_____	Email:	_____
Fax:	704.333.2926				
Email:	goranpogarcic@ls3p.com				

Related Section & Paragraph No.: _____
 Related Sheet & Detail No.: _____

Contractor’s Inquiry: _____

Contractor’s Recommended Solution: _____

Attachments: _____
 Architect’s Response Requested By: _____

Architect’s Response: _____

Signed: _____ Date: _____
 Attachments: _____

Architect’s response will be formally issued by Addendum.

END OF DOCUMENT 006313

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DOCUMENT 006325 – REQUEST FOR SUBSTITUTION FORM

Requests for Substitution are accepted from prime Bidders only. Subcontractors and suppliers shall submit requests through a prime Bidder. Bidders are required to submit this completed form with required attachments no later than 10 days prior to opening of Bids. Comply with requirements of the Instructions to Bidders.

Project:	Grier Middle School	Project No.:	9201-218240	Date:	_____
	Gaston County Schools	Spec Section No.:	_____		
To:	LS3P ASSOCIATES LTD.	Spec. Section No.:	_____		
	227 W. Trade Street, Suite 700				
	Charlotte, NC 28202	Contractor:	_____		
Attn:	Goran Pogarcic	Requested by:	_____		
Phone:	704.333.6686	Phone:	_____		
Fax:	704.333.2926	Fax:	_____		
Email:	goranpogarcic@ls3p.com	Email:	_____		

Reason for not providing specified item: _____

Savings to Owner for accepting Substitution: _____

Specified Product/Fabrication Method

(List name/description; model no., manufacturer): _____

Required Information for <i>Specified</i> Product:	Attached:
Point by Point Comparative Product Data	<input type="checkbox"/>
Tests	<input type="checkbox"/>
Reports	<input type="checkbox"/>
Fabrication Drawings	<input type="checkbox"/>
Samples (Where Applicable)	<input type="checkbox"/>

Proposed Product/Fabrication Method

(List name/description; model no., manufacturer): _____

Required Information for <i>Proposed</i> Product:	Attached:
Point by Point Comparative Product Data	<input type="checkbox"/> (Required)
Tests	<input type="checkbox"/>
Reports	<input type="checkbox"/>
Fabrication Drawings	<input type="checkbox"/>
Samples (Where Applicable)	<input type="checkbox"/>

List of Related Changes/Modifications: _____

Differences between proposed substitution
and specified product: _____

Do proposed product/fabrication methods
affect other parts of the Work?

No Yes: Explain _____

Undersigned certifies:

- Proposed substitution has been fully investigated and determined to be equal or superior in all respects to specified product as utilized for this project, except as noted herein.
- Qualifications of manufacturer, installer, and other specified parties meet the specified qualifications.
- Same special warranty will be furnished for proposed substitution as for specified product.
- Same maintenance service and source for replacement parts, as applicable, is available as that specified.
- Proposed substitution does not affect dimensions and functional clearances, except as noted herein.

For the Bidder:

Submitted by: _____

Signed: _____

Firm: _____

Telephone: _____ Fax: _____ Email: _____

For the Contractor:

Submitted by: _____

Signed: _____

Firm: _____

Telephone: _____ Fax: _____ Email: _____

END OF DOCUMENT 006325

DRAFT AIA® Document A201™ – 2017

General Conditions of the Contract for Construction

for the following PROJECT:

(Name and location or address)

<< >>
<< >>

THE OWNER:

(Name, legal status and address)

<< >>< >>
<< >>

THE ARCHITECT:

(Name, legal status and address)

<< >>< >>
<< >>

TABLE OF ARTICLES

- | | |
|----|--|
| 1 | GENERAL PROVISIONS |
| 2 | OWNER |
| 3 | CONTRACTOR |
| 4 | ARCHITECT |
| 5 | SUBCONTRACTORS |
| 6 | CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS |
| 7 | CHANGES IN THE WORK |
| 8 | TIME |
| 9 | PAYMENTS AND COMPLETION |
| 10 | PROTECTION OF PERSONS AND PROPERTY |
| 11 | INSURANCE AND BONDS |
| 12 | UNCOVERING AND CORRECTION OF WORK |
| 13 | MISCELLANEOUS PROVISIONS |
| 14 | TERMINATION OR SUSPENSION OF THE CONTRACT |
| 15 | CLAIMS AND DISPUTES |

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INDEX

(Topics and numbers in bold are Section headings.)

Acceptance of Nonconforming Work

9.6.6, 9.9.3, **12.3**

Acceptance of Work

9.6.6, 9.8.2, 9.9.3, 9.10.1, 9.10.3, **12.3**

Access to Work

3.16, 6.2.1, 12.1

Accident Prevention

10

Acts and Omissions

3.2, 3.3.2, 3.12.8, 3.18, 4.2.3, 8.3.1, 9.5.1, 10.2.5,

10.2.8, 13.3.2, 14.1, 15.1.2, 15.2

Addenda

1.1.1

Additional Costs, Claims for

3.7.4, 3.7.5, 10.3.2, 15.1.5

Additional Inspections and Testing

9.4.2, 9.8.3, 12.2.1, **13.4**

Additional Time, Claims for

3.2.4, 3.7.4, 3.7.5, 3.10.2, 8.3.2, **15.1.6**

Administration of the Contract

3.1.3, **4.2**, 9.4, 9.5

Advertisement or Invitation to Bid

1.1.1

Aesthetic Effect

4.2.13

Allowances

3.8

Applications for Payment

4.2.5, 7.3.9, 9.2, **9.3**, 9.4, 9.5.1, 9.5.4, 9.6.3, 9.7, 9.10

Approvals

2.1.1, 2.3.1, 2.5, 3.1.3, 3.10.2, 3.12.8, 3.12.9,

3.12.10.1, 4.2.7, 9.3.2, 13.4.1

Arbitration

8.3.1, 15.3.2, **15.4**

ARCHITECT

4

Architect, Definition of

4.1.1

Architect, Extent of Authority

2.5, 3.12.7, 4.1.2, 4.2, 5.2, 6.3, 7.1.2, 7.3.4, 7.4, 9.2,

9.3.1, 9.4, 9.5, 9.6.3, 9.8, 9.10.1, 9.10.3, 12.1, 12.2.1,

13.4.1, 13.4.2, 14.2.2, 14.2.4, 15.1.4, 15.2.1

Architect, Limitations of Authority and Responsibility

2.1.1, 3.12.4, 3.12.8, 3.12.10, 4.1.2, 4.2.1, 4.2.2, 4.2.3,

4.2.6, 4.2.7, 4.2.10, 4.2.12, 4.2.13, 5.2.1, 7.4, 9.4.2,

9.5.4, 9.6.4, 15.1.4, 15.2

Architect's Additional Services and Expenses

2.5, 12.2.1, 13.4.2, 13.4.3, 14.2.4

Architect's Administration of the Contract

3.1.3, 3.7.4, 15.2, 9.4.1, 9.5

Architect's Approvals

2.5, 3.1.3, 3.5, 3.10.2, 4.2.7

Architect's Authority to Reject Work

3.5, 4.2.6, 12.1.2, 12.2.1

Architect's Copyright

1.1.7, 1.5

Architect's Decisions

3.7.4, 4.2.6, 4.2.7, 4.2.11, 4.2.12, 4.2.13, 4.2.14, 6.3,

7.3.4, 7.3.9, 8.1.3, 8.3.1, 9.2, 9.4.1, 9.5, 9.8.4, 9.9.1,

13.4.2, 15.2

Architect's Inspections

3.7.4, 4.2.2, 4.2.9, 9.4.2, 9.8.3, 9.9.2, 9.10.1, 13.4

Architect's Instructions

3.2.4, 3.3.1, 4.2.6, 4.2.7, 13.4.2

Architect's Interpretations

4.2.11, 4.2.12

Architect's Project Representative

4.2.10

Architect's Relationship with Contractor

1.1.2, 1.5, 2.3.3, 3.1.3, 3.2.2, 3.2.3, 3.2.4, 3.3.1, 3.4.2,

3.5, 3.7.4, 3.7.5, 3.9.2, 3.9.3, 3.10, 3.11, 3.12, 3.16,

3.18, 4.1.2, 4.2, 5.2, 6.2.2, 7, 8.3.1, 9.2, 9.3, 9.4, 9.5,

9.7, 9.8, 9.9, 10.2.6, 10.3, 11.3, 12, 13.3.2, 13.4, 15.2

Architect's Relationship with Subcontractors

1.1.2, 4.2.3, 4.2.4, 4.2.6, 9.6.3, 9.6.4, 11.3

Architect's Representations

9.4.2, 9.5.1, 9.10.1

Architect's Site Visits

3.7.4, 4.2.2, 4.2.9, 9.4.2, 9.5.1, 9.9.2, 9.10.1, 13.4

Asbestos

10.3.1

Attorneys' Fees

3.18.1, 9.6.8, 9.10.2, 10.3.3

Award of Separate Contracts

6.1.1, 6.1.2

Award of Subcontracts and Other Contracts for Portions of the Work

5.2

Basic Definitions

1.1

Bidding Requirements

1.1.1

Binding Dispute Resolution

8.3.1, 9.7, 11.5, 13.1, 15.1.2, 15.1.3, 15.2.1, 15.2.5,

15.2.6.1, 15.3.1, 15.3.2, 15.3.3, 15.4.1

Bonds, Lien

7.3.4.4, 9.6.8, 9.10.2, 9.10.3

Bonds, Performance, and Payment

7.3.4.4, 9.6.7, 9.10.3, **11.1.2**, 11.1.3, **11.5**

Building Information Models Use and Reliance

1.8

Building Permit

3.7.1

Capitalization

1.3

Certificate of Substantial Completion

9.8.3, 9.8.4, 9.8.5

Certificates for Payment

4.2.1, 4.2.5, 4.2.9, 9.3.3, **9.4**, 9.5, 9.6.1, 9.6.6, 9.7,

9.10.1, 9.10.3, 14.1.1.3, 14.2.4, 15.1.4

Certificates of Inspection, Testing or Approval

13.4.4

Certificates of Insurance
9.10.2
Change Orders
1.1.1, 3.4.2, 3.7.4, 3.8.2.3, 3.11, 3.12.8, 4.2.8, 5.2.3,
7.1.2, 7.1.3, **7.2**, 7.3.2, 7.3.7, 7.3.9, 7.3.10, 8.3.1,
9.3.1.1, 9.10.3, 10.3.2, 11.2, 11.5, 12.1.2
Change Orders, Definition of
7.2.1
CHANGES IN THE WORK
2.2.2, 3.11, 4.2.8, 7, 7.2.1, 7.3.1, 7.4, 8.3.1, 9.3.1.1,
11.5
Claims, Definition of
15.1.1
Claims, Notice of
1.6.2, 15.1.3
CLAIMS AND DISPUTES
3.2.4, 6.1.1, 6.3, 7.3.9, 9.3.3, 9.10.4, 10.3.3, **15**, 15.4
Claims and Timely Assertion of Claims
15.4.1
Claims for Additional Cost
3.2.4, 3.3.1, 3.7.4, 7.3.9, 9.5.2, 10.2.5, 10.3.2, **15.1.5**
Claims for Additional Time
3.2.4, 3.3.1, 3.7.4, 6.1.1, 8.3.2, 9.5.2, 10.3.2, **15.1.6**
Concealed or Unknown Conditions, Claims for
3.7.4
Claims for Damages
3.2.4, 3.18, 8.3.3, 9.5.1, 9.6.7, 10.2.5, 10.3.3, 11.3,
11.3.2, 14.2.4, 15.1.7
Claims Subject to Arbitration
15.4.1
Cleaning Up
3.15, 6.3
Commencement of the Work, Conditions Relating to
2.2.1, 3.2.2, 3.4.1, 3.7.1, 3.10.1, 3.12.6, 5.2.1, 5.2.3,
6.2.2, 8.1.2, 8.2.2, 8.3.1, 11.1, 11.2, **15.1.5**
Commencement of the Work, Definition of
8.1.2
Communications
3.9.1, **4.2.4**
Completion, Conditions Relating to
3.4.1, 3.11, 3.15, 4.2.2, 4.2.9, 8.2, 9.4.2, 9.8, 9.9.1,
9.10, 12.2, 14.1.2, 15.1.2
COMPLETION, PAYMENTS AND
9
Completion, Substantial
3.10.1, 4.2.9, 8.1.1, 8.1.3, 8.2.3, 9.4.2, 9.8, 9.9.1,
9.10.3, 12.2, 15.1.2
Compliance with Laws
2.3.2, 3.2.3, 3.6, 3.7, 3.12.10, 3.13, 9.6.4, 10.2.2, 13.1,
13.3, 13.4.1, 13.4.2, 13.5, 14.1.1, 14.2.1.3, 15.2.8,
15.4.2, 15.4.3
Concealed or Unknown Conditions
3.7.4, 4.2.8, 8.3.1, 10.3
Conditions of the Contract
1.1.1, 6.1.1, 6.1.4
Consent, Written
3.4.2, 3.14.2, 4.1.2, 9.8.5, 9.9.1, 9.10.2, 9.10.3, 13.2,
15.4.4.2

Consolidation or Joinder
15.4.4
CONSTRUCTION BY OWNER OR BY
SEPARATE CONTRACTORS
1.1.4, **6**
Construction Change Directive, Definition of
7.3.1
Construction Change Directives
1.1.1, 3.4.2, 3.11, 3.12.8, 4.2.8, 7.1.1, 7.1.2, 7.1.3, **7.3**,
9.3.1.1
Construction Schedules, Contractor's
3.10, 3.11, 3.12.1, 3.12.2, 6.1.3, 15.1.6.2
Contingent Assignment of Subcontracts
5.4, 14.2.2.2
Continuing Contract Performance
15.1.4
Contract, Definition of
1.1.2
CONTRACT, TERMINATION OR
SUSPENSION OF THE
5.4.1.1, 5.4.2, 11.5, **14**
Contract Administration
3.1.3, 4, 9.4, 9.5
Contract Award and Execution, Conditions Relating
to
3.7.1, 3.10, 5.2, 6.1
Contract Documents, Copies Furnished and Use of
1.5.2, 2.3.6, 5.3
Contract Documents, Definition of
1.1.1
Contract Sum
2.2.2, 2.2.4, 3.7.4, 3.7.5, 3.8, 3.10.2, 5.2.3, 7.3, 7.4,
9.1, 9.2, 9.4.2, 9.5.1.4, 9.6.7, 9.7, 10.3.2, 11.5, 12.1.2,
12.3, 14.2.4, 14.3.2, 15.1.4.2, **15.1.5**, **15.2.5**
Contract Sum, Definition of
9.1
Contract Time
1.1.4, 2.2.1, 2.2.2, 3.7.4, 3.7.5, 3.10.2, 5.2.3, 6.1.5,
7.2.1.3, 7.3.1, 7.3.5, 7.3.6, 7, 7, 7.3.10, 7.4, 8.1.1,
8.2.1, 8.2.3, 8.3.1, 9.5.1, 9.7, 10.3.2, 12.1.1, 12.1.2,
14.3.2, 15.1.4.2, 15.1.6.1, 15.2.5
Contract Time, Definition of
8.1.1
CONTRACTOR
3
Contractor, Definition of
3.1, **6.1.2**
Contractor's Construction and Submittal
Schedules
3.10, 3.12.1, 3.12.2, 4.2.3, 6.1.3, 15.1.6.2
Contractor's Employees
2.2.4, 3.3.2, 3.4.3, 3.8.1, 3.9, 3.18.2, 4.2.3, 4.2.6, 10.2,
10.3, 11.3, 14.1, 14.2.1.1
Contractor's Liability Insurance
11.1
Contractor's Relationship with Separate Contractors
and Owner's Forces
3.12.5, 3.14.2, 4.2.4, 6, 11.3, 12.2.4

Contractor's Relationship with Subcontractors
1.2.2, 2.2.4, 3.3.2, 3.18.1, 3.18.2, 4.2.4, 5, 9.6.2, 9.6.7,
9.10.2, 11.2, 11.3, 11.4

Contractor's Relationship with the Architect
1.1.2, 1.5, 2.3.3, 3.1.3, 3.2.2, 3.2.3, 3.2.4, 3.3.1, 3.4.2,
3.5.1, 3.7.4, 3.10, 3.11, 3.12, 3.16, 3.18, 4.2, 5.2, 6.2.2,
7, 8.3.1, 9.2, 9.3, 9.4, 9.5, 9.7, 9.8, 9.9, 10.2.6, 10.3,
11.3, 12, 13.4, 15.1.3, 15.2.1

Contractor's Representations
3.2.1, 3.2.2, 3.5, 3.12.6, 6.2.2, 8.2.1, 9.3.3, 9.8.2

Contractor's Responsibility for Those Performing the
Work
3.3.2, 3.18, 5.3, 6.1.3, 6.2, 9.5.1, 10.2.8

Contractor's Review of Contract Documents
3.2

Contractor's Right to Stop the Work
2.2.2, 9.7

Contractor's Right to Terminate the Contract
14.1

Contractor's Submittals
3.10, 3.11, 3.12, 4.2.7, 5.2.1, 5.2.3, 9.2, 9.3, 9.8.2,
9.8.3, 9.9.1, 9.10.2, 9.10.3

Contractor's Superintendent
3.9, 10.2.6

Contractor's Supervision and Construction
Procedures
1.2.2, 3.3, 3.4, 3.12.10, 4.2.2, 4.2.7, 6.1.3, 6.2.4, 7.1.3,
7.3.4, 7.3.6, 8.2, 10, 12, 14, 15.1.4

Coordination and Correlation
1.2, 3.2.1, 3.3.1, 3.10, 3.12.6, 6.1.3, 6.2.1

Copies Furnished of Drawings and Specifications
1.5, 2.3.6, 3.11

Copyrights
1.5, **3.17**

Correction of Work
2.5, 3.7.3, 9.4.2, 9.8.2, 9.8.3, 9.9.1, 12.1.2, **12.2**, 12.3,
15.1.3.1, 15.1.3.2, 15.2.1

Correlation and Intent of the Contract Documents
1.2

Cost, Definition of
7.3.4

Costs
2.5, 3.2.4, 3.7.3, 3.8.2, 3.15.2, 5.4.2, 6.1.1, 6.2.3,
7.3.3.3, 7.3.4, 7.3.8, 7.3.9, 9.10.2, 10.3.2, 10.3.6, 11.2,
12.1.2, 12.2.1, 12.2.4, 13.4, 14

Cutting and Patching
3.14, 6.2.5

Damage to Construction of Owner or Separate
Contractors
3.14.2, 6.2.4, 10.2.1.2, 10.2.5, 10.4, 12.2.4

Damage to the Work
3.14.2, 9.9.1, 10.2.1.2, 10.2.5, 10.4, 12.2.4

Damages, Claims for
3.2.4, 3.18, 6.1.1, 8.3.3, 9.5.1, 9.6.7, 10.3.3, 11.3.2,
11.3, 14.2.4, 15.1.7

Damages for Delay
6.2.3, 8.3.3, 9.5.1.6, 9.7, 10.3.2, 14.3.2

Date of Commencement of the Work, Definition of
8.1.2

Date of Substantial Completion, Definition of
8.1.3

Day, Definition of
8.1.4

Decisions of the Architect
3.7.4, 4.2.6, 4.2.7, 4.2.11, 4.2.12, 4.2.13, 6.3, 7.3.4,
7.3.9, 8.1.3, 8.3.1, 9.2, 9.4, 9.5.1, 9.8.4, 9.9.1, 13.4.2,
14.2.2, 14.2.4, 15.1, 15.2

Decisions to Withhold Certification
9.4.1, **9.5**, 9.7, 14.1.1.3

Defective or Nonconforming Work, Acceptance,
Rejection and Correction of
2.5, 3.5, 4.2.6, 6.2.3, 9.5.1, 9.5.3, 9.6.6, 9.8.2, 9.9.3,
9.10.4, 12.2.1

Definitions
1.1, 2.1.1, 3.1.1, 3.5, 3.12.1, 3.12.2, 3.12.3, 4.1.1, 5.1,
6.1.2, 7.2.1, 7.3.1, 8.1, 9.1, 9.8.1, 15.1.1

Delays and Extensions of Time
3.2, **3.7.4**, 5.2.3, 7.2.1, 7.3.1, **7.4**, **8.3**, 9.5.1, **9.7**,
10.3.2, **10.4**, 14.3.2, **15.1.6**, 15.2.5

Digital Data Use and Transmission
1.7

Disputes
6.3, 7.3.9, 15.1, 15.2

Documents and Samples at the Site
3.11

Drawings, Definition of
1.1.5

Drawings and Specifications, Use and Ownership of
3.11

Effective Date of Insurance
8.2.2

Emergencies
10.4, 14.1.1.2, **15.1.5**

Employees, Contractor's
3.3.2, 3.4.3, 3.8.1, 3.9, 3.18.2, 4.2.3, 4.2.6, 10.2,
10.3.3, 11.3, 14.1, 14.2.1.1

Equipment, Labor, or Materials
1.1.3, 1.1.6, 3.4, 3.5, 3.8.2, 3.8.3, 3.12, 3.13, 3.15.1,
4.2.6, 4.2.7, 5.2.1, 6.2.1, 7.3.4, 9.3.2, 9.3.3, 9.5.1.3,
9.10.2, 10.2.1, 10.2.4, 14.2.1.1, 14.2.1.2

Execution and Progress of the Work
1.1.3, 1.2.1, 1.2.2, 2.3.4, 2.3.6, 3.1, 3.3.1, 3.4.1, 3.7.1,
3.10.1, 3.12, 3.14, 4.2, 6.2.2, 7.1.3, 7.3.6, 8.2, 9.5.1,
9.9.1, 10.2, 10.3, 12.1, 12.2, 14.2, 14.3.1, 15.1.4

Extensions of Time
3.2.4, 3.7.4, 5.2.3, 7.2.1, 7.3, 7.4, 9.5.1, 9.7, 10.3.2,
10.4, 14.3, 15.1.6, **15.2.5**

Failure of Payment
9.5.1.3, **9.7**, 9.10.2, 13.5, 14.1.1.3, 14.2.1.2

Faulty Work
(See Defective or Nonconforming Work)

Final Completion and Final Payment
4.2.1, 4.2.9, 9.8.2, **9.10**, 12.3, 14.2.4, 14.4.3

Financial Arrangements, Owner's
2.2.1, 13.2.2, 14.1.1.4

GENERAL PROVISIONS

1

Governing Law

13.1

Guarantees (See Warranty)

Hazardous Materials and Substances

10.2.4, 10.3

Identification of Subcontractors and Suppliers

5.2.1

Indemnification

3.17, 3.18, 9.6.8, 9.10.2, 10.3.3, 11.3

Information and Services Required of the Owner

2.1.2, 2.2, 2.3, 3.2.2, 3.12.10.1, 6.1.3, 6.1.4, 6.2.5,

9.6.1, 9.9.2, 9.10.3, 10.3.3, 11.2, 13.4.1, 13.4.2,

14.1.1.4, 14.1.4, 15.1.4

Initial Decision

15.2

Initial Decision Maker, Definition of

1.1.8

Initial Decision Maker, Decisions

14.2.4, 15.1.4.2, 15.2.1, 15.2.2, 15.2.3, 15.2.4, 15.2.5

Initial Decision Maker, Extent of Authority

14.2.4, 15.1.4.2, 15.2.1, 15.2.2, 15.2.3, 15.2.4, 15.2.5

Injury or Damage to Person or Property

10.2.8, 10.4

Inspections

3.1.3, 3.3.3, 3.7.1, 4.2.2, 4.2.6, 4.2.9, 9.4.2, 9.8.3,

9.9.2, 9.10.1, 12.2.1, 13.4

Instructions to Bidders

1.1.1

Instructions to the Contractor

3.2.4, 3.3.1, 3.8.1, 5.2.1, 7, 8.2.2, 12, 13.4.2

Instruments of Service, Definition of

1.1.7

Insurance

6.1.1, 7.3.4, 8.2.2, 9.3.2, 9.8.4, 9.9.1, 9.10.2, 10.2.5, 11

Insurance, Notice of Cancellation or Expiration

11.1.4, 11.2.3

Insurance, Contractor's Liability

11.1

Insurance, Effective Date of

8.2.2, 14.4.2

Insurance, Owner's Liability

11.2

Insurance, Property

10.2.5, 11.2, 11.4, 11.5

Insurance, Stored Materials

9.3.2

INSURANCE AND BONDS

11

Insurance Companies, Consent to Partial Occupancy

9.9.1

Insured loss, Adjustment and Settlement of

11.5

Intent of the Contract Documents

1.2.1, 4.2.7, 4.2.12, 4.2.13

Interest

13.5

Interpretation

1.1.8, 1.2.3, 1.4, 4.1.1, 5.1, 6.1.2, 15.1.1

Interpretations, Written

4.2.11, 4.2.12

Judgment on Final Award

15.4.2

Labor and Materials, Equipment

1.1.3, 1.1.6, 3.4, 3.5, 3.8.2, 3.8.3, 3.12, 3.13, 3.15.1,

5.2.1, 6.2.1, 7.3.4, 9.3.2, 9.3.3, 9.5.1.3, 9.10.2, 10.2.1,

10.2.4, 14.2.1.1, 14.2.1.2

Labor Disputes

8.3.1

Laws and Regulations

1.5, 2.3.2, 3.2.3, 3.2.4, 3.6, 3.7, 3.12.10, 3.13, 9.6.4,

9.9.1, 10.2.2, 13.1, 13.3.1, 13.4.2, 13.5, 14, 15.2.8,

15.4

Liens

2.1.2, 9.3.1, 9.3.3, 9.6.8, 9.10.2, 9.10.4, 15.2.8

Limitations, Statutes of

12.2.5, 15.1.2, 15.4.1.1

Limitations of Liability

3.2.2, 3.5, 3.12.10, 3.12.10.1, 3.17, 3.18.1, 4.2.6,

4.2.7, 6.2.2, 9.4.2, 9.6.4, 9.6.7, 9.6.8, 10.2.5, 10.3.3,

11.3, 12.2.5, 13.3.1

Limitations of Time

2.1.2, 2.2, 2.5, 3.2.2, 3.10, 3.11, 3.12.5, 3.15.1, 4.2.7,

5.2, 5.3, 5.4.1, 6.2.4, 7.3, 7.4, 8.2, 9.2, 9.3.1, 9.3.3,

9.4.1, 9.5, 9.6, 9.7, 9.8, 9.9, 9.10, 12.2, 13.4, 14, 15,

15.1.2, 15.1.3, 15.1.5

Materials, Hazardous

10.2.4, 10.3

Materials, Labor, Equipment and

1.1.3, 1.1.6, 3.4.1, 3.5, 3.8.2, 3.8.3, 3.12, 3.13, 3.15.1,

5.2.1, 6.2.1, 7.3.4, 9.3.2, 9.3.3, 9.5.1.3, 9.10.2,

10.2.1.2, 10.2.4, 14.2.1.1, 14.2.1.2

Means, Methods, Techniques, Sequences and

Procedures of Construction

3.3.1, 3.12.10, 4.2.2, 4.2.7, 9.4.2

Mechanic's Lien

2.1.2, 9.3.1, 9.3.3, 9.6.8, 9.10.2, 9.10.4, 15.2.8

Mediation

8.3.1, 15.1.3.2, 15.2.1, 15.2.5, 15.2.6, 15.3, 15.4.1,

15.4.1.1

Minor Changes in the Work

1.1.1, 3.4.2, 3.12.8, 4.2.8, 7.1, 7.4

MISCELLANEOUS PROVISIONS

13

Modifications, Definition of

1.1.1

Modifications to the Contract

1.1.1, 1.1.2, 2.5, 3.11, 4.1.2, 4.2.1, 5.2.3, 7, 8.3.1, 9.7,

10.3.2

Mutual Responsibility

6.2

Nonconforming Work, Acceptance of

9.6.6, 9.9.3, 12.3

Nonconforming Work, Rejection and Correction of
2.4, 2.5, 3.5, 4.2.6, 6.2.4, 9.5.1, 9.8.2, 9.9.3, 9.10.4,
12.2

Notice

1.6, 1.6.1, 1.6.2, 2.1.2, 2.2.2., 2.2.3, 2.2.4, 2.5, 3.2.4,
3.3.1, 3.7.4, 3.7.5, 3.9.2, 3.12.9, 3.12.10, 5.2.1, 7.4,
8.2.2 9.6.8, 9.7, 9.10.1, 10.2.8, 10.3.2, 11.5, 12.2.2.1,
13.4.1, 13.4.2, 14.1, 14.2.2, 14.4.2, 15.1.3, 15.1.5,
15.1.6, 15.4.1

Notice of Cancellation or Expiration of Insurance
11.1.4, 11.2.3

Notice of Claims

1.6.2, 2.1.2, 3.7.4, 9.6.8, 10.2.8, **15.1.3**, 15.1.5, 15.1.6,
15.2.8, 15.3.2, 15.4.1

Notice of Testing and Inspections
13.4.1, 13.4.2

Observations, Contractor's
3.2, 3.7.4

Occupancy
2.3.1, 9.6.6, 9.8

Orders, Written
1.1.1, 2.4, 3.9.2, 7, 8.2.2, 11.5, 12.1, 12.2.2.1, 13.4.2,
14.3.1

OWNER 2

Owner, Definition of
2.1.1

Owner, Evidence of Financial Arrangements
2.2, 13.2.2, 14.1.1.4

Owner, Information and Services Required of the
2.1.2, **2.2**, 2.3, 3.2.2, 3.12.10, 6.1.3, 6.1.4, 6.2.5, 9.3.2,
9.6.1, 9.6.4, 9.9.2, 9.10.3, 10.3.3, 11.2, 13.4.1, 13.4.2,
14.1.1.4, 14.1.4, 15.1.4

Owner's Authority
1.5, 2.1.1, 2.3.32.4, 2.5, 3.4.2, 3.8.1, 3.12.10, 3.14.2,
4.1.2, 4.2.4, 4.2.9, 5.2.1, 5.2.4, 5.4.1, 6.1, 6.3, 7.2.1,
7.3.1, 8.2.2, 8.3.1, 9.3.2, 9.5.1, 9.6.4, 9.9.1, 9.10.2,
10.3.2, 11.4, 11.5, 12.2.2, 12.3, 13.2.2, 14.3, 14.4,
15.2.7

Owner's Insurance
11.2

Owner's Relationship with Subcontractors
1.1.2, 5.2, 5.3, 5.4, 9.6.4, 9.10.2, 14.2.2

Owner's Right to Carry Out the Work
2.5, 14.2.2

Owner's Right to Clean Up
6.3

**Owner's Right to Perform Construction and to
Award Separate Contracts**

6.1
Owner's Right to Stop the Work
2.4

Owner's Right to Suspend the Work
14.3

Owner's Right to Terminate the Contract
14.2, 14.4

Ownership and Use of Drawings, Specifications and Other Instruments of Service

1.1.1, 1.1.6, 1.1.7, **1.5**, 2.3.6, 3.2.2, 3.11, 3.17, 4.2.12,
5.3

Partial Occupancy or Use
9.6.6, **9.9**

Patching, Cutting and
3.14, 6.2.5

Patents
3.17

Payment, Applications for
4.2.5, 7.3.9, 9.2, **9.3**, 9.4, 9.5, 9.6.3, 9.7, 9.8.5, 9.10.1,
14.2.3, 14.2.4, 14.4.3

Payment, Certificates for
4.2.5, 4.2.9, 9.3.3, **9.4**, 9.5, 9.6.1, 9.6.6, 9.7, 9.10.1,
9.10.3, 14.1.1.3, 14.2.4

Payment, Failure of
9.5.1.3, **9.7**, 9.10.2, 13.5, 14.1.1.3, 14.2.1.2

Payment, Final
4.2.1, 4.2.9, **9.10**, 12.3, 14.2.4, 14.4.3

Payment Bond, Performance Bond and
7.3.4.4, 9.6.7, 9.10.3, **11.1.2**

Payments, Progress
9.3, **9.6**, 9.8.5, 9.10.3, 14.2.3, 15.1.4

PAYMENTS AND COMPLETION 9

Payments to Subcontractors
5.4.2, 9.5.1.3, 9.6.2, 9.6.3, 9.6.4, 9.6.7, 14.2.1.2

PCB
10.3.1

Performance Bond and Payment Bond
7.3.4.4, 9.6.7, 9.10.3, **11.1.2**

Permits, Fees, Notices and Compliance with Laws
2.3.1, **3.7**, 3.13, 7.3.4.4, 10.2.2

PERSONS AND PROPERTY, PROTECTION OF 10

Polychlorinated Biphenyl
10.3.1

Product Data, Definition of
3.12.2

Product Data and Samples, Shop Drawings
3.11, **3.12**, 4.2.7

Progress and Completion
4.2.2, **8.2**, 9.8, 9.9.1, 14.1.4, 15.1.4

Progress Payments
9.3, **9.6**, 9.8.5, 9.10.3, 14.2.3, 15.1.4

Project, Definition of
1.1.4

Project Representatives
4.2.10

Property Insurance
10.2.5, **11.2**

Proposal Requirements
1.1.1

PROTECTION OF PERSONS AND PROPERTY 10

Regulations and Laws
1.5, 2.3.2, 3.2.3, 3.6, 3.7, 3.12.10, 3.13, 9.6.4, 9.9.1,
10.2.2, 13.1, 13.3, 13.4.1, 13.4.2, 13.5, 14, 15.2.8, 15.4
Rejection of Work
4.2.6, 12.2.1
Releases and Waivers of Liens
9.3.1, 9.10.2
Representations
3.2.1, 3.5, 3.12.6, 8.2.1, 9.3.3, 9.4.2, 9.5.1, 9.10.1
Representatives
2.1.1, 3.1.1, 3.9, 4.1.1, 4.2.10, 13.2.1
Responsibility for Those Performing the Work
3.3.2, 3.18, 4.2.2, 4.2.3, 5.3, 6.1.3, 6.2, 6.3, 9.5.1, 10
Retainage
9.3.1, 9.6.2, 9.8.5, 9.9.1, 9.10.2, 9.10.3
**Review of Contract Documents and Field
Conditions by Contractor**
3.2, 3.12.7, 6.1.3
Review of Contractor's Submittals by Owner and
Architect
3.10.1, 3.10.2, 3.11, 3.12, 4.2, 5.2, 6.1.3, 9.2, 9.8.2
Review of Shop Drawings, Product Data and Samples
by Contractor
3.12
Rights and Remedies
1.1.2, 2.4, 2.5, 3.5, 3.7.4, 3.15.2, 4.2.6, 5.3, 5.4, 6.1,
6.3, 7.3.1, 8.3, 9.5.1, 9.7, 10.2.5, 10.3, 12.2.1, 12.2.2,
12.2.4, 13.3, 14, 15.4
Royalties, Patents and Copyrights
3.17
Rules and Notices for Arbitration
15.4.1
Safety of Persons and Property
10.2, 10.4
Safety Precautions and Programs
3.3.1, 4.2.2, 4.2.7, 5.3, 10.1, 10.2, 10.4
Samples, Definition of
3.12.3
Samples, Shop Drawings, Product Data and
3.11, 3.12, 4.2.7
Samples at the Site, Documents and
3.11
Schedule of Values
9.2, 9.3.1
Schedules, Construction
3.10, 3.12.1, 3.12.2, 6.1.3, 15.1.6.2
Separate Contracts and Contractors
1.1.4, 3.12.5, 3.14.2, 4.2.4, 4.2.7, 6, 8.3.1, 12.1.2
Separate Contractors, Definition of
6.1.1
Shop Drawings, Definition of
3.12.1
Shop Drawings, Product Data and Samples
3.11, 3.12, 4.2.7
Site, Use of
3.13, 6.1.1, 6.2.1
Site Inspections
3.2.2, 3.3.3, 3.7.1, 3.7.4, 4.2, 9.9.2, 9.4.2, 9.10.1, 13.4

Site Visits, Architect's
3.7.4, 4.2.2, 4.2.9, 9.4.2, 9.5.1, 9.9.2, 9.10.1, 13.4
Special Inspections and Testing
4.2.6, 12.2.1, 13.4
Specifications, Definition of
1.1.6
Specifications
1.1.1, 1.1.6, 1.2.2, 1.5, 3.12.10, 3.17, 4.2.14
Statute of Limitations
15.1.2, 15.4.1.1
Stopping the Work
2.2.2, 2.4, 9.7, 10.3, 14.1
Stored Materials
6.2.1, 9.3.2, 10.2.1.2, 10.2.4
Subcontractor, Definition of
5.1.1
SUBCONTRACTORS
5
Subcontractors, Work by
1.2.2, 3.3.2, 3.12.1, 3.18, 4.2.3, 5.2.3, 5.3, 5.4, 9.3.1.2,
9.6.7
Subcontractual Relations
5.3, 5.4, 9.3.1.2, 9.6, 9.10, 10.2.1, 14.1, 14.2.1
Submittals
3.10, 3.11, 3.12, 4.2.7, 5.2.1, 5.2.3, 7.3.4, 9.2, 9.3, 9.8,
9.9.1, 9.10.2, 9.10.3
Submittal Schedule
3.10.2, 3.12.5, 4.2.7
Subrogation, Waivers of
6.1.1, 11.3
Substances, Hazardous
10.3
Substantial Completion
4.2.9, 8.1.1, 8.1.3, 8.2.3, 9.4.2, 9.8, 9.9.1, 9.10.3, 12.2,
15.1.2
Substantial Completion, Definition of
9.8.1
Substitution of Subcontractors
5.2.3, 5.2.4
Substitution of Architect
2.3.3
Substitutions of Materials
3.4.2, 3.5, 7.3.8
Sub-subcontractor, Definition of
5.1.2
Subsurface Conditions
3.7.4
Successors and Assigns
13.2
Superintendent
3.9, 10.2.6
Supervision and Construction Procedures
1.2.2, 3.3, 3.4, 3.12.10, 4.2.2, 4.2.7, 6.1.3, 6.2.4, 7.1.3,
7.3.4, 8.2, 8.3.1, 9.4.2, 10, 12, 14, 15.1.4
Suppliers
1.5, 3.12.1, 4.2.4, 4.2.6, 5.2.1, 9.3, 9.4.2, 9.5.4, 9.6,
9.10.5, 14.2.1

Surety
5.4.1.2, 9.6.8, 9.8.5, 9.10.2, 9.10.3, 11.1.2, 14.2.2,
15.2.7
Surety, Consent of
9.8.5, 9.10.2, 9.10.3
Surveys
1.1.7, 2.3.4
Suspension by the Owner for Convenience
14.3
Suspension of the Work
3.7.5, 5.4.2, 14.3
Suspension or Termination of the Contract
5.4.1.1, 14
Taxes
3.6, 3.8.2.1, 7.3.4.4
Termination by the Contractor
14.1, 15.1.7
Termination by the Owner for Cause
5.4.1.1, **14.2, 15.1.7**
Termination by the Owner for Convenience
14.4
Termination of the Architect
2.3.3
Termination of the Contractor Employment
14.2.2

TERMINATION OR SUSPENSION OF THE CONTRACT
14
Tests and Inspections
3.1.3, 3.3.3, 3.7.1, 4.2.2, 4.2.6, 4.2.9, 9.4.2, 9.8.3,
9.9.2, 9.10.1, 10.3.2, 12.2.1, **13.4**
TIME
8
Time, Delays and Extensions of
3.2.4, 3.7.4, 5.2.3, 7.2.1, 7.3.1, 7.4, **8.3, 9.5.1, 9.7,**
10.3.2, 10.4, 14.3.2, 15.1.6, 15.2.5
Time Limits
2.1.2, 2.2, 2.5, 3.2.2, 3.10, 3.11, 3.12.5, 3.15.1, 4.2,
5.2, 5.3, 5.4, 6.2.4, 7.3, 7.4, 8.2, 9.2, 9.3.1, 9.3.3, 9.4.1,
9.5, 9.6, 9.7, 9.8, 9.9, 9.10, 12.2, 13.4, 14, 15.1.2,
15.1.3, 15.4
Time Limits on Claims
3.7.4, 10.2.8, 15.1.2, 15.1.3

Title to Work
9.3.2, 9.3.3
UNCOVERING AND CORRECTION OF WORK
12
Uncovering of Work
12.1
Unforeseen Conditions, Concealed or Unknown
3.7.4, 8.3.1, 10.3
Unit Prices
7.3.3.2, 9.1.2
Use of Documents
1.1.1, 1.5, 2.3.6, 3.12.6, 5.3
Use of Site
3.13, 6.1.1, 6.2.1
Values, Schedule of
9.2, 9.3.1
Waiver of Claims by the Architect
13.3.2
Waiver of Claims by the Contractor
9.10.5, 13.3.2, **15.1.7**
Waiver of Claims by the Owner
9.9.3, 9.10.3, 9.10.4, 12.2.2.1, 13.3.2, 14.2.4, **15.1.7**
Waiver of Consequential Damages
14.2.4, 15.1.7
Waiver of Liens
9.3, 9.10.2, 9.10.4
Waivers of Subrogation
6.1.1, **11.3**
Warranty
3.5, 4.2.9, 9.3.3, 9.8.4, 9.9.1, 9.10.2, 9.10.4, 12.2.2,
15.1.2
Weather Delays
8.3, 15.1.6.2
Work, Definition of
1.1.3
Written Consent
1.5.2, 3.4.2, 3.7.4, 3.12.8, 3.14.2, 4.1.2, 9.3.2, 9.10.3,
13.2, 13.3.2, 15.4.4.2
Written Interpretations
4.2.11, 4.2.12
Written Orders
1.1.1, 2.4, 3.9, 7, 8.2.2, 12.1, 12.2, 13.4.2, 14.3.1

ARTICLE 1 GENERAL PROVISIONS

§ 1.1 Basic Definitions

§ 1.1.1 The Contract Documents

The Contract Documents are enumerated in the Agreement between the Owner and Contractor (hereinafter the Agreement) and consist of the Agreement, Conditions of the Contract (General, Supplementary and other Conditions), Drawings, Specifications, Addenda issued prior to execution of the Contract, other documents listed in the Agreement, and Modifications issued after execution of the Contract. A Modification is (1) a written amendment to the Contract signed by both parties, (2) a Change Order, (3) a Construction Change Directive, or (4) a written order for a minor change in the Work issued by the Architect. Unless specifically enumerated in the Agreement, the Contract Documents do not include the advertisement or invitation to bid, Instructions to Bidders, sample forms, other information furnished by the Owner in anticipation of receiving bids or proposals, the Contractor's bid or proposal, or portions of Addenda relating to bidding or proposal requirements.

§ 1.1.2 The Contract

The Contract Documents form the Contract for Construction. The Contract represents the entire and integrated agreement between the parties hereto and supersedes prior negotiations, representations, or agreements, either written or oral. The Contract may be amended or modified only by a Modification. The Contract Documents shall not be construed to create a contractual relationship of any kind (1) between the Contractor and the Architect or the Architect's consultants, (2) between the Owner and a Subcontractor or a Sub-subcontractor, (3) between the Owner and the Architect or the Architect's consultants, or (4) between any persons or entities other than the Owner and the Contractor. The Architect shall, however, be entitled to performance and enforcement of obligations under the Contract intended to facilitate performance of the Architect's duties.

§ 1.1.3 The Work

The term "Work" means the construction and services required by the Contract Documents, whether completed or partially completed, and includes all other labor, materials, equipment, and services provided or to be provided by the Contractor to fulfill the Contractor's obligations. The Work may constitute the whole or a part of the Project.

§ 1.1.4 The Project

The Project is the total construction of which the Work performed under the Contract Documents may be the whole or a part and which may include construction by the Owner and by Separate Contractors.

§ 1.1.5 The Drawings

The Drawings are the graphic and pictorial portions of the Contract Documents showing the design, location and dimensions of the Work, generally including plans, elevations, sections, details, schedules, and diagrams.

§ 1.1.6 The Specifications

The Specifications are that portion of the Contract Documents consisting of the written requirements for materials, equipment, systems, standards and workmanship for the Work, and performance of related services.

§ 1.1.7 Instruments of Service

Instruments of Service are representations, in any medium of expression now known or later developed, of the tangible and intangible creative work performed by the Architect and the Architect's consultants under their respective professional services agreements. Instruments of Service may include, without limitation, studies, surveys, models, sketches, drawings, specifications, and other similar materials.

§ 1.1.8 Initial Decision Maker

The Initial Decision Maker is the person identified in the Agreement to render initial decisions on Claims in accordance with Section 15.2. The Initial Decision Maker shall not show partiality to the Owner or Contractor and shall not be liable for results of interpretations or decisions rendered in good faith.

§ 1.2 Correlation and Intent of the Contract Documents

§ 1.2.1 The intent of the Contract Documents is to include all items necessary for the proper execution and completion of the Work by the Contractor. The Contract Documents are complementary, and what is required by one shall be as binding as if required by all; performance by the Contractor shall be required only to the extent consistent with the Contract Documents and reasonably inferable from them as being necessary to produce the indicated results.

§ 1.2.1.1 The invalidity of any provision of the Contract Documents shall not invalidate the Contract or its remaining provisions. If it is determined that any provision of the Contract Documents violates any law, or is otherwise invalid or unenforceable, then that provision shall be revised to the extent necessary to make that provision legal and enforceable. In such case the Contract Documents shall be construed, to the fullest extent permitted by law, to give effect to the parties' intentions and purposes in executing the Contract.

§ 1.2.2 Organization of the Specifications into divisions, sections and articles, and arrangement of Drawings shall not control the Contractor in dividing the Work among Subcontractors or in establishing the extent of Work to be performed by any trade.

§ 1.2.3 Unless otherwise stated in the Contract Documents, words that have well-known technical or construction industry meanings are used in the Contract Documents in accordance with such recognized meanings.

§ 1.3 Capitalization

Terms capitalized in these General Conditions include those that are (1) specifically defined, (2) the titles of numbered articles, or (3) the titles of other documents published by the American Institute of Architects.

§ 1.4 Interpretation

In the interest of brevity the Contract Documents frequently omit modifying words such as "all" and "any" and articles such as "the" and "an," but the fact that a modifier or an article is absent from one statement and appears in another is not intended to affect the interpretation of either statement.

§ 1.5 Ownership and Use of Drawings, Specifications, and Other Instruments of Service

§ 1.5.1 The Architect and the Architect's consultants shall be deemed the authors and owners of their respective Instruments of Service, including the Drawings and Specifications, and retain all common law, statutory, and other reserved rights in their Instruments of Service, including copyrights. The Contractor, Subcontractors, Sub-subcontractors, and suppliers shall not own or claim a copyright in the Instruments of Service. Submittal or distribution to meet official regulatory requirements or for other purposes in connection with the Project is not to be construed as publication in derogation of the Architect's or Architect's consultants' reserved rights.

§ 1.5.2 The Contractor, Subcontractors, Sub-subcontractors, and suppliers are authorized to use and reproduce the Instruments of Service provided to them, subject to any protocols established pursuant to Sections 1.7 and 1.8, solely and exclusively for execution of the Work. All copies made under this authorization shall bear the copyright notice, if any, shown on the Instruments of Service. The Contractor, Subcontractors, Sub-subcontractors, and suppliers may not use the Instruments of Service on other projects or for additions to the Project outside the scope of the Work without the specific written consent of the Owner, Architect, and the Architect's consultants.

§ 1.6 Notice

§ 1.6.1 Except as otherwise provided in Section 1.6.2, where the Contract Documents require one party to notify or give notice to the other party, such notice shall be provided in writing to the designated representative of the party to whom the notice is addressed and shall be deemed to have been duly served if delivered in person, by mail, by courier, or by electronic transmission if a method for electronic transmission is set forth in the Agreement.

§ 1.6.2 Notice of Claims as provided in Section 15.1.3 shall be provided in writing and shall be deemed to have been duly served only if delivered to the designated representative of the party to whom the notice is addressed by certified or registered mail, or by courier providing proof of delivery.

§ 1.7 Digital Data Use and Transmission

The parties shall agree upon protocols governing the transmission and use of Instruments of Service or any other information or documentation in digital form. The parties will use AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, to establish the protocols for the development, use, transmission, and exchange of digital data.

§ 1.8 Building Information Models Use and Reliance

Any use of, or reliance on, all or a portion of a building information model without agreement to protocols governing the use of, and reliance on, the information contained in the model and without having those protocols set forth in AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, and the requisite AIA Document G202™–2013, Project Building Information Modeling Protocol Form, shall be at the using or relying party's sole risk

and without liability to the other party and its contractors or consultants, the authors of, or contributors to, the building information model, and each of their agents and employees.

ARTICLE 2 OWNER

§ 2.1 General

§ 2.1.1 The Owner is the person or entity identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number. The Owner shall designate in writing a representative who shall have express authority to bind the Owner with respect to all matters requiring the Owner's approval or authorization. Except as otherwise provided in Section 4.2.1, the Architect does not have such authority. The term "Owner" means the Owner or the Owner's authorized representative.

§ 2.1.2 The Owner shall furnish to the Contractor, within fifteen days after receipt of a written request, information necessary and relevant for the Contractor to evaluate, give notice of, or enforce mechanic's lien rights. Such information shall include a correct statement of the record legal title to the property on which the Project is located, usually referred to as the site, and the Owner's interest therein.

§ 2.2 Evidence of the Owner's Financial Arrangements

§ 2.2.1 Prior to commencement of the Work and upon written request by the Contractor, the Owner shall furnish to the Contractor reasonable evidence that the Owner has made financial arrangements to fulfill the Owner's obligations under the Contract. The Contractor shall have no obligation to commence the Work until the Owner provides such evidence. If commencement of the Work is delayed under this Section 2.2.1, the Contract Time shall be extended appropriately.

§ 2.2.2 Following commencement of the Work and upon written request by the Contractor, the Owner shall furnish to the Contractor reasonable evidence that the Owner has made financial arrangements to fulfill the Owner's obligations under the Contract only if (1) the Owner fails to make payments to the Contractor as the Contract Documents require; (2) the Contractor identifies in writing a reasonable concern regarding the Owner's ability to make payment when due; or (3) a change in the Work materially changes the Contract Sum. If the Owner fails to provide such evidence, as required, within fourteen days of the Contractor's request, the Contractor may immediately stop the Work and, in that event, shall notify the Owner that the Work has stopped. However, if the request is made because a change in the Work materially changes the Contract Sum under (3) above, the Contractor may immediately stop only that portion of the Work affected by the change until reasonable evidence is provided. If the Work is stopped under this Section 2.2.2, the Contract Time shall be extended appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable costs of shutdown, delay and start-up, plus interest as provided in the Contract Documents.

§ 2.2.3 After the Owner furnishes evidence of financial arrangements under this Section 2.2, the Owner shall not materially vary such financial arrangements without prior notice to the Contractor.

§ 2.2.4 Where the Owner has designated information furnished under this Section 2.2 as "confidential," the Contractor shall keep the information confidential and shall not disclose it to any other person. However, the Contractor may disclose "confidential" information, after seven (7) days' notice to the Owner, where disclosure is required by law, including a subpoena or other form of compulsory legal process issued by a court or governmental entity, or by court or arbitrator(s) order. The Contractor may also disclose "confidential" information to its employees, consultants, sureties, Subcontractors and their employees, Sub-subcontractors, and others who need to know the content of such information solely and exclusively for the Project and who agree to maintain the confidentiality of such information.

§ 2.3 Information and Services Required of the Owner

§ 2.3.1 Except for permits and fees that are the responsibility of the Contractor under the Contract Documents, including those required under Section 3.7.1, the Owner shall secure and pay for necessary approvals, easements, assessments and charges required for construction, use or occupancy of permanent structures or for permanent changes in existing facilities.

§ 2.3.2 The Owner shall retain an architect lawfully licensed to practice architecture, or an entity lawfully practicing architecture, in the jurisdiction where the Project is located. That person or entity is identified as the Architect in the Agreement and is referred to throughout the Contract Documents as if singular in number.

§ 2.3.3 If the employment of the Architect terminates, the Owner shall employ a successor to whom the Contractor has no reasonable objection and whose status under the Contract Documents shall be that of the Architect.

§ 2.3.4 The Owner shall furnish surveys describing physical characteristics, legal limitations and utility locations for the site of the Project, and a legal description of the site. The Contractor shall be entitled to rely on the accuracy of information furnished by the Owner but shall exercise proper precautions relating to the safe performance of the Work.

§ 2.3.5 The Owner shall furnish information or services required of the Owner by the Contract Documents with reasonable promptness. The Owner shall also furnish any other information or services under the Owner's control and relevant to the Contractor's performance of the Work with reasonable promptness after receiving the Contractor's written request for such information or services.

§ 2.3.6 Unless otherwise provided in the Contract Documents, the Owner shall furnish to the Contractor one copy of the Contract Documents for purposes of making reproductions pursuant to Section 1.5.2.

§ 2.4 Owner's Right to Stop the Work

If the Contractor fails to correct Work that is not in accordance with the requirements of the Contract Documents as required by Section 12.2 or repeatedly fails to carry out Work in accordance with the Contract Documents, the Owner may issue a written order to the Contractor to stop the Work, or any portion thereof, until the cause for such order has been eliminated; however, the right of the Owner to stop the Work shall not give rise to a duty on the part of the Owner to exercise this right for the benefit of the Contractor or any other person or entity, except to the extent required by Section 6.1.3.

§ 2.5 Owner's Right to Carry Out the Work

If the Contractor defaults or neglects to carry out the Work in accordance with the Contract Documents and fails within a ten-day period after receipt of notice from the Owner to commence and continue correction of such default or neglect with diligence and promptness, the Owner may, without prejudice to other remedies the Owner may have, correct such default or neglect. Such action by the Owner and amounts charged to the Contractor are both subject to prior approval of the Architect and the Architect may, pursuant to Section 9.5.1, withhold or nullify a Certificate for Payment in whole or in part, to the extent reasonably necessary to reimburse the Owner for the reasonable cost of correcting such deficiencies, including Owner's expenses and compensation for the Architect's additional services made necessary by such default, neglect, or failure. If current and future payments are not sufficient to cover such amounts, the Contractor shall pay the difference to the Owner. If the Contractor disagrees with the actions of the Owner or the Architect, or the amounts claimed as costs to the Owner, the Contractor may file a Claim pursuant to Article 15.

ARTICLE 3 CONTRACTOR

§ 3.1 General

§ 3.1.1 The Contractor is the person or entity identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number. The Contractor shall be lawfully licensed, if required in the jurisdiction where the Project is located. The Contractor shall designate in writing a representative who shall have express authority to bind the Contractor with respect to all matters under this Contract. The term "Contractor" means the Contractor or the Contractor's authorized representative.

§ 3.1.2 The Contractor shall perform the Work in accordance with the Contract Documents.

§ 3.1.3 The Contractor shall not be relieved of its obligations to perform the Work in accordance with the Contract Documents either by activities or duties of the Architect in the Architect's administration of the Contract, or by tests, inspections or approvals required or performed by persons or entities other than the Contractor.

§ 3.2 Review of Contract Documents and Field Conditions by Contractor

§ 3.2.1 Execution of the Contract by the Contractor is a representation that the Contractor has visited the site, become generally familiar with local conditions under which the Work is to be performed, and correlated personal observations with requirements of the Contract Documents.

§ 3.2.2 Because the Contract Documents are complementary, the Contractor shall, before starting each portion of the Work, carefully study and compare the various Contract Documents relative to that portion of the Work, as well as the information furnished by the Owner pursuant to Section 2.3.4, shall take field measurements of any existing conditions related to that portion of the Work, and shall observe any conditions at the site affecting it. These

obligations are for the purpose of facilitating coordination and construction by the Contractor and are not for the purpose of discovering errors, omissions, or inconsistencies in the Contract Documents; however, the Contractor shall promptly report to the Architect any errors, inconsistencies or omissions discovered by or made known to the Contractor as a request for information in such form as the Architect may require. It is recognized that the Contractor's review is made in the Contractor's capacity as a contractor and not as a licensed design professional, unless otherwise specifically provided in the Contract Documents.

§ 3.2.3 The Contractor is not required to ascertain that the Contract Documents are in accordance with applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of public authorities, but the Contractor shall promptly report to the Architect any nonconformity discovered by or made known to the Contractor as a request for information in such form as the Architect may require.

§ 3.2.4 If the Contractor believes that additional cost or time is involved because of clarifications or instructions the Architect issues in response to the Contractor's notices or requests for information pursuant to Sections 3.2.2 or 3.2.3, the Contractor shall submit Claims as provided in Article 15. If the Contractor fails to perform the obligations of Sections 3.2.2 or 3.2.3, the Contractor shall pay such costs and damages to the Owner, subject to Section 15.1.7, as would have been avoided if the Contractor had performed such obligations. If the Contractor performs those obligations, the Contractor shall not be liable to the Owner or Architect for damages resulting from errors, inconsistencies or omissions in the Contract Documents, for differences between field measurements or conditions and the Contract Documents, or for nonconformities of the Contract Documents to applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities.

§ 3.3 Supervision and Construction Procedures

§ 3.3.1 The Contractor shall supervise and direct the Work, using the Contractor's best skill and attention. The Contractor shall be solely responsible for, and have control over, construction means, methods, techniques, sequences, and procedures, and for coordinating all portions of the Work under the Contract. If the Contract Documents give specific instructions concerning construction means, methods, techniques, sequences, or procedures, the Contractor shall evaluate the jobsite safety thereof and shall be solely responsible for the jobsite safety of such means, methods, techniques, sequences, or procedures. If the Contractor determines that such means, methods, techniques, sequences or procedures may not be safe, the Contractor shall give timely notice to the Owner and Architect, and shall propose alternative means, methods, techniques, sequences, or procedures. The Architect shall evaluate the proposed alternative solely for conformance with the design intent for the completed construction. Unless the Architect objects to the Contractor's proposed alternative, the Contractor shall perform the Work using its alternative means, methods, techniques, sequences, or procedures.

§ 3.3.2 The Contractor shall be responsible to the Owner for acts and omissions of the Contractor's employees, Subcontractors and their agents and employees, and other persons or entities performing portions of the Work for, or on behalf of, the Contractor or any of its Subcontractors.

§ 3.3.3 The Contractor shall be responsible for inspection of portions of Work already performed to determine that such portions are in proper condition to receive subsequent Work.

§ 3.4 Labor and Materials

§ 3.4.1 Unless otherwise provided in the Contract Documents, the Contractor shall provide and pay for labor, materials, equipment, tools, construction equipment and machinery, water, heat, utilities, transportation, and other facilities and services necessary for proper execution and completion of the Work, whether temporary or permanent and whether or not incorporated or to be incorporated in the Work.

§ 3.4.2 Except in the case of minor changes in the Work approved by the Architect in accordance with Section 3.12.8 or ordered by the Architect in accordance with Section 7.4, the Contractor may make substitutions only with the consent of the Owner, after evaluation by the Architect and in accordance with a Change Order or Construction Change Directive.

§ 3.4.3 The Contractor shall enforce strict discipline and good order among the Contractor's employees and other persons carrying out the Work. The Contractor shall not permit employment of unfit persons or persons not properly skilled in tasks assigned to them.

§ 3.5 Warranty

§ 3.5.1 The Contractor warrants to the Owner and Architect that materials and equipment furnished under the Contract will be of good quality and new unless the Contract Documents require or permit otherwise. The Contractor further warrants that the Work will conform to the requirements of the Contract Documents and will be free from defects, except for those inherent in the quality of the Work the Contract Documents require or permit. Work, materials, or equipment not conforming to these requirements may be considered defective. The Contractor's warranty excludes remedy for damage or defect caused by abuse, alterations to the Work not executed by the Contractor, improper or insufficient maintenance, improper operation, or normal wear and tear and normal usage. If required by the Architect, the Contractor shall furnish satisfactory evidence as to the kind and quality of materials and equipment.

§ 3.5.2 All material, equipment, or other special warranties required by the Contract Documents shall be issued in the name of the Owner, or shall be transferable to the Owner, and shall commence in accordance with Section 9.8.4.

§ 3.6 Taxes

The Contractor shall pay sales, consumer, use and similar taxes for the Work provided by the Contractor that are legally enacted when bids are received or negotiations concluded, whether or not yet effective or merely scheduled to go into effect.

§ 3.7 Permits, Fees, Notices and Compliance with Laws

§ 3.7.1 Unless otherwise provided in the Contract Documents, the Contractor shall secure and pay for the building permit as well as for other permits, fees, licenses, and inspections by government agencies necessary for proper execution and completion of the Work that are customarily secured after execution of the Contract and legally required at the time bids are received or negotiations concluded.

§ 3.7.2 The Contractor shall comply with and give notices required by applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities applicable to performance of the Work.

§ 3.7.3 If the Contractor performs Work knowing it to be contrary to applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of public authorities, the Contractor shall assume appropriate responsibility for such Work and shall bear the costs attributable to correction.

§ 3.7.4 Concealed or Unknown Conditions

If the Contractor encounters conditions at the site that are (1) subsurface or otherwise concealed physical conditions that differ materially from those indicated in the Contract Documents or (2) unknown physical conditions of an unusual nature that differ materially from those ordinarily found to exist and generally recognized as inherent in construction activities of the character provided for in the Contract Documents, the Contractor shall promptly provide notice to the Owner and the Architect before conditions are disturbed and in no event later than 14 days after first observance of the conditions. The Architect will promptly investigate such conditions and, if the Architect determines that they differ materially and cause an increase or decrease in the Contractor's cost of, or time required for, performance of any part of the Work, will recommend that an equitable adjustment be made in the Contract Sum or Contract Time, or both. If the Architect determines that the conditions at the site are not materially different from those indicated in the Contract Documents and that no change in the terms of the Contract is justified, the Architect shall promptly notify the Owner and Contractor, stating the reasons. If either party disputes the Architect's determination or recommendation, that party may submit a Claim as provided in Article 15.

§ 3.7.5 If, in the course of the Work, the Contractor encounters human remains or recognizes the existence of burial markers, archaeological sites or wetlands not indicated in the Contract Documents, the Contractor shall immediately suspend any operations that would affect them and shall notify the Owner and Architect. Upon receipt of such notice, the Owner shall promptly take any action necessary to obtain governmental authorization required to resume the operations. The Contractor shall continue to suspend such operations until otherwise instructed by the Owner but shall continue with all other operations that do not affect those remains or features. Requests for adjustments in the Contract Sum and Contract Time arising from the existence of such remains or features may be made as provided in Article 15.

§ 3.8 Allowances

§ 3.8.1 The Contractor shall include in the Contract Sum all allowances stated in the Contract Documents. Items covered by allowances shall be supplied for such amounts and by such persons or entities as the Owner may direct, but the Contractor shall not be required to employ persons or entities to whom the Contractor has reasonable objection.

§ 3.8.2 Unless otherwise provided in the Contract Documents,

- .1 allowances shall cover the cost to the Contractor of materials and equipment delivered at the site and all required taxes, less applicable trade discounts;
- .2 Contractor's costs for unloading and handling at the site, labor, installation costs, overhead, profit, and other expenses contemplated for stated allowance amounts shall be included in the Contract Sum but not in the allowances; and
- .3 whenever costs are more than or less than allowances, the Contract Sum shall be adjusted accordingly by Change Order. The amount of the Change Order shall reflect (1) the difference between actual costs and the allowances under Section 3.8.2.1 and (2) changes in Contractor's costs under Section 3.8.2.2.

§ 3.8.3 Materials and equipment under an allowance shall be selected by the Owner with reasonable promptness.

§ 3.9 Superintendent

§ 3.9.1 The Contractor shall employ a competent superintendent and necessary assistants who shall be in attendance at the Project site during performance of the Work. The superintendent shall represent the Contractor, and communications given to the superintendent shall be as binding as if given to the Contractor.

§ 3.9.2 The Contractor, as soon as practicable after award of the Contract, shall notify the Owner and Architect of the name and qualifications of a proposed superintendent. Within 14 days of receipt of the information, the Architect may notify the Contractor, stating whether the Owner or the Architect (1) has reasonable objection to the proposed superintendent or (2) requires additional time for review. Failure of the Architect to provide notice within the 14-day period shall constitute notice of no reasonable objection.

§ 3.9.3 The Contractor shall not employ a proposed superintendent to whom the Owner or Architect has made reasonable and timely objection. The Contractor shall not change the superintendent without the Owner's consent, which shall not unreasonably be withheld or delayed.

§ 3.10 Contractor's Construction and Submittal Schedules

§ 3.10.1 The Contractor, promptly after being awarded the Contract, shall submit for the Owner's and Architect's information a Contractor's construction schedule for the Work. The schedule shall contain detail appropriate for the Project, including (1) the date of commencement of the Work, interim schedule milestone dates, and the date of Substantial Completion; (2) an apportionment of the Work by construction activity; and (3) the time required for completion of each portion of the Work. The schedule shall provide for the orderly progression of the Work to completion and shall not exceed time limits current under the Contract Documents. The schedule shall be revised at appropriate intervals as required by the conditions of the Work and Project.

§ 3.10.2 The Contractor, promptly after being awarded the Contract and thereafter as necessary to maintain a current submittal schedule, shall submit a submittal schedule for the Architect's approval. The Architect's approval shall not be unreasonably delayed or withheld. The submittal schedule shall (1) be coordinated with the Contractor's construction schedule, and (2) allow the Architect reasonable time to review submittals. If the Contractor fails to submit a submittal schedule, or fails to provide submittals in accordance with the approved submittal schedule, the Contractor shall not be entitled to any increase in Contract Sum or extension of Contract Time based on the time required for review of submittals.

§ 3.10.3 The Contractor shall perform the Work in general accordance with the most recent schedules submitted to the Owner and Architect.

§ 3.11 Documents and Samples at the Site

The Contractor shall make available, at the Project site, the Contract Documents, including Change Orders, Construction Change Directives, and other Modifications, in good order and marked currently to indicate field changes and selections made during construction, and the approved Shop Drawings, Product Data, Samples, and similar required submittals. These shall be in electronic form or paper copy, available to the Architect and Owner, and delivered to the Architect for submittal to the Owner upon completion of the Work as a record of the Work as constructed.

§ 3.12 Shop Drawings, Product Data and Samples

§ 3.12.1 Shop Drawings are drawings, diagrams, schedules, and other data specially prepared for the Work by the Contractor or a Subcontractor, Sub-subcontractor, manufacturer, supplier, or distributor to illustrate some portion of the Work.

§ 3.12.2 Product Data are illustrations, standard schedules, performance charts, instructions, brochures, diagrams, and other information furnished by the Contractor to illustrate materials or equipment for some portion of the Work.

§ 3.12.3 Samples are physical examples that illustrate materials, equipment, or workmanship, and establish standards by which the Work will be judged.

§ 3.12.4 Shop Drawings, Product Data, Samples, and similar submittals are not Contract Documents. Their purpose is to demonstrate how the Contractor proposes to conform to the information given and the design concept expressed in the Contract Documents for those portions of the Work for which the Contract Documents require submittals. Review by the Architect is subject to the limitations of Section 4.2.7. Informational submittals upon which the Architect is not expected to take responsive action may be so identified in the Contract Documents. Submittals that are not required by the Contract Documents may be returned by the Architect without action.

§ 3.12.5 The Contractor shall review for compliance with the Contract Documents, approve, and submit to the Architect, Shop Drawings, Product Data, Samples, and similar submittals required by the Contract Documents, in accordance with the submittal schedule approved by the Architect or, in the absence of an approved submittal schedule, with reasonable promptness and in such sequence as to cause no delay in the Work or in the activities of the Owner or of Separate Contractors.

§ 3.12.6 By submitting Shop Drawings, Product Data, Samples, and similar submittals, the Contractor represents to the Owner and Architect that the Contractor has (1) reviewed and approved them, (2) determined and verified materials, field measurements and field construction criteria related thereto, or will do so, and (3) checked and coordinated the information contained within such submittals with the requirements of the Work and of the Contract Documents.

§ 3.12.7 The Contractor shall perform no portion of the Work for which the Contract Documents require submittal and review of Shop Drawings, Product Data, Samples, or similar submittals, until the respective submittal has been approved by the Architect.

§ 3.12.8 The Work shall be in accordance with approved submittals except that the Contractor shall not be relieved of responsibility for deviations from the requirements of the Contract Documents by the Architect's approval of Shop Drawings, Product Data, Samples, or similar submittals, unless the Contractor has specifically notified the Architect of such deviation at the time of submittal and (1) the Architect has given written approval to the specific deviation as a minor change in the Work, or (2) a Change Order or Construction Change Directive has been issued authorizing the deviation. The Contractor shall not be relieved of responsibility for errors or omissions in Shop Drawings, Product Data, Samples, or similar submittals, by the Architect's approval thereof.

§ 3.12.9 The Contractor shall direct specific attention, in writing or on resubmitted Shop Drawings, Product Data, Samples, or similar submittals, to revisions other than those requested by the Architect on previous submittals. In the absence of such notice, the Architect's approval of a resubmission shall not apply to such revisions.

§ 3.12.10 The Contractor shall not be required to provide professional services that constitute the practice of architecture or engineering unless such services are specifically required by the Contract Documents for a portion of the Work or unless the Contractor needs to provide such services in order to carry out the Contractor's responsibilities for construction means, methods, techniques, sequences, and procedures. The Contractor shall not be required to provide professional services in violation of applicable law.

§ 3.12.10.1 If professional design services or certifications by a design professional related to systems, materials, or equipment are specifically required of the Contractor by the Contract Documents, the Owner and the Architect will specify all performance and design criteria that such services must satisfy. The Contractor shall be entitled to rely upon the adequacy and accuracy of the performance and design criteria provided in the Contract Documents. The Contractor shall cause such services or certifications to be provided by an appropriately licensed design professional, whose signature and seal shall appear on all drawings, calculations, specifications, certifications, Shop Drawings, and other submittals prepared by such professional. Shop Drawings, and other submittals related to the Work, designed or

certified by such professional, if prepared by others, shall bear such professional's written approval when submitted to the Architect. The Owner and the Architect shall be entitled to rely upon the adequacy and accuracy of the services, certifications, and approvals performed or provided by such design professionals, provided the Owner and Architect have specified to the Contractor the performance and design criteria that such services must satisfy. Pursuant to this Section 3.12.10, the Architect will review and approve or take other appropriate action on submittals only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents.

§ 3.12.10.2 If the Contract Documents require the Contractor's design professional to certify that the Work has been performed in accordance with the design criteria, the Contractor shall furnish such certifications to the Architect at the time and in the form specified by the Architect.

§ 3.13 Use of Site

The Contractor shall confine operations at the site to areas permitted by applicable laws, statutes, ordinances, codes, rules and regulations, lawful orders of public authorities, and the Contract Documents and shall not unreasonably encumber the site with materials or equipment.

§ 3.14 Cutting and Patching

§ 3.14.1 The Contractor shall be responsible for cutting, fitting, or patching required to complete the Work or to make its parts fit together properly. All areas requiring cutting, fitting, or patching shall be restored to the condition existing prior to the cutting, fitting, or patching, unless otherwise required by the Contract Documents.

§ 3.14.2 The Contractor shall not damage or endanger a portion of the Work or fully or partially completed construction of the Owner or Separate Contractors by cutting, patching, or otherwise altering such construction, or by excavation. The Contractor shall not cut or otherwise alter construction by the Owner or a Separate Contractor except with written consent of the Owner and of the Separate Contractor. Consent shall not be unreasonably withheld. The Contractor shall not unreasonably withhold, from the Owner or a Separate Contractor, its consent to cutting or otherwise altering the Work.

§ 3.15 Cleaning Up

§ 3.15.1 The Contractor shall keep the premises and surrounding area free from accumulation of waste materials and rubbish caused by operations under the Contract. At completion of the Work, the Contractor shall remove waste materials, rubbish, the Contractor's tools, construction equipment, machinery, and surplus materials from and about the Project.

§ 3.15.2 If the Contractor fails to clean up as provided in the Contract Documents, the Owner may do so and the Owner shall be entitled to reimbursement from the Contractor.

§ 3.16 Access to Work

The Contractor shall provide the Owner and Architect with access to the Work in preparation and progress wherever located.

§ 3.17 Royalties, Patents and Copyrights

The Contractor shall pay all royalties and license fees. The Contractor shall defend suits or claims for infringement of copyrights and patent rights and shall hold the Owner and Architect harmless from loss on account thereof, but shall not be responsible for defense or loss when a particular design, process, or product of a particular manufacturer or manufacturers is required by the Contract Documents, or where the copyright violations are contained in Drawings, Specifications, or other documents prepared by the Owner or Architect. However, if an infringement of a copyright or patent is discovered by, or made known to, the Contractor, the Contractor shall be responsible for the loss unless the information is promptly furnished to the Architect.

§ 3.18 Indemnification

§ 3.18.1 To the fullest extent permitted by law, the Contractor shall indemnify and hold harmless the Owner, Architect, Architect's consultants, and agents and employees of any of them from and against claims, damages, losses, and expenses, including but not limited to attorneys' fees, arising out of or resulting from performance of the Work, provided that such claim, damage, loss, or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the Work itself), but only to the extent caused by the negligent acts or omissions of the Contractor, a Subcontractor, anyone directly or indirectly employed by them, or anyone for

whose acts they may be liable, regardless of whether or not such claim, damage, loss, or expense is caused in part by a party indemnified hereunder. Such obligation shall not be construed to negate, abridge, or reduce other rights or obligations of indemnity that would otherwise exist as to a party or person described in this Section 3.18.

§ 3.18.2 In claims against any person or entity indemnified under this Section 3.18 by an employee of the Contractor, a Subcontractor, anyone directly or indirectly employed by them, or anyone for whose acts they may be liable, the indemnification obligation under Section 3.18.1 shall not be limited by a limitation on amount or type of damages, compensation, or benefits payable by or for the Contractor or a Subcontractor under workers' compensation acts, disability benefit acts, or other employee benefit acts.

ARTICLE 4 ARCHITECT

§ 4.1 General

§ 4.1.1 The Architect is the person or entity retained by the Owner pursuant to Section 2.3.2 and identified as such in the Agreement.

§ 4.1.2 Duties, responsibilities, and limitations of authority of the Architect as set forth in the Contract Documents shall not be restricted, modified, or extended without written consent of the Owner, Contractor, and Architect. Consent shall not be unreasonably withheld.

§ 4.2 Administration of the Contract

§ 4.2.1 The Architect will provide administration of the Contract as described in the Contract Documents and will be an Owner's representative during construction until the date the Architect issues the final Certificate for Payment. The Architect will have authority to act on behalf of the Owner only to the extent provided in the Contract Documents.

§ 4.2.2 The Architect will visit the site at intervals appropriate to the stage of construction, or as otherwise agreed with the Owner, to become generally familiar with the progress and quality of the portion of the Work completed, and to determine in general if the Work observed is being performed in a manner indicating that the Work, when fully completed, will be in accordance with the Contract Documents. However, the Architect will not be required to make exhaustive or continuous on-site inspections to check the quality or quantity of the Work. The Architect will not have control over, charge of, or responsibility for the construction means, methods, techniques, sequences or procedures, or for the safety precautions and programs in connection with the Work, since these are solely the Contractor's rights and responsibilities under the Contract Documents.

§ 4.2.3 On the basis of the site visits, the Architect will keep the Owner reasonably informed about the progress and quality of the portion of the Work completed, and promptly report to the Owner (1) known deviations from the Contract Documents, (2) known deviations from the most recent construction schedule submitted by the Contractor, and (3) defects and deficiencies observed in the Work. The Architect will not be responsible for the Contractor's failure to perform the Work in accordance with the requirements of the Contract Documents. The Architect will not have control over or charge of, and will not be responsible for acts or omissions of, the Contractor, Subcontractors, or their agents or employees, or any other persons or entities performing portions of the Work.

§ 4.2.4 Communications

The Owner and Contractor shall include the Architect in all communications that relate to or affect the Architect's services or professional responsibilities. The Owner shall promptly notify the Architect of the substance of any direct communications between the Owner and the Contractor otherwise relating to the Project. Communications by and with the Architect's consultants shall be through the Architect. Communications by and with Subcontractors and suppliers shall be through the Contractor. Communications by and with Separate Contractors shall be through the Owner. The Contract Documents may specify other communication protocols.

§ 4.2.5 Based on the Architect's evaluations of the Contractor's Applications for Payment, the Architect will review and certify the amounts due the Contractor and will issue Certificates for Payment in such amounts.

§ 4.2.6 The Architect has authority to reject Work that does not conform to the Contract Documents. Whenever the Architect considers it necessary or advisable, the Architect will have authority to require inspection or testing of the Work in accordance with Sections 13.4.2 and 13.4.3, whether or not the Work is fabricated, installed or completed. However, neither this authority of the Architect nor a decision made in good faith either to exercise or not to exercise such authority shall give rise to a duty or responsibility of the Architect to the Contractor, Subcontractors, suppliers, their agents or employees, or other persons or entities performing portions of the Work.

§ 4.2.7 The Architect will review and approve, or take other appropriate action upon, the Contractor's submittals such as Shop Drawings, Product Data, and Samples, but only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents. The Architect's action will be taken in accordance with the submittal schedule approved by the Architect or, in the absence of an approved submittal schedule, with reasonable promptness while allowing sufficient time in the Architect's professional judgment to permit adequate review. Review of such submittals is not conducted for the purpose of determining the accuracy and completeness of other details such as dimensions and quantities, or for substantiating instructions for installation or performance of equipment or systems, all of which remain the responsibility of the Contractor as required by the Contract Documents. The Architect's review of the Contractor's submittals shall not relieve the Contractor of the obligations under Sections 3.3, 3.5, and 3.12. The Architect's review shall not constitute approval of safety precautions or of any construction means, methods, techniques, sequences, or procedures. The Architect's approval of a specific item shall not indicate approval of an assembly of which the item is a component.

§ 4.2.8 The Architect will prepare Change Orders and Construction Change Directives, and may order minor changes in the Work as provided in Section 7.4. The Architect will investigate and make determinations and recommendations regarding concealed and unknown conditions as provided in Section 3.7.4.

§ 4.2.9 The Architect will conduct inspections to determine the date or dates of Substantial Completion and the date of final completion; issue Certificates of Substantial Completion pursuant to Section 9.8; receive and forward to the Owner, for the Owner's review and records, written warranties and related documents required by the Contract and assembled by the Contractor pursuant to Section 9.10; and issue a final Certificate for Payment pursuant to Section 9.10.

§ 4.2.10 If the Owner and Architect agree, the Architect will provide one or more Project representatives to assist in carrying out the Architect's responsibilities at the site. The Owner shall notify the Contractor of any change in the duties, responsibilities and limitations of authority of the Project representatives.

§ 4.2.11 The Architect will interpret and decide matters concerning performance under, and requirements of, the Contract Documents on written request of either the Owner or Contractor. The Architect's response to such requests will be made in writing within any time limits agreed upon or otherwise with reasonable promptness.

§ 4.2.12 Interpretations and decisions of the Architect will be consistent with the intent of, and reasonably inferable from, the Contract Documents and will be in writing or in the form of drawings. When making such interpretations and decisions, the Architect will endeavor to secure faithful performance by both Owner and Contractor, will not show partiality to either, and will not be liable for results of interpretations or decisions rendered in good faith.

§ 4.2.13 The Architect's decisions on matters relating to aesthetic effect will be final if consistent with the intent expressed in the Contract Documents.

§ 4.2.14 The Architect will review and respond to requests for information about the Contract Documents. The Architect's response to such requests will be made in writing within any time limits agreed upon or otherwise with reasonable promptness. If appropriate, the Architect will prepare and issue supplemental Drawings and Specifications in response to the requests for information.

ARTICLE 5 SUBCONTRACTORS

§ 5.1 Definitions

§ 5.1.1 A Subcontractor is a person or entity who has a direct contract with the Contractor to perform a portion of the Work at the site. The term "Subcontractor" is referred to throughout the Contract Documents as if singular in number and means a Subcontractor or an authorized representative of the Subcontractor. The term "Subcontractor" does not include a Separate Contractor or the subcontractors of a Separate Contractor.

§ 5.1.2 A Sub-subcontractor is a person or entity who has a direct or indirect contract with a Subcontractor to perform a portion of the Work at the site. The term "Sub-subcontractor" is referred to throughout the Contract Documents as if singular in number and means a Sub-subcontractor or an authorized representative of the Sub-subcontractor.

§ 5.2 Award of Subcontracts and Other Contracts for Portions of the Work

§ 5.2.1 Unless otherwise stated in the Contract Documents, the Contractor, as soon as practicable after award of the Contract, shall notify the Owner and Architect of the persons or entities proposed for each principal portion of the Work, including those who are to furnish materials or equipment fabricated to a special design. Within 14 days of receipt of the information, the Architect may notify the Contractor whether the Owner or the Architect (1) has reasonable objection to any such proposed person or entity or (2) requires additional time for review. Failure of the Architect to provide notice within the 14-day period shall constitute notice of no reasonable objection.

§ 5.2.2 The Contractor shall not contract with a proposed person or entity to whom the Owner or Architect has made reasonable and timely objection. The Contractor shall not be required to contract with anyone to whom the Contractor has made reasonable objection.

§ 5.2.3 If the Owner or Architect has reasonable objection to a person or entity proposed by the Contractor, the Contractor shall propose another to whom the Owner or Architect has no reasonable objection. If the proposed but rejected Subcontractor was reasonably capable of performing the Work, the Contract Sum and Contract Time shall be increased or decreased by the difference, if any, occasioned by such change, and an appropriate Change Order shall be issued before commencement of the substitute Subcontractor's Work. However, no increase in the Contract Sum or Contract Time shall be allowed for such change unless the Contractor has acted promptly and responsively in submitting names as required.

§ 5.2.4 The Contractor shall not substitute a Subcontractor, person, or entity for one previously selected if the Owner or Architect makes reasonable objection to such substitution.

§ 5.3 Subcontractual Relations

By appropriate written agreement, the Contractor shall require each Subcontractor, to the extent of the Work to be performed by the Subcontractor, to be bound to the Contractor by terms of the Contract Documents, and to assume toward the Contractor all the obligations and responsibilities, including the responsibility for safety of the Subcontractor's Work that the Contractor, by these Contract Documents, assumes toward the Owner and Architect. Each subcontract agreement shall preserve and protect the rights of the Owner and Architect under the Contract Documents with respect to the Work to be performed by the Subcontractor so that subcontracting thereof will not prejudice such rights, and shall allow to the Subcontractor, unless specifically provided otherwise in the subcontract agreement, the benefit of all rights, remedies, and redress against the Contractor that the Contractor, by the Contract Documents, has against the Owner. Where appropriate, the Contractor shall require each Subcontractor to enter into similar agreements with Sub-subcontractors. The Contractor shall make available to each proposed Subcontractor, prior to the execution of the subcontract agreement, copies of the Contract Documents to which the Subcontractor will be bound, and, upon written request of the Subcontractor, identify to the Subcontractor terms and conditions of the proposed subcontract agreement that may be at variance with the Contract Documents. Subcontractors will similarly make copies of applicable portions of such documents available to their respective proposed Sub-subcontractors.

§ 5.4 Contingent Assignment of Subcontracts

§ 5.4.1 Each subcontract agreement for a portion of the Work is assigned by the Contractor to the Owner, provided that

- .1 assignment is effective only after termination of the Contract by the Owner for cause pursuant to Section 14.2 and only for those subcontract agreements that the Owner accepts by notifying the Subcontractor and Contractor; and
- .2 assignment is subject to the prior rights of the surety, if any, obligated under bond relating to the Contract.

When the Owner accepts the assignment of a subcontract agreement, the Owner assumes the Contractor's rights and obligations under the subcontract.

§ 5.4.2 Upon such assignment, if the Work has been suspended for more than 30 days, the Subcontractor's compensation shall be equitably adjusted for increases in cost resulting from the suspension.

§ 5.4.3 Upon assignment to the Owner under this Section 5.4, the Owner may further assign the subcontract to a successor contractor or other entity. If the Owner assigns the subcontract to a successor contractor or other entity, the Owner shall nevertheless remain legally responsible for all of the successor contractor's obligations under the subcontract.

ARTICLE 6 CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS

§ 6.1 Owner's Right to Perform Construction and to Award Separate Contracts

§ 6.1.1 The term "Separate Contractor(s)" shall mean other contractors retained by the Owner under separate agreements. The Owner reserves the right to perform construction or operations related to the Project with the Owner's own forces, and with Separate Contractors retained under Conditions of the Contract substantially similar to those of this Contract, including those provisions of the Conditions of the Contract related to insurance and waiver of subrogation.

§ 6.1.2 When separate contracts are awarded for different portions of the Project or other construction or operations on the site, the term "Contractor" in the Contract Documents in each case shall mean the Contractor who executes each separate Owner-Contractor Agreement.

§ 6.1.3 The Owner shall provide for coordination of the activities of the Owner's own forces and of each Separate Contractor with the Work of the Contractor, who shall cooperate with them. The Contractor shall participate with any Separate Contractors and the Owner in reviewing their construction schedules. The Contractor shall make any revisions to its construction schedule deemed necessary after a joint review and mutual agreement. The construction schedules shall then constitute the schedules to be used by the Contractor, Separate Contractors, and the Owner until subsequently revised.

§ 6.1.4 Unless otherwise provided in the Contract Documents, when the Owner performs construction or operations related to the Project with the Owner's own forces or with Separate Contractors, the Owner or its Separate Contractors shall have the same obligations and rights that the Contractor has under the Conditions of the Contract, including, without excluding others, those stated in Article 3, this Article 6, and Articles 10, 11, and 12.

§ 6.2 Mutual Responsibility

§ 6.2.1 The Contractor shall afford the Owner and Separate Contractors reasonable opportunity for introduction and storage of their materials and equipment and performance of their activities, and shall connect and coordinate the Contractor's construction and operations with theirs as required by the Contract Documents.

§ 6.2.2 If part of the Contractor's Work depends for proper execution or results upon construction or operations by the Owner or a Separate Contractor, the Contractor shall, prior to proceeding with that portion of the Work, promptly notify the Architect of apparent discrepancies or defects in the construction or operations by the Owner or Separate Contractor that would render it unsuitable for proper execution and results of the Contractor's Work. Failure of the Contractor to notify the Architect of apparent discrepancies or defects prior to proceeding with the Work shall constitute an acknowledgment that the Owner's or Separate Contractor's completed or partially completed construction is fit and proper to receive the Contractor's Work. The Contractor shall not be responsible for discrepancies or defects in the construction or operations by the Owner or Separate Contractor that are not apparent.

§ 6.2.3 The Contractor shall reimburse the Owner for costs the Owner incurs that are payable to a Separate Contractor because of the Contractor's delays, improperly timed activities or defective construction. The Owner shall be responsible to the Contractor for costs the Contractor incurs because of a Separate Contractor's delays, improperly timed activities, damage to the Work or defective construction.

§ 6.2.4 The Contractor shall promptly remedy damage that the Contractor wrongfully causes to completed or partially completed construction or to property of the Owner or Separate Contractor as provided in Section 10.2.5.

§ 6.2.5 The Owner and each Separate Contractor shall have the same responsibilities for cutting and patching as are described for the Contractor in Section 3.14.

§ 6.3 Owner's Right to Clean Up

If a dispute arises among the Contractor, Separate Contractors, and the Owner as to the responsibility under their respective contracts for maintaining the premises and surrounding area free from waste materials and rubbish, the Owner may clean up and the Architect will allocate the cost among those responsible.

ARTICLE 7 CHANGES IN THE WORK

§ 7.1 General

§ 7.1.1 Changes in the Work may be accomplished after execution of the Contract, and without invalidating the Contract, by Change Order, Construction Change Directive or order for a minor change in the Work, subject to the limitations stated in this Article 7 and elsewhere in the Contract Documents.

§ 7.1.2 A Change Order shall be based upon agreement among the Owner, Contractor, and Architect. A Construction Change Directive requires agreement by the Owner and Architect and may or may not be agreed to by the Contractor. An order for a minor change in the Work may be issued by the Architect alone.

§ 7.1.3 Changes in the Work shall be performed under applicable provisions of the Contract Documents. The Contractor shall proceed promptly with changes in the Work, unless otherwise provided in the Change Order, Construction Change Directive, or order for a minor change in the Work.

§ 7.2 Change Orders

§ 7.2.1 A Change Order is a written instrument prepared by the Architect and signed by the Owner, Contractor, and Architect stating their agreement upon all of the following:

- .1 The change in the Work;
- .2 The amount of the adjustment, if any, in the Contract Sum; and
- .3 The extent of the adjustment, if any, in the Contract Time.

§ 7.3 Construction Change Directives

§ 7.3.1 A Construction Change Directive is a written order prepared by the Architect and signed by the Owner and Architect, directing a change in the Work prior to agreement on adjustment, if any, in the Contract Sum or Contract Time, or both. The Owner may by Construction Change Directive, without invalidating the Contract, order changes in the Work within the general scope of the Contract consisting of additions, deletions, or other revisions, the Contract Sum and Contract Time being adjusted accordingly.

§ 7.3.2 A Construction Change Directive shall be used in the absence of total agreement on the terms of a Change Order.

§ 7.3.3 If the Construction Change Directive provides for an adjustment to the Contract Sum, the adjustment shall be based on one of the following methods:

- .1 Mutual acceptance of a lump sum properly itemized and supported by sufficient substantiating data to permit evaluation;
- .2 Unit prices stated in the Contract Documents or subsequently agreed upon;
- .3 Cost to be determined in a manner agreed upon by the parties and a mutually acceptable fixed or percentage fee; or
- .4 As provided in Section 7.3.4.

§ 7.3.4 If the Contractor does not respond promptly or disagrees with the method for adjustment in the Contract Sum, the Architect shall determine the adjustment on the basis of reasonable expenditures and savings of those performing the Work attributable to the change, including, in case of an increase in the Contract Sum, an amount for overhead and profit as set forth in the Agreement, or if no such amount is set forth in the Agreement, a reasonable amount. In such case, and also under Section 7.3.3.3, the Contractor shall keep and present, in such form as the Architect may prescribe, an itemized accounting together with appropriate supporting data. Unless otherwise provided in the Contract Documents, costs for the purposes of this Section 7.3.4 shall be limited to the following:

- .1 Costs of labor, including applicable payroll taxes, fringe benefits required by agreement or custom, workers' compensation insurance, and other employee costs approved by the Architect;
- .2 Costs of materials, supplies, and equipment, including cost of transportation, whether incorporated or consumed;
- .3 Rental costs of machinery and equipment, exclusive of hand tools, whether rented from the Contractor or others;
- .4 Costs of premiums for all bonds and insurance, permit fees, and sales, use, or similar taxes, directly related to the change; and
- .5 Costs of supervision and field office personnel directly attributable to the change.

§ 7.3.5 If the Contractor disagrees with the adjustment in the Contract Time, the Contractor may make a Claim in accordance with applicable provisions of Article 15.

§ 7.3.6 Upon receipt of a Construction Change Directive, the Contractor shall promptly proceed with the change in the Work involved and advise the Architect of the Contractor's agreement or disagreement with the method, if any, provided in the Construction Change Directive for determining the proposed adjustment in the Contract Sum or Contract Time.

§ 7.3.7 A Construction Change Directive signed by the Contractor indicates the Contractor's agreement therewith, including adjustment in Contract Sum and Contract Time or the method for determining them. Such agreement shall be effective immediately and shall be recorded as a Change Order.

§ 7.3.8 The amount of credit to be allowed by the Contractor to the Owner for a deletion or change that results in a net decrease in the Contract Sum shall be actual net cost as confirmed by the Architect. When both additions and credits covering related Work or substitutions are involved in a change, the allowance for overhead and profit shall be figured on the basis of net increase, if any, with respect to that change.

§ 7.3.9 Pending final determination of the total cost of a Construction Change Directive to the Owner, the Contractor may request payment for Work completed under the Construction Change Directive in Applications for Payment. The Architect will make an interim determination for purposes of monthly certification for payment for those costs and certify for payment the amount that the Architect determines, in the Architect's professional judgment, to be reasonably justified. The Architect's interim determination of cost shall adjust the Contract Sum on the same basis as a Change Order, subject to the right of either party to disagree and assert a Claim in accordance with Article 15.

§ 7.3.10 When the Owner and Contractor agree with a determination made by the Architect concerning the adjustments in the Contract Sum and Contract Time, or otherwise reach agreement upon the adjustments, such agreement shall be effective immediately and the Architect will prepare a Change Order. Change Orders may be issued for all or any part of a Construction Change Directive.

§ 7.4 Minor Changes in the Work

The Architect may order minor changes in the Work that are consistent with the intent of the Contract Documents and do not involve an adjustment in the Contract Sum or an extension of the Contract Time. The Architect's order for minor changes shall be in writing. If the Contractor believes that the proposed minor change in the Work will affect the Contract Sum or Contract Time, the Contractor shall notify the Architect and shall not proceed to implement the change in the Work. If the Contractor performs the Work set forth in the Architect's order for a minor change without prior notice to the Architect that such change will affect the Contract Sum or Contract Time, the Contractor waives any adjustment to the Contract Sum or extension of the Contract Time.

ARTICLE 8 TIME

§ 8.1 Definitions

§ 8.1.1 Unless otherwise provided, Contract Time is the period of time, including authorized adjustments, allotted in the Contract Documents for Substantial Completion of the Work.

§ 8.1.2 The date of commencement of the Work is the date established in the Agreement.

§ 8.1.3 The date of Substantial Completion is the date certified by the Architect in accordance with Section 9.8.

§ 8.1.4 The term "day" as used in the Contract Documents shall mean calendar day unless otherwise specifically defined.

§ 8.2 Progress and Completion

§ 8.2.1 Time limits stated in the Contract Documents are of the essence of the Contract. By executing the Agreement, the Contractor confirms that the Contract Time is a reasonable period for performing the Work.

§ 8.2.2 The Contractor shall not knowingly, except by agreement or instruction of the Owner in writing, commence the Work prior to the effective date of insurance required to be furnished by the Contractor and Owner.

§ 8.2.3 The Contractor shall proceed expeditiously with adequate forces and shall achieve Substantial Completion within the Contract Time.

§ 8.3 Delays and Extensions of Time

§ 8.3.1 If the Contractor is delayed at any time in the commencement or progress of the Work by (1) an act or neglect of the Owner or Architect, of an employee of either, or of a Separate Contractor; (2) by changes ordered in the Work; (3) by labor disputes, fire, unusual delay in deliveries, unavoidable casualties, adverse weather conditions documented in accordance with Section 15.1.6.2, or other causes beyond the Contractor's control; (4) by delay authorized by the Owner pending mediation and binding dispute resolution; or (5) by other causes that the Contractor asserts, and the Architect determines, justify delay, then the Contract Time shall be extended for such reasonable time as the Architect may determine.

§ 8.3.2 Claims relating to time shall be made in accordance with applicable provisions of Article 15.

§ 8.3.3 This Section 8.3 does not preclude recovery of damages for delay by either party under other provisions of the Contract Documents.

ARTICLE 9 PAYMENTS AND COMPLETION

§ 9.1 Contract Sum

§ 9.1.1 The Contract Sum is stated in the Agreement and, including authorized adjustments, is the total amount payable by the Owner to the Contractor for performance of the Work under the Contract Documents.

§ 9.1.2 If unit prices are stated in the Contract Documents or subsequently agreed upon, and if quantities originally contemplated are materially changed so that application of such unit prices to the actual quantities causes substantial inequity to the Owner or Contractor, the applicable unit prices shall be equitably adjusted.

§ 9.2 Schedule of Values

Where the Contract is based on a stipulated sum or Guaranteed Maximum Price, the Contractor shall submit a schedule of values to the Architect before the first Application for Payment, allocating the entire Contract Sum to the various portions of the Work. The schedule of values shall be prepared in the form, and supported by the data to substantiate its accuracy, required by the Architect. This schedule, unless objected to by the Architect, shall be used as a basis for reviewing the Contractor's Applications for Payment. Any changes to the schedule of values shall be submitted to the Architect and supported by such data to substantiate its accuracy as the Architect may require, and unless objected to by the Architect, shall be used as a basis for reviewing the Contractor's subsequent Applications for Payment.

§ 9.3 Applications for Payment

§ 9.3.1 At least ten days before the date established for each progress payment, the Contractor shall submit to the Architect an itemized Application for Payment prepared in accordance with the schedule of values, if required under Section 9.2, for completed portions of the Work. The application shall be notarized, if required, and supported by all data substantiating the Contractor's right to payment that the Owner or Architect require, such as copies of requisitions, and releases and waivers of liens from Subcontractors and suppliers, and shall reflect retainage if provided for in the Contract Documents.

§ 9.3.1.1 As provided in Section 7.3.9, such applications may include requests for payment on account of changes in the Work that have been properly authorized by Construction Change Directives, or by interim determinations of the Architect, but not yet included in Change Orders.

§ 9.3.1.2 Applications for Payment shall not include requests for payment for portions of the Work for which the Contractor does not intend to pay a Subcontractor or supplier, unless such Work has been performed by others whom the Contractor intends to pay.

§ 9.3.2 Unless otherwise provided in the Contract Documents, payments shall be made on account of materials and equipment delivered and suitably stored at the site for subsequent incorporation in the Work. If approved in advance by the Owner, payment may similarly be made for materials and equipment suitably stored off the site at a location agreed upon in writing. Payment for materials and equipment stored on or off the site shall be conditioned upon compliance by the Contractor with procedures satisfactory to the Owner to establish the Owner's title to such materials

and equipment or otherwise protect the Owner's interest, and shall include the costs of applicable insurance, storage, and transportation to the site, for such materials and equipment stored off the site.

§ 9.3.3 The Contractor warrants that title to all Work covered by an Application for Payment will pass to the Owner no later than the time of payment. The Contractor further warrants that upon submittal of an Application for Payment all Work for which Certificates for Payment have been previously issued and payments received from the Owner shall, to the best of the Contractor's knowledge, information, and belief, be free and clear of liens, claims, security interests, or encumbrances, in favor of the Contractor, Subcontractors, suppliers, or other persons or entities that provided labor, materials, and equipment relating to the Work.

§ 9.4 Certificates for Payment

§ 9.4.1 The Architect will, within seven days after receipt of the Contractor's Application for Payment, either (1) issue to the Owner a Certificate for Payment in the full amount of the Application for Payment, with a copy to the Contractor; or (2) issue to the Owner a Certificate for Payment for such amount as the Architect determines is properly due, and notify the Contractor and Owner of the Architect's reasons for withholding certification in part as provided in Section 9.5.1; or (3) withhold certification of the entire Application for Payment, and notify the Contractor and Owner of the Architect's reason for withholding certification in whole as provided in Section 9.5.1.

§ 9.4.2 The issuance of a Certificate for Payment will constitute a representation by the Architect to the Owner, based on the Architect's evaluation of the Work and the data in the Application for Payment, that, to the best of the Architect's knowledge, information, and belief, the Work has progressed to the point indicated, the quality of the Work is in accordance with the Contract Documents, and that the Contractor is entitled to payment in the amount certified. The foregoing representations are subject to an evaluation of the Work for conformance with the Contract Documents upon Substantial Completion, to results of subsequent tests and inspections, to correction of minor deviations from the Contract Documents prior to completion, and to specific qualifications expressed by the Architect. However, the issuance of a Certificate for Payment will not be a representation that the Architect has (1) made exhaustive or continuous on-site inspections to check the quality or quantity of the Work; (2) reviewed construction means, methods, techniques, sequences, or procedures; (3) reviewed copies of requisitions received from Subcontractors and suppliers and other data requested by the Owner to substantiate the Contractor's right to payment; or (4) made examination to ascertain how or for what purpose the Contractor has used money previously paid on account of the Contract Sum.

§ 9.5 Decisions to Withhold Certification

§ 9.5.1 The Architect may withhold a Certificate for Payment in whole or in part, to the extent reasonably necessary to protect the Owner, if in the Architect's opinion the representations to the Owner required by Section 9.4.2 cannot be made. If the Architect is unable to certify payment in the amount of the Application, the Architect will notify the Contractor and Owner as provided in Section 9.4.1. If the Contractor and Architect cannot agree on a revised amount, the Architect will promptly issue a Certificate for Payment for the amount for which the Architect is able to make such representations to the Owner. The Architect may also withhold a Certificate for Payment or, because of subsequently discovered evidence, may nullify the whole or a part of a Certificate for Payment previously issued, to such extent as may be necessary in the Architect's opinion to protect the Owner from loss for which the Contractor is responsible, including loss resulting from acts and omissions described in Section 3.3.2, because of

- .1 defective Work not remedied;
- .2 third party claims filed or reasonable evidence indicating probable filing of such claims, unless security acceptable to the Owner is provided by the Contractor;
- .3 failure of the Contractor to make payments properly to Subcontractors or suppliers for labor, materials or equipment;
- .4 reasonable evidence that the Work cannot be completed for the unpaid balance of the Contract Sum;
- .5 damage to the Owner or a Separate Contractor;
- .6 reasonable evidence that the Work will not be completed within the Contract Time, and that the unpaid balance would not be adequate to cover actual or liquidated damages for the anticipated delay; or
- .7 repeated failure to carry out the Work in accordance with the Contract Documents.

§ 9.5.2 When either party disputes the Architect's decision regarding a Certificate for Payment under Section 9.5.1, in whole or in part, that party may submit a Claim in accordance with Article 15.

§ 9.5.3 When the reasons for withholding certification are removed, certification will be made for amounts previously withheld.

§ 9.5.4 If the Architect withholds certification for payment under Section 9.5.1.3, the Owner may, at its sole option, issue joint checks to the Contractor and to any Subcontractor or supplier to whom the Contractor failed to make payment for Work properly performed or material or equipment suitably delivered. If the Owner makes payments by joint check, the Owner shall notify the Architect and the Contractor shall reflect such payment on its next Application for Payment.

§ 9.6 Progress Payments

§ 9.6.1 After the Architect has issued a Certificate for Payment, the Owner shall make payment in the manner and within the time provided in the Contract Documents, and shall so notify the Architect.

§ 9.6.2 The Contractor shall pay each Subcontractor, no later than seven days after receipt of payment from the Owner, the amount to which the Subcontractor is entitled, reflecting percentages actually retained from payments to the Contractor on account of the Subcontractor's portion of the Work. The Contractor shall, by appropriate agreement with each Subcontractor, require each Subcontractor to make payments to Sub-subcontractors in a similar manner.

§ 9.6.3 The Architect will, on request, furnish to a Subcontractor, if practicable, information regarding percentages of completion or amounts applied for by the Contractor and action taken thereon by the Architect and Owner on account of portions of the Work done by such Subcontractor.

§ 9.6.4 The Owner has the right to request written evidence from the Contractor that the Contractor has properly paid Subcontractors and suppliers amounts paid by the Owner to the Contractor for subcontracted Work. If the Contractor fails to furnish such evidence within seven days, the Owner shall have the right to contact Subcontractors and suppliers to ascertain whether they have been properly paid. Neither the Owner nor Architect shall have an obligation to pay, or to see to the payment of money to, a Subcontractor or supplier, except as may otherwise be required by law.

§ 9.6.5 The Contractor's payments to suppliers shall be treated in a manner similar to that provided in Sections 9.6.2, 9.6.3 and 9.6.4.

§ 9.6.6 A Certificate for Payment, a progress payment, or partial or entire use or occupancy of the Project by the Owner shall not constitute acceptance of Work not in accordance with the Contract Documents.

§ 9.6.7 Unless the Contractor provides the Owner with a payment bond in the full penal sum of the Contract Sum, payments received by the Contractor for Work properly performed by Subcontractors or provided by suppliers shall be held by the Contractor for those Subcontractors or suppliers who performed Work or furnished materials, or both, under contract with the Contractor for which payment was made by the Owner. Nothing contained herein shall require money to be placed in a separate account and not commingled with money of the Contractor, create any fiduciary liability or tort liability on the part of the Contractor for breach of trust, or entitle any person or entity to an award of punitive damages against the Contractor for breach of the requirements of this provision.

§ 9.6.8 Provided the Owner has fulfilled its payment obligations under the Contract Documents, the Contractor shall defend and indemnify the Owner from all loss, liability, damage or expense, including reasonable attorney's fees and litigation expenses, arising out of any lien claim or other claim for payment by any Subcontractor or supplier of any tier. Upon receipt of notice of a lien claim or other claim for payment, the Owner shall notify the Contractor. If approved by the applicable court, when required, the Contractor may substitute a surety bond for the property against which the lien or other claim for payment has been asserted.

§ 9.7 Failure of Payment

If the Architect does not issue a Certificate for Payment, through no fault of the Contractor, within seven days after receipt of the Contractor's Application for Payment, or if the Owner does not pay the Contractor within seven days after the date established in the Contract Documents, the amount certified by the Architect or awarded by binding dispute resolution, then the Contractor may, upon seven additional days' notice to the Owner and Architect, stop the Work until payment of the amount owing has been received. The Contract Time shall be extended appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable costs of shutdown, delay and start-up, plus interest as provided for in the Contract Documents.

§ 9.8 Substantial Completion

§ 9.8.1 Substantial Completion is the stage in the progress of the Work when the Work or designated portion thereof is sufficiently complete in accordance with the Contract Documents so that the Owner can occupy or utilize the Work for its intended use.

§ 9.8.2 When the Contractor considers that the Work, or a portion thereof which the Owner agrees to accept separately, is substantially complete, the Contractor shall prepare and submit to the Architect a comprehensive list of items to be completed or corrected prior to final payment. Failure to include an item on such list does not alter the responsibility of the Contractor to complete all Work in accordance with the Contract Documents.

§ 9.8.3 Upon receipt of the Contractor's list, the Architect will make an inspection to determine whether the Work or designated portion thereof is substantially complete. If the Architect's inspection discloses any item, whether or not included on the Contractor's list, which is not sufficiently complete in accordance with the Contract Documents so that the Owner can occupy or utilize the Work or designated portion thereof for its intended use, the Contractor shall, before issuance of the Certificate of Substantial Completion, complete or correct such item upon notification by the Architect. In such case, the Contractor shall then submit a request for another inspection by the Architect to determine Substantial Completion.

§ 9.8.4 When the Work or designated portion thereof is substantially complete, the Architect will prepare a Certificate of Substantial Completion that shall establish the date of Substantial Completion; establish responsibilities of the Owner and Contractor for security, maintenance, heat, utilities, damage to the Work and insurance; and fix the time within which the Contractor shall finish all items on the list accompanying the Certificate. Warranties required by the Contract Documents shall commence on the date of Substantial Completion of the Work or designated portion thereof unless otherwise provided in the Certificate of Substantial Completion.

§ 9.8.5 The Certificate of Substantial Completion shall be submitted to the Owner and Contractor for their written acceptance of responsibilities assigned to them in the Certificate. Upon such acceptance, and consent of surety if any, the Owner shall make payment of retainage applying to the Work or designated portion thereof. Such payment shall be adjusted for Work that is incomplete or not in accordance with the requirements of the Contract Documents.

§ 9.9 Partial Occupancy or Use

§ 9.9.1 The Owner may occupy or use any completed or partially completed portion of the Work at any stage when such portion is designated by separate agreement with the Contractor, provided such occupancy or use is consented to by the insurer and authorized by public authorities having jurisdiction over the Project. Such partial occupancy or use may commence whether or not the portion is substantially complete, provided the Owner and Contractor have accepted in writing the responsibilities assigned to each of them for payments, retainage, if any, security, maintenance, heat, utilities, damage to the Work and insurance, and have agreed in writing concerning the period for correction of the Work and commencement of warranties required by the Contract Documents. When the Contractor considers a portion substantially complete, the Contractor shall prepare and submit a list to the Architect as provided under Section 9.8.2. Consent of the Contractor to partial occupancy or use shall not be unreasonably withheld. The stage of the progress of the Work shall be determined by written agreement between the Owner and Contractor or, if no agreement is reached, by decision of the Architect.

§ 9.9.2 Immediately prior to such partial occupancy or use, the Owner, Contractor, and Architect shall jointly inspect the area to be occupied or portion of the Work to be used in order to determine and record the condition of the Work.

§ 9.9.3 Unless otherwise agreed upon, partial occupancy or use of a portion or portions of the Work shall not constitute acceptance of Work not complying with the requirements of the Contract Documents.

§ 9.10 Final Completion and Final Payment

§ 9.10.1 Upon receipt of the Contractor's notice that the Work is ready for final inspection and acceptance and upon receipt of a final Application for Payment, the Architect will promptly make such inspection. When the Architect finds the Work acceptable under the Contract Documents and the Contract fully performed, the Architect will promptly issue a final Certificate for Payment stating that to the best of the Architect's knowledge, information and belief, and on the basis of the Architect's on-site visits and inspections, the Work has been completed in accordance with the Contract Documents and that the entire balance found to be due the Contractor and noted in the final Certificate is due and payable. The Architect's final Certificate for Payment will constitute a further representation that conditions listed in Section 9.10.2 as precedent to the Contractor's being entitled to final payment have been fulfilled.

§ 9.10.2 Neither final payment nor any remaining retained percentage shall become due until the Contractor submits to the Architect (1) an affidavit that payrolls, bills for materials and equipment, and other indebtedness connected with the Work for which the Owner or the Owner's property might be responsible or encumbered (less amounts withheld by Owner) have been paid or otherwise satisfied, (2) a certificate evidencing that insurance required by the Contract Documents to remain in force after final payment is currently in effect, (3) a written statement that the Contractor knows of no reason that the insurance will not be renewable to cover the period required by the Contract Documents, (4) consent of surety, if any, to final payment, (5) documentation of any special warranties, such as manufacturers' warranties or specific Subcontractor warranties, and (6) if required by the Owner, other data establishing payment or satisfaction of obligations, such as receipts and releases and waivers of liens, claims, security interests, or encumbrances arising out of the Contract, to the extent and in such form as may be designated by the Owner. If a Subcontractor refuses to furnish a release or waiver required by the Owner, the Contractor may furnish a bond satisfactory to the Owner to indemnify the Owner against such lien, claim, security interest, or encumbrance. If a lien, claim, security interest, or encumbrance remains unsatisfied after payments are made, the Contractor shall refund to the Owner all money that the Owner may be compelled to pay in discharging the lien, claim, security interest, or encumbrance, including all costs and reasonable attorneys' fees.

§ 9.10.3 If, after Substantial Completion of the Work, final completion thereof is materially delayed through no fault of the Contractor or by issuance of Change Orders affecting final completion, and the Architect so confirms, the Owner shall, upon application by the Contractor and certification by the Architect, and without terminating the Contract, make payment of the balance due for that portion of the Work fully completed, corrected, and accepted. If the remaining balance for Work not fully completed or corrected is less than retainage stipulated in the Contract Documents, and if bonds have been furnished, the written consent of the surety to payment of the balance due for that portion of the Work fully completed and accepted shall be submitted by the Contractor to the Architect prior to certification of such payment. Such payment shall be made under terms and conditions governing final payment, except that it shall not constitute a waiver of Claims.

§ 9.10.4 The making of final payment shall constitute a waiver of Claims by the Owner except those arising from

- .1 liens, Claims, security interests, or encumbrances arising out of the Contract and unsettled;
- .2 failure of the Work to comply with the requirements of the Contract Documents;
- .3 terms of special warranties required by the Contract Documents; or
- .4 audits performed by the Owner, if permitted by the Contract Documents, after final payment.

§ 9.10.5 Acceptance of final payment by the Contractor, a Subcontractor, or a supplier, shall constitute a waiver of claims by that payee except those previously made in writing and identified by that payee as unsettled at the time of final Application for Payment.

ARTICLE 10 PROTECTION OF PERSONS AND PROPERTY

§ 10.1 Safety Precautions and Programs

The Contractor shall be responsible for initiating, maintaining, and supervising all safety precautions and programs in connection with the performance of the Contract.

§ 10.2 Safety of Persons and Property

§ 10.2.1 The Contractor shall take reasonable precautions for safety of, and shall provide reasonable protection to prevent damage, injury, or loss to

- .1 employees on the Work and other persons who may be affected thereby;
- .2 the Work and materials and equipment to be incorporated therein, whether in storage on or off the site, under care, custody, or control of the Contractor, a Subcontractor, or a Sub-subcontractor; and
- .3 other property at the site or adjacent thereto, such as trees, shrubs, lawns, walks, pavements, roadways, structures, and utilities not designated for removal, relocation, or replacement in the course of construction.

§ 10.2.2 The Contractor shall comply with, and give notices required by applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities, bearing on safety of persons or property or their protection from damage, injury, or loss.

§ 10.2.3 The Contractor shall implement, erect, and maintain, as required by existing conditions and performance of the Contract, reasonable safeguards for safety and protection, including posting danger signs and other warnings

against hazards; promulgating safety regulations; and notifying the owners and users of adjacent sites and utilities of the safeguards.

§ 10.2.4 When use or storage of explosives or other hazardous materials or equipment, or unusual methods are necessary for execution of the Work, the Contractor shall exercise utmost care and carry on such activities under supervision of properly qualified personnel.

§ 10.2.5 The Contractor shall promptly remedy damage and loss (other than damage or loss insured under property insurance required by the Contract Documents) to property referred to in Sections 10.2.1.2 and 10.2.1.3 caused in whole or in part by the Contractor, a Subcontractor, a Sub-subcontractor, or anyone directly or indirectly employed by any of them, or by anyone for whose acts they may be liable and for which the Contractor is responsible under Sections 10.2.1.2 and 10.2.1.3. The Contractor may make a Claim for the cost to remedy the damage or loss to the extent such damage or loss is attributable to acts or omissions of the Owner or Architect or anyone directly or indirectly employed by either of them, or by anyone for whose acts either of them may be liable, and not attributable to the fault or negligence of the Contractor. The foregoing obligations of the Contractor are in addition to the Contractor's obligations under Section 3.18.

§ 10.2.6 The Contractor shall designate a responsible member of the Contractor's organization at the site whose duty shall be the prevention of accidents. This person shall be the Contractor's superintendent unless otherwise designated by the Contractor in writing to the Owner and Architect.

§ 10.2.7 The Contractor shall not permit any part of the construction or site to be loaded so as to cause damage or create an unsafe condition.

§ 10.2.8 Injury or Damage to Person or Property

If either party suffers injury or damage to person or property because of an act or omission of the other party, or of others for whose acts such party is legally responsible, notice of the injury or damage, whether or not insured, shall be given to the other party within a reasonable time not exceeding 21 days after discovery. The notice shall provide sufficient detail to enable the other party to investigate the matter.

§ 10.3 Hazardous Materials and Substances

§ 10.3.1 The Contractor is responsible for compliance with any requirements included in the Contract Documents regarding hazardous materials or substances. If the Contractor encounters a hazardous material or substance not addressed in the Contract Documents and if reasonable precautions will be inadequate to prevent foreseeable bodily injury or death to persons resulting from a material or substance, including but not limited to asbestos or polychlorinated biphenyl (PCB), encountered on the site by the Contractor, the Contractor shall, upon recognizing the condition, immediately stop Work in the affected area and notify the Owner and Architect of the condition.

§ 10.3.2 Upon receipt of the Contractor's notice, the Owner shall obtain the services of a licensed laboratory to verify the presence or absence of the material or substance reported by the Contractor and, in the event such material or substance is found to be present, to cause it to be rendered harmless. Unless otherwise required by the Contract Documents, the Owner shall furnish in writing to the Contractor and Architect the names and qualifications of persons or entities who are to perform tests verifying the presence or absence of the material or substance or who are to perform the task of removal or safe containment of the material or substance. The Contractor and the Architect will promptly reply to the Owner in writing stating whether or not either has reasonable objection to the persons or entities proposed by the Owner. If either the Contractor or Architect has an objection to a person or entity proposed by the Owner, the Owner shall propose another to whom the Contractor and the Architect have no reasonable objection. When the material or substance has been rendered harmless, Work in the affected area shall resume upon written agreement of the Owner and Contractor. By Change Order, the Contract Time shall be extended appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable additional costs of shutdown, delay, and start-up.

§ 10.3.3 To the fullest extent permitted by law, the Owner shall indemnify and hold harmless the Contractor, Subcontractors, Architect, Architect's consultants, and agents and employees of any of them from and against claims, damages, losses, and expenses, including but not limited to attorneys' fees, arising out of or resulting from performance of the Work in the affected area if in fact the material or substance presents the risk of bodily injury or death as described in Section 10.3.1 and has not been rendered harmless, provided that such claim, damage, loss, or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property

(other than the Work itself), except to the extent that such damage, loss, or expense is due to the fault or negligence of the party seeking indemnity.

§ 10.3.4 The Owner shall not be responsible under this Section 10.3 for hazardous materials or substances the Contractor brings to the site unless such materials or substances are required by the Contract Documents. The Owner shall be responsible for hazardous materials or substances required by the Contract Documents, except to the extent of the Contractor's fault or negligence in the use and handling of such materials or substances.

§ 10.3.5 The Contractor shall reimburse the Owner for the cost and expense the Owner incurs (1) for remediation of hazardous materials or substances the Contractor brings to the site and negligently handles, or (2) where the Contractor fails to perform its obligations under Section 10.3.1, except to the extent that the cost and expense are due to the Owner's fault or negligence.

§ 10.3.6 If, without negligence on the part of the Contractor, the Contractor is held liable by a government agency for the cost of remediation of a hazardous material or substance solely by reason of performing Work as required by the Contract Documents, the Owner shall reimburse the Contractor for all cost and expense thereby incurred.

§ 10.4 Emergencies

In an emergency affecting safety of persons or property, the Contractor shall act, at the Contractor's discretion, to prevent threatened damage, injury, or loss. Additional compensation or extension of time claimed by the Contractor on account of an emergency shall be determined as provided in Article 15 and Article 7.

ARTICLE 11 INSURANCE AND BONDS

§ 11.1 Contractor's Insurance and Bonds

§ 11.1.1 The Contractor shall purchase and maintain insurance of the types and limits of liability, containing the endorsements, and subject to the terms and conditions, as described in the Agreement or elsewhere in the Contract Documents. The Contractor shall purchase and maintain the required insurance from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located. The Owner, Architect, and Architect's consultants shall be named as additional insureds under the Contractor's commercial general liability policy or as otherwise described in the Contract Documents.

§ 11.1.2 The Contractor shall provide surety bonds of the types, for such penal sums, and subject to such terms and conditions as required by the Contract Documents. The Contractor shall purchase and maintain the required bonds from a company or companies lawfully authorized to issue surety bonds in the jurisdiction where the Project is located.

§ 11.1.3 Upon the request of any person or entity appearing to be a potential beneficiary of bonds covering payment of obligations arising under the Contract, the Contractor shall promptly furnish a copy of the bonds or shall authorize a copy to be furnished.

§ 11.1.4 Notice of Cancellation or Expiration of Contractor's Required Insurance. Within three (3) business days of the date the Contractor becomes aware of an impending or actual cancellation or expiration of any insurance required by the Contract Documents, the Contractor shall provide notice to the Owner of such impending or actual cancellation or expiration. Upon receipt of notice from the Contractor, the Owner shall, unless the lapse in coverage arises from an act or omission of the Owner, have the right to stop the Work until the lapse in coverage has been cured by the procurement of replacement coverage by the Contractor. The furnishing of notice by the Contractor shall not relieve the Contractor of any contractual obligation to provide any required coverage.

§ 11.2 Owner's Insurance

§ 11.2.1 The Owner shall purchase and maintain insurance of the types and limits of liability, containing the endorsements, and subject to the terms and conditions, as described in the Agreement or elsewhere in the Contract Documents. The Owner shall purchase and maintain the required insurance from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located.

§ 11.2.2 Failure to Purchase Required Property Insurance. If the Owner fails to purchase and maintain the required property insurance, with all of the coverages and in the amounts described in the Agreement or elsewhere in the Contract Documents, the Owner shall inform the Contractor in writing prior to commencement of the Work. Upon receipt of notice from the Owner, the Contractor may delay commencement of the Work and may obtain insurance that

will protect the interests of the Contractor, Subcontractors, and Sub-Subcontractors in the Work. When the failure to provide coverage has been cured or resolved, the Contract Sum and Contract Time shall be equitably adjusted. In the event the Owner fails to procure coverage, the Owner waives all rights against the Contractor, Subcontractors, and Sub-subcontractors to the extent the loss to the Owner would have been covered by the insurance to have been procured by the Owner. The cost of the insurance shall be charged to the Owner by a Change Order. If the Owner does not provide written notice, and the Contractor is damaged by the failure or neglect of the Owner to purchase or maintain the required insurance, the Owner shall reimburse the Contractor for all reasonable costs and damages attributable thereto.

§ 11.2.3 Notice of Cancellation or Expiration of Owner's Required Property Insurance. Within three (3) business days of the date the Owner becomes aware of an impending or actual cancellation or expiration of any property insurance required by the Contract Documents, the Owner shall provide notice to the Contractor of such impending or actual cancellation or expiration. Unless the lapse in coverage arises from an act or omission of the Contractor: (1) the Contractor, upon receipt of notice from the Owner, shall have the right to stop the Work until the lapse in coverage has been cured by the procurement of replacement coverage by either the Owner or the Contractor; (2) the Contract Time and Contract Sum shall be equitably adjusted; and (3) the Owner waives all rights against the Contractor, Subcontractors, and Sub-subcontractors to the extent any loss to the Owner would have been covered by the insurance had it not expired or been cancelled. If the Contractor purchases replacement coverage, the cost of the insurance shall be charged to the Owner by an appropriate Change Order. The furnishing of notice by the Owner shall not relieve the Owner of any contractual obligation to provide required insurance.

§ 11.3 Waivers of Subrogation

§ 11.3.1 The Owner and Contractor waive all rights against (1) each other and any of their subcontractors, sub-subcontractors, agents, and employees, each of the other; (2) the Architect and Architect's consultants; and (3) Separate Contractors, if any, and any of their subcontractors, sub-subcontractors, agents, and employees, for damages caused by fire, or other causes of loss, to the extent those losses are covered by property insurance required by the Agreement or other property insurance applicable to the Project, except such rights as they have to proceeds of such insurance. The Owner or Contractor, as appropriate, shall require similar written waivers in favor of the individuals and entities identified above from the Architect, Architect's consultants, Separate Contractors, subcontractors, and sub-subcontractors. The policies of insurance purchased and maintained by each person or entity agreeing to waive claims pursuant to this section 11.3.1 shall not prohibit this waiver of subrogation. This waiver of subrogation shall be effective as to a person or entity (1) even though that person or entity would otherwise have a duty of indemnification, contractual or otherwise, (2) even though that person or entity did not pay the insurance premium directly or indirectly, or (3) whether or not the person or entity had an insurable interest in the damaged property.

§ 11.3.2 If during the Project construction period the Owner insures properties, real or personal or both, at or adjacent to the site by property insurance under policies separate from those insuring the Project, or if after final payment property insurance is to be provided on the completed Project through a policy or policies other than those insuring the Project during the construction period, to the extent permissible by such policies, the Owner waives all rights in accordance with the terms of Section 11.3.1 for damages caused by fire or other causes of loss covered by this separate property insurance.

§ 11.4 Loss of Use, Business Interruption, and Delay in Completion Insurance

The Owner, at the Owner's option, may purchase and maintain insurance that will protect the Owner against loss of use of the Owner's property, or the inability to conduct normal operations, due to fire or other causes of loss. The Owner waives all rights of action against the Contractor and Architect for loss of use of the Owner's property, due to fire or other hazards however caused.

§ 11.5 Adjustment and Settlement of Insured Loss

§ 11.5.1 A loss insured under the property insurance required by the Agreement shall be adjusted by the Owner as fiduciary and made payable to the Owner as fiduciary for the insureds, as their interests may appear, subject to requirements of any applicable mortgagee clause and of Section 11.5.2. The Owner shall pay the Architect and Contractor their just shares of insurance proceeds received by the Owner, and by appropriate agreements the Architect and Contractor shall make payments to their consultants and Subcontractors in similar manner.

§ 11.5.2 Prior to settlement of an insured loss, the Owner shall notify the Contractor of the terms of the proposed settlement as well as the proposed allocation of the insurance proceeds. The Contractor shall have 14 days from receipt of notice to object to the proposed settlement or allocation of the proceeds. If the Contractor does not object, the

Owner shall settle the loss and the Contractor shall be bound by the settlement and allocation. Upon receipt, the Owner shall deposit the insurance proceeds in a separate account and make the appropriate distributions. Thereafter, if no other agreement is made or the Owner does not terminate the Contract for convenience, the Owner and Contractor shall execute a Change Order for reconstruction of the damaged or destroyed Work in the amount allocated for that purpose. If the Contractor timely objects to either the terms of the proposed settlement or the allocation of the proceeds, the Owner may proceed to settle the insured loss, and any dispute between the Owner and Contractor arising out of the settlement or allocation of the proceeds shall be resolved pursuant to Article 15. Pending resolution of any dispute, the Owner may issue a Construction Change Directive for the reconstruction of the damaged or destroyed Work.

ARTICLE 12 UNCOVERING AND CORRECTION OF WORK

§ 12.1 Uncovering of Work

§ 12.1.1 If a portion of the Work is covered contrary to the Architect's request or to requirements specifically expressed in the Contract Documents, it must, if requested in writing by the Architect, be uncovered for the Architect's examination and be replaced at the Contractor's expense without change in the Contract Time.

§ 12.1.2 If a portion of the Work has been covered that the Architect has not specifically requested to examine prior to its being covered, the Architect may request to see such Work and it shall be uncovered by the Contractor. If such Work is in accordance with the Contract Documents, the Contractor shall be entitled to an equitable adjustment to the Contract Sum and Contract Time as may be appropriate. If such Work is not in accordance with the Contract Documents, the costs of uncovering the Work, and the cost of correction, shall be at the Contractor's expense.

§ 12.2 Correction of Work

§ 12.2.1 Before Substantial Completion

The Contractor shall promptly correct Work rejected by the Architect or failing to conform to the requirements of the Contract Documents, discovered before Substantial Completion and whether or not fabricated, installed or completed. Costs of correcting such rejected Work, including additional testing and inspections, the cost of uncovering and replacement, and compensation for the Architect's services and expenses made necessary thereby, shall be at the Contractor's expense.

§ 12.2.2 After Substantial Completion

§ 12.2.2.1 In addition to the Contractor's obligations under Section 3.5, if, within one year after the date of Substantial Completion of the Work or designated portion thereof or after the date for commencement of warranties established under Section 9.9.1, or by terms of any applicable special warranty required by the Contract Documents, any of the Work is found to be not in accordance with the requirements of the Contract Documents, the Contractor shall correct it promptly after receipt of notice from the Owner to do so, unless the Owner has previously given the Contractor a written acceptance of such condition. The Owner shall give such notice promptly after discovery of the condition. During the one-year period for correction of Work, if the Owner fails to notify the Contractor and give the Contractor an opportunity to make the correction, the Owner waives the rights to require correction by the Contractor and to make a claim for breach of warranty. If the Contractor fails to correct nonconforming Work within a reasonable time during that period after receipt of notice from the Owner or Architect, the Owner may correct it in accordance with Section 2.5.

§ 12.2.2.2 The one-year period for correction of Work shall be extended with respect to portions of Work first performed after Substantial Completion by the period of time between Substantial Completion and the actual completion of that portion of the Work.

§ 12.2.2.3 The one-year period for correction of Work shall not be extended by corrective Work performed by the Contractor pursuant to this Section 12.2.

§ 12.2.3 The Contractor shall remove from the site portions of the Work that are not in accordance with the requirements of the Contract Documents and are neither corrected by the Contractor nor accepted by the Owner.

§ 12.2.4 The Contractor shall bear the cost of correcting destroyed or damaged construction of the Owner or Separate Contractors, whether completed or partially completed, caused by the Contractor's correction or removal of Work that is not in accordance with the requirements of the Contract Documents.

§ 12.2.5 Nothing contained in this Section 12.2 shall be construed to establish a period of limitation with respect to other obligations the Contractor has under the Contract Documents. Establishment of the one-year period for correction of Work as described in Section 12.2.2 relates only to the specific obligation of the Contractor to correct the Work, and has no relationship to the time within which the obligation to comply with the Contract Documents may be sought to be enforced, nor to the time within which proceedings may be commenced to establish the Contractor's liability with respect to the Contractor's obligations other than specifically to correct the Work.

§ 12.3 Acceptance of Nonconforming Work

If the Owner prefers to accept Work that is not in accordance with the requirements of the Contract Documents, the Owner may do so instead of requiring its removal and correction, in which case the Contract Sum will be reduced as appropriate and equitable. Such adjustment shall be effected whether or not final payment has been made.

ARTICLE 13 MISCELLANEOUS PROVISIONS

§ 13.1 Governing Law

The Contract shall be governed by the law of the place where the Project is located, excluding that jurisdiction's choice of law rules. If the parties have selected arbitration as the method of binding dispute resolution, the Federal Arbitration Act shall govern Section 15.4.

§ 13.2 Successors and Assigns

§ 13.2.1 The Owner and Contractor respectively bind themselves, their partners, successors, assigns, and legal representatives to covenants, agreements, and obligations contained in the Contract Documents. Except as provided in Section 13.2.2, neither party to the Contract shall assign the Contract as a whole without written consent of the other. If either party attempts to make an assignment without such consent, that party shall nevertheless remain legally responsible for all obligations under the Contract.

§ 13.2.2 The Owner may, without consent of the Contractor, assign the Contract to a lender providing construction financing for the Project, if the lender assumes the Owner's rights and obligations under the Contract Documents. The Contractor shall execute all consents reasonably required to facilitate the assignment.

§ 13.3 Rights and Remedies

§ 13.3.1 Duties and obligations imposed by the Contract Documents and rights and remedies available thereunder shall be in addition to and not a limitation of duties, obligations, rights, and remedies otherwise imposed or available by law.

§ 13.3.2 No action or failure to act by the Owner, Architect, or Contractor shall constitute a waiver of a right or duty afforded them under the Contract, nor shall such action or failure to act constitute approval of or acquiescence in a breach thereunder, except as may be specifically agreed upon in writing.

§ 13.4 Tests and Inspections

§ 13.4.1 Tests, inspections, and approvals of portions of the Work shall be made as required by the Contract Documents and by applicable laws, statutes, ordinances, codes, rules, and regulations or lawful orders of public authorities. Unless otherwise provided, the Contractor shall make arrangements for such tests, inspections, and approvals with an independent testing laboratory or entity acceptable to the Owner, or with the appropriate public authority, and shall bear all related costs of tests, inspections, and approvals. The Contractor shall give the Architect timely notice of when and where tests and inspections are to be made so that the Architect may be present for such procedures. The Owner shall bear costs of tests, inspections, or approvals that do not become requirements until after bids are received or negotiations concluded. The Owner shall directly arrange and pay for tests, inspections, or approvals where building codes or applicable laws or regulations so require.

§ 13.4.2 If the Architect, Owner, or public authorities having jurisdiction determine that portions of the Work require additional testing, inspection, or approval not included under Section 13.4.1, the Architect will, upon written authorization from the Owner, instruct the Contractor to make arrangements for such additional testing, inspection, or approval, by an entity acceptable to the Owner, and the Contractor shall give timely notice to the Architect of when and where tests and inspections are to be made so that the Architect may be present for such procedures. Such costs, except as provided in Section 13.4.3, shall be at the Owner's expense.

§ 13.4.3 If procedures for testing, inspection, or approval under Sections 13.4.1 and 13.4.2 reveal failure of the portions of the Work to comply with requirements established by the Contract Documents, all costs made necessary by such

failure, including those of repeated procedures and compensation for the Architect's services and expenses, shall be at the Contractor's expense.

§ 13.4.4 Required certificates of testing, inspection, or approval shall, unless otherwise required by the Contract Documents, be secured by the Contractor and promptly delivered to the Architect.

§ 13.4.5 If the Architect is to observe tests, inspections, or approvals required by the Contract Documents, the Architect will do so promptly and, where practicable, at the normal place of testing.

§ 13.4.6 Tests or inspections conducted pursuant to the Contract Documents shall be made promptly to avoid unreasonable delay in the Work.

§ 13.5 Interest

Payments due and unpaid under the Contract Documents shall bear interest from the date payment is due at the rate the parties agree upon in writing or, in the absence thereof, at the legal rate prevailing from time to time at the place where the Project is located.

ARTICLE 14 TERMINATION OR SUSPENSION OF THE CONTRACT

§ 14.1 Termination by the Contractor

§ 14.1.1 The Contractor may terminate the Contract if the Work is stopped for a period of 30 consecutive days through no act or fault of the Contractor, a Subcontractor, a Sub-subcontractor, their agents or employees, or any other persons or entities performing portions of the Work, for any of the following reasons:

- .1 Issuance of an order of a court or other public authority having jurisdiction that requires all Work to be stopped;
- .2 An act of government, such as a declaration of national emergency, that requires all Work to be stopped;
- .3 Because the Architect has not issued a Certificate for Payment and has not notified the Contractor of the reason for withholding certification as provided in Section 9.4.1, or because the Owner has not made payment on a Certificate for Payment within the time stated in the Contract Documents; or
- .4 The Owner has failed to furnish to the Contractor reasonable evidence as required by Section 2.2.

§ 14.1.2 The Contractor may terminate the Contract if, through no act or fault of the Contractor, a Subcontractor, a Sub-subcontractor, their agents or employees, or any other persons or entities performing portions of the Work, repeated suspensions, delays, or interruptions of the entire Work by the Owner as described in Section 14.3, constitute in the aggregate more than 100 percent of the total number of days scheduled for completion, or 120 days in any 365-day period, whichever is less.

§ 14.1.3 If one of the reasons described in Section 14.1.1 or 14.1.2 exists, the Contractor may, upon seven days' notice to the Owner and Architect, terminate the Contract and recover from the Owner payment for Work executed, as well as reasonable overhead and profit on Work not executed, and costs incurred by reason of such termination.

§ 14.1.4 If the Work is stopped for a period of 60 consecutive days through no act or fault of the Contractor, a Subcontractor, a Sub-subcontractor, or their agents or employees or any other persons or entities performing portions of the Work because the Owner has repeatedly failed to fulfill the Owner's obligations under the Contract Documents with respect to matters important to the progress of the Work, the Contractor may, upon seven additional days' notice to the Owner and the Architect, terminate the Contract and recover from the Owner as provided in Section 14.1.3.

§ 14.2 Termination by the Owner for Cause

§ 14.2.1 The Owner may terminate the Contract if the Contractor

- .1 repeatedly refuses or fails to supply enough properly skilled workers or proper materials;
- .2 fails to make payment to Subcontractors or suppliers in accordance with the respective agreements between the Contractor and the Subcontractors or suppliers;
- .3 repeatedly disregards applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of a public authority; or
- .4 otherwise is guilty of substantial breach of a provision of the Contract Documents.

§ 14.2.2 When any of the reasons described in Section 14.2.1 exist, and upon certification by the Architect that sufficient cause exists to justify such action, the Owner may, without prejudice to any other rights or remedies of the

Owner and after giving the Contractor and the Contractor's surety, if any, seven days' notice, terminate employment of the Contractor and may, subject to any prior rights of the surety:

- .1 Exclude the Contractor from the site and take possession of all materials, equipment, tools, and construction equipment and machinery thereon owned by the Contractor;
- .2 Accept assignment of subcontracts pursuant to Section 5.4; and
- .3 Finish the Work by whatever reasonable method the Owner may deem expedient. Upon written request of the Contractor, the Owner shall furnish to the Contractor a detailed accounting of the costs incurred by the Owner in finishing the Work.

§ 14.2.3 When the Owner terminates the Contract for one of the reasons stated in Section 14.2.1, the Contractor shall not be entitled to receive further payment until the Work is finished.

§ 14.2.4 If the unpaid balance of the Contract Sum exceeds costs of finishing the Work, including compensation for the Architect's services and expenses made necessary thereby, and other damages incurred by the Owner and not expressly waived, such excess shall be paid to the Contractor. If such costs and damages exceed the unpaid balance, the Contractor shall pay the difference to the Owner. The amount to be paid to the Contractor or Owner, as the case may be, shall be certified by the Initial Decision Maker, upon application, and this obligation for payment shall survive termination of the Contract.

§ 14.3 Suspension by the Owner for Convenience

§ 14.3.1 The Owner may, without cause, order the Contractor in writing to suspend, delay or interrupt the Work, in whole or in part for such period of time as the Owner may determine.

§ 14.3.2 The Contract Sum and Contract Time shall be adjusted for increases in the cost and time caused by suspension, delay, or interruption under Section 14.3.1. Adjustment of the Contract Sum shall include profit. No adjustment shall be made to the extent

- .1 that performance is, was, or would have been, so suspended, delayed, or interrupted, by another cause for which the Contractor is responsible; or
- .2 that an equitable adjustment is made or denied under another provision of the Contract.

§ 14.4 Termination by the Owner for Convenience

§ 14.4.1 The Owner may, at any time, terminate the Contract for the Owner's convenience and without cause.

§ 14.4.2 Upon receipt of notice from the Owner of such termination for the Owner's convenience, the Contractor shall

- .1 cease operations as directed by the Owner in the notice;
- .2 take actions necessary, or that the Owner may direct, for the protection and preservation of the Work; and
- .3 except for Work directed to be performed prior to the effective date of termination stated in the notice, terminate all existing subcontracts and purchase orders and enter into no further subcontracts and purchase orders.

§ 14.4.3 In case of such termination for the Owner's convenience, the Owner shall pay the Contractor for Work properly executed; costs incurred by reason of the termination, including costs attributable to termination of Subcontracts; and the termination fee, if any, set forth in the Agreement.

ARTICLE 15 CLAIMS AND DISPUTES

§ 15.1 Claims

§ 15.1.1 Definition

A Claim is a demand or assertion by one of the parties seeking, as a matter of right, payment of money, a change in the Contract Time, or other relief with respect to the terms of the Contract. The term "Claim" also includes other disputes and matters in question between the Owner and Contractor arising out of or relating to the Contract. The responsibility to substantiate Claims shall rest with the party making the Claim. This Section 15.1.1 does not require the Owner to file a Claim in order to impose liquidated damages in accordance with the Contract Documents.

§ 15.1.2 Time Limits on Claims

The Owner and Contractor shall commence all Claims and causes of action against the other and arising out of or related to the Contract, whether in contract, tort, breach of warranty or otherwise, in accordance with the requirements of the binding dispute resolution method selected in the Agreement and within the period specified by applicable law,

but in any case not more than 10 years after the date of Substantial Completion of the Work. The Owner and Contractor waive all Claims and causes of action not commenced in accordance with this Section 15.1.2.

§ 15.1.3 Notice of Claims

§ 15.1.3.1 Claims by either the Owner or Contractor, where the condition giving rise to the Claim is first discovered prior to expiration of the period for correction of the Work set forth in Section 12.2.2, shall be initiated by notice to the other party and to the Initial Decision Maker with a copy sent to the Architect, if the Architect is not serving as the Initial Decision Maker. Claims by either party under this Section 15.1.3.1 shall be initiated within 21 days after occurrence of the event giving rise to such Claim or within 21 days after the claimant first recognizes the condition giving rise to the Claim, whichever is later.

§ 15.1.3.2 Claims by either the Owner or Contractor, where the condition giving rise to the Claim is first discovered after expiration of the period for correction of the Work set forth in Section 12.2.2, shall be initiated by notice to the other party. In such event, no decision by the Initial Decision Maker is required.

§ 15.1.4 Continuing Contract Performance

§ 15.1.4.1 Pending final resolution of a Claim, except as otherwise agreed in writing or as provided in Section 9.7 and Article 14, the Contractor shall proceed diligently with performance of the Contract and the Owner shall continue to make payments in accordance with the Contract Documents.

§ 15.1.4.2 The Contract Sum and Contract Time shall be adjusted in accordance with the Initial Decision Maker's decision, subject to the right of either party to proceed in accordance with this Article 15. The Architect will issue Certificates for Payment in accordance with the decision of the Initial Decision Maker.

§ 15.1.5 Claims for Additional Cost

If the Contractor wishes to make a Claim for an increase in the Contract Sum, notice as provided in Section 15.1.3 shall be given before proceeding to execute the portion of the Work that is the subject of the Claim. Prior notice is not required for Claims relating to an emergency endangering life or property arising under Section 10.4.

§ 15.1.6 Claims for Additional Time

§ 15.1.6.1 If the Contractor wishes to make a Claim for an increase in the Contract Time, notice as provided in Section 15.1.3 shall be given. The Contractor's Claim shall include an estimate of cost and of probable effect of delay on progress of the Work. In the case of a continuing delay, only one Claim is necessary.

§ 15.1.6.2 If adverse weather conditions are the basis for a Claim for additional time, such Claim shall be documented by data substantiating that weather conditions were abnormal for the period of time, could not have been reasonably anticipated, and had an adverse effect on the scheduled construction.

§ 15.1.7 Waiver of Claims for Consequential Damages

The Contractor and Owner waive Claims against each other for consequential damages arising out of or relating to this Contract. This mutual waiver includes

- .1 damages incurred by the Owner for rental expenses, for losses of use, income, profit, financing, business and reputation, and for loss of management or employee productivity or of the services of such persons; and
- .2 damages incurred by the Contractor for principal office expenses including the compensation of personnel stationed there, for losses of financing, business and reputation, and for loss of profit, except anticipated profit arising directly from the Work.

This mutual waiver is applicable, without limitation, to all consequential damages due to either party's termination in accordance with Article 14. Nothing contained in this Section 15.1.7 shall be deemed to preclude assessment of liquidated damages, when applicable, in accordance with the requirements of the Contract Documents.

§ 15.2 Initial Decision

§ 15.2.1 Claims, excluding those where the condition giving rise to the Claim is first discovered after expiration of the period for correction of the Work set forth in Section 12.2.2 or arising under Sections 10.3, 10.4, and 11.5, shall be referred to the Initial Decision Maker for initial decision. The Architect will serve as the Initial Decision Maker, unless otherwise indicated in the Agreement. Except for those Claims excluded by this Section 15.2.1, an initial decision shall be required as a condition precedent to mediation of any Claim. If an initial decision has not been rendered within

30 days after the Claim has been referred to the Initial Decision Maker, the party asserting the Claim may demand mediation and binding dispute resolution without a decision having been rendered. Unless the Initial Decision Maker and all affected parties agree, the Initial Decision Maker will not decide disputes between the Contractor and persons or entities other than the Owner.

§ 15.2.2 The Initial Decision Maker will review Claims and within ten days of the receipt of a Claim take one or more of the following actions: (1) request additional supporting data from the claimant or a response with supporting data from the other party, (2) reject the Claim in whole or in part, (3) approve the Claim, (4) suggest a compromise, or (5) advise the parties that the Initial Decision Maker is unable to resolve the Claim if the Initial Decision Maker lacks sufficient information to evaluate the merits of the Claim or if the Initial Decision Maker concludes that, in the Initial Decision Maker's sole discretion, it would be inappropriate for the Initial Decision Maker to resolve the Claim.

§ 15.2.3 In evaluating Claims, the Initial Decision Maker may, but shall not be obligated to, consult with or seek information from either party or from persons with special knowledge or expertise who may assist the Initial Decision Maker in rendering a decision. The Initial Decision Maker may request the Owner to authorize retention of such persons at the Owner's expense.

§ 15.2.4 If the Initial Decision Maker requests a party to provide a response to a Claim or to furnish additional supporting data, such party shall respond, within ten days after receipt of the request, and shall either (1) provide a response on the requested supporting data, (2) advise the Initial Decision Maker when the response or supporting data will be furnished, or (3) advise the Initial Decision Maker that no supporting data will be furnished. Upon receipt of the response or supporting data, if any, the Initial Decision Maker will either reject or approve the Claim in whole or in part.

§ 15.2.5 The Initial Decision Maker will render an initial decision approving or rejecting the Claim, or indicating that the Initial Decision Maker is unable to resolve the Claim. This initial decision shall (1) be in writing; (2) state the reasons therefor; and (3) notify the parties and the Architect, if the Architect is not serving as the Initial Decision Maker, of any change in the Contract Sum or Contract Time or both. The initial decision shall be final and binding on the parties but subject to mediation and, if the parties fail to resolve their dispute through mediation, to binding dispute resolution.

§ 15.2.6 Either party may file for mediation of an initial decision at any time, subject to the terms of Section 15.2.6.1.

§ 15.2.6.1 Either party may, within 30 days from the date of receipt of an initial decision, demand in writing that the other party file for mediation. If such a demand is made and the party receiving the demand fails to file for mediation within 30 days after receipt thereof, then both parties waive their rights to mediate or pursue binding dispute resolution proceedings with respect to the initial decision.

§ 15.2.7 In the event of a Claim against the Contractor, the Owner may, but is not obligated to, notify the surety, if any, of the nature and amount of the Claim. If the Claim relates to a possibility of a Contractor's default, the Owner may, but is not obligated to, notify the surety and request the surety's assistance in resolving the controversy.

§ 15.2.8 If a Claim relates to or is the subject of a mechanic's lien, the party asserting such Claim may proceed in accordance with applicable law to comply with the lien notice or filing deadlines.

§ 15.3 Mediation

§ 15.3.1 Claims, disputes, or other matters in controversy arising out of or related to the Contract, except those waived as provided for in Sections 9.10.4, 9.10.5, and 15.1.7, shall be subject to mediation as a condition precedent to binding dispute resolution.

§ 15.3.2 The parties shall endeavor to resolve their Claims by mediation which, unless the parties mutually agree otherwise, shall be administered by the American Arbitration Association in accordance with its Construction Industry Mediation Procedures in effect on the date of the Agreement. A request for mediation shall be made in writing, delivered to the other party to the Contract, and filed with the person or entity administering the mediation. The request may be made concurrently with the filing of binding dispute resolution proceedings but, in such event, mediation shall proceed in advance of binding dispute resolution proceedings, which shall be stayed pending mediation for a period of 60 days from the date of filing, unless stayed for a longer period by agreement of the parties

or court order. If an arbitration is stayed pursuant to this Section 15.3.2, the parties may nonetheless proceed to the selection of the arbitrator(s) and agree upon a schedule for later proceedings.

§ 15.3.3 Either party may, within 30 days from the date that mediation has been concluded without resolution of the dispute or 60 days after mediation has been demanded without resolution of the dispute, demand in writing that the other party file for binding dispute resolution. If such a demand is made and the party receiving the demand fails to file for binding dispute resolution within 60 days after receipt thereof, then both parties waive their rights to binding dispute resolution proceedings with respect to the initial decision.

§ 15.3.4 The parties shall share the mediator's fee and any filing fees equally. The mediation shall be held in the place where the Project is located, unless another location is mutually agreed upon. Agreements reached in mediation shall be enforceable as settlement agreements in any court having jurisdiction thereof.

§ 15.4 Arbitration

§ 15.4.1 If the parties have selected arbitration as the method for binding dispute resolution in the Agreement, any Claim subject to, but not resolved by, mediation shall be subject to arbitration which, unless the parties mutually agree otherwise, shall be administered by the American Arbitration Association in accordance with its Construction Industry Arbitration Rules in effect on the date of the Agreement. The Arbitration shall be conducted in the place where the Project is located, unless another location is mutually agreed upon. A demand for arbitration shall be made in writing, delivered to the other party to the Contract, and filed with the person or entity administering the arbitration. The party filing a notice of demand for arbitration must assert in the demand all Claims then known to that party on which arbitration is permitted to be demanded.

§ 15.4.1.1 A demand for arbitration shall be made no earlier than concurrently with the filing of a request for mediation, but in no event shall it be made after the date when the institution of legal or equitable proceedings based on the Claim would be barred by the applicable statute of limitations. For statute of limitations purposes, receipt of a written demand for arbitration by the person or entity administering the arbitration shall constitute the institution of legal or equitable proceedings based on the Claim.

§ 15.4.2 The award rendered by the arbitrator or arbitrators shall be final, and judgment may be entered upon it in accordance with applicable law in any court having jurisdiction thereof.

§ 15.4.3 The foregoing agreement to arbitrate and other agreements to arbitrate with an additional person or entity duly consented to by parties to the Agreement, shall be specifically enforceable under applicable law in any court having jurisdiction thereof.

§ 15.4.4 Consolidation or Joinder

§ 15.4.4.1 Subject to the rules of the American Arbitration Association or other applicable arbitration rules, either party may consolidate an arbitration conducted under this Agreement with any other arbitration to which it is a party provided that (1) the arbitration agreement governing the other arbitration permits consolidation, (2) the arbitrations to be consolidated substantially involve common questions of law or fact, and (3) the arbitrations employ materially similar procedural rules and methods for selecting arbitrator(s).

§ 15.4.4.2 Subject to the rules of the American Arbitration Association or other applicable arbitration rules, either party may include by joinder persons or entities substantially involved in a common question of law or fact whose presence is required if complete relief is to be accorded in arbitration, provided that the party sought to be joined consents in writing to such joinder. Consent to arbitration involving an additional person or entity shall not constitute consent to arbitration of any claim, dispute or other matter in question not described in the written consent.

§ 15.4.4.3 The Owner and Contractor grant to any person or entity made a party to an arbitration conducted under this Section 15.4, whether by joinder or consolidation, the same rights of joinder and consolidation as those of the Owner and Contractor under this Agreement.

GUIDELINES FOR RECRUITMENT AND SELECTION OF MINORITY BUSINESSES FOR PARTICIPATION IN STATE CONSTRUCTION CONTRACTS

In accordance with G.S. 143-128.2 (effective January 1, 2002) these guidelines establish goals for minority participation in single-prime bidding, separate-prime bidding, construction manager at risk, and alternative contracting methods, on State construction projects in the amount of \$300,000 or more. The legislation provides that the State shall have a verifiable ten percent (10%) goal for participation by minority businesses in the total value of work for each project for which a contract or contracts are awarded. These requirements are published to accomplish that end.

SECTION A: INTENT

It is the intent of these guidelines that the State of North Carolina, as awarding authority for construction projects, and the contractors and subcontractors performing the construction contracts awarded shall cooperate and in good faith do all things legal, proper and reasonable to achieve the statutory goal of ten percent (10%) for participation by minority businesses in each construction project as mandated by GS 143-128.2. Nothing in these guidelines shall be construed to require contractors or awarding authorities to award contracts or subcontracts to or to make purchases of materials or equipment from minority-business contractors or minority-business subcontractors who do not submit the lowest responsible, responsive bid or bids.

SECTION B: DEFINITIONS

1. Minority - a person who is a citizen or lawful permanent resident of the United States and who is:
 - a. Black, that is, a person having origins in any of the black racial groups in Africa;
 - b. Hispanic, that is, a person of Spanish or Portuguese culture with origins in Mexico, South or Central America, or the Caribbean Islands, regardless of race;
 - c. Asian American, that is, a person having origins in any of the original peoples of the Far East, Southeast Asia and Asia, the Indian subcontinent, the Pacific Islands;
 - d. American Indian, that is, a person having origins in any of the original peoples of North America; or
 - e. Female
2. Minority Business - means a business:
 - a. In which at least fifty-one percent (51%) is owned by one or more minority persons, or in the case of a corporation, in which at least fifty-one percent (51%) of the stock is owned by one or more minority persons or socially and economically disadvantaged individuals; and
 - b. Of which the management and daily business operations are controlled by one or more of the minority persons or socially and economically disadvantaged individuals who own it.
3. Socially and economically disadvantaged individual - means the same as defined in 15 U.S.C. 637. "Socially disadvantaged individuals are those who have been subjected to racial or ethnic prejudice or cultural bias because of their identity as a member of a group without regard to their individual qualities". "Economically disadvantaged individuals are those socially disadvantaged individuals whose ability to compete in the free enterprise system has been impaired due to diminished capital and credit opportunities as compared to others in the same business area who are not socially disadvantaged".
4. Public Entity - means State and all public subdivisions and local governmental units.
5. Owner - The State of North Carolina, through the Agency/Institution named in the contract.
6. Designer – Any person, firm, partnership, or corporation, which has contracted with the State of North Carolina to perform architectural or engineering, work.
7. Bidder - Any person, firm, partnership, corporation, association, or joint venture seeking to be awarded a public contract or subcontract.

8. Contract - A mutually binding legal relationship or any modification thereof obligating the seller to furnish equipment, materials or services, including construction, and obligating the buyer to pay for them.
9. Contractor - Any person, firm, partnership, corporation, association, or joint venture which has contracted with the State of North Carolina to perform construction work or repair.
10. Subcontractor - A firm under contract with the prime contractor or construction manager at risk for supplying materials or labor and materials and/or installation. The subcontractor may or may not provide materials in his subcontract.

SECTION C: RESPONSIBILITIES

1. Office for Historically Underutilized Businesses, Department of Administration (hereinafter referred to as HUB Office).

The HUB Office has established a program, which allows interested persons or businesses qualifying as a minority business under G.S. 143-128.2, to obtain certification in the State of North Carolina procurement system. The information provided by the minority businesses will be used by the HUB Office to:

- a. Identify those areas of work for which there are minority businesses, as requested.
- b. Make available to interested parties a list of prospective minority business contractors and subcontractors.
- c. Assist in the determination of technical assistance needed by minority business contractors.

In addition to being responsible for the certification/verification of minority businesses that want to participate in the State construction program, the HUB Office will:

- (1) Maintain a current list of minority businesses. The list shall include the areas of work in which each minority business is interested.
- (2) Inform minority businesses on how to identify and obtain contracting and subcontracting opportunities through the State Construction Office and other public entities.
- (3) Inform minority businesses of the contracting and subcontracting process for public construction building projects.
- (4) Work with the North Carolina trade and professional organizations to improve the ability of minority businesses to compete in the State construction projects.
- (5) The HUB Office also oversees the minority business program by:
 - a. Monitoring compliance with the program requirements.
 - b. Assisting in the implementation of training and technical assistance programs.
 - c. Identifying and implementing outreach efforts to increase the utilization of minority businesses.
 - d. Reporting the results of minority business utilization to the Secretary of the Department of Administration, the Governor, and the General Assembly.

2. State Construction Office

The State Construction Office will be responsible for the following:

- a. Furnish to the HUB Office a minimum of twenty-one days prior to the bid opening the following:
 - (1) Project description and location;
 - (2) Locations where bidding documents may be reviewed;
 - (3) Name of a representative of the owner who can be contacted during the advertising period to advise who the prospective bidders are;
 - (4) Date, time and location of the bid opening.
 - (5) Date, time and location of prebid conference, if scheduled.
- b. Attending scheduled prebid conference, if necessary, to clarify requirements of the general statutes regarding minority-business participation, including the bidders' responsibilities.

- c. Reviewing the apparent low bidders' statutory compliance with the requirements listed in the proposal, that must be complied with, if the bid is to be considered as responsive, prior to award of contracts. The State reserves the right to reject any or all bids and to waive informalities.
- d. Reviewing of minority business requirements at Preconstruction conference.
- e. Monitoring of contractors' compliance with minority business requirements in the contract documents during construction.
- f. Provide statistical data and required reports to the HUB Office.
- g. Resolve any protest and disputes arising after implementation of the plan, in conjunction with the HUB Office.

3. Owner

Before awarding a contract, owner shall do the following:

- a. Develop and implement a minority business participation outreach plan to identify minority businesses that can perform public building projects and to implement outreach efforts to encourage minority business participation in these projects to include education, recruitment, and interaction between minority businesses and non-minority businesses.
- b. Attend the scheduled prebid conference.
- c. At least 10 days prior to the scheduled day of bid opening, notify minority businesses that have requested notices from the public entity for public construction or repair work and minority businesses that otherwise indicated to the Office for Historically Underutilized Businesses an interest in the type of work being bid or the potential contracting opportunities listed in the proposal. The notification shall include the following:
 - 1. A description of the work for which the bid is being solicited.
 - 2. The date, time, and location where bids are to be submitted.
 - 3. The name of the individual within the owner's organization who will be available to answer questions about the project.
 - 4. Where bid documents may be reviewed.
 - 5. Any special requirements that may exist.
- d. Utilize other media, as appropriate, likely to inform potential minority businesses of the bid being sought.
- e. Maintain documentation of any contacts, correspondence, or conversation with minority business firms made in an attempt to meet the goals.
- f. Review, jointly with the designer, all requirements of G.S. 143-128.2(c) and G.S. 143-128.2(f) – (i.e. bidders' proposals for identification of the minority businesses that will be utilized with corresponding total dollar value of the bid and affidavit listing good faith efforts, or affidavit of self-performance of work, if the contractor will perform work under contract by its own workforce) - prior to recommendation of award to the State Construction Office.
- g. Evaluate documentation to determine good faith effort has been achieved for minority business utilization prior to recommendation of award to State Construction Office.
- h. Review prime contractors' pay applications for compliance with minority business utilization commitments prior to payment.
- i. Make documentation showing evidence of implementation of Owner's responsibilities available for review by State Construction Office and HUB Office, upon request

4. Designer

Under the single-prime bidding, separate prime bidding, construction manager at risk, or alternative contracting method, the designer will:

- a. Attend the scheduled prebid conference to explain minority business requirements to the prospective bidders.
- b. Assist the owner to identify and notify prospective minority business prime and subcontractors of potential contracting opportunities.
- c. Maintain documentation of any contacts, correspondence, or conversation with minority business firms made in an attempt to meet the goals.
- d. Review jointly with the owner, all requirements of G.S. 143-128.2(c) and G.S.143-128.2(f) – (i.e. bidders' proposals for identification of the minority businesses that will be utilized with

corresponding total dollar value of the bid and affidavit listing Good Faith Efforts, or affidavit of self-performance of work, if the contractor will perform work under contract by its own workforce) - prior to recommendation of award.

- e. During construction phase of the project, review “MBE Documentation for Contract Payment” – (Appendix E) for compliance with minority business utilization commitments. Submit Appendix E form with monthly pay applications to the owner and forward copies to the State Construction Office.
- f. Make documentation showing evidence of implementation of Designer’s responsibilities available for review by State Construction Office and HUB Office, upon request.

5. Prime Contractor(s), CM at Risk, and Its First-Tier Subcontractors

Under the single-prime bidding, the separate-prime bidding, construction manager at risk and alternative contracting methods, contractor(s) will:

- a. Attend the scheduled prebid conference.
- b. Identify or determine those work areas of a subcontract where minority businesses may have an interest in performing subcontract work.
- c. At least ten (10) days prior to the scheduled day of bid opening, notify minority businesses of potential subcontracting opportunities listed in the proposal. The notification will include the following:
 - (1) A description of the work for which the subbid is being solicited.
 - (2) The date, time and location where subbids are to be submitted.
 - (3) The name of the individual within the company who will be available to answer questions about the project.
 - (4) Where bid documents may be reviewed.
 - (5) Any special requirements that may exist, such as insurance, licenses, bonds and financial arrangements.

If there are more than three (3) minority businesses in the general locality of the project who offer similar contracting or subcontracting services in the specific trade, the contractor(s) shall notify three (3), but may contact more, if the contractor(s) so desires.

- d. During the bidding process, comply with the contractor(s) requirements listed in the proposal for minority participation.
- e. Identify on the bid, the minority businesses that will be utilized on the project with corresponding total dollar value of the bid and affidavit listing good faith efforts as required by G.S. 143-128.2(c) and G.S. 143-128.2(f).
- f. Make documentation showing evidence of implementation of PM, CM-at-Risk and First-Tier Subcontractor responsibilities available for review by State Construction Office and HUB Office, upon request.
- g. Upon being named the apparent low bidder, the Bidder shall provide one of the following: (1) an affidavit (Affidavit C) that includes a description of the portion of work to be executed by minority businesses, expressed as a percentage of the total contract price, which is equal to or more than the applicable goal; (2) if the percentage is not equal to the applicable goal, then documentation of all good faith efforts taken to meet the goal. Failure to comply with these requirements is grounds for rejection of the bid and award to the next lowest responsible and responsive bidder.
- h. The contractor(s) shall identify the name(s) of minority business subcontractor(s) and corresponding dollar amount of work on the schedule of values. The schedule of values shall be provided as required in Article 31 of the General Conditions of the Contract to facilitate payments to the subcontractors.
- i. The contractor(s) shall submit with each monthly pay request(s) and final payment(s), “MBE Documentation for Contract Payment” – (Appendix E), for designer’s review.
- j. During the construction of a project, at any time, if it becomes necessary to replace a minority business subcontractor, immediately advise the owner, State Construction Office, and the Director of the HUB Office in writing, of the circumstances involved. The prime contractor shall make a good faith effort to replace a minority business subcontractor with another minority business subcontractor.

- k. If during the construction of a project additional subcontracting opportunities become available, make a good faith effort to solicit subbids from minority businesses.
- l. It is the intent of these requirements apply to all contractors performing as prime contractor and first tier subcontractor under construction manager at risk on state projects.

6. Minority Business Responsibilities

While minority businesses are not required to become certified in order to participate in the State construction projects, it is recommended that they become certified and should take advantage of the appropriate technical assistance that is made available. In addition, minority businesses who are contacted by owners or bidders must respond promptly whether or not they wish to submit a bid.

SECTION 4: DISPUTE PROCEDURES

It is the policy of this state that disputes that involves a person's rights, duties or privileges, should be settled through informal procedures. To that end, minority business disputes arising under these guidelines should be resolved as governed under G.S. 143-128(g).

SECTION 5: These guidelines shall apply upon promulgation on state construction projects. Copies of these guidelines may be obtained from the Department of Administration, State Construction Office, (physical address) 301 North Wilmington Street, Suite 450, NC Education Building, Raleigh, North Carolina, 27601-2827, (mail address) 1307 Mail Service Center, Raleigh, North Carolina, 27699-1307, phone (919) 807-4100, Website: www.nc-sco.com

SECTION 6: In addition to these guidelines, there will be issued with each construction bid package provisions for contractual compliance providing minority business participation in the state construction program.

MINORITY BUSINESS CONTRACT PROVISIONS (CONSTRUCTION)

APPLICATION:

The **Guidelines for Recruitment and Selection of Minority Businesses for Participation in State Construction Contracts** are hereby made a part of these contract documents. These guidelines shall apply to all contractors regardless of ownership. Copies of these guidelines may be obtained from the Department of Administration, State Construction Office, (physical address) 301 North Wilmington Street, Suite 450, NC Education Building, Raleigh, North Carolina, 27601-2827, (mail address) 1307 Mail Service Center, Raleigh, North Carolina, 27699-1307, phone (919) 807-4100, Website: <http://www.nc-sco.com>

MINORITY BUSINESS SUBCONTRACT GOALS:

The goals for participation by minority firms as subcontractors on this project have been set at 10%.

The bidder must identify on its bid, the minority businesses that will be utilized on the project with corresponding total dollar value of the bid and affidavit (Affidavit A) listing good faith efforts **or** affidavit (Affidavit B) of self-performance of work, if the bidder will perform work under contract by its own workforce, as required by G.S. 143-128.2(c) and G.S. 143-128.2(f).

The lowest responsible, responsive bidder must provide Affidavit C, that includes a description of the portion of work to be executed by minority businesses, expressed as a percentage of the total contract price, which is equal to or more than the applicable goal.

OR

Provide Affidavit D, that includes a description of the portion of work to be executed by minority businesses, expressed as a percentage of the total contract price, **with documentation of Good Faith Effort, if the percentage is not equal to the applicable goal.**

OR

Provide Affidavit B, which includes sufficient information for the State to determine that the bidder does not customarily subcontract work on this type project.

The above information must be provided as required. Failure to submit these documents is grounds for rejection of the bid.

MINIMUM COMPLIANCE REQUIREMENTS:

All written statements, affidavits or intentions made by the Bidder shall become a part of the agreement between the Contractor and the State for performance of this contract. Failure to comply with any of these statements, affidavits or intentions, or with the minority business Guidelines shall constitute a breach of the contract. A finding by the State that any information submitted either prior to award of the contract or during the performance of the contract is inaccurate, false or incomplete, shall also constitute a breach of the contract. Any such breach may result in termination of the contract in accordance with the termination provisions contained in the contract. It shall be solely at the option of the State whether to terminate the contract for breach.

In determining whether a contractor has made Good Faith Efforts, the State will evaluate all efforts made by the Contractor and will determine compliance in regard to quantity, intensity, and results of these efforts. Good Faith Efforts include:

- (1) Contacting minority businesses that reasonably could have been expected to submit a quote and that were known to the contractor or available on State or local government maintained lists at least 10 days before the bid or proposal date and notifying them of the nature and scope of the work to be performed.
- (2) Making the construction plans, specifications and requirements available for review by prospective minority businesses, or providing these documents to them at least 10 days before the bid or proposals are due.
- (3) Breaking down or combining elements of work into economically feasible units to facilitate minority participation.
- (4) Working with minority trade, community, or contractor organizations identified by the Office for Historically Underutilized Businesses and included in the bid documents that provide assistance in recruitment of minority businesses.
- (5) Attending any prebid meetings scheduled by the public owner.
- (6) Providing assistance in getting required bonding or insurance or providing alternatives to bonding or insurance for subcontractors.
- (7) Negotiating in good faith with interested minority businesses and not rejecting them as unqualified without sound reasons based on their capabilities. Any rejection of a minority business based on lack of qualification should have the reasons documented in writing.
- (8) Providing assistance to an otherwise qualified minority business in need of equipment, loan capital, lines of credit, or joint pay agreements to secure loans, supplies, or letters of credit, including waiving credit that is ordinarily required. Assisting minority businesses in obtaining the same unit pricing with the bidder's suppliers in order to help minority businesses in establishing credit.
- (9) Negotiating joint venture and partnership arrangements with minority businesses in order to increase opportunities for minority business participation on a public construction or repair project when possible.
- (10) Providing quick pay agreements and policies to enable minority contractors and suppliers to meet cash-flow demands.

APPENDIX E

MBE DOCUMENTATION FOR CONTRACT PAYMENTS

Prime Contractor/Architect: _____

Address & Phone: _____

Project Name: _____

Pay Application #: _____ Period: _____

The following is a list of payments made to Minority Business Enterprises on this project for the above-mentioned period.

MBE FIRM NAME	* INDICATE TYPE OF MBE	AMOUNT PAID THIS MONTH	TOTAL PAYMENTS TO DATE	TOTAL AMOUNT COMMITTED

*Minority categories: Black, African American (B), Hispanic (H), Asian American (A), American Indian (I), Female (F), Social and Economically Disadvantage (D)

Date: _____ Approved/Certified By: _____

Name

Title

Signature

SUBMIT WITH EACH PAY REQUEST & FINAL PAYMENT

Identification of Minority Business Participation

I, _____
 (Name of Bidder)

do hereby certify that on this project, we will use the following minority business enterprises as construction subcontractors, vendors, suppliers or providers of professional services.

Firm Name, Address and Phone #	Work type	*Minority Category

*Minority categories: Black, African American (**B**), Hispanic (**H**), Asian American (**A**) American Indian (**I**), Female (**F**) Socially and Economically Disadvantaged (**D**)

The total value of minority business contracting will be (\$)_____.

State of North Carolina AFFIDAVIT A – Listing of Good Faith Efforts

County of _____

(Name of Bidder)

Affidavit of _____

I have made a good faith effort to comply under the following areas checked:

Bidders must earn at least 50 points from the good faith efforts listed for their bid to be considered responsive. (1 NC Administrative Code 30 I.0101)

- 1 – (10 pts)** Contacted minority businesses that reasonably could have been expected to submit a quote and that were known to the contractor, or available on State or local government maintained lists, at least 10 days before the bid date and notified them of the nature and scope of the work to be performed.
- 2 --(10 pts)** Made the construction plans, specifications and requirements available for review by prospective minority businesses, or providing these documents to them at least 10 days before the bids are due.
- 3 – (15 pts)** Broken down or combined elements of work into economically feasible units to facilitate minority participation.
- 4 – (10 pts)** Worked with minority trade, community, or contractor organizations identified by the Office of Historically Underutilized Businesses and included in the bid documents that provide assistance in recruitment of minority businesses.
- 5 – (10 pts)** Attended prebid meetings scheduled by the public owner.
- 6 – (20 pts)** Provided assistance in getting required bonding or insurance or provided alternatives to bonding or insurance for subcontractors.
- 7 – (15 pts)** Negotiated in good faith with interested minority businesses and did not reject them as unqualified without sound reasons based on their capabilities. Any rejection of a minority business based on lack of qualification should have the reasons documented in writing.
- 8 – (25 pts)** Provided assistance to an otherwise qualified minority business in need of equipment, loan capital, lines of credit, or joint pay agreements to secure loans, supplies, or letters of credit, including waiving credit that is ordinarily required. Assisted minority businesses in obtaining the same unit pricing with the bidder's suppliers in order to help minority businesses in establishing credit.
- 9 – (20 pts)** Negotiated joint venture and partnership arrangements with minority businesses in order to increase opportunities for minority business participation on a public construction or repair project when possible.
- 10 - (20 pts)** Provided quick pay agreements and policies to enable minority contractors and suppliers to meet cash-flow demands.

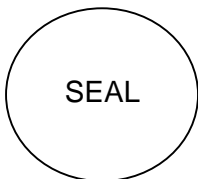
The undersigned, if apparent low bidder, will enter into a formal agreement with the firms listed in the Identification of Minority Business Participation schedule conditional upon scope of contract to be executed with the Owner. Substitution of contractors must be in accordance with GS143-128.2(d) Failure to abide by this statutory provision will constitute a breach of the contract.

The undersigned hereby certifies that he or she has read the terms of the minority business commitment and is authorized to bind the bidder to the commitment herein set forth.

Date: _____ Name of Authorized Officer: _____

Signature: _____

Title: _____



State of North Carolina, County of _____

Subscribed and sworn to before me this _____ day of _____ 20____

Notary Public _____

My commission expires _____

State of North Carolina --AFFIDAVIT B-- Intent to Perform Contract with Own Workforce.

County of _____

Affidavit of _____

(Name of Bidder)

I hereby certify that it is our intent to perform 100% of the work required for the _____

_____ contract.

(Name of Project)

In making this certification, the Bidder states that the Bidder does not customarily subcontract elements of this type project, and normally performs and has the capability to perform and will perform all elements of the work on this project with his/her own current work forces; and

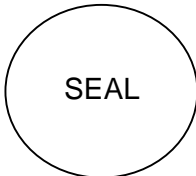
The Bidder agrees to provide any additional information or documentation requested by the owner in support of the above statement.

The undersigned hereby certifies that he or she has read this certification and is authorized to bind the Bidder to the commitments herein contained.

Date: _____ Name of Authorized Officer: _____

Signature: _____

Title: _____



State of North Carolina, County of _____

Subscribed and sworn to before me this _____ day of _____ 20____

Notary Public _____

My commission expires _____

State of North Carolina - AFFIDAVIT C - Portion of the Work to be Performed by Minority Firms

County of _____

(Note this form is to be submitted only by the apparent lowest responsible, responsive bidder.)

If the portion of the work to be executed by minority businesses as defined in GS143-128.2(g) is equal to or greater than 10% of the bidders total contract price, then the bidder must complete this affidavit. This affidavit shall be provided by the apparent lowest responsible, responsive bidder within **72 hours** after notification of being low bidder.

Affidavit of _____ I do hereby certify that on the _____
(Name of Bidder)

_____ (Project Name)
 Project ID# _____ Amount of Bid \$ _____

I will expend a minimum of _____% of the total dollar amount of the contract with minority business enterprises. Minority businesses will be employed as construction subcontractors, vendors, suppliers or providers of professional services. Such work will be subcontracted to the following firms listed below. Attach additional sheets if required

Name and Phone Number	*Minority Category	Work description	Dollar Value

*Minority categories: Black, African American (B), Hispanic (H), Asian American (A) American Indian (I), Female (F) Socially and Economically Disadvantaged (D)

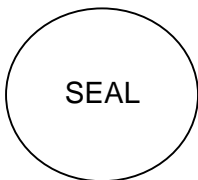
Pursuant to GS143-128.2(d), the undersigned will enter into a formal agreement with Minority Firms for work listed in this schedule conditional upon execution of a contract with the Owner. Failure to fulfill this commitment may constitute a breach of the contract.

The undersigned hereby certifies that he or she has read the terms of this commitment and is authorized to bind the bidder to the commitment herein set forth.

Date: _____ Name of Authorized Officer: _____

Signature: _____

Title: _____



State of North Carolina, County of _____
 Subscribed and sworn to before me this _____ day of _____ 20____
 Notary Public _____
 My commission expires _____

State of North Carolina AFFIDAVIT D – Good Faith Efforts

County of _____

(Note this form is to be submitted only by the apparent lowest responsible, responsive bidder.)

If the goal of 10% participation by minority business **is not** achieved, the Bidder shall provide the following documentation to the Owner of his good faith efforts:

(Name of Bidder)

Affidavit of: _____

I do certify the attached documentation as true and accurate representation of my good faith efforts.

(Attach additional sheets if required)

Name and Phone Number	*Minority Category	Work description	Dollar Value

*Minority categories: Black, African American (**B**), Hispanic (**H**), Asian American (**A**) American Indian (**I**), Female (**F**) Socially and Economically Disadvantaged (**D**)

Documentation of the Bidder's good faith efforts to meet the goals set forth in these provisions.

Examples of documentation include, but are not limited to, the following evidence:

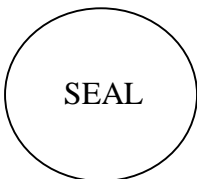
- A. Copies of solicitations for quotes to at least three (3) minority business firms from the source list provided by the State for each subcontract to be let under this contract (if 3 or more firms are shown on the source list). Each solicitation shall contain a specific description of the work to be subcontracted, location where bid documents can be reviewed, representative of the Prime Bidder to contact, and location, date and time when quotes must be received.
- B. Copies of quotes or responses received from each firm responding to the solicitation.
- C. A telephone log of follow-up calls to each firm sent a solicitation.
- D. For subcontracts where a minority business firm is not considered the lowest responsible sub-bidder, copies of quotes received from all firms submitting quotes for that particular subcontract.
- E. Documentation of any contacts or correspondence to minority business, community, or contractor organizations in an attempt to meet the goal.
- F. Copy of pre-bid roster.
- G. Letter documenting efforts to provide assistance in obtaining required bonding or insurance for minority business.
- H. Letter detailing reasons for rejection of minority business due to lack of qualification.
- I. Letter documenting proposed assistance offered to minority business in need of equipment, loan capital, lines of credit, or joint pay agreements to secure loans, supplies, or letter of credit, including waiving credit that is ordinarily required.

Failure to provide the documentation as listed in these provisions may result in rejection of the bid and award to the next lowest responsible and responsive bidder.

Date: _____ Name of Authorized Officer: _____

Signature: _____

Title: _____



State of North Carolina, County of _____

Subscribed and sworn to before me this _____ day of _____ 20____

Notary Public _____

My commission expires _____

SECTION 011000 - SUMMARY**PART 1 - GENERAL****1.1 SUMMARY****A. Section Includes:**

1. Project information.
2. Work covered by Contract Documents.
3. Phased construction.
4. Contractor's use of site and premises.
5. Work restrictions.
6. Specification and Drawing conventions.

1.2 PROJECT INFORMATION

- A. Project Identification:** Gaston County Schools; Grier Middle School; LS3P Project Number 9201-218240.
1. Project Location: 1622 Garrison Boulevard, Gastonia, North Carolina 28054.
- B. Owner:** Gaston County Schools, 943 Osceola Street, Gastonia, North Carolina 28053.
1. Owner's Representative: Paul Nault; Email: phnault@gaston.k12.nc.us.
- C. Architect:** LS3P, 227 West Trade Street, Suite 700, Charlotte, North Carolina 28202; Phone: 704.333.6686.
1. Architect's Representative: Goran Pogarcic, Senior Designer.
- D. Architect's Consultants:** Architect has retained the following design professionals, who have prepared designated portions of the Contract Documents:
1. Civil/Landscape: Seamon Whiteside, 1111 Metropolitan Avenue, Suite 1050, Charlotte, NC 28204.
 2. Structural: ARP Engineering Inc., P.O. Box 587, Monroe, NC 28111.
 3. Plumbing, Mechanical, and Electrical Engineers: Optima Engineering, 1927 S. Tryon Street, Suite 300, Charlotte, NC 28203.
- E. Insert title of design discipline** Web-Based Project Software: Project software will be used for purposes of managing communication and documents during the construction stage.
1. See Section 013100 "Project Management and Coordination." For requirements for using web-based Project software.

1.3 WORK COVERED BY CONTRACT DOCUMENTS

- A. The Work of Project is defined by the Contract Documents and includes, but is not limited to, the following:**
1. Replacement of multiple buildings at Grier Middle School campus with modern 2-story building with partial basement to serve 1,000 students (1,200 core), totaling approximately 165,821 sq. ft. Primary building components are load-bearing CMU walls with brick veneer on exterior, fully adhered SBS mod bit roofing membrane over rigid insulation and metal deck, and energy-efficient glazing. The new building is designed to meet Energy Star rating. Athletic fields with concession

buildings with PVC membrane roofing are included in the project scope (baseball, softball, and football).

B. Type of Contract:

1. Project will be constructed under a single prime contract.

1.4 PHASED CONSTRUCTION

A. Construct the Work in phases, with each phase substantially complete as indicated below.

1. Phase 1: Construction of new 2-story school building.
 - a. Commencement of Construction:
 - 1) Start Date: May 2023.
 - b. Substantial Completion:
 - 1) By June 2025.
2. Phase 2: Abatement and demolition of existing buildings on school campus.
 - a. Abatement and Demolition:
 - 1) Start Date: June 2025.
 - 2) End Date: November 2025.
3. Phase 3: Construction of Athletic Fields and Concession Buildings.
 - a. Commencement of Construction:
 - 1) Start Date: November 2025.
 - b. Substantial Completion:
 - 1) By July 2026.

B. Before commencing Work of each phase, submit an updated copy of Contractor's construction schedule, showing the sequence, commencement and completion dates, and move-out and -in dates of Owner's personnel for all phases of the Work.

1.5 CONTRACTOR'S USE OF SITE AND PREMISES

A. Limits on Use of Site: Limit use of Project site to areas within the Contract limits indicated. Do not disturb portions of Project site beyond areas in which the Work is indicated.

1. Limits on Use of Site: Confine construction operations to areas indicated on Drawings..
2. Driveways, Walkways and Entrances: Keep driveways and entrances serving premises clear and available to Owner, Owner's employees, and emergency vehicles at all times. Do not use these areas for parking or for storage of materials.
 - a. Schedule deliveries to minimize use of driveways and entrances by construction operations.
 - b. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.

1.6 SPECIFICATION AND DRAWING CONVENTIONS

- A. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:
1. Imperative mood and streamlined language are generally used in the Specifications. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.
 2. Text Color: Text used in the Specifications, including units of measure, manufacturer and product names, and other text may appear in multiple colors or underlined as part of a hyperlink; no emphasis is implied by text with these characteristics.
 3. Hypertext: Text used in the Specifications may contain hyperlinks. Hyperlinks may allow for access to linked information that is not residing in the Specifications. Unless otherwise indicated, linked information is not part of the Contract Documents.
 4. Specification requirements are to be performed by Contractor unless specifically stated otherwise.
- B. Division 00 Contracting Requirements: General provisions of the Contract, including General and Supplementary Conditions, apply to all Sections of the Specifications.
- C. Division 01 General Requirements: Requirements of Sections in Division 01 apply to the Work of all Sections in the Specifications.
- D. Drawing Coordination: Requirements for materials and products identified on Drawings are described in detail in the Specifications. One or more of the following are used on Drawings to identify materials and products:
1. Terminology: Materials and products are identified by the typical generic terms used in the individual Specifications Sections.
 2. Abbreviations: Materials and products are identified by abbreviations scheduled on Drawings and published as part of the U.S. National CAD Standard.
 3. Keynoting: Materials and products are identified by reference keynotes referencing Specification Section numbers found in this Project Manual.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 011000

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SECTION 012100 - ALLOWANCES**PART 1 - GENERAL****1.1 SUMMARY**

- A. Section includes administrative and procedural requirements governing allowances.
 - 1. Certain items are specified in Contract Documents as allowances. Allowances have been established in lieu of additional requirements and to defer selection of actual materials and equipment to later date when direction will be provided to Contractor. If necessary, additional requirements will be issued by Change Order. Include defined costs associated with allowances in base Bid.
- B. Types of allowances include the following:
 - 1. Quantity allowances.
 - 2. Contingency allowances.
 - 3. Unforeseen allowances.

1.2 SELECTION AND PURCHASE

- A. At the earliest practical date after award of the Contract, advise Architect of the date when final selection and purchase of each product or system described by an allowance must be completed to avoid delaying the Work.
- B. At Architect's request, obtain proposals for each allowance for use in making final selections. Include recommendations that are relevant to performing the Work.
- C. Purchase products and systems selected by Architect from the designated supplier.

1.3 ACTION SUBMITTALS

- A. Submit proposals for purchase of products or systems included in allowances in the form specified for Change Orders.

1.4 INFORMATIONAL SUBMITTALS

- A. Submit invoices or delivery slips to show actual quantities of materials delivered to the site for use in fulfillment of each allowance.
- B. Submit time sheets and other documentation to show labor time and cost for installation of allowance items that include installation as part of the allowance.
- C. Coordinate and process submittals for allowance items in same manner as for other portions of the Work.

1.5 QUANTITY ALLOWANCES

- A. Allowance shall include cost to Contractor of specific products and materials ordered by Owner or selected by Architect under allowance and shall include [taxes,]freight[,] and delivery to Project site.

-
- B. Unless otherwise indicated, Contractor's costs for receiving and handling at Project site, labor, installation, overhead and profit, and similar costs related to products and materials ordered by Owner or selected by Architect under allowance shall be included as part of the Contract Sum and not part of the allowance.
 - C. Unused Materials: Return unused materials purchased under an allowance to manufacturer or supplier for credit to Owner, after installation has been completed and accepted.
 - 1. If requested by Architect, retain and prepare unused material for storage by Owner. Deliver unused material to Owner's storage space as directed.

1.6 CONTINGENCY ALLOWANCES

- A. Use the contingency allowance only as directed by Architect for Owner's purposes and only by Change Orders that indicate amounts to be charged to the allowance.
- B. Contractor's overhead, profit, and related costs for products and equipment ordered by Owner under the contingency allowance are included in the allowance and are not part of the Contract Sum. These costs include delivery, installation, taxes, insurance, equipment rental, and similar costs.
- C. Change Orders authorizing use of funds from the contingency allowance will include Contractor's related costs and reasonable overhead and profit.
- D. At Project closeout, credit unused amounts remaining in the contingency allowance to Owner by Change Order.

1.7 UNFORESEENS ALLOWANCES

- A. Unforeseens Allowance is limited to those items and Work hidden, undetectable, or unforeseen and not visible from pre-bid, on-site observation, or not shown, called-for, or reasonably implied in the Contract Documents.
- B. Use unforeseens allowance only as directed by Architect for Owner's purposes and only by Change Orders that indicate amounts to be charged to the allowance.
- C. Contractor's related costs for products and equipment ordered by Owner under the unforeseens allowance are included in the allowance and are not part of the Contract Sum. The costs include delivery, installation, taxes, insurance, equipment rental, and similar costs.
- D. Change Orders authorizing use of funds from the unforeseens allowance will include Contractor's related costs and reasonable overhead and profit margins.
- E. At Project closeout, credit unused amounts of remaining in the unforeseens allowances to Owner by Change Order.

1.8 ADJUSTMENT OF ALLOWANCES

- A. Allowance Adjustment: To adjust allowance amounts, prepare a Change Order proposal based on the difference between purchase amount and the allowance, multiplied by final measurement of work-in-place where applicable. If applicable, include reasonable allowances for cutting losses, tolerances, mixing wastes, normal product imperfections, required maintenance materials, and similar margins.
 - 1. Include installation costs in purchase amount only where indicated as part of the allowance.

2. If requested, prepare explanation and documentation to substantiate distribution of overhead costs and other markups.
 3. Submit substantiation of a change in scope of Work, if any, claimed in Change Orders related to unit-cost allowances.
 4. Owner reserves the right to establish the quantity of work-in-place by independent quantity survey, measure, or count.
- B. Submit claims for increased costs due to a change in the scope or nature of the allowance described in the Contract Documents, whether for the purchase order amount or Contractor's handling, labor, installation, overhead, and profit.
1. Do not include Contractor's or subcontractor's indirect expense in the Change Order cost amount unless it is clearly shown that the nature or extent of Work has changed from what could have been foreseen from information in the Contract Documents.
 2. No change to Contractor's indirect expense is permitted for selection of higher- or lower-priced materials or systems of the same scope and nature as originally indicated.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine products covered by an allowance promptly on delivery for damage or defects. Return damaged or defective products to manufacturer for replacement.

3.2 PREPARATION

- A. Coordinate materials and their installation for each allowance with related materials and installations to ensure that each allowance item is completely integrated and interfaced with related work.

3.3 SCHEDULE OF ALLOWANCES

- A. Allowance No. 1: Quantity Allowance: Include 500 cu. yd. of mass rock excavation and disposal off-site, as specified in Division 31 Section "Earth Moving."
1. Coordinate quantity allowance adjustment with unit-price requirements in Section 012200 "Unit Prices."
- B. Allowance No. 2: Quantity Allowance: Include 100 cu. yd. of utility trench rock excavation and disposal off-site as specified in Division 31 Section "Earth Moving."
1. Coordinate quantity allowance adjustment with unit-price requirements in Section 012200 "Unit Prices."
- C. Allowance No. 3: Quantity Allowance: Include 500 cu. yd. of structural fill/backfill (imported) in-place on-site as specified in Division 31 Section "Earth Moving."
1. Coordinate quantity allowance adjustment with unit-price requirements in Section 012200 "Unit Prices."
- D. Allowance No. 4: Quantity Allowance: Include 5,000 cu yd. of unsuitable soil removal and disposal off-site as specified in Division 31 Section "Earth Moving."

-
1. Coordinate quantity allowance adjustment with unit-price requirements in Section 012200 "Unit Prices."
- E. Allowance No. 5: Quantity Allowance: Include 2,700 tons of No. 57 washed crushed stone for foundation bridging of alluvial soils as specified in Division 31 Section "Earth Moving."
1. Coordinate quantity allowance adjustment with unit-price requirements in Section 012200 "Unit Prices."
- F. Allowance No. 6: Contingency Allowance: Include a contingency allowance of \$450,000.00 for use according to Owner's written instructions.
- G. Allowance No. 7: Unforeseens Allowance: Include an allowance of \$75,000.00 for additional unforeseen abatement.

END OF SECTION 012100

SECTION 012200 - UNIT PRICES**PART 1 - GENERAL****1.1 SUMMARY**

- A. Section includes administrative and procedural requirements for unit prices.

1.2 DEFINITIONS

- A. Unit price is a price per unit of measurement for materials, equipment, or services, or a portion of the Work, added to or deducted from the Contract Sum by appropriate modification, if the scope of Work or estimated quantities of Work required by the Contract Documents are increased or decreased.

1.3 PROCEDURES

- A. Unit prices include all necessary material, plus cost for delivery, installation, insurance, applicable taxes, overhead, and profit.
- B. Measurement and Payment: See individual Specification Sections for work that requires establishment of unit prices. Methods of measurement and payment for unit prices are specified in those Sections.
- C. Owner reserves the right to reject Contractor's measurement of work-in-place that involves use of established unit prices and to have this work measured, at Owner's expense, by an independent surveyor acceptable to Contractor.
- D. List of Unit Prices: A schedule of unit prices is included in Part 3. Specification Sections referenced in the Part 3 "Schedule of Unit Prices" Article contain requirements for materials described under each unit price.

PART 2 - PRODUCTS (Not Used)**PART 3 - EXECUTION****3.1 SCHEDULE OF UNIT PRICES**

- A. Unit Price No. 1: General Mass Rock Excavation and Disposal Off-Site.
1. Description: Provide a price per bank cubic yard of General Mass Rock Excavation and Disposal Off-Site. Measurement shall be by cross section of excavation. Unit prices shall include removal, transportation, all offsite disposal costs, replacement with onsite suitable material and measurement.
 2. Unit of Measurement: Cubic yard, based on survey of volume removed measure in place.
 3. Quantity Allowance: Coordinate unit price with allowance adjustment requirements in Section 012100 "Allowances."
- B. Unit Price No. 2: Utility Trench Rock Excavation and Disposal Off-Site.
1. Description: Provide a price per bank cubic yard of Utility Trench Rock Excavation and Disposal Off-Site. Measurement shall be by cross section of excavation. Unit prices shall include removal, transportation, all offsite disposal costs, replacement with onsite suitable material and measurement.

-
2. Unit of Measurement: Cubic yard, based on survey of volume removed measured in place.
 3. Quantity Allowance: Coordinate unit price with allowance adjustment requirements in Section 012100 "Allowances."
- C. Unit Price No. 3: Structural Fill/Backfill (Imported) In-Place On-Site.
1. Description: Provide a price per bank cubic yard of Structural Fill/Backfill (Imported) In-Place On-Site. Measurement shall be by cross section of excavation. Unit prices shall include removal, transportation, all offsite disposal costs, replacement with onsite suitable material and measurement.
 2. Unit of Measurement: Cubic yard, based on survey of volume removed measured in place.
 3. Quantity Allowance: Coordinate unit price with allowance adjustment requirements in Section 012100 "Allowances."
- D. Unit Price No. 4: Unsuitable Soil Removal and Disposal Off-Site.
1. Description: Provide a price per bank cubic yard of removal and offsite disposal of unsuitable soil. Measurement shall be by cross section of excavation. Unit prices shall include removal, transportation, all offsite disposal costs, and measurement. Soil is assumed to be excavated and hauled off.
 2. Unit of Measurement: Cubic yard, based on survey of volume removed measured in place.
 3. Quantity Allowance: Coordinate unit price with allowance adjustment requirements in Section 012100 "Allowances."
- E. Unit Price No. 5: No. 57 Washed Crushed Stone for Foundation Bridging of Alluvial Soils.
1. Description: No. 57 washed crushed stone for foundation bridging of alluvial soils in accordance with Division 31 Section "Earth Moving."
 2. Unit of Measurement: Ton, based on washed crushed stone in place verified by geotechnical engineer.
 3. Quantity Allowance: Coordinate unit price with allowance adjustment requirements in Section 012100 "Allowances."

END OF SECTION 012200

SECTION 012300 - ALTERNATES**PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for alternates.

1.3 DEFINITIONS

- A. Alternate: An amount proposed by bidders and stated on the Bid Form for certain work defined in the bidding requirements that may be added to or deducted from the base bid amount if the Owner decides to accept a corresponding change either in the amount of construction to be completed or in the products, materials, equipment, systems, or installation methods described in the Contract Documents.
 - 1. Alternates described in this Section are part of the Work only if enumerated in the Agreement.
 - 2. The cost or credit for each alternate is the net addition to or deduction from the Contract Sum to incorporate alternates into the Work. No other adjustments are made to the Contract Sum.

1.4 PROCEDURES

- A. Coordination: Revise or adjust affected adjacent work as necessary to completely integrate work of the alternate into Project.
 - 1. Include, as part of each alternate, miscellaneous devices, accessory objects, and similar items incidental to or required for a complete installation, whether or not indicated as part of alternate.
- B. Notification: Immediately following award of the Contract, notify each party involved, in writing, of the status of each alternate. Indicate if alternates have been accepted, rejected, or deferred for later consideration. Include a complete description of negotiated modifications to alternates.
- C. Execute accepted alternates under the same conditions as other Work of the Contract.
- D. Schedule: A Part 3 "Schedule of Alternates" Article is included at the end of this Section. Specification Sections referenced in schedule contain requirements for materials necessary to achieve the work described under each alternate.

PART 2 - PRODUCTS (Not Used)**PART 3 - EXECUTION****3.1 SCHEDULE OF ALTERNATES**

- A. Alternate No. 1: Baseball and Softball Fields.
 - 1. Base Bid: Provide grass field with conduit only as indicated on Drawings and Specifications.

-
2. Alternate: Provide field lights at Baseball and Softball fields as indicated on Drawings and Specifications.
- B. Alternate No. 2: Football Field.
1. Base Bid: Provide grass field with conduit only as indicated on Drawings and Specifications.
 2. Alternate: Provide field lights at Football field as indicated on Drawings and Specifications.
- C. Alternate No. 3: Chain-Link Fencing.
1. Base Bid: Provide decorative metal fence along road frontage and Specifications.
 2. Alternate: In lieu of decorative metal fence, provide chain-link fence with black vinyl as indicated on Drawings and Specifications.
- D. Alternate No. 4: 8-Lane Running Track.
1. Base Bid: Provide 6-lane running track as indicated on Drawings.
 2. Alternate: Provide 8-lane running track as indicated on Drawings.
- E. Alternate No. 5: Owner-Preferred Vendor Package for Mechanical System.
1. Provide Schneider BAS Controls (no substitutions) as indicated on Drawings and specifications.
- F. Alternate No. 6: Owner-Preferred Vendor Package for Electrical.
1. Provide cost for Square D as indicated on Drawings and specifications.
- G. Alternate No. 7: Owner-Preferred Vendor Package for Boilers.
1. Provide cost for boilers by Weil McLain (no substitutions).
- H. Alternate No. 8: Owner-Preferred Vendor Package for HVAC equipment.
1. Provide cost for Chillers, Air Handling Units, and Rooftop Units by Trane and DDC Controls by Schneider (no substitutions).

END OF SECTION 012300

SECTION 012500 - SUBSTITUTION PROCEDURES**PART 1 - GENERAL****1.1 SUMMARY**

- A. Section includes administrative and procedural requirements for substitutions.

1.2 DEFINITIONS

- A. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents.
1. Substitutions for Cause: Changes proposed by Contractor that are required due to changed Project conditions, such as unavailability of product, regulatory changes, or unavailability of required warranty terms.
 2. Substitutions for Convenience: Changes proposed by Contractor or Owner that are not required to meet other Project requirements but may offer advantage to Contractor or Owner.

1.3 ACTION SUBMITTALS

- A. Substitution Requests: Submit documentation identifying product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
1. Substitution Request Form: Use CSI Form 13.1A or form acceptable to Architect.
 2. Documentation: Show compliance with requirements for substitutions and the following, as applicable:
 - a. Statement indicating why specified product or fabrication or installation method cannot be provided, if applicable.
 - b. Coordination of information, including a list of changes or revisions needed to other parts of the Work and to construction performed by Owner and separate contractors that will be necessary to accommodate proposed substitution.
 - c. Detailed comparison of significant qualities of proposed substitutions with those of the Work specified. Include annotated copy of applicable Specification Section. Significant qualities may include attributes, such as performance, weight, size, durability, visual effect, sustainable design characteristics, warranties, and specific features and requirements indicated. Indicate deviations, if any, from the Work specified.
 - d. Product Data, including drawings and descriptions of products and fabrication and installation procedures.
 - e. Samples, where applicable or requested.
 - f. List of similar installations for completed projects, with project names and addresses as well as names and addresses of architects and owners.
 - g. Material test reports from a qualified testing agency, indicating and interpreting test results for compliance with requirements indicated.
 - h. Research reports evidencing compliance with building code in effect for Project, from a model code organization acceptable to authorities having jurisdiction.
 - i. Detailed comparison of Contractor's construction schedule using proposed substitutions with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating date of receipt of purchase order, lack of availability, or delays in delivery.
 - j. Cost information, including a proposal of change, if any, in the Contract Sum.

- k. Contractor's certification that proposed substitution complies with requirements in the Contract Documents, except as indicated in substitution request, is compatible with related materials and is appropriate for applications indicated.
 - l. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.
3. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within seven days of receipt of a request for substitution. Architect will notify Contractor through Construction Manager of acceptance or rejection of proposed substitution within 15 days of receipt of request, or seven days of receipt of additional information or documentation, whichever is later.
 4. Forms of Acceptance:
 - a. Pre-Bid: Addenda.
 - b. After Contract Award: Change Order, Construction Change Directive, or Architect's Supplemental Instructions for minor changes in the Work.
 - c. Use product specified if Architect does not issue a decision on use of a proposed substitution within time allocated.

1.4 QUALITY ASSURANCE

- A. Compatibility of Substitutions: Investigate and document compatibility of proposed substitution with related products and materials. Engage a qualified testing agency to perform compatibility tests recommended by manufacturers.

1.5 PROCEDURES

- A. Coordination: Revise or adjust affected work as necessary to integrate work of the approved substitutions.

1.6 SUBSTITUTIONS

- A. Substitutions for Cause: Submit requests for substitution immediately on discovery of need for change, but not later than 15 days prior to time required for preparation and review of related submittals.
 1. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:
 - a. Requested substitution is consistent with the Contract Documents and will produce indicated results.
 - b. Substitution request is fully documented and properly submitted.
 - c. Requested substitution will not adversely affect Contractor's construction schedule.
 - d. Requested substitution has received necessary approvals of authorities having jurisdiction.
 - e. Requested substitution is compatible with other portions of the Work.
 - f. Requested substitution has been coordinated with other portions of the Work.
 - g. Requested substitution provides specified warranty.
 - h. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.
- B. Substitutions for Convenience: Not allowed.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 012500

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SECTION 012600 - CONTRACT MODIFICATION PROCEDURES**PART 1 - GENERAL****1.1 SUMMARY**

- A. Section includes administrative and procedural requirements for handling and processing Contract modifications.
- B. Related Requirements:
 - 1. Section 012500 "Substitution Procedures" for administrative procedures for handling requests for substitutions made after the Contract award.

1.2 MINOR CHANGES IN THE WORK

- A. Architect will issue supplemental instructions authorizing minor changes in the Work, not involving adjustment to the Contract Sum or the Contract Time, on AIA Document G710.

1.3 PROPOSAL REQUESTS

- A. Owner-Initiated Proposal Requests: Architect will issue a detailed description of proposed changes in the Work that may require adjustment to the Contract Sum or the Contract Time. If necessary, the description will include supplemental or revised Drawings and Specifications.
 - 1. Work Change Proposal Requests issued by Architect are not instructions either to stop work in progress or to execute the proposed change.
 - 2. Within time specified in Proposal Request or 20 days, when not otherwise specified, after receipt of Proposal Request, submit a quotation estimating cost adjustments to the Contract Sum and the Contract Time necessary to execute the change.
 - a. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
 - b. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
 - c. Include costs of labor and supervision directly attributable to the change.
 - d. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
 - e. Quotation Form: Use forms acceptable to Architect.
- B. Contractor-Initiated Proposals: If latent or changed conditions require modifications to the Contract, Contractor may initiate a claim by submitting a request for a change to Architect.
 - 1. Include a statement outlining reasons for the change and the effect of the change on the Work. Provide a complete description of the proposed change. Indicate the effect of the proposed change on the Contract Sum and the Contract Time.
 - 2. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
 - 3. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
 - 4. Include costs of labor and supervision directly attributable to the change.

5. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
6. Comply with requirements in Section 012500 "Substitution Procedures" if the proposed change requires substitution of one product or system for product or system specified.
7. Proposal Request Form: Use form acceptable to Architect.

1.4 CHANGE ORDER PROCEDURES

- A. On Owner's approval of a Work Change Proposal Request, Architect will issue a Change Order for signatures of Owner and Contractor on AIA Document G701.

1.5 CONSTRUCTION CHANGE DIRECTIVE

- A. Construction Change Directive: Architect may issue a Construction Change Directive on AIA Document G714. Construction Change Directive instructs Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order.
 1. Construction Change Directive contains a complete description of change in the Work. It also designates method to be followed to determine change in the Contract Sum or the Contract Time.
- B. Documentation: Maintain detailed records on a time and material basis of work required by the Construction Change Directive.
 1. After completion of change, submit an itemized account and supporting data necessary to substantiate cost and time adjustments to the Contract.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 012600

SECTION 012900 - PAYMENT PROCEDURES**PART 1 - GENERAL****1.1 SUMMARY**

- A. Section includes administrative and procedural requirements necessary to prepare and process Applications for Payment.

1.2 SCHEDULE OF VALUES

- A. Coordination: Coordinate preparation of the schedule of values with preparation of Contractor's construction schedule. Cost-loaded Critical Path Method Schedule may serve to satisfy requirements for the schedule of values.
1. Coordinate line items in the schedule of values with items required to be indicated as separate activities in Contractor's construction schedule.
 2. Submit the schedule of values to Architect at earliest possible date, but no later than seven days before the date scheduled for submittal of initial Applications for Payment.
- B. Format and Content: Use Project Manual table of contents as a guide to establish line items for the schedule of values. Provide at least one line item for each Specification Section.
1. Identification: Include the following Project identification on the schedule of values:
 - a. Project name and location.
 - b. Name of Architect.
 - c. Architect's Project number.
 - d. Contractor's name and address.
 - e. Date of submittal.
 2. Arrange schedule of values consistent with format of AIA Document G703.
 3. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Provide multiple line items for principal subcontract amounts in excess of five percent of the Contract Sum.
 4. Provide a separate line item in the schedule of values for each part of the Work where Applications for Payment may include materials or equipment purchased or fabricated and stored, but not yet installed.
 - a. Differentiate between items stored on-site and items stored off-site.
 5. five Schedule of Values Revisions: Revise the schedule of values when Change Orders or Construction Change Directives result in a change in the Contract Sum. Include at least one separate line item for each Change Order and Construction Change Directive.

1.3 APPLICATIONS FOR PAYMENT

- A. Each Application for Payment following the initial Application for Payment shall be consistent with previous applications and payments, as certified by Architect and paid for by Owner.
- B. Payment Application Times: The date for each progress payment is indicated in the Owner/Contractor Agreement. The period of construction work covered by each Application for Payment is the period indicated in the Agreement.

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- C. Application Preparation: Complete every entry on form. Notarize and execute by a person authorized to sign legal documents on behalf of Contractor. Architect will return incomplete applications without action.
1. Entries shall match data on the schedule of values and Contractor's construction schedule. Use updated schedules if revisions were made.
 2. Include amounts of Change Orders and Construction Change Directives issued before last day of construction period covered by application.
- D. Transmittal: Submit three signed and notarized original copies of each Application for Payment to Architect by a method ensuring receipt within 24 hours. One copy shall include waivers of lien and similar attachments if required.
1. Transmit each copy with a transmittal form listing attachments and recording appropriate information about application.
- E. Waivers of Mechanic's Lien: With each Application for Payment, submit waivers of mechanic's lien from entities lawfully entitled to file a mechanic's lien arising out of the Contract and related to the Work covered by the payment.
1. Submit partial waivers on each item for amount requested in previous application, after deduction for retainage, on each item.
 2. When an application shows completion of an item, submit conditional final or full waivers.
 3. Owner reserves the right to designate which entities involved in the Work must submit waivers.
 4. Submit final Application for Payment with or preceded by conditional final waivers from every entity involved with performance of the Work covered by the application who is lawfully entitled to a lien.
 5. Waiver Forms: Submit executed waivers of lien on forms acceptable to Owner.
- F. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of first Application for Payment include the following:
1. List of subcontractors.
 2. Schedule of values.
 3. Contractor's construction schedule (preliminary if not final).
 4. Products list (preliminary if not final).
 5. Submittal schedule (preliminary if not final).
 6. List of Contractor's staff assignments.
 7. List of Contractor's principal consultants.
 8. Copies of building permits.
 9. Copies of authorizations and licenses from authorities having jurisdiction for performance of the Work.
 10. Initial progress report.
 11. Report of preconstruction conference.
 12. Certificates of insurance and insurance policies.
 13. Performance and payment bonds.
 14. Data needed to acquire Owner's insurance.
- G. Application for Payment at Substantial Completion: After Architect issues the Certificate of Substantial Completion, submit an Application for Payment showing 100 percent completion for portion of the Work claimed as substantially complete.
1. Include documentation supporting claim that the Work is substantially complete and a statement showing an accounting of changes to the Contract Sum.
 - a. Complete administrative actions, submittals, and Work preceding this application, as described in Section 017700 "Closeout Procedures."

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2. This application shall reflect Certificate(s) of Substantial Completion issued previously for Owner occupancy of designated portions of the Work.
- H. Final Payment Application: After completing Project closeout requirements, submit final Application for Payment with releases and supporting documentation not previously submitted and accepted, including, but not limited, to the following:
1. Evidence of completion of Project closeout requirements.
 2. Certification of completion of final punch list items.
 3. Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid.
 4. Updated final statement, accounting for final changes to the Contract Sum.
 5. AIA Document G706.
 6. AIA Document G706A.
 7. AIA Document G707.
 8. Evidence that claims have been settled.
 9. Final meter readings for utilities, a measured record of stored fuel, and similar data as of date of Substantial Completion or when Owner took possession of and assumed responsibility for corresponding elements of the Work.
 10. Final liquidated damages settlement statement.
 11. Proof that taxes, fees, and similar obligations are paid.
 12. Waivers and releases.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 012900

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SECTION 013100 - PROJECT MANAGEMENT AND COORDINATION**PART 1 - GENERAL****1.1 SUMMARY**

- A. Section includes administrative provisions for coordinating construction operations on Project, including, but not limited to, the following:
1. General coordination procedures.
 2. Coordination drawings.
 3. RFIs.
 4. Digital project management procedures.
 5. Web-based Project management software package.
 6. Project meetings.

1.2 DEFINITIONS

- A. BIM: Building Information Modeling.
- B. RFI: Request for Information. Request from Owner, Architect, or Contractor seeking information required by or clarifications of the Contract Documents.

1.3 INFORMATIONAL SUBMITTALS

- A. Subcontract List: Prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design. Include the following information in tabular form:
1. Name, address, telephone number, and email address of entity performing subcontract or supplying products.
 2. Number and title of related Specification Section(s) covered by subcontract.
 3. Drawing number and detail references, as appropriate, covered by subcontract.

1.4 GENERAL COORDINATION PROCEDURES

- A. Coordination: Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations included in different Sections that depend on each other for proper installation, connection, and operation.
1. Schedule construction operations in sequence required to assure proper performance of components, where installation of one part of the Work depends on installation of other components, before or after its own installation.
 2. Coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair.
 3. Make adequate provisions to accommodate items scheduled for later installation.
- B. Prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.
1. Prepare similar memoranda for Owner and separate contractors if coordination of their Work is required.

1.5 COORDINATION DRAWINGS

- A. Coordination Drawings, General: Prepare coordination drawings according to requirements in individual Sections, and additionally where installation is not completely indicated on Shop Drawings, where limited space availability necessitates coordination, or if coordination is required to facilitate integration of products and materials fabricated or installed by more than one entity.
1. Content: Project-specific information, drawn accurately to a scale large enough to indicate and resolve conflicts. Do not base coordination drawings on standard printed data. Include the following information, as applicable:
 - a. Use applicable Drawings as a basis for preparation of coordination drawings. Prepare sections, elevations, and details as needed to describe relationship of various systems and components.
 - b. Indicate functional and spatial relationships of components of architectural, structural, civil, mechanical, and electrical systems.
 - c. Indicate space requirements for routine maintenance and for anticipated replacement of components during the life of the installation.
 - d. Show location and size of access doors required for access to concealed dampers, valves, and other controls.
 - e. Indicate required installation sequences.
 - f. Indicate dimensions shown on Drawings. Specifically note dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements. Provide alternative sketches to Architect indicating proposed resolution of such conflicts. Minor dimension changes and difficult installations will not be considered changes to the Contract.
- B. Coordination Drawing Organization: Organize coordination drawings as follows:
1. Floor Plans and Reflected Ceiling Plans: Show architectural and structural elements, and mechanical, plumbing, fire-protection, fire-alarm, and electrical Work. Show locations of visible ceiling-mounted devices relative to acoustical ceiling grid. Supplement plan drawings with section drawings where required to adequately represent the Work.
 2. Plenum Space: Indicate subframing for support of ceiling and wall systems, mechanical and electrical equipment, and related Work. Locate components within plenums to accommodate layout of light fixtures and other components indicated on Drawings. Indicate areas of conflict between light fixtures and other components.
 3. Structural Penetrations: Indicate penetrations and openings required for all disciplines.
 4. Slab Edge and Embedded Items: Indicate slab edge locations and sizes and locations of embedded items for metal fabrications, sleeves, anchor bolts, bearing plates, angles, door floor closers, slab depressions for floor finishes, curbs and housekeeping pads, and similar items.
 5. Mechanical and Plumbing Work: Show the following:
 - a. Sizes and bottom elevations of ductwork, piping, and conduit runs, including insulation, bracing, flanges, and support systems.
 - b. Dimensions of major components, such as dampers, valves, diffusers, access doors, cleanouts and electrical distribution equipment.
 - c. Fire-rated enclosures around ductwork.
 6. Electrical Work: Show the following:
 - a. Runs of vertical and horizontal conduit 1-1/4 inches in diameter and larger.
 - b. Light fixture, exit light, emergency battery pack, smoke detector, and other fire-alarm locations.
 - c. Panel board, switchboard, switchgear, transformer, busway, generator, and motor-control center locations.
 - d. Location of pull boxes and junction boxes, dimensioned from column center lines.

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7. Fire-Protection System: Show the following:
 - a. Locations of standpipes, mains piping, branch lines, pipe drops, and sprinkler heads.
 8. Review: Architect will review coordination drawings to verify that components requiring coordination have been included, but not for the details of the coordination, which are Contractor's responsibility. If Architect determines that coordination drawings are not being prepared in sufficient scope or detail, or are otherwise deficient, Architect will so inform Contractor, who shall make suitable modifications and resubmit.
 9. Coordination Drawing Prints: Prepare coordination drawing prints according to requirements in Section 013300 "Submittal Procedures" and post to Project Information Management System.
- C. Coordination Drawing Process: Prepare coordination drawings in the following manner:
1. Schedule submittal and review of Fire Sprinkler, Plumbing, HVAC, and Electrical Shop Drawings to make required changes prior to preparation of coordination drawings.
 2. Commence routing of coordination drawing files with HVAC Installer, who will provide drawing plan files denoting approved ductwork. HVAC Installer will locate ductwork and piping on a single layer, using orange color. Forward drawings to Plumbing Installer.
 3. Plumbing Installer will locate plumbing and equipment on a single layer, using blue color.
 4. Fire Sprinkler Installer will locate piping and equipment, using red color. Fire Sprinkler Installer shall forward drawing files to Electrical Installer.
 5. Electrical Installer will indicate service and feeder conduit runs and equipment in green color. Electrical Installer shall forward drawing files to Communications and Electronic Safety and Security Installer.
 6. Communications and Electronic Safety and Security Installer will indicate cable trays and cabling runs and equipment in purple color. Communications and Electronic Safety and Security Installer shall forward completed drawing files to Contractor.
 7. Contractor shall perform the final coordination review. As each coordination drawing is completed, Contractor will meet with Architect to review and resolve conflicts on the coordination drawings.
- D. Coordination Digital Data Files: Prepare coordination digital data files according to the following requirements:
1. File Preparation Format: Same digital data software program, version, and operating system as original Drawings.
 2. DWG File Submittal Format: Submit or post coordination drawing files using PDF format.
 3. BIM File Incorporation: Develop and incorporate coordination drawing files into BIM established for Project.
 - a. Perform three-dimensional component conflict analysis as part of preparation of coordination drawings. Resolve component conflicts prior to submittal. Indicate where conflict resolution requires modification of design requirements by Architect.
 4. Architect will furnish Contractor one set of digital data files of Drawings for use in preparing coordination digital data files.
 - a. Architect makes no representations as to the accuracy or completeness of digital data files as they relate to Drawings.
 - b. Digital Data Software Program: Drawings are available in REVIT.
 - c. Contractor shall execute a data licensing agreement in the form of Agreement included in this Project Manual.

1.6 REQUEST FOR INFORMATION (RFI)

- A. General: Immediately on discovery of the need for additional information, clarification, or interpretation of the Contract Documents, Contractor shall prepare and submit an RFI via the Project Information Management System.
1. Architect will not respond to those RFIs submitted to Architect by other entities controlled by Contractor.
 2. Coordinate and submit RFIs in a prompt manner to avoid delays in Contractor's work or work of subcontractors.
- B. Content of the RFI: Include a detailed, legible description of item needing information or interpretation and the following:
1. Project name.
 2. Owner name.
 3. Owner's Project number.
 4. Name of Architect.
 5. Architect's Project number.
 6. Date.
 7. Name of Contractor.
 8. RFI number, numbered sequentially.
 9. RFI subject.
 10. Specification Section number and title and related paragraphs, as appropriate.
 11. Drawing number and detail references, as appropriate.
 12. Field dimensions and conditions, as appropriate.
 13. Contractor's suggested resolution. If Contractor's suggested resolution impacts the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
 14. Contractor's signature.
 15. Attachments: Include sketches, descriptions, measurements, photos, Product Data, Shop Drawings, coordination drawings, and other information necessary to fully describe items needing interpretation.
 - a. Include dimensions, thicknesses, structural grid references, and details of affected materials, assemblies, and attachments on attached sketches.
- C. RFI Forms: Software-generated form with substantially the same content as indicated above, acceptable to Architect.
1. Attachments shall be electronic files in PDF format.
- D. Architect's Action: Architect will review each RFI, determine action required, and respond. Allow seven days for Architect's response for each RFI. RFIs received by Architect after 1:00 p.m. will be considered as received the following working day.
1. The following Contractor-generated RFIs will not be reviewed:
 - a. Requests for approval of submittals.
 - b. Requests for approval of substitutions.
 - c. Requests for approval of Contractor's means and methods.
 - d. Requests for coordination information already indicated in the Contract Documents.
 - e. Requests for adjustments in the Contract Time or the Contract Sum.
 - f. Requests for interpretation of Architect's actions on submittals.
 - g. Incomplete RFIs or inaccurately prepared RFIs.
 2. Architect's action may include a request for additional information, in which case Architect's time for response will date from time of receipt by Architect of additional information.

3. Architect's action on RFIs that may result in a change to the Contract Time or the Contract Sum may be eligible for Contractor to submit Change Proposal according to Section 012600 "Contract Modification Procedures."
 - a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Architect in writing within 5 days of receipt of the RFI response.

- E. RFI Log: The Project Information Management System will create and maintain the RFI log.
- F. On receipt of Architect's action, immediately distribute the RFI response to affected parties. Review response and notify Architect within seven days if Contractor disagrees with response.

1.7 WEB-BASED PROJECT INFORMATION MANAGEMENT SYSTEM

- A. The Architect has established a web-based Project Information Management System to facilitate communication and record-keeping during the project. Architect will provide access to Contractor's key personnel. Refer to www.NewForma.com.
 1. Use Architect's web-based Project Information Management System for purposes of managing project communication and documentation until Final Completion.
 2. Due to the size restrictions on email communication, all electronic files must be submitted through the Project Information Management System. Architect assumes no responsibility for information not received or retrieved by Contractor's failure to use the Project Information Management System and such loss or delay of information will not be considered as a delay claim.
- B. The Project Information Management System shall include the following:
 1. Project directory.
 2. Project correspondence.
 3. Meeting minutes.
 4. Contract modifications forms and logs.
 5. RFI forms and logs.
 6. Submittal forms and logs.
 7. Architect's Supplementary Instruction forms and logs
 8. Proposal request forms and logs.
 9. Change order forms and logs.
 10. Reminder and tracking functions.
 11. Task and issue management.
 12. Photo documentation.
 13. Schedule and calendar management.
 14. Payment application forms.
 15. Drawing and specification document hosting, viewing, and updating.
 16. Online document collaborations.
 17. Archiving function.
- C. Contractor, subcontractors, and other parties granted access by Contractor to Project Information Management System shall execute a data licensing agreement in the Form of Agreement included in this Project Manual.

1.8 PROJECT MEETINGS

- A. General: Schedule and conduct meetings and conferences at Project site unless otherwise indicated.

1. Attendees: Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Notify Owner and Architect of scheduled meeting dates and times a minimum of 10 working days prior to meeting.
 2. Agenda: Prepare the meeting agenda. Distribute the agenda to all invited attendees.
 3. Minutes: Entity responsible for conducting meeting will record discussions and agreements achieved. Distribute the meeting minutes to attendees, including Owner and Architect, within three days of the meeting.
- B. Preconstruction Conference: Schedule and conduct a preconstruction conference before starting construction, at a time convenient to Owner and Architect, but no later than 5 days after execution of the Agreement.
1. Attendees: Authorized representatives of Owner Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the conference. Participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
 2. Agenda: Discuss items of significance that could affect progress, including the following:
 - a. Responsibilities and personnel assignments.
 - b. Tentative construction schedule.
 - c. Phasing.
 - d. Critical work sequencing and long lead items.
 - e. Designation of key personnel and their duties.
 - f. Lines of communications.
 - g. Use of web-based Project software.
 - h. Procedures for processing field decisions and Change Orders.
 - i. Procedures for RFIs.
 - j. Procedures for testing and inspecting.
 - k. Procedures for processing Applications for Payment.
 - l. Distribution of the Contract Documents.
 - m. Submittal procedures.
 - n. Preparation of Record Documents.
 - o. Use of the premises and existing building.
 - p. Work restrictions.
 - q. Working hours.
 - r. Owner's occupancy requirements.
 - s. Responsibility for temporary facilities and controls.
 - t. Procedures for moisture and mold control.
 - u. Procedures for disruptions and shutdowns.
 - v. Construction waste management and recycling.
 - w. Parking availability.
 - x. Office, work, and storage areas.
 - y. Equipment deliveries and priorities.
 - z. First aid.
 - aa. Security.
 - bb. Progress cleaning.
 - cc. Bonds and insurance.
 3. Minutes: Entity responsible for conducting meeting will record and distribute meeting minutes.
- C. Preinstallation Conferences: Conduct a preinstallation conference at Project site before each construction activity when required by other Sections and when required for coordination with other construction.
1. Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise Architect of scheduled meeting dates.

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2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including requirements for the following:
 - a. Contract Documents.
 - b. Options.
 - c. Related RFIs.
 - d. Related Change Orders.
 - e. Purchases.
 - f. Deliveries.
 - g. Submittals.
 - h. Sustainable design requirements.
 - i. Review of mockups.
 - j. Possible conflicts.
 - k. Compatibility requirements.
 - l. Time schedules.
 - m. Weather limitations.
 - n. Manufacturer's written instructions.
 - o. Warranty requirements.
 - p. Compatibility of materials.
 - q. Acceptability of substrates.
 - r. Temporary facilities and controls.
 - s. Space and access limitations.
 - t. Regulations of authorities having jurisdiction.
 - u. Testing and inspecting requirements.
 - v. Installation procedures.
 - w. Coordination with other work.
 - x. Required performance results.
 - y. Protection of adjacent work.
 - z. Protection of construction and personnel.
 3. Record conference discussions, agreements, and disagreements, including required corrective measures and actions.
 4. Reporting: Distribute minutes of the meeting to each party present and to other parties requiring information.
 5. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.
- D. Project Closeout Conference: Schedule and conduct a project closeout conference, at a time convenient to Owner and Architect, but no later than 60 days prior to the scheduled date of Substantial Completion.
1. Conduct the conference to review requirements and responsibilities related to Project closeout.
 2. Attendees: Authorized representatives of Owner, Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the meeting. Participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
 3. Agenda: Discuss items of significance that could affect or delay Project closeout, including the following:
 - a. Preparation of Record Documents.
 - b. Procedures required prior to inspection for Substantial Completion and for final inspection for acceptance.
 - c. Procedures for completing and archiving web-based Project software site data files.
 - d. Submittal of written warranties.
 - e. Requirements for completing sustainable design documentation.
 - f. Requirements for preparing operations and maintenance data.

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- g. Requirements for delivery of material samples, attic stock, and spare parts.
 - h. Requirements for demonstration and training.
 - i. Preparation of Contractor's punch list.
 - j. Procedures for processing Applications for Payment at Substantial Completion and for final payment.
 - k. Submittal procedures.
 - l. Coordination of separate contracts.
 - m. Owner's partial occupancy requirements.
 - n. Installation of Owner's furniture, fixtures, and equipment.
 - o. Responsibility for removing temporary facilities and controls.
4. Minutes: Entity conducting meeting will record and distribute meeting minutes.
- E. Progress Meetings: Conduct progress meetings at regular intervals.
- 1. Coordinate dates of meetings with preparation of payment requests.
 - 2. Attendees: In addition to representatives of Owner and Architect, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
 - 3. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
 - a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's construction schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
 - 1) Review schedule for next period.
 - b. Review present and future needs of each entity present, including the following:
 - 1) Interface requirements.
 - 2) Sequence of operations.
 - 3) Resolution of BIM component conflicts.
 - 4) Status of submittals.
 - 5) Deliveries.
 - 6) Off-site fabrication.
 - 7) Access.
 - 8) Site use.
 - 9) Temporary facilities and controls.
 - 10) Progress cleaning.
 - 11) Quality and work standards.
 - 12) Status of correction of deficient items.
 - 13) Field observations.
 - 14) Status of RFIs.
 - 15) Status of Proposal Requests.
 - 16) Pending changes.
 - 17) Status of Change Orders.
 - 18) Pending claims and disputes.
 - 19) Documentation of information for payment requests.
 - 4. Minutes: Entity responsible for conducting the meeting will record and distribute the meeting minutes to each party present and to parties requiring information.

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- a. Schedule Updating: Revise Contractor's construction schedule after each progress meeting, where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting.
- F. Coordination Meetings: Conduct Project coordination meetings at regular intervals. Project coordination meetings are in addition to specific meetings held for other purposes, such as progress meetings and preinstallation conferences.
1. Attendees: In addition to representatives of Owner and Architect, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the meetings shall be familiar with Project and authorized to conclude matters relating to the Work.
 2. Agenda: Review and correct or approve minutes of the previous coordination meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
 - a. Combined Contractor's Construction Schedule: Review progress since the last coordination meeting. Determine whether each contract is on time, ahead of schedule, or behind schedule, in relation to combined Contractor's construction schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
 - b. Schedule Updating: Revise combined Contractor's construction schedule after each coordination meeting, where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with report of each meeting.
 - c. Review present and future needs of each contractor present, including the following:
 - 1) Interface requirements.
 - 2) Sequence of operations.
 - 3) Resolution of BIM component conflicts.
 - 4) Status of submittals.
 - 5) Deliveries.
 - 6) Off-site fabrication.
 - 7) Access.
 - 8) Site use.
 - 9) Temporary facilities and controls.
 - 10) Work hours.
 - 11) Hazards and risks.
 - 12) Progress cleaning.
 - 13) Quality and work standards.
 - 14) Status of RFIs.
 - 15) Proposal Requests.
 - 16) Change Orders.
 - 17) Pending changes.
 3. Reporting: Record meeting results and distribute copies to everyone in attendance and to others affected by decisions or actions resulting from each meeting.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 013100

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SECTION 013200 - CONSTRUCTION PROGRESS DOCUMENTATION**PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:
 - 1. Startup construction schedule.
 - 2. Contractor's Construction Schedule.
 - 3. Submittals schedule.
 - 4. Daily construction reports.
 - 5. Site condition reports.
 - 6. Unusual event reports.
- B. Related Requirements:
 - 1. Section 014000 "Quality Requirements" for schedule of tests and inspections.
 - 2. Section 012900 "Payment Procedures" for schedule of values and requirements for use of cost-loaded schedule for Applications for Payment.

1.3 DEFINITIONS

- A. General: Refer to the glossary of terms in AGC's "Construction Planning & Scheduling" for terminology used in this section.
- B. Float: The measure of leeway in starting and completing an activity.
 - 1. Float time is not for the exclusive use or benefit of either Owner or Contractor, but is a jointly owned, expiring Project resource available to both parties as needed to meet schedule milestones and Contract completion date.
 - 2. Free float is the amount of time an activity can be delayed without adversely affecting the early start of the successor activity.
 - 3. Total float is the measure of leeway in starting or completing an activity without adversely affecting the planned Project completion date.
- C. Resource Loading: The allocation of manpower and equipment necessary for completing an activity as scheduled.

1.4 INFORMATIONAL SUBMITTALS

- A. Format for Submittals: Submit required submittals in the following format:
 - 1. Working electronic copy of schedule file.
 - 2. PDF file.
- B. Startup construction schedule.

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1. Submittal of cost-loaded startup construction schedule will not constitute approval of schedule of values for cost-loaded activities.
 - C. Startup Network Diagram: Of size required to display entire network for entire construction period. Show logic ties for activities.
 - D. Contractor's Construction Schedule: Initial schedule, of size required to display entire schedule for entire construction period.
 1. Submit a working electronic copy of schedule, using software indicated, and labeled to comply with requirements for submittals. Include type of schedule (initial and updated) and date.
 - E. CPM Reports: Concurrent with CPM schedule, submit each of the following reports. Format for each activity in reports shall contain activity number, activity description, cost and resource loading, original duration, remaining duration, early start date, early finish date, late start date, late finish date, and total float in calendar days.
 1. Activity Report: List of activities sorted by activity number and then early start date, or actual start date if known.
 2. Logic Report: List of preceding and succeeding activities for each activity, sorted in ascending order by activity number and then by early start date, or actual start date if known.
 3. Total Float Report: List of activities sorted in ascending order of total float.
 4. Earnings Report: Compilation of Contractor's total earnings from the Notice to Proceed until most recent Application for Payment.
 - F. Construction Schedule Updating Reports: Submit with Applications for Payment.
 - G. Daily Construction Reports: Submit at weekly intervals.
 - H. Site Condition Reports: Submit at time of discovery of differing conditions.
 - I. Unusual Event Reports: Submit at time of unusual event.
 - J. Qualification Data: For scheduling consultant.
- 1.5 CONTRACTOR'S CONSTRUCTION SCHEDULE
- A. Procedures: Comply with procedures contained in AGC's "Construction Planning & Scheduling."
 - B. Time Frame: Extend schedule from date established for the Notice of Award to date of Final Completion.
 1. Contract completion date shall not be changed by submission of a schedule that shows an early completion date, unless specifically authorized by Change Order.
 - C. Activities: Treat each floor or separate area as a separate numbered activity for each main element of the Work. Comply with the following:
 1. Activity Duration: Define activities so no activity is longer than 30 days, unless specifically allowed by Architect.
 2. Procurement Activities: Include procurement process activities for the following long lead-time items and major items, requiring a cycle of more than 60 days, as separate activities in schedule. Procurement cycle activities include, but are not limited to, submittals, approvals, purchasing, fabrication, and delivery.

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3. Submittal Review Time: Include review and resubmittal times indicated in Section 013300 "Submittal Procedures" in schedule. Coordinate submittal review times in Contractor's Construction Schedule with submittal schedule.
 4. Startup and Testing Time: Include no fewer than 14 days for startup and testing.
 5. Substantial Completion: Indicate completion in advance of date established for Substantial Completion, and allow time for Architect's administrative procedures necessary for certification of Substantial Completion.
 6. Punch List and Final Completion: Include not more than the days indicated in the Agreement for completion of punch list items and Final Completion.
 - 7.
- D. Constraints: Include constraints and work restrictions indicated in the Contract Documents and as follows in schedule, and show how the sequence of the Work is affected.
1. Work by Owner: Include a separate activity for each portion of the Work performed by Owner.
 2. Work Restrictions: Show the effect of the following items on the schedule:
 - a. Limitations of continued occupancies.
 - b. Uninterruptible services.
 - c. Partial occupancy before Substantial Completion.
 - d. Use-of-premises restrictions.
 - e. Provisions for future construction.
 - f. Seasonal variations.
 - g. Environmental control.
 3. Work Stages: Indicate important stages of construction for each major portion of the Work, including, but not limited to, the following:
 - a. Subcontract awards.
 - b. Submittals.
 - c. Purchases.
 - d. Mockups.
 - e. Fabrication.
 - f. Sample testing.
 - g. Deliveries.
 - h. Installation.
 - i. Tests and inspections.
 - j. Adjusting.
 - k. Curing.
 - l. Building flush-out.
 - m. Startup and placement into final use and operation.
 4. Construction Areas: Identify each major area of construction for each major portion of the Work. Indicate where each construction activity within a major area must be sequenced or integrated with other construction activities to provide for the following:
 - a. Structural completion.
 - b. Temporary enclosure and space conditioning.
 - c. Permanent space enclosure.
 - d. Completion of mechanical installation.
 - e. Completion of electrical installation.
 - f. Substantial Completion.
- E. Milestones: Include milestones indicated in the Contract Documents in schedule, including, but not limited to, the Notice to Proceed, Substantial Completion, and Final Completion.

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- F. Cost Correlation: Superimpose a cost correlation timeline, indicating planned and actual costs. On the line, show planned and actual dollar volume of the Work performed as of planned and actual dates used for preparation of payment requests.
1. See Section 012900 "Payment Procedures" for cost reporting and payment procedures.
- G. Upcoming Work Summary: Prepare summary report indicating activities scheduled to occur or commence prior to submittal of next schedule update. Summarize the following issues:
1. Unresolved issues.
 2. Unanswered Requests for Information.
 3. Rejected or unreturned submittals.
 4. Notations on returned submittals.
 5. Pending modifications affecting the Work and the Contract Time.
- H. Contractor's Construction Schedule Updating: At monthly intervals, update schedule to reflect actual construction progress and activities. Issue schedule one week before each regularly scheduled progress meeting.
1. Revise schedule immediately after each meeting or other activity where revisions have been recognized or made. Issue updated schedule concurrently with the report of each such meeting.
 2. Include a report with updated schedule that indicates every change, including, but not limited to, changes in logic, durations, actual starts and finishes, and activity durations.
 3. As the Work progresses, indicate Final Completion percentage for each activity.
- I. Recovery Schedule: When periodic update indicates the Work is 14 or more calendar days behind the current approved schedule, submit a separate recovery schedule indicating means by which Contractor intends to regain compliance with the schedule. Indicate changes to working hours, working days, crew sizes, equipment required to achieve compliance, and date by which recovery will be accomplished.
- J. Distribution: Distribute copies of approved schedule to Architect Owner, separate contractors, testing and inspecting agencies, and other parties identified by Contractor with a need-to-know schedule responsibility.
1. Post copies in Project meeting rooms and temporary field offices.
 2. When revisions are made, distribute updated schedules to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in performance of construction activities.
- K. Computer Scheduling Software: Prepare schedules using current version of a program that has been developed specifically to manage construction schedules.
- 1.6 STARTUP CONSTRUCTION SCHEDULE
- A. Gantt-Chart Schedule: Submit startup, horizontal, Gantt-chart-type construction schedule within seven days of date established for the Notice to Proceed.
- B. Preparation: Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line. Outline significant construction activities for first 60 days of construction. Include skeleton diagram for the remainder of the Work and a cash requirement prediction based on indicated activities.
- 1.7 CPM SCHEDULE REQUIREMENTS
- A. Prepare network diagrams using AON (activity-on-node) format.

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- B. Startup Network Diagram: Submit diagram within 14 days of date established for the Notice to Proceed. Outline significant construction activities for the first 90 days of construction. Include skeleton diagram for the remainder of the Work and a cash requirement prediction based on indicated activities.
- C. CPM Schedule: Prepare Contractor's Construction Schedule using a cost- and resource-loaded, time-scaled CPM network analysis diagram for the Work.
1. Develop network diagram in sufficient time to submit CPM schedule, so it can be accepted for use no later than 60 days after date established for commencement of the Work.
 - a. Failure to include any work item required for performance of this Contract shall not excuse Contractor from completing all work within applicable completion dates.
 2. Conduct educational workshops to train and inform key Project personnel, including subcontractors' personnel, in proper methods of providing data and using CPM schedule information.
 3. Establish procedures for monitoring and updating CPM schedule and for reporting progress. Coordinate procedures with progress meeting and payment request dates.
 4. Use "one workday" as the unit of time for individual activities. Indicate nonworking days and holidays incorporated into the schedule to coordinate with the Contract Time.
- D. CPM Schedule Preparation: Prepare a list of all activities required to complete the Work. Using the startup network diagram, prepare a skeleton network to identify probable critical paths.
1. Activities: Indicate the estimated time duration, sequence requirements, and relationship of each activity in relation to other activities. Include estimated time frames for the following activities:
 - a. Preparation and processing of submittals.
 - b. Mobilization and demobilization.
 - c. Purchase of materials.
 - d. Delivery.
 - e. Fabrication.
 - f. Utility interruptions.
 - g. Installation.
 - h. Work by Owner that may affect or be affected by Contractor's activities.
 - i. Testing and inspection.
 - j. Punch list and Final Completion.
 - k. Activities occurring following Final Completion.
 2. Critical Path Activities: Identify critical path activities, including those for interim completion dates. Scheduled start and completion dates shall be consistent with Contract milestone dates.
 3. Processing: Process data to produce output data on a computer-drawn, time-scaled network. Revise data, reorganize activity sequences, and reproduce as often as necessary to produce the CPM schedule within the limitations of the Contract Time.
 4. Format: Mark the critical path. Locate the critical path near center of network; locate paths with most float near the edges.
 - a. Subnetworks on separate sheets are permissible for activities clearly off the critical path.
 5. Cost- and Resource-Loading of CPM Schedule: Assign cost to construction activities on the CPM schedule. Do not assign costs to submittal activities. Obtain Architect's approval prior to assigning costs to fabrication and delivery activities. Assign costs under main subcontracts for testing and commissioning activities, operation and maintenance manuals, punch list activities, Project record documents, sustainable design documentation, and demonstration and training (if applicable), in the amount of 5 percent of the Contract Sum.
 - a. Each activity cost shall reflect an appropriate value subject to approval by Architect.
 - b. Total cost assigned to activities shall equal the total Contract Sum.

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- E. Contract Modifications: For each proposed contract modification and concurrent with its submission, prepare a time-impact analysis using a network fragment to demonstrate the effect of the proposed change on the overall Project schedule.
- F. Initial Issue of Schedule: Prepare initial network diagram from a sorted activity list indicating straight "early start-total float." Identify critical activities. Prepare tabulated reports showing the following:
1. Contractor or subcontractor and the Work or activity.
 2. Description of activity.
 3. Main events of activity.
 4. Immediate preceding and succeeding activities.
 5. Early and late start dates.
 6. Early and late finish dates.
 7. Activity duration in workdays.
 8. Total float or slack time.
 9. Average size of workforce.
 10. Dollar value of activity (coordinated with the schedule of values).
- G. Schedule Updating: Concurrent with making revisions to schedule, prepare tabulated reports showing the following:
1. Identification of activities that have changed.
 2. Changes in early and late start dates.
 3. Changes in early and late finish dates.
 4. Changes in activity durations in workdays.
 5. Changes in the critical path.
 6. Changes in total float or slack time.
 7. Changes in the Contract Time.
- H. Value Summaries: Prepare two cumulative value lists, sorted by finish dates.
1. In first list, tabulate activity number, early finish date, dollar value, and cumulative dollar value.
 2. In second list, tabulate activity number, late finish date, dollar value, and cumulative dollar value.
 3. In subsequent issues of both lists, substitute actual finish dates for activities completed as of list date.
 4. Prepare list for ease of comparison with payment requests; coordinate timing with progress meetings.
 - a. In both value summary lists, tabulate "actual percent complete" and "cumulative value completed" with total at bottom.
 - b. Submit value summary printouts one week before each regularly scheduled progress meeting.

1.8 REPORTS

- A. Daily Construction Reports: Prepare a daily construction report recording the following information concerning events at Project site:
1. List of subcontractors at Project site.
 2. List of separate contractors at Project site.
 3. Approximate count of personnel at Project site.
 4. Equipment at Project site.
 5. Material deliveries.
 6. High and low temperatures and general weather conditions, including presence of rain or snow.
 7. Testing and inspection.
 8. Accidents.

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9. Meetings and significant decisions.
 10. Unusual events.
 11. Stoppages, delays, shortages, and losses.
 12. Meter readings and similar recordings.
 13. Emergency procedures.
 14. Orders and requests of authorities having jurisdiction.
 15. Change Orders received and implemented.
 16. Construction Change Directives received and implemented.
 17. Services connected and disconnected.
 18. Equipment or system tests and startups.
 19. Partial completions and occupancies.
 20. Substantial Completions authorized.
- B. Material Location Reports: At weekly intervals, prepare and submit a comprehensive list of materials delivered to and stored at Project site. List shall be cumulative, showing materials previously reported plus items recently delivered. Include with list a statement of progress on and delivery dates for materials or items of equipment fabricated or stored away from Project site. Indicate the following categories for stored materials:
1. Material stored prior to previous report and remaining in storage.
 2. Material stored prior to previous report and since removed from storage and installed.
 3. Material stored following previous report and remaining in storage.
- C. Site Condition Reports: Immediately on discovery of a difference between site conditions and the Contract Documents, prepare and submit a detailed report. Submit with a Request for Information. Include a detailed description of the differing conditions, together with recommendations for changing the Contract Documents.
- D. Unusual Event Reports: When an event of an unusual and significant nature occurs at Project site, whether or not related directly to the Work, prepare and submit a special report. List chain of events, persons participating, responses by Contractor's personnel, evaluation of results or effects, and similar pertinent information. Advise Owner in advance when these events are known or predictable.
1. Submit unusual event reports directly to Owner within one day(s) of an occurrence. Distribute copies of report to parties affected by the occurrence.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 013200

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SECTION 013300 - SUBMITTAL PROCEDURES**PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY**A. Section Includes:**

1. Submittal schedule requirements.
2. Administrative and procedural requirements for submittals.

- B. Electronic Files Transfer: Use Architect's web-based Project Information Management System specifically established for Project for submittals containing electronic files. Refer to Division 01 Section "Project Management and Coordination" for additional information on the Project Information Management System.

1. The web address or hyperlink will be provided at initial preconstruction conference.
2. The Architect assumes on responsibility for information lost or not received by Contractor's failure to submit and retrieve through the Project Information Management System.
3. Contractor's failure to submit and retrieve through the Project Information Management System will not be considered in delay claims associated with lost or missing information.

C. Related Requirements:

1. Section 012900 "Payment Procedures" for submitting Applications for Payment and the schedule of values.
2. Section 013100 "Project Management and Coordination" for submitting coordination drawings and subcontract list and for requirements for web-based Project software.
3. Section 013200 "Construction Progress Documentation" for submitting schedules and reports, including Contractor's construction schedule.
4. Section 014000 "Quality Requirements" for submitting test and inspection reports, and schedule of tests and inspections.
5. Section 017700 "Closeout Procedures" for submitting closeout submittals and maintenance material submittals.
6. Section 017823 "Operation and Maintenance Data" for submitting operation and maintenance manuals.
7. Section 017839 "Project Record Documents" for submitting record Drawings, record Specifications, and record Product Data.

1.3 DEFINITIONS

- A. Action Submittals: Written and graphic information and physical samples that require Architect's responsive action. Action submittals are those submittals indicated in individual Specification Sections as "action submittals."
- B. Informational Submittals: Written and graphic information and physical samples that do not require Architect's responsive action. Submittals may be rejected for not complying with requirements.

Informational submittals are those submittals indicated in individual Specification Sections as "informational submittals."

1.4 SUBMITTAL SCHEDULE

- A. Submittal Schedule: Submit, as an action submittal, a list of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, ordering, manufacturing, fabrication, and delivery when establishing dates. Include additional time required for making corrections or revisions to submittals noted by Architect and additional time for handling and reviewing submittals required by those corrections.
1. Coordinate submittal schedule with list of subcontracts, the schedule of values, and Contractor's construction schedule.
 2. Initial Submittal Schedule: Submit concurrently with startup construction schedule. Include submittals required during the first 60 days of construction. List those submittals required to maintain orderly progress of the Work and those required early because of long lead time for manufacture or fabrication.
 3. Final Submittal Schedule: Submit concurrently with the first complete submittal of Contractor's construction schedule.
 - a. Submit revised submittal schedule as required to reflect changes in current status and timing for submittals.
 4. Format: Arrange the following information in a tabular format:
 - a. Scheduled date for first submittal.
 - b. Specification Section number and title.
 - c. Submittal Category: Action; informational.
 - d. Name of subcontractor.
 - e. Description of the Work covered.
 - f. Scheduled date for Architect's final release or approval.
 - g. Scheduled dates for purchasing.
 - h. Scheduled date of fabrication.
 - i. Scheduled dates for installation.
 - j. Activity or event number.

1.5 SUBMITTAL FORMATS

- A. Submittal Information: Include the following information in each submittal:
1. Project name.
 2. Date.
 3. Name of Architect.
 4. Name of Contractor.
 5. Name of firm or entity that prepared submittal.
 6. Names of subcontractor, manufacturer, and supplier.
 7. Unique submittal number, including revision identifier. Include Specification Section number with sequential alphanumeric identifier and alphanumeric suffix for resubmittals.
 8. Category and type of submittal.
 9. Submittal purpose and description.
 10. Number and title of Specification Section, with paragraph number and generic name for each of multiple items.
 11. Drawing number and detail references, as appropriate.
 12. Indication of full or partial submittal.
 13. Location(s) where product is to be installed, as appropriate.
 14. Other necessary identification.

15. Remarks.
16. Signature of transmitter.

- B. Options: Identify options requiring selection by Architect.
- C. Deviations and Additional Information: On each submittal, clearly indicate deviations from requirements in the Contract Documents, including minor variations and limitations; include relevant additional information and revisions, other than those requested by Architect on previous submittals. Indicate by highlighting on each submittal or noting on attached separate sheet.
- D. Electronic Submittals: Prepare submittals as PDF package, incorporating complete information into each PDF file. Name PDF file with submittal number.
- E. Submittals Utilizing Web-Based Project Software: Prepare submittals as PDF files or other format indicated by Project management software.

1.6 SUBMITTAL PROCEDURES

- A. Prepare and submit submittals required by individual Specification Sections. Types of submittals are indicated in individual Specification Sections.
 1. Email: Prepare submittals as PDF package and transmit to Architect by sending via email. Include PDF transmittal form. Include information in email subject line as requested by Architect.
 - a. Architect will return annotated file. Annotate and retain one copy of file as a digital Project Record Document file.
 2. Web-Based Project Management Software: Prepare submittals in PDF form, and upload to web-based Project management software website. Enter required data in web-based software site to fully identify submittal.
- B. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.
 1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
 2. Submit all submittal items required for each Specification Section concurrently unless partial submittals for portions of the Work are indicated on approved submittal schedule.
 3. Submit action submittals and informational submittals required by the same Specification Section as separate packages under separate transmittals.
 4. Coordinate transmittal of submittals for related parts of the Work specified in different Sections, so processing will not be delayed because of need to review submittals concurrently for coordination.
 - a. Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.
- C. Processing Time: Allow time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Architect's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.
 1. Initial Review: Allow 15 days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Architect will advise Contractor when a submittal being processed must be delayed for coordination.

2. Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.
 3. Resubmittal Review: Allow 15 days for review of each resubmittal.
 4. Sequential Review: Where sequential review of submittals by Architect's consultants, Owner, or other parties is indicated, allow 21 days for initial review of each submittal.
 5. Concurrent Consultant Review: Where the Contract Documents indicate that submittals may be transmitted simultaneously to Architect and to Architect's consultants, allow 15 days for review of each submittal. Submittal will be returned to Architect before being returned to Contractor.
 - a. Submit one copy of submittal to concurrent reviewer in addition to specified number of copies to Architect.
- D. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.
1. Note date and content of previous submittal.
 2. Note date and content of revision in label or title block, and clearly indicate extent of revision.
 3. Resubmit submittals until they are marked with approval notation from Architect's action stamp.
- E. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.
- F. Use for Construction: Retain complete copies of submittals on Project site. Use only final action submittals that are marked with approval notation from Architect's action stamp.

1.7 SUBMITTAL REQUIREMENTS

- A. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.
1. If information must be specially prepared for submittal because standard published data are unsuitable for use, submit as Shop Drawings, not as Product Data.
 2. Mark each copy of each submittal to show which products and options are applicable.
 3. Include the following information, as applicable:
 - a. Manufacturer's catalog cuts.
 - b. Manufacturer's product specifications.
 - c. Standard color charts.
 - d. Statement of compliance with specified referenced standards.
 - e. Testing by recognized testing agency.
 - f. Application of testing agency labels and seals.
 - g. Notation of coordination requirements.
 - h. Availability and delivery time information.
 4. For equipment, include the following in addition to the above, as applicable:
 - a. Wiring diagrams that show factory-installed wiring.
 - b. Printed performance curves.
 - c. Operational range diagrams.
 - d. Clearances required to other construction, if not indicated on accompanying Shop Drawings.
 5. Submit Product Data before Shop Drawings, and before or concurrently with Samples.
- B. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data.

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1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:
 - a. Identification of products.
 - b. Schedules.
 - c. Compliance with specified standards.
 - d. Notation of coordination requirements.
 - e. Notation of dimensions established by field measurement.
 - f. Relationship and attachment to adjoining construction clearly indicated.
 - g. Seal and signature of professional engineer if specified.

 - C. Samples: Submit Samples for review of type, color, pattern, and texture for a check of these characteristics with other materials.
 1. Transmit Samples that contain multiple, related components, such as accessories together in one submittal package.
 2. Identification: Permanently attach label on unexposed side of Samples that includes the following:
 - a. Project name and submittal number.
 - b. Generic description of Sample.
 - c. Product name and name of manufacturer.
 - d. Sample source.
 - e. Number and title of applicable Specification Section.
 - f. Specification paragraph number and generic name of each item.
 3. Email Transmittal: Provide PDF transmittal. Include digital image file illustrating Sample characteristics and identification information for record.
 4. Web-Based Project Management Software: Prepare submittals in PDF form, and upload to web-based Project software website. Enter required data in web-based software site to fully identify submittal.
 5. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.
 - a. Samples that may be incorporated into the Work are indicated in individual Specification Sections. Such Samples must be in an undamaged condition at time of use.
 - b. Samples not incorporated into the Work, or otherwise designated as Owner's property, are the property of Contractor.
 6. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units, showing the full range of colors, textures, and patterns available.
 - a. Number of Samples: Submit one full set(s) of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Architect will return submittal with options selected.
 7. Samples for Verification: Submit full-size units or Samples of size indicated, prepared from same material to be used for the Work, cured and finished in manner specified, and physically identical with material or product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.
 - a. Number of Samples: Submit three sets of Samples. Architect will retain two Sample sets; remainder will be returned.

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- 1) Submit a single Sample where assembly details, workmanship, fabrication techniques, connections, operation, and other similar characteristics are to be demonstrated.
 - 2) If variation in color, pattern, texture, or other characteristic is inherent in material or product represented by a Sample, submit at least three sets of paired units that show approximate limits of variations.
- D. Product Schedule: As required in individual Specification Sections, prepare a written summary indicating types of products required for the Work and their intended location. Include the following information in tabular form:
1. Type of product. Include unique identifier for each product indicated in the Contract Documents or assigned by Contractor if none is indicated.
 2. Manufacturer and product name, and model number if applicable.
 3. Number and name of room or space.
 4. Location within room or space.
- E. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, contact information of architects and owners, and other information specified.
- F. Design Data: Prepare and submit written and graphic information indicating compliance with indicated performance and design criteria in individual Specification Sections. Include list of assumptions and summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Number each page of submittal.
- G. Certificates:
1. Certificates and Certifications Submittals: Submit a statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity. Provide a notarized signature where indicated.
 2. Installer Certificates: Submit written statements on manufacturer's letterhead, certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.
 3. Manufacturer Certificates: Submit written statements on manufacturer's letterhead, certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.
 4. Material Certificates: Submit written statements on manufacturer's letterhead, certifying that material complies with requirements in the Contract Documents.
 5. Product Certificates: Submit written statements on manufacturer's letterhead, certifying that product complies with requirements in the Contract Documents.
 6. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of AWS B2.1/B2.1M on AWS forms. Include names of firms and personnel certified.
- H. Test and Research Reports:
1. Compatibility Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for substrate preparation and primers required.
 2. Field Test Reports: Submit written reports indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.

3. Material Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.
4. Preconstruction Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements in the Contract Documents.
5. Product Test Reports: Submit written reports indicating that current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.
6. Research Reports: Submit written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project. Include the following information:
 - a. Name of evaluation organization.
 - b. Date of evaluation.
 - c. Time period when report is in effect.
 - d. Product and manufacturers' names.
 - e. Description of product.
 - f. Test procedures and results.
 - g. Limitations of use.

1.8 DELEGATED-DESIGN SERVICES

- A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.
 1. If criteria indicated are insufficient to perform services or certification required, submit a written request for additional information to Architect.
- B. Delegated-Design Services Certification: In addition to Shop Drawings, Product Data, and other required submittals, submit digitally signed PDF file one paper copies of certificate, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional.
 1. Indicate that products and systems comply with performance and design criteria in the Contract Documents. Include list of codes, loads, and other factors used in performing these services.

1.9 CONTRACTOR'S REVIEW

- A. Action Submittals and Informational Submittals: Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Architect.
- B. Contractor's Approval: Indicate Contractor's approval for each submittal with a uniform approval stamp. Include name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.
 1. Architect will not review submittals received from Contractor that do not have Contractor's review and approval.
- C. Approval Stamp: Stamp each submittal with a uniform, approval stamp. Include Project name and location, submittal number, Specification Section title and number, name of reviewer, checked, and approved for compliance with the Contract Documents.

1.10 ARCHITECT'S REVIEW

- A. General: Architect will not review submittals that do not bear Contractor's approval stamp and will return them without action.
- B. Action Submittals: Architect will review each submittal, indicate corrections or revisions required, and return. Architect will stamp each submittal with an action stamp and will mark appropriately to indicate action, as follows:
 - 1. Action Stamp Notations:
 - a. No Exceptions Taken: The work covered by the submittal may proceed.
 - b. Note Markings: The work covered by the submittal may proceed provided it complies with both the Architect's notations and corrections on the submittal and the Contract Documents.
 - c. Rejected: Do not proceed with the Work covered by the submittal. Prepare a new submittal for a product that complies with the Contract Documents.
 - 2. PDF Submittals: Architect will indicate, via markup on each submittal, the appropriate action
 - 3. Submittals by Web-Based Project Management Software: Architect will indicate, on Project management software website, the appropriate action.
- C. Informational Submittals: Architect will review each submittal and will not return it, or will return it if it does not comply with requirements. Architect will forward each submittal to appropriate party.
- D. Partial submittals prepared for a portion of the Work will be reviewed when use of partial submittals has received prior approval from Architect.
- E. Incomplete submittals are unacceptable, will be considered nonresponsive, and will be returned for resubmittal without review.
- F. Architect will return without review submittals received from sources other than Contractor.
- G. Submittals not required by the Contract Documents will be returned by Architect without action, with notation "No Action Taken."

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 013300

DIGITAL DATA LETTER OF AGREEMENT

An Agreement Between the Architect and _____ (the "Transferee," either Original or Third Party, as the case may be) for Transfer of Digital Data

Architect:	LS3P 227 W. Trade Street Charlotte, NC 28202 Contact: Goran Pogarcic	Transferee:	Original 3 rd Party
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Contract No.:		Project No.:	9201-218240	Project Name:	Grier Middle School – Gaston County Schools
Location:	Charlotte, NC	Date:			

The Architect will provide the following Digital Data, dated as of the particular transmission, to the Transferee **for information purposes only:**

Digital Data was prepared using the following:

Software:	Revit (.rvt)	Version:	
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Digital Data to be delivered via the following media: Newforma Website posting

TERMS AND CONDITIONS

1. The Architect and its consultants make no representation as to the compatibility of the Digital Data with any hardware or software. The Transferee shall notify the Architect within five (5) business days of any problems associated with accessing and/or using the Digital Data.
2. The Transferee acknowledges and agrees that the Digital Data can be modified unintentionally or otherwise. The Transferee acknowledges and agrees that the Architect and its consultants may remove all indications of ownership from the Digital Data prior to transmission.
3. All Digital Data shall be considered the property of the Architect and/or its consultants and shall not be used for other Projects, for additions to this Project, or for completion of this Project without the prior written permission of the Architect and/or its consultants. Digital Data shall not be re-transmitted by the Original Transferee to a Third Party Transferee without prior execution of an agreement identical to this Agreement between the Architect, the Original Transferee, and the Third Party Transferee. Under no circumstances shall the transmission of the Digital Data be considered a sale of goods or a sale of copyrights.
4. **THE ARCHITECT AND THE ARCHITECT'S CONSULTANTS HEREBY EXPRESSLY DISCLAIM ANY AND ALL WARRANTIES, BOTH EXPRESS AND IMPLIED, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTY OF MERCHANTABILITY AND THE IMPLIED WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE AS WELL AS ANY WARRANTY OF ACCURACY,**

COMPLETENESS, AND/OR PERMANENCE. THERE ARE NO WARRANTIES WHICH EXTEND BEYOND THE DESCRIPTION ON THE FACE HEREOF. Addenda information and/or revisions made to the most current Digital Data after any date of transmission may not have been incorporated into the transmitted Digital Data. The Architect may update the Digital Data and give notice to authorized parties (or not) as is consistent with the Architect's professional skill and care and the orderly progress of the Work. In the event of a conflict between the Architect's printed instruments of service (whether sealed or not) and the Digital Data, the printed instruments of service shall govern. The Transferee acknowledges and agrees that the duty to determine the existence of any and all conflicts between the Digital Data and any other information upon which the Transferee relies rests solely upon the Transferee. The Digital Data shall not be considered Contract Documents or Construction Documents as defined by any General Conditions of Contract for Construction. The Digital Data is being provided on a strictly "AS IS" basis.

5. The use and/or provision of the Digital Data prepared by the Architect and/or its consultants shall not in any way reduce or obviate the Transferee's duty to check and coordinate dimensions, details, and quantities of materials as required to facilitate construction of the Project. Confirmation of existing conditions is the sole responsibility of the Transferee.

6. The Transferee agrees to the extent permitted by applicable law, to indemnify, hold harmless, release, and defend the Architect and/or its consultants, their officers, shareholders, employees, and sub-consultants from any and all injuries, claims, demands, expenses, suits, liabilities, losses, damages, costs, disputes, other matters in question, third party claims, pass-through claims, subrogated claims, and/or claim expenses related to the Digital Data, including but not limited to, attorneys' fees, expert witness fees, and court costs arising out of or in any way related to or connected with any negligent act and/or omission in the generation, provision, and/or use of the Digital Data by the Transferee and/or any of its subcontractors, suppliers, and/or consultants and waive any and all rights to such claims and causes of action.

7. The Transferee waives damages against the Architect for any and all injuries, claims, losses, expenses, damages, disputes, other matters in question, and/or claim expenses arising out of or relating to this Agreement and/or generation, provision, and/or use of the Digital Data, including, but not limited to, consequential damages and reasonable attorneys' fees and defense costs.

8. The Architect's and/or the Architect's consultants' liability to the Transferee and/or any of its subcontractors, suppliers, and/or consultants for any and all injuries, claims, losses, expenses, damages, disputes, other matters in question, third party claims, pass-through claims, subrogated claims, and/or claim expenses arising out of or relating to this Agreement and/or the Digital Data, including, but not limited to, reasonable attorneys' fees and defense costs, regardless of the nature of the claim or damage, shall not exceed, either individually or in the aggregate, the total amount of \$1,000.00. Such causes include, but are not limited to, the Architect's and/or the Architect's consultants' negligence, errors, omissions, strict liability, breach of contract, and/or breach of warranty.

9. Upon information and belief, there are no licensing or copyright fees due to others based on the transmission of the Digital Data, but to the extent that such unknown fees do exist, the Transferee agrees to pay the required fees and hold the Architect and/or its consultants harmless from any associated costs or penalties.

10. Upon execution of this Agreement, the Architect grants to the Transferee a non-exclusive, non-transferable (except as set forth herein) license to use the Digital Data solely and exclusively for informational purposes only, provided that the Transferee substantially performs its obligations, including prompt payment of all sums when due, under this Agreement.

11. Any purchase order number provided by the Transferee is for the Transferee's accounting purposes only. The Transferee acknowledges and agrees that purchase order terms and conditions are null, void, and inapplicable to this Agreement.

12. Payment of the service fee set forth herein is due prior to transmission of the Digital Data.

13. This Agreement constitutes the entire agreement between the parties relative to the Digital Data and shall be governed by the laws of the State of North Carolina.

AUTHORIZED ACCEPTANCE

by Architect:
LS3P

Signature

Print Name and Title

Date

by Original Transferee:

Signature

Print Name and Title

Date

by Third Party Transferee:

Signature

Print Name and Title

Date

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SECTION 014000 - QUALITY REQUIREMENTS**PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for quality assurance and quality control.
- B. Testing and inspection services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.
 - 1. Specific quality-assurance and quality-control requirements for individual work results are specified in their respective Specification Sections. Requirements in individual Sections may also cover production of standard products.
 - 2. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and quality-control procedures that facilitate compliance with the Contract Document requirements.
 - 3. Requirements for Contractor to provide quality-assurance and quality-control services required by Architect, Owner, or authorities having jurisdiction are not limited by provisions of this Section.
 - 4. Division 01 Section "Construction Progress Documentation" for developing a schedule of required tests and inspections.

1.3 DEFINITIONS

- A. Experienced: When used with an entity or individual, "experienced," unless otherwise further described, means having successfully completed a minimum of five previous projects similar in nature, size, and extent to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.
- B. Field Quality-Control Tests and Inspections: Tests and inspections that are performed on-site for installation of the Work and for completed Work.
- C. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, subcontractor, or sub-subcontractor, to perform a particular construction operation, including installation, erection, application, assembly, and similar operations.
 - 1. Use of trade-specific terminology in referring to a Work result does not require that certain construction activities specified apply exclusively to specific trade(s).
- D. Mockups: Full-size physical assemblies that are constructed either as freestanding temporary built elements or as part of permanent construction. Mockups are constructed to verify selections made under Sample submittals; to demonstrate aesthetic effects and qualities of materials and execution; to review coordination, testing, or operation; to show interface between dissimilar materials; and to demonstrate compliance with specified installation tolerances. Mockups are not Samples. Unless otherwise indicated, approved mockups establish the standard by which the Work will be judged.

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1. In-Place Mockups: Mockups constructed on-site in their actual final location as part of permanent construction.
 - E. Preconstruction Testing: Tests and inspections performed specifically for Project before products and materials are incorporated into the Work, to verify performance or compliance with specified criteria. Unless otherwise indicated, copies of reports of tests or inspections performed for other than the Project do not meet this definition.
 - F. Product Tests: Tests and inspections that are performed by a nationally recognized testing laboratory (NRTL) according to 29 CFR 1910.7, by a testing agency accredited according to NIST's National Voluntary Laboratory Accreditation Program (NVLAP), or by a testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with specified requirements.
 - G. Source Quality-Control Tests and Inspections: Tests and inspections that are performed at the source (e.g., plant, mill, factory, or shop).
 - H. Testing Agency: An entity engaged to perform specific tests, inspections, or both. The term "testing laboratory" shall have the same meaning as the term "testing agency."
 - I. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work, to guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.
 - J. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work, to evaluate that actual products incorporated into the Work and completed construction comply with requirements. Contractor's quality-control services do not include contract administration activities performed by Architect.
- 1.4 REGULATORY REQUIREMENTS
- A. Copies of Regulations: Obtain copies of the applicable regulations and retain at Project site to be available for reference by parties who have a reasonable need.
- 1.5 DELEGATED-DESIGN SERVICES
- A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.
 1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Architect.
 - B. Delegated-Design Services Statement: Submit a statement signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional, indicating that the products and systems are in compliance with performance and design criteria indicated. Include list of codes, loads, and other factors used in performing these services.
- 1.6 CONFLICTING REQUIREMENTS
- A. Conflicting Standards and Other Requirements: If compliance with two or more standards or requirements is specified and the standards or requirements establish different or conflicting requirements

for minimum quantities or quality levels, inform the Architect regarding the conflict and obtain clarification prior to proceeding with the Work. Refer conflicting requirements that are different, but apparently equal, to Architect for clarification before proceeding.

- B. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to Architect for a decision before proceeding.

1.7 INFORMATIONAL SUBMITTALS

- A. Contractor's Quality-Control Plan: For quality-assurance and quality-control activities and responsibilities.
- B. Qualification Data: For Contractor's quality-control personnel.
- C. Contractor's Statement of Responsibility: When required by authorities having jurisdiction, submit copy of written statement of responsibility submitted to authorities having jurisdiction before starting work on the following systems:
 - 1. Seismic-force-resisting system, designated seismic system, or component listed in the Statement of Special Inspections.
 - 2. Primary wind-force-resisting system or a wind-resisting component listed in the Statement of Special Inspections.
- D. Testing Agency Qualifications: For testing agencies specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.
- E. Schedule of Tests and Inspections: Prepare in tabular form and include the following:
 - 1. Specification Section number and title.
 - 2. Entity responsible for performing tests and inspections.
 - 3. Description of test and inspection.
 - 4. Identification of applicable standards.
 - 5. Identification of test and inspection methods.
 - 6. Number of tests and inspections required.
 - 7. Time schedule or time span for tests and inspections.
 - 8. Requirements for obtaining samples.
 - 9. Unique characteristics of each quality-control service.
- F. Reports: Prepare and submit certified written reports and documents as specified.
- G. Permits, Licenses, and Certificates: For Owner's record, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents established for compliance with standards and regulations bearing on performance of the Work.

1.8 CONTRACTOR'S QUALITY-CONTROL PLAN

- A. Quality-Control Plan, General: Submit quality-control plan within 10 days of Notice to Proceed, and not less than five days prior to preconstruction conference. Submit in format acceptable to Architect. Identify personnel, procedures, controls, instructions, tests, records, and forms to be used to carry out Contractor's

quality-assurance and quality-control responsibilities and to coordinate Owner's quality-assurance and quality-control activities. Coordinate with Contractor's Construction Schedule.

- B. Quality-Control Personnel Qualifications: Engage qualified personnel trained and experienced in managing and executing quality-assurance and quality-control procedures similar in nature and extent to those required for Project.
 - 1. Project quality-control manager may also serve as Project superintendent.
- C. Submittal Procedure: Describe procedures for ensuring compliance with requirements through review and management of submittal process. Indicate qualifications of personnel responsible for submittal review.
- D. Testing and Inspection: In quality-control plan, include a comprehensive schedule of Work requiring testing or inspection, including the following:
 - 1. Contractor-performed tests and inspections, including subcontractor-performed tests and inspections. Include required tests and inspections and Contractor-elected tests and inspections. Distinguish source quality-control tests and inspections from field quality-control tests and inspections.
 - 2. Special inspections required by authorities having jurisdiction and indicated on the Statement of Special Inspections.
 - 3. Owner-performed tests and inspections indicated in the Contract Documents.
- E. Continuous Inspection of Workmanship: Describe process for continuous inspection during construction to identify and correct deficiencies in workmanship in addition to testing and inspection specified. Indicate types of corrective actions to be required to bring the Work into compliance with standards of workmanship established by Contract requirements and approved mockups.
- F. Monitoring and Documentation: Maintain testing and inspection reports, including log of approved and rejected results. Include Work Architect has indicated as nonconforming or defective. Indicate corrective actions taken to bring nonconforming Work into compliance with requirements. Comply with requirements of authorities having jurisdiction.

1.9 REPORTS AND DOCUMENTS

- A. Test and Inspection Reports: Prepare and submit certified written reports specified in other Sections. Include the following:
 - 1. Date of issue.
 - 2. Project title and number.
 - 3. Name, address, telephone number, and email address of testing agency.
 - 4. Dates and locations of samples and tests or inspections.
 - 5. Names of individuals making tests and inspections.
 - 6. Description of the Work and test and inspection method.
 - 7. Identification of product and Specification Section.
 - 8. Complete test or inspection data.
 - 9. Test and inspection results and an interpretation of test results.
 - 10. Record of temperature and weather conditions at time of sample-taking and testing and inspection.
 - 11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
 - 12. Recommendations on retesting and reinspecting.
- B. Manufacturer's Technical Representative's Field Reports: Prepare written information documenting manufacturer's technical representative's tests and inspections specified in other Sections. Include the following:

1. Name, address, telephone number, and email address of technical representative making report.
 2. Statement on condition of substrates and their acceptability for installation of product.
 3. Statement that products at Project site comply with requirements.
 4. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.
 5. Results of operational and other tests and a statement of whether observed performance complies with requirements.
 6. Statement of whether conditions, products, and installation will affect warranty.
 7. Other required items indicated in individual Specification Sections.
- C. Factory-Authorized Service Representative's Reports: Prepare written information documenting manufacturer's factory-authorized service representative's tests and inspections specified in other Sections. Include the following:
1. Name, address, telephone number, and email address of factory-authorized service representative making report.
 2. Statement that equipment complies with requirements.
 3. Results of operational and other tests and a statement of whether observed performance complies with requirements.
 4. Statement of whether conditions, products, and installation will affect warranty.
 5. Other required items indicated in individual Specification Sections.

1.10 QUALITY ASSURANCE

- A. Qualifications paragraphs in this article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.
- B. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units. As applicable, procure products from manufacturers able to meet qualification requirements, warranty requirements, and technical or factory-authorized service representative requirements.
- C. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
- D. Installer Qualifications: A firm or individual experienced in installing, erecting, applying, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.
- E. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or product that is similar in material, design, and extent to those indicated for this Project.
- F. Specialists: Certain Specification Sections require that specific construction activities shall be performed by entities who are recognized experts in those operations. Specialists shall satisfy qualification requirements indicated and shall be engaged in the activities indicated.
1. Requirements of authorities having jurisdiction shall supersede requirements for specialists.
- G. Testing and Inspecting Agency Qualifications: An NRTL, an NVLAP, or an independent agency with the experience and capability to conduct testing and inspection indicated, as documented in accordance with

ASTM E329, and with additional qualifications specified in individual Sections; and, where required by authorities having jurisdiction, that is acceptable to authorities.

- H. Manufacturer's Technical Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to observe and inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.
- I. Factory-Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect, demonstrate, repair, and perform service on installations of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.
- J. Preconstruction Testing: Where testing agency is indicated to perform preconstruction testing for compliance with specified requirements for performance and test methods, comply with the following Contractor's responsibilities, including the following:
 - 1. Provide test specimens representative of proposed products and construction.
 - 2. Submit specimens in a timely manner with sufficient time for testing and analyzing results to prevent delaying the Work.
 - 3. Provide sizes and configurations of test assemblies, mockups, and laboratory mockups to adequately demonstrate capability of products to comply with performance requirements.
 - 4. Build site-assembled test assemblies and mockups, using installers who will perform same tasks for Project.
 - 5. Build laboratory mockups at testing facility, using personnel, products, and methods of construction indicated for the completed Work.
 - 6. When testing is complete, remove test specimens and test assemblies and do not reuse products on Project.
 - 7. Testing Agency Responsibilities: Submit a certified written report of each test, inspection, and similar quality-assurance service to Architect, with copy to Contractor. Interpret tests and inspections, and state in each report whether tested and inspected Work complies with or deviates from the Contract Documents.
- K. In-Place Mockups: Before installing portions of the Work requiring in-place mockups, build mockups indicated for each form of construction and finish indicated, using materials indicated for the completed Work:
 - 1. Build mockups in location and of size indicated or, if not indicated, as directed by Architect or Construction Manager.
 - 2. Notify Architect [through Construction Manager,] seven days in advance of dates and times when mockups will be constructed.
 - 3. Demonstrate the proposed range of aesthetic effects and workmanship.
 - 4. Perform field-testing as indicated on in-place mockups to verify compliance with requirements.
 - 5. Obtain Architect's and Owner's approval of mockups before continuing work or installation.
 - 6. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
 - 7. Approved mockups may be incorporated into the Work.

1.11 QUALITY CONTROL

- A. Owner Responsibilities: Where quality-control services are indicated as Owner's responsibility, Owner will engage a qualified testing agency to perform these services.
 - 1. Owner will furnish Contractor with names, addresses, and telephone numbers of testing agencies engaged and a description of types of testing and inspection they are engaged to perform.

-
2. Costs for retesting and reinspecting construction that replaces or is necessitated by Work that failed to comply with the Contract Documents will be charged to Contractor, and the Contract Sum will be adjusted by Change Order.
- B. Contractor Responsibilities: Tests and inspections not explicitly assigned to Owner are Contractor's responsibility. Perform additional quality-control activities, whether specified or not, to verify and document that the Work complies with requirements.
1. Unless otherwise indicated, provide quality-control services specified and those required by authorities having jurisdiction. Perform quality-control services required of Contractor by authorities having jurisdiction, whether specified or not.
 2. Engage a qualified testing agency to perform quality-control services.
 - a. Contractor shall not employ same entity engaged by Owner, unless agreed to in writing by Owner.
 3. Notify testing agencies at least 24 hours in advance of time when Work that requires testing or inspection will be performed.
 4. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.
 5. Testing and inspection requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
 6. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.
- C. Retesting/Reinspecting: Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and reinspecting, for construction that replaced Work that failed to comply with the Contract Documents.
- D. Testing Agency Responsibilities: Cooperate with Architect and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.
1. Notify Architect and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
 2. Determine the locations from which test samples will be taken and in which in-situ tests are conducted.
 3. Conduct and interpret tests and inspections, and state in each report whether tested and inspected Work complies with or deviates from requirements.
 4. Submit a certified written report, in duplicate, of each test, inspection, and similar quality-control service through Contractor.
 5. Do not release, revoke, alter, or increase the Contract Document requirements or approve or accept any portion of the Work.
 6. Do not perform duties of Contractor.
- E. Manufacturer's Field Services: Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing as specified in Section 013300 "Submittal Procedures."
- F. Manufacturer's Technical Services: Where indicated, engage a manufacturer's technical representative to observe and inspect the Work. Manufacturer's technical representative's services include participation in preinstallation conferences, examination of substrates and conditions, verification of materials, observation of Installer activities, inspection of completed portions of the Work, and submittal of written reports.
- G. Contractor's Associated Requirements and Services: Cooperate with agencies and representatives performing required tests, inspections, and similar quality-control services, and provide reasonable

auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:

1. Access to the Work.
2. Incidental labor and facilities necessary to facilitate tests and inspections.
3. Adequate quantities of representative samples of materials that require testing and inspection. Assist agency in obtaining samples.
4. Facilities for storage and field curing of test samples.
5. Delivery of samples to testing agencies.
6. Preliminary design mix proposed for use for material mixes that require control by testing agency.
7. Security and protection for samples and for testing and inspection equipment at Project site.

H. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and quality-control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspection.

1. Schedule times for tests, inspections, obtaining samples, and similar activities.

I. Schedule of Tests and Inspections: Prepare a schedule of tests, inspections, and similar quality-control services required by the Contract Documents. Coordinate and submit concurrently with Contractor's Construction Schedule. Update and submit with each Application for Payment.

1. Schedule Contents: Include tests, inspections, and quality-control services, including Contractor- and Owner-retained services, commissioning activities, and other Project-required services paid for by other entities.
2. Distribution: Distribute schedule to Owner, Architect, testing agencies, and each party involved in performance of portions of the Work where tests and inspections are required.

1.12 SPECIAL TESTS AND INSPECTIONS

A. Statement of Responsibility: Prior to commencement of work on the system or component, each contractor responsible for the construction of main wind-or seismic resisting system , or seismic-resisting component listed in the Statement of Special Inspections shall submit a written statement of responsibility to the Authority Having Jurisdiction and to the Owner indicating acceptance of responsibility for the construction of systems or components in accordance with the Contract Documents.

B. The Contractor's Statement of Responsibility shall include the following:

1. Acknowledgment that Contractor has read the Statement of Special Inspections and has correlated its requirements with the Drawings and Specifications.
2. Acknowledgement that construction of main wind-or seismic resisting system , or seismic-resisting component includes special requirements as contained in the Statement of Special Inspections.
3. Acknowledgement that control will be exercised to obtain conformance with the Construction Documents approved by the Authority Having Jurisdiction.
4. Procedures for exercising control within the Contractor's organization, the methods and frequency of reporting and the distribution of reports.
5. Identification and qualifications of the person(s) exercising such control and their position(s) in the organization.

C. Special Tests and Inspections: Owner will engage a qualified testing agency to conduct special tests and inspections required by authorities having jurisdiction as the responsibility of Owner, and as follows:

1. Verifying that manufacturer maintains detailed fabrication and quality-control procedures, and reviewing the completeness and adequacy of those procedures to perform the Work.

2. Notifying Architect and Contractor promptly of irregularities and deficiencies observed in the Work during performance of its services.
3. Submitting a certified written report of each test, inspection, and similar quality-control service to Architect with copy to Contractor and to authorities having jurisdiction.
4. Submitting a final report of special tests and inspections at Substantial Completion, which includes a list of unresolved deficiencies.
5. Interpreting tests and inspections, and stating in each report whether tested and inspected Work complies with or deviates from the Contract Documents.
6. Retesting and reinspecting corrected Work.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 TEST AND INSPECTION LOG

- A. Test and Inspection Log: Prepare a record of tests and inspections. Include the following:
 1. Date test or inspection was conducted.
 2. Description of the Work tested or inspected.
 3. Date test or inspection results were transmitted to Architect.
 4. Identification of testing agency or special inspector conducting test or inspection.
- B. Maintain log at Project site. Post changes and revisions as they occur. Provide access to test and inspection log for Architect's and authorities' having jurisdiction reference during normal working hours.
 1. Submit log at Project closeout as part of Project Record Documents.

3.2 REPAIR AND PROTECTION

- A. General: On completion of testing, inspection, sample-taking, and similar services, repair damaged construction and restore substrates and finishes.
 1. Provide materials and comply with installation requirements specified in other Specification Sections or matching existing substrates and finishes. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible. Comply with the Contract Document requirements for cutting and patching in Section 017300 "Execution."
- B. Protect construction exposed by or for quality-control service activities.
- C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION 014000

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SECTION 015000 - TEMPORARY FACILITIES AND CONTROLS**PART 1 - GENERAL****1.1 SUMMARY**

- A. Section includes requirements for temporary utilities, support facilities, and security and protection facilities.

1.2 USE CHARGES

A. For Phase 1 of Construction:

1. Water and Sewer Service from Existing System: Water from Owner's existing water system is available for use without metering and without payment of use charges. Provide connections and extensions of services as required for construction operations.
2. Electric Power Service from Existing System: Electric power from Owner's existing system is available for use without metering and without payment of use charges. Provide connections and extensions of services as required for construction operations.

B. For Phases 2 and 3 of Construction:

1. Sewer Service: Pay sewer-service use charges for sewer usage by all entities for construction operations.
2. Water Service: Pay water-service use charges for water used by all entities for construction operations.
3. Electric Power Service: Pay electric-power-service use charges for electricity used by all entities for construction operations.

1.3 INFORMATIONAL SUBMITTALS

- A. Site Utilization Plan: Show temporary facilities, temporary utility lines and connections, staging areas, construction site entrances, vehicle circulation, and parking areas for construction personnel.
- B. Implementation and Termination Schedule: Within 15 days of date established for commencement of the Work, submit schedule indicating implementation and termination dates of each temporary utility.
- C. Project Identification and Temporary Signs: Show fabrication and installation details, including plans, elevations, details, layouts, typestyles, graphic elements, and message content.
- D. Fire-Safety Program: Show compliance with requirements of NFPA 241 and authorities having jurisdiction. Indicate Contractor personnel responsible for management of fire-prevention program.
- E. Moisture- and Mold-Protection Plan: Describe procedures and controls for protecting materials and construction from water absorption and damage and mold. Describe delivery, handling, storage, installation, and protection provisions for materials subject to water absorption or water damage.
1. Indicate procedures for discarding water-damaged materials, protocols for mitigating water intrusion into completed Work, and requirements for replacing water-damaged Work.
 2. Indicate sequencing of work that requires water, such as sprayed fire-resistive materials, plastering, and terrazzo grinding, and describe plans for dealing with water from these operations. Show procedures for verifying that wet construction has dried sufficiently to permit installation of finish materials.

3. Indicate methods to be used to avoid trapping water in finished work.

F. Dust- and HVAC-Control Plan: Submit coordination drawing and narrative that indicates the dust- and HVAC-control measures proposed for use, proposed locations, and proposed time frame for their operation. Include the following:

1. Locations of dust-control partitions at each phase of work.
2. HVAC system isolation schematic drawing.
3. Location of proposed air-filtration system discharge.
4. Waste-handling procedures.
5. Other dust-control measures.

1.4 QUALITY ASSURANCE

- A. Electric Service: Comply with NECA, NEMA, and UL standards and regulations for temporary electric service. Install service to comply with NFPA 70.
- B. Tests and Inspections: Arrange for authorities having jurisdiction to test and inspect each temporary utility before use. Obtain required certifications and permits.
- C. Accessible Temporary Egress: Comply with applicable provisions in the DOJ's "2010 ADA Standards for Accessible Design" and ICC A117.1 Insert accessibility regulation.

1.5 PROJECT CONDITIONS

- A. Temporary Use of Permanent Facilities: Engage Installer of each permanent service to assume responsibility for operation, maintenance, and protection of each permanent service during its use as a construction facility before Owner's acceptance, regardless of previously assigned responsibilities.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Portable Chain-Link Fencing: Minimum 2-inch, 0.148-inch- thick, galvanized-steel, chain-link fabric fencing; minimum 6 feet high with galvanized-steel pipe posts; minimum 2-3/8-inch- OD line posts and 2-7/8-inch- OD corner and pull posts, with 1-5/8-inch- OD top and bottom rails. Provide concrete bases for supporting posts.
- B. Polyethylene Sheet: Reinforced, fire-resistive sheet, 10-mil minimum thickness, with flame-spread rating of 15 or less in accordance with ASTM E84 and passing NFPA 701 Test Method 2.

2.2 TEMPORARY FACILITIES

- A. Field Offices:
 1. Prefabricated or mobile units with serviceable finishes, temperature controls, and foundations adequate for normal loading.
- B. Common-Use Field Office: Of sufficient size to accommodate needs of Owner, Architect, Construction Manager, and construction personnel office activities and to accommodate Project meetings specified in other Division 01 Sections. Keep office clean and orderly. Furnish and equip offices as follows:
 1. Drinking water and private toilet.

- C. Storage and Fabrication Sheds: Provide sheds sized, furnished, and equipped to accommodate materials and equipment for construction operations.
1. Store combustible materials apart from building.

2.3 EQUIPMENT

- A. Fire Extinguishers: Portable, UL rated; with class and extinguishing agent as required by locations and classes of fire exposures.
- B. HVAC Equipment: Unless Owner authorizes use of permanent HVAC system, provide vented, self-contained, liquid-propane-gas or fuel-oil heaters with individual space thermostatic control.
1. Use of gasoline-burning space heaters, open-flame heaters, or salamander-type heating units is prohibited.

PART 3 - EXECUTION

3.1 TEMPORARY FACILITIES, GENERAL

- A. Conservation: Coordinate construction and use of temporary facilities with consideration given to conservation of energy, water, and materials. Coordinate use of temporary utilities to minimize waste.

3.2 INSTALLATION, GENERAL

- A. Locate facilities where they will serve Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required by progress of the Work.
- B. Provide each facility ready for use when needed to avoid delay. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.

3.3 TEMPORARY UTILITY INSTALLATION

- A. General: Install temporary service or connect to existing service.
1. Arrange with utility company, Owner, and existing users for time when service can be interrupted, if necessary, to make connections for temporary services.
- B. Sewers and Drainage: Provide temporary utilities to remove effluent lawfully.
1. Connect temporary sewers to municipal system as directed by authorities having jurisdiction.
- C. Water Service:
1. Install water service and distribution piping in sizes and pressures adequate for construction.
 2. Connect to Owner's existing water service facilities. Clean and maintain water service facilities in a condition acceptable to Owner. At Substantial Completion, restore these facilities to condition existing before initial use.
- D. Sanitary Facilities: Provide temporary toilets, wash facilities, safety shower and eyewash facilities, and drinking water for use of construction personnel. Comply with requirements of authorities having jurisdiction for type, number, location, operation, and maintenance of fixtures and facilities.

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- E. Temporary Heating and Cooling: Provide temporary heating and cooling required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of low temperatures or high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed.
- F. Electric Power Service:
1. Provide electric power service and distribution system of sufficient size, capacity, and power characteristics required for construction operations.
- G. Lighting: Provide temporary lighting with local switching that provides adequate illumination for construction operations, observations, inspections, and traffic conditions.
1. Install and operate temporary lighting that fulfills security and protection requirements without operating entire system.
- H. Telephone Service: Provide temporary telephone service in common-use facilities for use by all construction personnel. Install WiFi cell phone access equipment land-based telephone line(s) for each field office.
1. At each telephone, post a list of important telephone numbers.
 - a. Police and fire departments.
 - b. Ambulance service.
 - c. Contractor's home office.
 - d. Contractor's emergency after-hours telephone number.
 - e. Architect's office.
 - f. Engineers' offices.
 - g. Owner's office.
 - h. Principal subcontractors' field and home offices.
- I. Electronic Communication Service: Provide secure WiFi wireless connection to internet with provisions for access by Architect and Owner.

3.4 SUPPORT FACILITIES INSTALLATION

- A. Comply with the following:
1. Provide construction for temporary field offices, shops, and sheds located within construction area or within 30 feet of building lines that is noncombustible in accordance with ASTM E136. Comply with NFPA 241.
 2. Maintain support facilities until Architect schedules Substantial Completion inspection. Remove before Substantial Completion. Personnel remaining after Substantial Completion will be permitted to use permanent facilities, under conditions acceptable to Owner.
- B. Project Signs: Provide Project signs as indicated. Unauthorized signs are not permitted.
1. Identification Signs: Provide Project identification signs as indicated on Drawings.
 2. Temporary Signs: Provide other signs as indicated and as required to inform public and individuals seeking entrance to Project.
 - a. Provide temporary, directional signs for construction personnel and visitors.
 3. Maintain and touch up signs, so they are legible at all times.

3.5 SECURITY AND PROTECTION FACILITIES INSTALLATION

- A. Site Enclosure Fence: Before construction operations begin, furnish and install site enclosure fence in a manner that will prevent people from easily entering site except by entrance gates.
 - 1. Extent of Fence: As required to enclose entire Project site or portion determined sufficient to accommodate construction operations.
- B. Security Enclosure and Lockup: Install temporary enclosure around partially completed areas of construction. Provide lockable entrances to prevent unauthorized entrance, vandalism, theft, and similar violations of security. Lock entrances at end of each workday.
- C. Barricades, Warning Signs, and Lights: Comply with requirements of authorities having jurisdiction for erecting structurally adequate barricades, including warning signs and lighting.
- D. Temporary Egress: Provide temporary egress from existing occupied facilities as indicated and as required by authorities having jurisdiction. Provide signage directing occupants to temporary egress.
- E. Temporary Enclosures: Provide temporary enclosures for protection of construction, in progress and completed, from exposure, foul weather, other construction operations, and similar activities. Provide temporary weathertight enclosure for building exterior.
 - 1. Where heating or cooling is needed and permanent enclosure is incomplete, insulate temporary enclosures.
- F. Temporary Fire Protection: Install and maintain temporary fire-protection facilities of types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 241; manage fire-prevention program.
 - 1. Prohibit smoking in construction areas. Comply with additional limits on smoking specified in other Sections.
 - 2. Supervise welding operations, combustion-type temporary heating units, and similar sources of fire ignition in accordance with requirements of authorities having jurisdiction.
 - 3. Develop and supervise an overall fire-prevention and -protection program for personnel at Project site. Review needs with local fire department and establish procedures to be followed. Instruct personnel in methods and procedures. Post warnings and information.
 - 4. Provide temporary standpipes and hoses for fire protection. Hang hoses with a warning sign, stating that hoses are for fire-protection purposes only and are not to be removed. Match hose size with outlet size and equip with suitable nozzles.

3.6 OPERATION, TERMINATION, AND REMOVAL

- A. Supervision: Enforce strict discipline in use of temporary facilities. To minimize waste and abuse, limit availability of temporary facilities to essential and intended uses.
- B. Maintenance: Maintain facilities in good operating condition until removal.
 - 1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour basis where required to achieve indicated results and to avoid possibility of damage.
- C. Temporary Facility Changeover: Do not change over from using temporary security and protection facilities to permanent facilities until Substantial Completion.

END OF SECTION 015000

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SECTION 016000 - PRODUCT REQUIREMENTS**PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for selection of products for use in Project; product delivery, storage, and handling; manufacturers' standard warranties on products; special warranties; and comparable products.
- B. Related Requirements:
 - 1. Section 011000 "Summary" for Contractor requirements related to Owner-furnished products.
 - 2. Section 012300 "Alternates" for products selected under an alternate.
 - 3. Section 012500 "Substitution Procedures" for requests for substitutions.
 - 4. Section 01770 "Closeout Procedures" for submitting warranties.

1.3 DEFINITIONS

- A. Products: Items obtained for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.
 - 1. Named Products: Items identified by manufacturer's product name, including make or model number or other designation shown or listed in manufacturer's published product literature that is current as of date of the Contract Documents.
 - 2. New Products: Items that have not previously been incorporated into another project or facility. Salvaged items or items reused from other projects are not considered new products. Items that are manufactured or fabricated to include recycled content materials are considered new products, unless indicated otherwise.
 - 3. Comparable Product: Product by named manufacturer that is demonstrated and approved through the comparable product submittal process described in Part 2 "Comparable Products" Article, to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.
- B. Basis-of-Design Product Specification: A specification in which a single manufacturer's product is named and accompanied by the words "basis-of-design product," including make or model number or other designation. Published attributes and characteristics of basis-of-design product establish salient characteristics of products.
 - 1. Evaluation of Comparable Products: In addition to the basis-of-design product description, product attributes and characteristics may be listed to establish the significant qualities related to type, function, in-service performance and physical properties, weight, dimension, durability, visual characteristics, and other special features and requirements for purposes of evaluating comparable products of additional manufacturers named in the specification. Manufacturer's published attributes and characteristics of basis-of-design product also establish salient characteristics of products for purposes of evaluating comparable products.

- C. Subject to Compliance with Requirements: Where the phrase "Subject to compliance with requirements" introduces a product selection procedure in an individual Specification Section, provide products qualified under the specified product procedure. In the event that a named product or product by a named manufacturer does not meet the other requirements of the specifications, select another named product or product from another named manufacturer that does meet the requirements of the specifications; submit a comparable product request or substitution request, if applicable.
- D. Comparable Product Specification Submittal: Comply with requirements in Section 013300 "Submittal Procedures." Show compliance with requirements.
- E. Basis-of-Design Product Specification Submittal: An action submittal complying with requirements in Section 013300 "Submittal Procedures."
- F. Substitution: Refer to Section 012500 "Substitution Procedures" for definition and limitations on substitutions.

1.4 QUALITY ASSURANCE

- A. Compatibility of Options: If Contractor is given option of selecting between two or more products for use on Project, select product compatible with products previously selected, even if previously selected products were also options.
 - 1. Resolution of Compatibility Disputes between Multiple Contractors:
 - a. Contractors are responsible for providing products and construction methods compatible with products and construction methods of other contractors.
 - b. If a dispute arises between the multiple contractors over concurrently selectable but incompatible products, Architect will determine which products shall be used.
- B. Identification of Products: Except for required labels and operating data, do not attach or imprint manufacturer or product names or trademarks on exposed surfaces of products or equipment that will be exposed to view in occupied spaces or on the exterior.
 - 1. Labels: Locate required product labels and stamps on a concealed surface, or, where required for observation following installation, on a visually accessible surface that is not conspicuous.
 - 2. Equipment Nameplates: Provide a permanent nameplate on each item of service- or power-operated equipment. Locate on a visually accessible but inconspicuous surface. Include information essential for operation, including the following:
 - a. Name of product and manufacturer.
 - b. Model and serial number.
 - c. Capacity.
 - d. Speed.
 - e. Ratings.
 - 3. See individual identification Sections in Divisions 21, 22, 23, and 26 for additional equipment identification requirements.

1.5 COORDINATION

- A. Modify or adjust affected work as necessary to integrate work of approved comparable products and approved substitutions.

1.6 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, and handle products, using means and methods that will prevent damage, deterioration, and loss, including theft and vandalism. Comply with manufacturer's written instructions.
- B. Delivery and Handling:
1. Schedule delivery to minimize long-term storage at Project site and to prevent overcrowding of construction spaces.
 2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
 3. Deliver products to Project site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
 4. Inspect products on delivery to determine compliance with the Contract Documents and that products are undamaged and properly protected.
- C. Storage:
1. Provide a secure location and enclosure at Project site for storage of materials and equipment.
 2. Store products to allow for inspection and measurement of quantity or counting of units.
 3. Store materials in a manner that will not endanger Project structure.
 4. Store products that are subject to damage by the elements under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation and with adequate protection from wind.
 5. Protect foam plastic from exposure to sunlight, except to extent necessary for period of installation and concealment.
 6. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.
 7. Protect stored products from damage and liquids from freezing.
 8. Provide a secure location and enclosure at Project site for storage of materials and equipment by Owner's construction forces. Coordinate location with Owner.

1.7 PRODUCT WARRANTIES

- A. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.
1. **Manufacturer's Warranty:** Written standard warranty form furnished by individual manufacturer for a particular product and issued in the name of the Owner or endorsed by manufacturer to Owner.
 2. **Special Warranty:** Written warranty required by the Contract Documents to provide specific rights for Owner and issued in the name of the Owner or endorsed by manufacturer to Owner.
- B. **Special Warranties:** Prepare a written document that contains appropriate terms and identification, ready for execution.
1. **Manufacturer's Standard Form:** Modified to include Project-specific information and properly executed.
 2. **Specified Form:** When specified forms are included in the Project Manual, prepare a written document, using indicated form properly executed.
 3. See other Sections for specific content requirements and particular requirements for submitting special warranties.

- C. Submittal Time: Comply with requirements in Section 017700 "Closeout Procedures."

PART 2 - PRODUCTS

2.1 PRODUCT SELECTION PROCEDURES

- A. General Product Requirements: Provide products that comply with the Contract Documents, are undamaged and, unless otherwise indicated, are new at time of installation.
1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.
 2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.
 3. Owner reserves the right to limit selection to products with warranties meeting requirements of the Contract Documents.
 4. Where products are accompanied by the term "as selected," Architect will make selection.
 5. Descriptive, performance, and reference standard requirements in the Specifications establish salient characteristics of products.
 6. Or Equal: For products specified by name and accompanied by the term "or equal," "or approved equal," or "or approved," comply with requirements in "Comparable Products" Article to obtain approval for use of an unnamed product.
 - a. Submit additional documentation required by Architect in order to establish equivalency of proposed products. Unless otherwise indicated, evaluation of "or equal" product status is by the Architect, whose determination is final.
- B. Specification Language
1. Compliance with Requirements: Manufacturers may change product formulations, revise warranties, and otherwise alter products after the design is finalized or bid. The phrase "Subject to compliance with requirements.." indicates that the selected product, even if listed by name in the specifications, must comply with the specification. If named product no longer complies, select another product meeting the requirements and submit as a substitution request.
 2. Proprietary Specification: Proprietary specifications may be indicated by the phrase "Subject to compliance with requirements, provide..." Followed by the name of a single manufacturer/product designation. Unless otherwise permitted, provide the named product. Product will be approved through the usual submittal process.
 3. Closed Specification: Closed specification may be indicated by the phrase "Subject to compliance with requirements, provide one of the following:.." followed by a list of manufacturers/products. Unless otherwise permitted, provide one of the listed products, which will be approved through the usual submittal process. Other products/manufacturers are considered substitutions.
 4. Comparable Products: The phrase "Subject to compliance with requirements, provide <name of manufacturer/product> or comparable product by one of the following..." Provide the named product or a product by one of the other listed manufacturers that meets the specification. Comparable products are approved through the usual submittal process. Other products/manufacturers are considered substitutions.
 5. Open Specification: Open specifications may be indicated by the phrase "Subject to compliance with requirements, available manufacturers/products that may be incorporated in the Work include, but are not limited to, the following:" The manufacturers and products are included in the specification for the Contractor's convenience only. Select one of the manufacturers/products or an unnamed product that meets the specification. Products will be approved through the usual submittal process.
 6. Basis-of-Design Product: Where Specifications name a product, or refer to a product indicated on Drawings, and include a list of manufacturers, provide the specified or indicated product or a

comparable product by one of the other named manufacturers. Drawings and Specifications indicate sizes, profiles, dimensions, and other characteristics that are based on the product named. Provide the named product or a product by one of the other listed manufacturers that meets the specification. Comparable products are approved through the usual submittal process. Other products/manufacturers are considered substitutions.

- C. Visual Matching Specification: Where Specifications require "match Architect's sample," or "match existing" provide a product that complies with requirements and matches Architect's sample. Architect's decision will be final on whether a proposed product matches.
 - 1. If no product available within specified category matches and complies with other specified requirements, comply with requirements in Section 012500 "Substitution Procedures" for proposal of product.
- D. Visual Selection Specification: Where Specifications include the phrase "as selected by Architect from manufacturer's full range" or similar phrase, select a product that complies with requirements. Architect will select color, gloss, pattern, density, or texture from manufacturer's product line that includes both standard and premium items.

PART 3 - EXECUTION (Not Used)

END OF SECTION 016000

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SECTION 017300 - EXECUTION**PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes general administrative and procedural requirements governing execution of the Work, including, but not limited to, the following:
 - 1. Construction layout.
 - 2. Field engineering and surveying.
 - 3. Installation of the Work.
 - 4. Coordination of Owner's portion of the Work.
 - 5. Coordination of Owner-installed products.
 - 6. Progress cleaning.
 - 7. Starting and adjusting.
 - 8. Protection of installed construction.
- B. Related Requirements:
 - 1. Section 011000 "Summary" for coordination of Owner-furnished products , Owner-performed work , Owner's separate contracts, and limits on use of Project site.
 - 2. Section 013300 "Submittal Procedures" for submitting surveys.
 - 3. Section 017329 "Cutting and Patching" for cutting and patching requirements.
 - 4. Section 017700 "Closeout Procedures" for submitting final property survey with Project Record Documents, recording of Owner-accepted deviations from indicated lines and levels, replacing defective work, and final cleaning.
 - 5. Section 024119 "Selective Demolition" for demolition and removal of selected portions of the building.
 - 6. Section 078413 "Penetration Firestopping" for patching penetrations in fire-rated construction.

1.3 DEFINITIONS

- A. Cutting: Removal of in-place construction necessary to permit installation or performance of subsequent work.
- B. Patching: Fitting and repair work required to restore construction to original conditions after installation of subsequent work.

1.4 INFORMATIONAL SUBMITTALS

- A. Certified Surveys: Submit two copies signed by professional engineer.
- B. Certificates: Submit certificate signed by professional engineer, certifying that location and elevation of improvements comply with requirements.

- C. Landfill Receipts: Submit copy of receipts issued by a landfill facility, licensed to accept hazardous materials, for hazardous waste disposal.

1.5 QUALITY ASSURANCE

- A. Land Surveyor Qualifications: A professional land surveyor who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing land-surveying services of the kind indicated.
- B. Professional Engineer Qualifications: Refer to Section 014000 "Quality Requirements."
- C. Manufacturer's Installation Instructions: Obtain and maintain on-site manufacturer's written recommendations and instructions for installation of specified products and equipment.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Comply with requirements specified in other Sections.
 - 1. For projects requiring compliance with sustainable design and construction practices and procedures, use products for patching that comply with sustainable design requirements.
- B. In-Place Materials: Use materials for patching identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.
 - 1. If identical materials are unavailable or cannot be used, use materials that, when installed, will provide a match acceptable to Architect for the visual and functional performance of in-place materials. Use materials that are not considered hazardous.
- C. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.
 - 1. Use cleaning products that comply with Green Seal's GS-37, or if GS-37 is not applicable, use products that comply with the California Code of Regulations maximum allowable VOC levels.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Existing Conditions: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, investigate and verify the existence and location of underground utilities, mechanical and electrical systems, and other construction affecting the Work.
 - 1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, gas service piping, and water-service piping; underground electrical services; and other utilities.
 - 2. Furnish location data for work related to Project that must be performed by public utilities serving Project site.

- B. Examination and Acceptance of Conditions: Before proceeding with each component of the Work, examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.
1. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
 2. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.
 3. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
- C. Written Report: Where a written report listing conditions detrimental to performance of the Work is required by other Sections, include the following:
1. Description of the Work, including Specification Section number and paragraph, and Drawing sheet number and detail, where applicable.
 2. List of detrimental conditions, including substrates.
 3. List of unacceptable installation tolerances.
 4. Recommended corrections.
- D. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

3.2 PREPARATION

- A. Existing Utility Information: Furnish information to Owner that is necessary to adjust, move, or relocate existing utility structures, utility poles, lines, services, or other utility appurtenances located in or affected by construction. Coordinate with authorities having jurisdiction.
- B. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
- C. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.
- D. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents, submit a request for information to Architect in accordance with requirements in Section 013100 "Project Management and Coordination."

3.3 CONSTRUCTION LAYOUT

- A. Verification: Before proceeding to lay out the Work, verify layout information shown on Drawings, in relation to the property survey and existing benchmarks and existing conditions. If discrepancies are discovered, notify Architect promptly.
- B. Engage a professional engineer experienced in laying out the Work, using the following accepted surveying practices:
1. Establish benchmarks and control points to set lines and levels at each story of construction and elsewhere as needed to locate each element of Project.
 2. Establish limits on use of Project site.

3. Establish dimensions within tolerances indicated. Do not scale Drawings to obtain required dimensions.
 4. Inform installers of lines and levels to which they must comply.
 5. Check the location, level and plumb, of every major element as the Work progresses.
 6. Notify Architect when deviations from required lines and levels exceed allowable tolerances.
 7. Close site surveys with an error of closure equal to or less than the standard established by authorities having jurisdiction.
- C. Site Improvements: Locate and lay out site improvements, including pavements, grading, fill and topsoil placement, utility slopes, and rim and invert elevations.
- D. Building Lines and Levels: Locate and lay out control lines and levels for structures, building foundations, column grids, and floor levels, including those required for mechanical and electrical work. Transfer survey markings and elevations for use with control lines and levels. Level foundations and piers from two or more locations.
- E. Record Log: Maintain a log of layout control work. Record deviations from required lines and levels. Include beginning and ending dates and times of surveys, weather conditions, name and duty of each survey party member, and types of instruments and tapes used. Make the log available for reference by Architect.

3.4 FIELD ENGINEERING

- A. Identification: Owner will identify existing benchmarks, control points, and property corners.
- B. Reference Points: Locate existing permanent benchmarks, control points, and similar reference points before beginning the Work. Preserve and protect permanent benchmarks and control points during construction operations.
1. Do not change or relocate existing benchmarks or control points without prior written approval of Architect. Report lost or destroyed permanent benchmarks or control points promptly. Report the need to relocate permanent benchmarks or control points to Architect before proceeding.
 2. Replace lost or destroyed permanent benchmarks and control points promptly. Base replacements on the original survey control points.
- C. Benchmarks: Establish and maintain a minimum of two permanent benchmarks on Project site, referenced to data established by survey control points. Comply with authorities having jurisdiction for type and size of benchmark.
1. Record benchmark locations, with horizontal and vertical data, on Project Record Documents.
 2. Where the actual location or elevation of layout points cannot be marked, provide temporary reference points sufficient to locate the Work.
 3. Remove temporary reference points when no longer needed. Restore marked construction to its original condition.
- D. Certified Survey: On completion of foundation walls, major site improvements, and other work requiring field-engineering services, prepare a certified survey showing dimensions, locations, angles, and elevations of construction and sitework.
- E. Final Property Survey: Engage a professional engineer to prepare a final property survey showing significant features (real property) for Project. Include on the survey a certification, signed by professional engineer, that principal metes, bounds, lines, and levels of Project are accurately positioned as shown on the survey.

1. Show boundary lines, monuments, streets, site improvements and utilities, existing improvements and significant vegetation, adjoining properties, acreage, grade contours, and the distance and bearing from a site corner to a legal point.
2. Recording: At Substantial Completion, have the final property survey recorded by or with authorities having jurisdiction as the official "property survey."

3.5 INSTALLATION

- A. Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.
 1. Make vertical work plumb, and make horizontal work level.
 2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
 3. Conceal pipes, ducts, and wiring in finished areas unless otherwise indicated.
 4. Maintain minimum headroom clearance of 96 inches in occupied spaces and 90 inches in unoccupied spaces, unless otherwise indicated on Drawings.
- B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.
- C. Install products at the time and under conditions that will ensure satisfactory results as judged by Architect. Maintain conditions required for product performance until Substantial Completion.
- D. Conduct construction operations, so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy of type expected for Project.
- E. Sequence the Work and allow adequate clearances to accommodate movement of construction items on-site and placement in permanent locations.
- F. Tools and Equipment: Select tools or equipment that minimize production of excessive noise levels.
- G. Templates: Obtain and distribute to the parties involved templates for Work specified to be factory prepared and field installed. Check Shop Drawings of other portions of the Work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.
- H. Attachment: Provide blocking and attachment plates and anchors and fasteners of adequate size and number to securely anchor each component in place, accurately located and aligned with other portions of the Work. Where size and type of attachments are not indicated, verify size and type required for load conditions with manufacturer.
 1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Architect.
 2. Allow for building movement, including thermal expansion and contraction.
 3. Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.
- I. Joints: Make joints of uniform width. Where joint locations in exposed Work are not indicated, arrange joints for the best visual effect, as judged by Architect. Fit exposed connections together to form hairline joints.
- J. Repair or remove and replace damaged, defective, or nonconforming Work.

1. Comply with Section 017700 "Closeout Procedures" for repairing or removing and replacing defective Work.

3.6 COORDINATION OF OWNER'S PORTION OF THE WORK

- A. Site Access: Provide access to Project site for Owner's construction personnel and Owner's separate contractors.
 1. Provide temporary facilities required for Owner-furnished, Contractor-installed and Owner-furnished, Owner-installed products.
 2. Refer to Section 011000 "Summary" for other requirements for Owner-furnished, Contractor-installed and Owner-furnished, Owner-installed products
- B. Coordination: Coordinate construction and operations of the Work with work performed by Owner's construction personnel and Owner's separate contractors.
 1. Construction Schedule: Inform Owner of Contractor's preferred construction schedule for Owner's portion of the Work. Adjust construction schedule based on a mutually agreeable timetable. Notify Owner if changes to schedule are required due to differences in actual construction progress.
 2. Preinstallation Conferences: Include Owner's construction personnel and Owner's separate contractors at preinstallation conferences covering portions of the Work that are to receive Owner's work. Attend preinstallation conferences conducted by Owner's construction personnel if portions of the Work depend on Owner's construction.

3.7 MOISTURE AND MOLD CONTROL

- A. General: Coordinate requirements in Contractor's approved Material and Mold Control Plan as described in Division 01 Section "Product Requirements." Avoid trapping water in finished work. Document visible signs of mold that may appear during construction. Comply with recommendations contained in Associated General Contractors (AGC) document "Managing the Risk of Mold in the Construction of Buildings," including the following:
 1. Exposed Phase of Construction:
 - a. Protect porous materials from water damage.
 - b. Protect stored and installed materials from flowing or standing water.
 - c. Keep porous and organic materials from coming into prolonged contact with concrete.
 - d. Remove standing water from decks.
 - e. Keep deck openings covered or dammed.
 - f. Use dunnage to create space between concrete decks and stored drywall.
 2. Partially Enclosed Phase of Construction:
 - a. Do not load or install drywall or other porous materials or components, or items with high organic content, into partially enclosed building.
 - b. Keep interior spaces reasonably clean and protected from water damage.
 - c. Periodically collect and remove waste containing cellulose or other organic matter.
 - d. Discard or replace water-damaged material.
 - e. Do not install material that is wet.
 - f. Discard, replace, or clean stored or installed material that begins to grow mold.
 - g. Perform work in a sequence that allows any wet materials adequate time to dry before enclosing the material in drywall or other interior finishes.
 3. Controlled Phase of Construction:
 - a. Control moisture and humidity inside building by maintaining effective dry-in conditions.
 - b. Utilize permanent HVAC system to control humidity.

3.8 PROGRESS CLEANING

- A. Clean Project site and work areas daily, including common areas. Enforce requirements strictly. Dispose of materials lawfully.
 - 1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
 - 2. Do not hold waste materials more than seven days during normal weather or three days if the temperature is expected to rise above 80 deg F.
 - 3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.
 - a. Use containers intended for holding waste materials of type to be stored.
 - 4. Coordinate progress cleaning for joint-use areas where Contractor and other contractors are working concurrently.
- B. Site: Maintain Project site free of waste materials and debris.
- C. Work Areas: Clean areas where Work is in progress to the level of cleanliness necessary for proper execution of the Work.
 - 1. Remove liquid spills promptly.
 - 2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.
- D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.
- E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.
- F. Exposed Surfaces: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.
- G. Waste Disposal: Do not bury or burn waste materials on-site. Do not wash waste materials down sewers or into waterways. Comply with waste disposal requirements in Section 017419 "Construction Waste Management and Disposal."
- H. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.
- I. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.
- J. Limiting Exposures: Supervise construction operations to ensure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

3.9 STARTING AND ADJUSTING

- A. Coordinate startup and adjusting of equipment and operating components with requirements in Section 019113 "General Commissioning Requirements."

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- B. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.
 - C. Adjust equipment for proper operation. Adjust operating components for proper operation without binding.
 - D. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
 - E. Manufacturer's Field Service: Comply with qualification requirements in Section 014000 "Quality Requirements."

3.10 PROTECTION AND REPAIR OF INSTALLED CONSTRUCTION

- A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.
- B. Repair Work previously completed and subsequently damaged during construction period. Repair to like-new condition.
- C. Protection of Existing Items: Provide protection and ensure that existing items to remain undisturbed by construction are maintained in condition that existed at commencement of the Work.
- D. Comply with manufacturer's written instructions for temperature and relative humidity.

END OF SECTION 017300

SECTION 017700 - CLOSEOUT PROCEDURES**PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for Contract closeout, including, but not limited to, the following:
 - 1. Substantial Completion procedures.
 - 2. Final completion procedures.
 - 3. Warranties.
 - 4. Final cleaning.
- B. Related Requirements:
 - 1. Section 012900 "Payment Procedures" for requirements for Applications for Payment for Substantial Completion and Final Completion.
 - 2. Section 017823 "Operation and Maintenance Data" for additional operation and maintenance manual requirements.
 - 3. Section 017839 "Project Record Documents" for submitting Record Drawings, Record Specifications, and Record Product Data.

1.3 DEFINITIONS

- A. List of Incomplete Items: Contractor-prepared list of items to be completed or corrected, prepared for the Architect's use prior to Architect's inspection, to determine if the Work is substantially complete.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of cleaning agent.
- B. Contractor's List of Incomplete Items: Initial submittal at Substantial Completion.
- C. Certified List of Incomplete Items: Final submittal at Final Completion.

1.5 CLOSEOUT SUBMITTALS

- A. Certificates of Release: From authorities having jurisdiction.
- B. Certificate of Insurance: For continuing coverage.
- C. Field Report: For pest-control inspection.

1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Schedule of Maintenance Material Items: For maintenance material submittal items required by other Sections.

1.7 SUBSTANTIAL COMPLETION PROCEDURES

- A. Contractor's List of Incomplete Items: Prepare and submit a list of items to be completed and corrected (Contractor's "punch list"), indicating the value of each item on the list and reasons why the Work is incomplete.
- B. Submittals Prior to Substantial Completion: Complete the following a minimum of 10 days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.
1. Certificates of Release: Obtain and submit releases from authorities having jurisdiction, permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
 2. Submit closeout submittals specified in other Division 01 Sections, including Project Record Documents, operation and maintenance manuals, damage or settlement surveys, property surveys, and similar final record information.
 3. Submit closeout submittals specified in individual Sections, including specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
 4. Submit maintenance material submittals specified in individual Sections, including tools, spare parts, extra materials, and similar items, and deliver to location designated by Architect. Label with manufacturer's name and model number.
 - a. Schedule of Maintenance Material Items: Prepare and submit schedule of maintenance material submittal items, including name and quantity of each item and name and number of related Specification Section. Obtain Architect's and Owner's signature for receipt of submittals.
 5. Submit testing, adjusting, and balancing records.
 6. Submit sustainable design submittals not previously submitted.
 7. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.
- C. Procedures Prior to Substantial Completion: Complete the following a minimum of 10 days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.
1. Advise Owner of pending insurance changeover requirements.
 2. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
 3. Complete startup and testing of systems and equipment.
 4. Perform preventive maintenance on equipment used prior to Substantial Completion.
 5. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems. Submit demonstration and training video recordings specified in Section 017900 "Demonstration and Training."
 6. Advise Owner of changeover in utility services.
 7. Participate with Owner in conducting inspection and walkthrough with local emergency responders.
 8. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
 9. Complete final cleaning requirements.
 10. Touch up paint and otherwise repair and restore marred exposed finishes to eliminate visual defects.

- D. Inspection: Submit a written request for inspection to determine Substantial Completion a minimum of 10 days prior to date the Work will be completed and ready for final inspection and tests. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare the Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by Architect, that must be completed or corrected before certificate will be issued.
1. Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.
 2. Results of completed inspection will form the basis of requirements for Final Completion.

1.8 FINAL COMPLETION PROCEDURES

- A. Submittals Prior to Final Completion: Before requesting final inspection for determining Final Completion, complete the following:
1. Submit a final Application for Payment in accordance with Section 012900 "Payment Procedures."
 2. Certified List of Incomplete Items: Submit certified copy of Architect's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Architect. Certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
 3. Certificate of Insurance: Submit evidence of final, continuing insurance coverage complying with insurance requirements.
 4. Submit pest-control final inspection report.
 5. Submit Final Completion photographic documentation.
- B. Inspection: Submit a written request for final inspection to determine acceptance a minimum of 10 days prior to date the Work will be completed and ready for final inspection and tests. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.
1. Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

1.9 LIST OF INCOMPLETE ITEMS

- A. Organization of List: Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction.
1. Organize list of spaces in sequential order, starting with exterior areas first, listed by room or space number.
 2. Organize items applying to each space by major element, including categories for ceilings, individual walls, floors, equipment, and building systems.
 3. Include the following information at the top of each page:
 - a. Project name.
 - b. Date.
 - c. Name of Architect.
 - d. Name of Contractor.
 - e. Page number.
 4. Submit list of incomplete items in the following format:

- a. MS Excel Electronic File: Architect will return annotated file.
- b. PDF Electronic File: Architect will return annotated file.
- c. Web-Based Project Software Upload: Utilize software feature for creating and updating list of incomplete items (punch list).
- d. Three Paper Copies: Architect will return two copies.

1.10 SUBMITTAL OF PROJECT WARRANTIES

- A. Time of Submittal: Submit written warranties on request of Architect for designated portions of the Work where warranties are indicated to commence on dates other than date of Substantial Completion, or when delay in submittal of warranties might limit Owner's rights under warranty.
- B. Partial Occupancy: Submit properly executed warranties within 15 days of completion of designated portions of the Work that are completed and occupied or used by Owner during construction period by separate agreement with Contractor.
- C. Organize warranty documents into an orderly sequence based on the table of contents of Project Manual.
- D. Warranty Electronic File: Provide warranties and bonds in PDF format. Assemble complete warranty and bond submittal package into a single electronic PDF file with bookmarks enabling navigation to each item. Provide bookmarked table of contents at beginning of document.
 1. Submit on digital media acceptable to Architect.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

PART 3 - EXECUTION

3.1 FINAL CLEANING

- A. General: Perform final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.
- B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.
 1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a designated portion of Project:
 - a. Clean Project site of rubbish, waste material, litter, and other foreign substances.
 - b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
 - c. Rake grounds that are not planted, mulched, or paved to a smooth, even-textured surface.
 - d. Remove tools, construction equipment, machinery, and surplus material from Project site.
 - e. Remove snow and ice to provide safe access to building.

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- f. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
 - g. Remove debris and surface dust from limited-access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
 - h. Clean flooring, removing debris, dirt, and staining; clean according to manufacturer's recommendations.
 - i. Vacuum and mop concrete.
 - j. Vacuum carpet and similar soft surfaces, removing debris and excess nap; clean according to manufacturer's recommendations if visible soil or stains remain.
 - k. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Polish mirrors and glass, taking care not to scratch surfaces.
 - l. Remove labels that are not permanent.
 - m. Wipe surfaces of mechanical and electrical equipment[, **elevator equipment,**] and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
 - n. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
 - o. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
 - p. Clean ducts, blowers, and coils if units were operated without filters during construction or that display contamination with particulate matter on inspection.
 - q. Clean luminaires, lamps, globes, and reflectors to function with full efficiency.
 - r. Clean strainers.
 - s. Leave Project clean and ready for occupancy.
- C. Pest Control: Comply with pest control requirements in Section 015000 "Temporary Facilities and Controls." Prepare written report.
- D. Construction Waste Disposal: Comply with waste-disposal requirements in Section 015000 "Temporary Facilities and Controls."
- 3.2 REPAIR OF THE WORK
- A. Complete repair and restoration operations required by Section 017300 "Execution" before requesting inspection for determination of Substantial Completion.

END OF SECTION 017700

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SECTION 017823 - OPERATION AND MAINTENANCE DATA**PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for preparing operation and maintenance manuals, including the following:
 - 1. Operation and maintenance documentation directory manuals.
 - 2. Emergency manuals.
 - 3. Systems and equipment operation manuals.
 - 4. Systems and equipment maintenance manuals.
 - 5. Product maintenance manuals.
- B. Related Requirements:
 - 1. Section 013300 "Submittal Procedures" for submitting copies of submittals for operation and maintenance manuals.

1.3 DEFINITIONS

- A. System: An organized collection of parts, equipment, or subsystems united by regular interaction.
- B. Subsystem: A portion of a system with characteristics similar to a system.

1.4 CLOSEOUT SUBMITTALS

- A. Submit operation and maintenance manuals indicated. Provide content for each manual as specified in individual Specification Sections, and as reviewed and approved at the time of Section submittals. Submit reviewed manual content formatted and organized as required by this Section.
 - 1. Architect will comment on whether content of operation and maintenance submittals is acceptable.
 - 2. Where applicable, clarify and update reviewed manual content to correspond to revisions and field conditions.
- B. Format: Submit operation and maintenance manuals in the following format:
 - 1. Submit in PDF electronic file and by uploading to web-based project software site. Enable reviewer comments on draft submittals.
- C. Initial Manual Submittal: Submit draft copy of each manual at least 30 days before commencing demonstration and training. Architect will comment on whether general scope and content of manual are acceptable.
- D. Final Manual Submittal: Submit each manual in final form prior to requesting inspection for Substantial Completion and at least 15 days before commencing demonstration and training. Architect will return copy with comments.

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1. Correct or revise each manual to comply with Architect's comments. Submit copies of each corrected manual within 15 days of receipt of Architect's comments and prior to commencing demonstration and training.
- E. Comply with Section 017700 "Closeout Procedures" for schedule for submitting operation and maintenance documentation.
- 1.5 FORMAT OF OPERATION AND MAINTENANCE MANUALS
- A. Manuals, Electronic Files: Submit manuals in the form of a multiple file composite electronic PDF file for each manual type required.
1. Electronic Files: Use electronic files prepared by manufacturer where available. Where scanning of paper documents is required, configure scanned file for minimum readable file size.
 2. File Names and Bookmarks: Bookmark individual documents based on file names. Name document files to correspond to system, subsystem, and equipment names used in manual directory and table of contents. Group documents for each system and subsystem into individual composite bookmarked files, then create composite manual, so that resulting bookmarks reflect the system, subsystem, and equipment names in a readily navigated file tree. Configure electronic manual to display bookmark panel on opening file.
- 1.6 REQUIREMENTS FOR EMERGENCY, OPERATION, AND MAINTENANCE MANUALS
- A. Organization of Manuals: Unless otherwise indicated, organize each manual into a separate section for each system and subsystem, and a separate section for each piece of equipment not part of a system. Each manual shall contain the following materials, in the order listed:
1. Title page.
 2. Table of contents.
 3. Manual contents.
- B. Title Page: Include the following information:
1. Subject matter included in manual.
 2. Name and address of Project.
 3. Name and address of Owner.
 4. Date of submittal.
 5. Name and contact information for Contractor.
 6. Name and contact information for Construction Manager.
 7. Name and contact information for Architect.
 8. Name and contact information for Commissioning Authority.
 9. Names and contact information for major consultants to the Architect that designed the systems contained in the manuals.
 10. Cross-reference to related systems in other operation and maintenance manuals.
- C. Table of Contents: List each product included in manual, identified by product name, indexed to the content of the volume, and cross-referenced to Specification Section number in Project Manual.
1. If operation or maintenance documentation requires more than one volume to accommodate data, include comprehensive table of contents for all volumes in each volume of the set.
- D. Manual Contents: Organize into sets of manageable size. Arrange contents alphabetically by system, subsystem, and equipment. If possible, assemble instructions for subsystems, equipment, and components of one system into a single binder.

- E. Identification: In the documentation directory and in each operation and maintenance manual, identify each system, subsystem, and piece of equipment with same designation used in the Contract Documents. If no designation exists, assign a designation according to ASHRAE Guideline 4, "Preparation of Operating and Maintenance Documentation for Building Systems."

1.7 OPERATION AND MAINTENANCE DOCUMENTATION DIRECTORY MANUAL

- A. Operation and Maintenance Documentation Directory: Prepare a separate manual that provides an organized reference to emergency, operation, and maintenance manuals. List items and their location to facilitate ready access to desired information. Include the following:
1. List of Systems and Subsystems: List systems alphabetically. Include references to operation and maintenance manuals that contain information about each system.
 2. List of Equipment: List equipment for each system, organized alphabetically by system. For pieces of equipment not part of system, list alphabetically in separate list.
 3. Tables of Contents: Include a table of contents for each emergency, operation, and maintenance manual.

1.8 EMERGENCY MANUALS

- A. Emergency Manual: Assemble a complete set of emergency information indicating procedures for use by emergency personnel and by Owner's operating personnel for types of emergencies indicated.
- B. Content: Organize manual into a separate section for each of the following:
1. Type of emergency.
 2. Emergency instructions.
 3. Emergency procedures.
- C. Type of Emergency: Where applicable for each type of emergency indicated below, include instructions and procedures for each system, subsystem, piece of equipment, and component:
1. Fire.
 2. Flood.
 3. Gas leak.
 4. Water leak.
 5. Power failure.
 6. Water outage.
 7. System, subsystem, or equipment failure.
 8. Chemical release or spill.
- D. Emergency Instructions: Describe and explain warnings, trouble indications, error messages, and similar codes and signals. Include responsibilities of Owner's operating personnel for notification of Installer, supplier, and manufacturer to maintain warranties.
- E. Emergency Procedures: Include the following, as applicable:
1. Instructions on stopping.
 2. Shutdown instructions for each type of emergency.
 3. Operating instructions for conditions outside normal operating limits.
 4. Required sequences for electric or electronic systems.
 5. Special operating instructions and procedures.

1.9 SYSTEMS AND EQUIPMENT OPERATION MANUALS

- A. Systems and Equipment Operation Manual: Assemble a complete set of data indicating operation of each system, subsystem, and piece of equipment not part of a system. Include information required for daily operation and management, operating standards, and routine and special operating procedures.
1. Engage a factory-authorized service representative to assemble and prepare information for each system, subsystem, and piece of equipment not part of a system.
 2. Prepare a separate manual for each system and subsystem, in the form of an instructional manual for use by Owner's operating personnel.
- B. Content: In addition to requirements in this Section, include operation data required in individual Specification Sections and the following information:
1. System, subsystem, and equipment descriptions. Use designations for systems and equipment indicated on Contract Documents.
 2. Performance and design criteria if Contractor has delegated design responsibility.
 3. Operating standards.
 4. Operating procedures.
 5. Operating logs.
 6. Wiring diagrams.
 7. Control diagrams.
 8. Piped system diagrams.
 9. Precautions against improper use.
 10. License requirements including inspection and renewal dates.
- C. Descriptions: Include the following:
1. Product name and model number. Use designations for products indicated on Contract Documents.
 2. Manufacturer's name.
 3. Equipment identification with serial number of each component.
 4. Equipment function.
 5. Operating characteristics.
 6. Limiting conditions.
 7. Performance curves.
 8. Engineering data and tests.
 9. Complete nomenclature and number of replacement parts.
- D. Operating Procedures: Include the following, as applicable:
1. Startup procedures.
 2. Equipment or system break-in procedures.
 3. Routine and normal operating instructions.
 4. Regulation and control procedures.
 5. Instructions on stopping.
 6. Normal shutdown instructions.
 7. Seasonal and weekend operating instructions.
 8. Required sequences for electric or electronic systems.
 9. Special operating instructions and procedures.
- E. Systems and Equipment Controls: Describe the sequence of operation, and diagram controls as installed.
- F. Piped Systems: Diagram piping as installed, and identify color coding where required for identification.

1.10 SYSTEMS AND EQUIPMENT MAINTENANCE MANUALS

- A. Systems and Equipment Maintenance Manuals: Assemble a complete set of data indicating maintenance of each system, subsystem, and piece of equipment not part of a system. Include manufacturers' maintenance documentation, preventive maintenance procedures and frequency, repair procedures, wiring and systems diagrams, lists of spare parts, and warranty information.
1. Engage a factory-authorized service representative to assemble and prepare information for each system, subsystem, and piece of equipment not part of a system.
 2. Prepare a separate manual for each system and subsystem, in the form of an instructional manual for use by Owner's operating personnel.
- B. Content: For each system, subsystem, and piece of equipment not part of a system, include source information, manufacturers' maintenance documentation, maintenance procedures, maintenance and service schedules, spare parts list and source information, maintenance service contracts, and warranties and bonds as described below.
- C. Source Information: List each system, subsystem, and piece of equipment included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual and drawing or schedule designation or identifier where applicable.
- D. Manufacturers' Maintenance Documentation: Include the following information for each component part or piece of equipment:
1. Standard maintenance instructions and bulletins; include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data include more than one item in a tabular format, identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete references to information not applicable.
 - a. Prepare supplementary text if manufacturers' standard printed data are not available and where the information is necessary for proper operation and maintenance of equipment or systems.
 2. Drawings, diagrams, and instructions required for maintenance, including disassembly and component removal, replacement, and assembly.
 3. Identification and nomenclature of parts and components.
 4. List of items recommended to be stocked as spare parts.
- E. Maintenance Procedures: Include the following information and items that detail essential maintenance procedures:
1. Test and inspection instructions.
 2. Troubleshooting guide.
 3. Precautions against improper maintenance.
 4. Disassembly; component removal, repair, and replacement; and reassembly instructions.
 5. Aligning, adjusting, and checking instructions.
 6. Demonstration and training video recording, if available.
- F. Maintenance and Service Schedules: Include service and lubrication requirements, list of required lubricants for equipment, and separate schedules for preventive and routine maintenance and service with standard time allotment.
1. Scheduled Maintenance and Service: Tabulate actions for daily, weekly, monthly, quarterly, semiannual, and annual frequencies.

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2. Maintenance and Service Record: Include manufacturers' forms for recording maintenance.
- G. Spare Parts List and Source Information: Include lists of replacement and repair parts, with parts identified and cross-referenced to manufacturers' maintenance documentation and local sources of maintenance materials and related services.
 - H. Maintenance Service Contracts: Include copies of maintenance agreements with name and telephone number of service agent.
 - I. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.
 1. Include procedures to follow and required notifications for warranty claims.
 - J. Drawings: Prepare drawings supplementing manufacturers' printed data to illustrate the relationship of component parts of equipment and systems and to illustrate control sequence and flow diagrams. Coordinate these drawings with information contained in record Drawings to ensure correct illustration of completed installation.
 1. Do not use original project record documents as part of maintenance manuals.
- 1.11 PRODUCT MAINTENANCE MANUALS
- A. Product Maintenance Manual: Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.
 - B. Content: Organize manual into a separate section for each product, material, and finish. Include source information, product information, maintenance procedures, repair materials and sources, and warranties and bonds, as described below.
 - C. Source Information: List each product included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual and drawing or schedule designation or identifier where applicable.
 - D. Product Information: Include the following, as applicable:
 1. Product name and model number.
 2. Manufacturer's name.
 3. Color, pattern, and texture.
 4. Material and chemical composition.
 5. Reordering information for specially manufactured products.
 - E. Maintenance Procedures: Include manufacturer's written recommendations and the following:
 1. Inspection procedures.
 2. Types of cleaning agents to be used and methods of cleaning.
 3. List of cleaning agents and methods of cleaning detrimental to product.
 4. Schedule for routine cleaning and maintenance.
 5. Repair instructions.
 - F. Repair Materials and Sources: Include lists of materials and local sources of materials and related services.

G. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.

1. Include procedures to follow and required notifications for warranty claims.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 017823

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SECTION 017836 – WARRANTIES**PART 1 - GENERAL****1.1 SUMMARY**

- A. This Section includes administrative and procedural requirements for warranties required by the Contract Documents, including manufacturer's standard warranties on products and special warranties.
 - 1. Refer to the General Conditions for terms of the Contractor's period for correction of the Work.
- B. Disclaimers and Limitations: Manufacturer's disclaimers and limitations on product warranties do not relieve the Contractor of the warranty on the Work that incorporates the products. Manufacturer's disclaimers and limitations on product warranties do not relieve suppliers, manufacturers, and Subcontractors required to countersign special warranties with the Contractor.

1.2 DEFINITIONS

- A. Standard Product Warranties: Preprinted written warranties published by individual manufacturers for particular products and are specifically endorsed by manufacturer to Owner.
- B. Special Warranties: Written warranties required by or incorporated in Contract Documents, either to extend time limits provided by standard warranties or to provide greater rights for Owner.

1.3 WARRANTY REQUIREMENTS

- A. Related Damages and Losses: When correcting failed or damaged warranted construction, remove and replace construction that has been damaged as a result of such failure, or remove and replace to provide access for correction of warranted construction.
- B. Reinstatement of Warranty: When Work covered by a warranty has failed and been corrected by replacement or rebuilding, reinstate the warranty by written endorsement. The reinstated warranty shall be equal to the original warranty with an equitable adjustment for depreciation.
- C. Replacement Cost: Upon determination that Work covered by a warranty has failed, replace or rebuild the Work to an acceptable condition complying with requirements of the Contract Documents. The Contractor is responsible for the cost of replacing or rebuilding defective Work regardless of whether the Owner has benefited from use of the Work through a portion of its anticipated useful service life.
- D. Owner's Recourse: Expressed warranties made to the Owner are in addition to implied warranties and shall not limit the duties, obligations, rights, and remedies otherwise available under the law. Expressed warranty periods shall not be interpreted as limitations on the time in which the Owner can enforce such other duties, obligations, rights, or remedies.
 - 1. Rejection of Warranties: The Owner reserves the right to reject warranties and to limit selection to products with warranties not in conflict with requirements of the Contract Documents.
- E. Where the Contract Documents require a special warranty or similar commitment on the Work or part of the Work, the Owner reserves the right to refuse to accept the Work, until the Contractor presents evidence that entities required to countersign such commitments are willing to do so.
- F. Warranty Commencement: Warranties required by the Contract Documents shall commence on the Date of Substantial Completion of the Work or designated portion thereof.

1.4 action SUBMITTALS

- A. Submit written warranties to the Architect prior to the date certified for Substantial Completion. If the Architect's Certificate of Substantial Completion designates a commencement date for warranties other than the date of Substantial Completion for the Work, or a designated portion of the Work, submit written warranties upon request of the Architect.
1. When a designated portion of the Work is completed and occupied or used by the Owner, by separate agreement with the Contractor during the construction period, submit properly executed warranties to the Architect within 15 days of completion of that designated portion of the Work.
- B. When the Contract Documents require the Contractor, or the Contractor and a Subcontractor, supplier, or manufacturer, to execute a special warranty, prepare a written document that contains appropriate terms and identification, ready for execution by the required parties. Submit a draft to the Owner, through the Architect, for approval prior to final execution.
- C. Prepare a written document utilizing the sample "General Warranty" form located at the end of this Section, ready for execution by the Contractor. The Contractor shall submit Subcontractor, supplier, or manufacturer draft warranties to the Owner, through the Architect, for approval prior to final execution.
1. Refer to Divisions 2 through 33 Sections for specific content requirements and particular requirements for submitting special warranties.
- D. Form of Submittal: At Final Completion compile two copies of each required warranty, properly executed by the Contractor, or by the Contractor, Subcontractor, supplier, or manufacturer. Organize the warranty documents into an orderly sequence based on the table of contents of the Project Manual.
- E. Bind warranties and bonds in heavy-duty, commercial-quality, durable 3-ring, vinyl-covered loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch paper.
1. Provide heavy paper dividers with celluloid covered tabs for each separate warranty. Mark the tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product, and the name, address, and telephone number of the Installer.
 2. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project title or name, and name of the Contractor.
 3. When warranted construction requires operation and maintenance manuals, provide additional copies of each required warranty, as necessary, for inclusion in each required manual.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 017832

SECTION 017839 - PROJECT RECORD DOCUMENTS**PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for Project Record Documents, including the following:
1. Record Drawings.
 2. Record specifications.
 3. Record Product Data.

1.3 CLOSEOUT SUBMITTALS

- A. Record Drawings: Comply with the following:
1. Number of Copies: Submit copies of Record Drawings as follows:
 - a. Initial Submittal:
 - 1) Submit PDF electronic files of scanned record prints and one set(s) of file prints.
 - 2) Architect will indicate whether general scope of changes, additional information recorded, and quality of drafting are acceptable.
 - b. Final Submittal:
 - 1) Submit PDF electronic files of scanned Record Prints and three set(s) of file prints.
 - 2) Print each drawing, whether or not changes and additional information were recorded.
 - c. Final Submittal:
 - 1) Submit Record Digital Data Files and three set(s) of Record Digital Data File plots.
 - 2) Plot each drawing file, whether or not changes and additional information were recorded.
 - B. Record Specifications: Submit annotated PDF electronic files of Project's Specifications, including addenda and Contract modifications.
 - C. Record Product Data: Submit annotated PDF electronic files and directories of each submittal.
 1. Where record Product Data are required as part of operation and maintenance manuals, submit duplicate marked-up Product Data as a component of manual.

1.4 RECORD DRAWINGS

- A. Record Digital Data Files: Immediately before inspection for Certificate of Substantial Completion, review marked-up record prints with Architect. When authorized, prepare a full set of corrected digital data files of the Contract Drawings, as follows:

1. Format: Annotated PDF electronic file.
 2. Incorporate changes and additional information previously marked on record prints. Delete, redraw, and add details and notations where applicable.
 3. Refer instances of uncertainty to Architect for resolution.
 4. Architect will furnish Contractor with one set of digital data files of the Contract Drawings for use in recording information.
 - a. See Section 013100 "Project Management and Coordination" for requirements related to use of Architect's digital data files.
 - b. Architect will provide data file layer information. Record markups in separate layers.
- B. Format: Identify and date each Record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location.
1. Format: Annotated PDF electronic file.
 2. Record Digital Data Files: Organize digital data information into separate electronic files that correspond to each sheet of the Contract Drawings. Name each file with the sheet identification. Include identification in each digital data file.
 3. Identification: As follows:
 - a. Project name.
 - b. Date.
 - c. Designation "PROJECT RECORD DRAWINGS."
 - d. Name of Architect.
 - e. Name of Contractor.

1.5 RECORD SPECIFICATIONS

- A. Preparation: Mark Specifications to indicate the actual product installation, where installation varies from that indicated in Specifications, addenda, and Contract modifications.
1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
 2. Mark copy with the proprietary name and model number of products, materials, and equipment furnished, including substitutions and product options selected.
 3. Record the name of manufacturer, supplier, Installer, and other information necessary to provide a record of selections made.
 4. For each principal product, indicate whether Record Product Data has been submitted in operation and maintenance manuals instead of submitted as Record Product Data.
 5. Note related Change Orders, Record Product Data, and Record Drawings where applicable.
- B. Format: Submit record specifications as annotated PDF electronic file, individually listing each Specification Section included in the Project Manual and all addenda, negotiated changes, and change orders.
1. Designate the manufacturer, product, and supplier, as applicable, actually provided for each product in each Section.

1.6 RECORD PRODUCT DATA

- A. Recording: Maintain one copy of each submittal during the construction period for Project Record Document purposes. Post changes and revisions to Project Record Documents as they occur; do not wait until end of Project.

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- B. Preparation: Mark Product Data to indicate the actual product installation where installation varies substantially from that indicated in Product Data submittal.
1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
 2. Include significant changes in the product delivered to Project site and changes in manufacturer's written instructions for installation.
 3. Note related Change Orders, Record Specifications, and Record Drawings where applicable.
- C. Format: Submit Record Product Data as annotated PDF electronic file.
1. Include Record Product Data directory organized by Specification Section number and title, electronically linked to each item of Record Product Data.

1.7 MISCELLANEOUS RECORD SUBMITTALS

- A. Assemble miscellaneous records required by other Specification Sections for miscellaneous record keeping and submittal in connection with actual performance of the Work. Bind or file miscellaneous records and identify each, ready for continued use and reference.
- B. Format: Submit miscellaneous record submittals as PDF electronic file.
1. Include miscellaneous record submittals directory organized by Specification Section number and title, electronically linked to each item of miscellaneous record submittals.

1.8 MAINTENANCE OF RECORD DOCUMENTS

- A. Maintenance of Record Documents: Store Record Documents in the field office apart from the Contract Documents used for construction. Do not use Project Record Documents for construction purposes. Maintain Record Documents in good order and in a clean, dry, legible condition, protected from deterioration and loss. Provide access to Project Record Documents for Architect's reference during normal working hours.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 017839

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SECTION 024116 – STRUCTURE DEMOLITION**PART 1 - GENERAL****1.1 SUMMARY**

- A. Section Includes:
1. Demolition and removal of buildings and site improvements.
 2. Removing below-grade construction.
 3. Disconnecting, capping or sealing, and removing site utilities.

1.2 MATERIALS OWNERSHIP

- A. Unless otherwise indicated, demolition waste becomes property of Contractor.

1.3 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
1. Arrange demolition schedule so as not to interfere with Owner's on-site operations.
- B. Predemolition Conference: Conduct conference at Project site to comply with requirements in Section 013100 – Project Management and Coordination.
1. Inspect and discuss condition of construction to be demolished.
 2. Review structural load limitations of existing structures.
 3. Review and finalize building demolition schedule and verify availability of demolition personnel, equipment, and facilities needed to make progress and avoid delays.
 4. Review and finalize protection requirements.
 5. Review procedures for protection of adjacent buildings.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For refrigerant recovery technician.
- B. Schedule of Building Demolition Activities: Indicate the following:
1. Detailed sequence of demolition Work, with starting and ending dates for each activity.
 2. Temporary interruption of utility services.
 3. Shutoff and capping or re-routing of utility services.
- C. Statement of Refrigerant Recovery: Signed by refrigerant recovery technician responsible for recovering refrigerant, stating that all refrigerant that was present was recovered and that recovery was performed per EPA regulations. Include name and address of technician and date refrigerant was recovered.

1.5 QUALITY ASSURANCE

- A. Demolition Contractor: A firm that has successfully completed demolition work similar to that required for this Project.
- B. Refrigerant Recovery Technician Qualifications: Certified by EPA-approved certification program.

1.6 FIELD CONDITIONS

- A. Buildings to be demolished will be vacated and their use discontinued before start of Work.
- B. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical. Owner assumes no responsibility for buildings and structures to be demolished.
 - 1. Before building demolition, Owner will remove salvageable materials.
- C. Hazardous Materials: It is not expected that hazardous materials will be encountered in Work.
 - 1. Hazardous materials will be removed by Owner before start of Work.
 - 2. If materials suspected of containing hazardous materials are encountered, do not disturb; immediately notify Architect and Owner. Hazardous materials will be removed by Owner under separate contract.
- D. On-site storage or sale of removed items or materials is not permitted.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Regulatory Requirements: Comply with governing EPA notification regulations before beginning demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.
- B. Standards: Comply with ASSE A10.6 and NFPA 241.

2.2 SOIL MATERIALS

- A. Satisfactory Soils: Comply with requirements in Section 312000 – Earth Moving.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that utilities have been disconnected and capped before starting demolition operations.
- B. Review Project Record Documents of existing construction or other existing condition and hazardous material information provided by Owner. Owner does not guarantee that existing conditions are same as those indicated in Project Record Documents.
- C. Perform, or engage professional engineer to perform, engineering survey of condition of building to determine whether removing any element might result in structural deficiency or unplanned collapse of any portion of structure or adjacent structures during building demolition operations.
- D. Steel Tendons: Locate tensioned steel tendons and include recommendations for de-tensioning.
- E. Verify that hazardous materials have been remediated before proceeding with building demolition operations.

3.2 PREPARATION

- A. Refrigerant: Before starting demolition, remove refrigerant from mechanical equipment per 40 CFR 82 and regulations of authorities having jurisdiction.

3.3 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

- A. Existing Utilities: Locate, identify, disconnect, and seal or cap off indicated utilities serving buildings and structures to be demolished.
1. Arrange to shut off indicated utilities with utility companies.
 2. Cut off pipe or conduit minimum of 24 inches below grade. Cap, valve, or plug and seal remaining portion of pipe or conduit after bypassing per requirements of authorities having jurisdiction.
 3. Do not start demolition Work until utility disconnecting and sealing have been completed and verified in writing.

3.4 PROTECTION

- A. Existing Facilities: Protect adjacent walkways, loading docks, building entries, and other building facilities during demolition operations. Maintain exits from existing buildings.
- B. Temporary Shoring: Provide and maintain interior and exterior shoring, bracing, or structural support to preserve stability and prevent unexpected movement or collapse of construction being demolished.
1. Strengthen or add new supports when required during progress of demolition.
- C. Existing Utilities to Remain: Maintain utility services to remain and protect from damage during demolition operations.
1. Provide temporary services during interruptions to existing utilities, as acceptable to Owner and authorities having jurisdiction.
 - a. Provide at least 72 hours' notice to occupants of affected buildings if shutdown of service is required during changeover.
- D. Temporary Protection: Erect temporary protection, such as walks, fences, railings, canopies, and covered passageways, where required by authorities having jurisdiction and as indicated. Comply with requirements in Section 015000 – Temporary Facilities and Controls.
1. Protect adjacent buildings and facilities from damage due to demolition activities.
 2. Protect existing site improvements, appurtenances, and landscaping to remain.
 3. Erect plainly visible fence around drip line of individual trees or around perimeter drip line of groups of trees to remain.
 4. Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.
 5. Provide protection to ensure safe passage of people around building demolition area and to and from occupied portions of adjacent buildings and structures.
 6. Protect walls, windows, roofs, and other adjacent exterior construction that are to remain and that are exposed to building demolition operations.
 7. Erect and maintain dustproof partitions and temporary enclosures to limit dust, noise, and dirt migration to occupied portions of adjacent buildings.
- E. Remove temporary barriers and protections where hazards no longer exist. Where open excavations or other hazardous conditions remain, leave temporary barriers and protections in place.

3.5 DEMOLITION, GENERAL

- A. General: Demolish indicated buildings and site improvements completely. Use methods required to complete Work within limitations of governing regulations and as follows:
1. Do not use cutting torches until Work area is cleared of flammable materials. Maintain portable fire-suppression devices during flame-cutting operations.
 2. Maintain fire watch during and for at least 6 hours after flame cutting operations.
 3. Maintain adequate ventilation when using cutting torches.
 4. Locate building demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
- B. Site Access and Temporary Controls: Conduct building demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
1. Do not close or obstruct streets, walks, walkways, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by authorities having jurisdiction.
 2. Use water mist and other suitable methods to limit spread of dust and dirt. Comply with governing environmental-protection regulations. Do not use water when it may damage adjacent construction or create hazardous or objectionable conditions, such as ice, flooding, and pollution.
- C. Explosives: Use of explosives is not permitted.

3.6 DEMOLITION BY MECHANICAL MEANS

- A. Proceed with demolition of structural framing members systematically, from higher to lower level. Complete building demolition operations above each floor or tier before disturbing supporting members on next lower level.
- B. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level in controlled descent.
1. Remove structural framing members and lower to ground by method suitable to minimize ground impact and dust generation.
- C. Below-Grade Construction: Demolish foundation walls and other below-grade construction.
1. Remove below-grade construction, including basements, foundation walls, and footings, to at least 12 inches below grade or to depths indicated.
- D. Existing Utilities: Demolish and remove existing utilities and below-grade utility structures.
1. Piping: Disconnect piping at unions, flanges, valves, or fittings.
 2. Wiring Ducts: Disassemble into unit lengths and remove plug-in and disconnecting devices.

3.7 SITE RESTORATION

- A. Below-Grade Areas: Rough grade below-grade areas ready for further excavation or new construction.
- B. Site Grading: Uniformly rough grade area of demolished construction to smooth surface, free from irregular surface changes. Provide smooth transition between adjacent existing grades and new grades.

3.8 REPAIRS

- A. Promptly repair damage to adjacent buildings caused by demolition operations.

3.9 DISPOSAL OF DEMOLISHED MATERIALS

- A. Remove demolition waste materials from Project site and legally dispose of them.
 - 1. Do not allow demolished materials to accumulate on-site.
 - 2. Remove and transport debris in manner that will prevent spillage on adjacent surfaces and areas.
- B. Do not burn demolished materials.

3.10 CLEANING

- A. Clean adjacent structures and improvements of dust, dirt, and debris caused by building demolition operations. Return adjacent areas to condition existing before building demolition operations began.
 - 1. Clean roadways of debris caused by debris transport.

END OF SECTION 024116

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SECTION 033000 - CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section specifies cast-in place concrete, including formwork, reinforcement, concrete materials, mix design, placement procedures, and finishes.
- B. Related Sections include the following:
 - 1. Division 31, Section "Earthwork" for drainage fill under slabs-on-grade.
 - 2. Division 32, Section "Concrete Pavement" for concrete pavement and walks.

1.2 SUBMITTALS

- A. Design Mixes: For each concrete mix. Include alternate mix designs when characteristics of materials, project conditions, weather, test results, or other circumstances warrant adjustments.
 - 1. Submit in accordance with ACI 318.99, Section 5.3.
 - 2. Indicate amounts of mix water to be withheld for later addition at Project site.
- B. Steel Reinforcement Shop Drawings: Details of fabrication, bending, and placement, prepared according to ACI 315, "Details and Detailing of Concrete Reinforcement." Include material, grade, bar schedules, stirrup spacing, bent bar diagrams, arrangement, and supports of concrete reinforcement. Include special reinforcement required for openings through concrete structures.
 - 1. Show all wall reinforcement in elevation.
- C. Welding Certificates: Copies of certificates for welding procedures and personnel.
- D. Material Certificates: Signed by manufacturers certifying that each of the following items complies with requirements:
 - 1. Cementitious materials and aggregates.
 - 2. Form materials and form-release agents.
 - 3. Steel reinforcement and reinforcement accessories.
 - 4. Admixtures.
 - 5. Curing materials.
 - 6. Floor and slab treatments.
 - 7. vapor barriers

1.3 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who has completed concrete Work similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.
- B. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products complying with ASTM C 94 requirements for production facilities and equipment.
 - 1. Manufacturer must be certified according to the National Ready Mixed Concrete Association's Certification of Ready Mixed Concrete Production Facilities.
- C. Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, qualified according to ASTM C 1077 and ASTM E 329 to conduct the testing indicated, as documented according to ASTM E 548.

1. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-1 or an equivalent certification program.
 2. Contractor shall employ a qualified independent testing and inspection agency for testing of mix designs.
 3. Owner will engage a qualified independent testing and inspection agency for field quality control.
- D. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, each aggregate from one source, and each admixture from the same manufacturer.
- E. Welding: Qualify procedures and personnel according to AWS D1.4, "Structural Welding Code-Reinforcing Steel."
- F. ACI Publications: Comply with the following, unless more stringent provisions are indicated:
1. ACI 301, "Specification for Structural Concrete."
 2. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."
 3. ACI 318, "Building Code Requirements for Structural Concrete."

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage.
- B. Waterstops: Store waterstops under cover to protect from moisture, sunlight, dirt, oil, and other contaminants.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
 1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products specified.
 2. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.

2.2 FORM-FACING MATERIALS

- A. Smooth-Formed Finished Concrete: Form-facing panels that will provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.
 1. Plywood, metal, or other approved panel materials.
 2. Exterior-grade plywood panels, suitable for concrete forms, complying with DOC PS 1, and as follows:
 - a. B-B (Concrete Form), Class 1, or better, mill-released agent treated and edge sealed.
- B. Rough-Formed Finished Concrete: Plywood, lumber, metal or other approved material. Provide lumber dressed on at least two edges and one side for tight fit.
- C. Chamfer Strips: Wood, metal, PVC, or rubber strips, 3/4 by 3/4 inch, minimum.
- D. Rustication Strips: Wood, metal, PVC, or rubber strips, kerfed for ease of form removal.

- E. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.
 - 1. Formulate form-release agent with rust inhibitor for steel form-facing materials.
- F. Form Ties: Factory-fabricated, removable or snap-off metal or glass-fiber-reinforced plastic form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.

2.3 STEEL REINFORCEMENT

- A. Reinforcing Bars: ASTM A 615/A 615M, Grade 60, deformed.
- B. Plain-Steel Wire: ASTM A 82, as drawn.
- C. Plain-Steel Welded Wire Fabric: ASTM A 185, fabricated from as-drawn steel wire into flat sheets.

2.4 REINFORCEMENT ACCESSORIES

- A. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire fabric in place. Manufacture bar supports according to CRSI's "Manual of Standard Practice" from steel wire, plastic, or precast concrete or fiber-reinforced concrete of greater compressive strength than concrete, and as follows:
 - 1. For concrete surfaces exposed to view where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected or CRSI Class 2 stainless-steel bar supports.
- B. Add other products for dowels or dowel sleeves if required. These include circular and rectangular plastic dowel sleeves, square dowels, and plastic-surfaced or reinforced-paper-covered dowels.
- C. Joint Dowel Bars: Plain-steel bars, ASTM A 615/A 615M, Grade 60. Cut bars true to length with ends square and free of burrs.

2.5 CONCRETE MATERIALS

- A. Portland Cement: ASTM C 150, Type I/II
 - 1. Fly Ash: ASTM C 618, Class F or Class C
- B. Normal-Weight Aggregate: ASTM C 33, uniformly graded, and as follows:
 - 1. Class: Moderate weathering region, but not less than 3M.
 - 2. Nominal Maximum Aggregate Size: 3/4 inch.
- C. Lightweight Aggregate: ASTM C 330.
 - 1. Nominal Maximum Aggregate Size: 3/4 inch.
- D. Water: Potable and complying with ASTM C 94.

2.6 ADMIXTURES

- A. General: Admixtures certified by manufacturer to contain not more than 0.1 percent water-soluble chloride ions by mass of cementitious material and to be compatible with other admixtures and cementitious materials. Do not use admixtures containing calcium chloride.
- B. Water-Reducing Admixture: ASTM C 494, Type A.
- C. Retarding Admixture: ASTM C494, Type B
- D. High-Range, Water-Reducing Admixture: ASTM C 494, Type F.

- E. Water-Reducing and Accelerating Admixture: ASTM C 494, Type E.
- F. Water-Reducing and Retarding Admixture: ASTM C 494, Type D.
- G. High-Range, Water-Reducing and Retarding Admixture: ASTM C494, Type G
- H. Set-Accelerating Corrosion-Inhibiting Admixture: Commercially formulated, anodic inhibitor or mixed cathodic and anodic inhibitor; capable of forming a protective barrier and minimizing chloride reactions with steel reinforcement in concrete and complying with ASTM C393 Type C
- I. Non-Set-Accelerating Corrosion-Inhibiting Admixture: Commercially formulated, anodic inhibitor or mixed cathodic and anodic inhibitor; capable of forming a protective barrier and minimizing chloride reactions with steel reinforcement in concrete.

2.7 WATERSTOPS

- A. Self-Expanding Butyl Strip Waterstops: Manufactured rectangular or trapezoidal strip, butyl rubber with sodium bentonite or other hydrophilic polymers, for adhesive bonding to concrete, $\frac{3}{4}$ by 1 inch.
 - 1. Products:
 - a. Colloid Environmental Technologies Company; Volclay Waterstop-RX.
 - b. Concrete Sealants Inc.; Conseal CS-231.
 - c. Greenstreak; Swellstop.
 - d. Henry Company, Sealants Division; Hydro-Flex.
 - e. JP Specialties Inc.; Earthshield Type 20.
 - f. Progress Unlimited Inc.; Superstop.
 - g. TCMiraDRI; Mirastop.

2.8 VAPOR BARRIER

- A. Vapor Barrier: ASTM E 1745, Class A, high density rubber modified polyolefin sheet.
 - 1. Properties:
 - a. Min. Permeance: ASTM E-96, 0.02 perms.
 - b. Water Vapor Retarder: ASTM E-1745, meets or exceeds Class A.
 - c. Thickness of Retarder: ACI 302.112-96, not less than 15 mils.
 - 2. Manufacturers:
 - a. Stego Wrap, (877) 464-7834.
 - b. Griffolyn 15 by Reef Industries, (800) 231-6075.
 - c. Moistop Ultra 15 by Fortifiber Industries, (800) 773-4777.
 - d. Perminator 15, W.R. Meadows Inc.
 - e. Vapor Block 15 by Raven Industries.
 - f. Viper Vapor Check II 15 mil by Insulation Solutions.
 - 3. Seam Tape and Penetration Tape:
 - a. Manufacturer's recommended tape.

2.9 FLOOR AND SLAB TREATMENTS

- A. Penetrating Liquid Floor treatment: Clear, Chemically reactive, waterborne solution of inorganic silicate or silicate materials and proprietary components; odorless; colorless; that penetrates, hardens, and densifies concrete surfaces.
 - 1. Penetrating Silicant Floor Hardeners

- a. Day-Chem J-17; Dayton Superior Corporation.
 - b. Euco Diamond Hard; Euclid Chemical Co.
 - c. Seal Hard; L&M Construction Chemicals, Inc.
 - d. Intraseal; Conspec.
 - e. Liquihard, W.R. Meadows Inc.
- B. Dry Shake Colored Hardener: Factory proportioned, mixed, and packaged, ready-to-use surface hardener.
1. Color: As selected by Architect.
 - a. Albedo: As selected by Architect

2.10 CURING MATERIALS

- A. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.
- B. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.
- C. Water: Potable.
- D. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B
 1. Dissipating
 2. Non-Dissipating, certified by manufacturer not to interfere with bonding of floor covering.

2.11 RELATED MATERIALS

- A. Joint-Filler Strips: 100% recycled rubber meeting ASTM D 1751 and ASTM D 1752.
- B. Bond Breaker: Felt Underlayment: Type II, asphalt-saturated organic felt, complying with ASTM D 226 (No. 30) or ASTM D 4869.
- C. Epoxy Joint Filler: Two-component, semi-rigid, 100 percent solids, epoxy resin with a Shore A hardness of 80 per ASTM D 2240.
- D. Bonding Agent: ASTM C 1059, Type II, non-redispersible, acrylic emulsion or styrene butadiene.
- E. Epoxy-Bonding Adhesive: ASTM C 881, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class and grade to suit requirements, and as follows:
 1. Type II, non-load bearing, for bonding freshly mixed concrete to hardened concrete.

2.12 CONCRETE MIXES

- A. Prepare design mixes for each type and strength of concrete determined by either laboratory trial mix or field test data bases, as follows:
 1. Proportion normal-weight concrete according to ACI 211.1, ACI 301, and ACI 318.
- B. Use a qualified independent testing agency for preparing and reporting proposed mix designs for the laboratory trial mix basis.
- C. Footings and Foundation Walls: Proportion normal-weight concrete mix as follows:
 1. Compressive Strength (28 Days): As indicated on Structural Drawings.
 2. Maximum Slump: 4 inches.
 3. Maximum Slump for Concrete Containing High-Range Water-Reducing Admixture: 8 inches after admixture is added to concrete with 2- to 4-inch slump.
- D. Slab-on-Grade: Proportion normal-weight concrete mix as follows:

1. Compressive Strength (28 Days): As indicated on Structural Drawings.
 2. Minimum Cementitious Materials Content: 470 lb/cu. yd.
 3. Maximum Slump: 3 inches prior to addition of water-reducing admixture; 8 inches after addition of water-reducing admixture.
- E. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than Portland cement in concrete as follows:
1. Combined Fly Ash and Pozzolan: 20 percent.
- F. Maximum Water-Cementitious Materials Ratio:
1. Interior Condition: 0.50
 2. Exterior Condition: 0.45 .
- G. Limit water-soluble, chloride-ion content in hardened concrete to 0.15 percent by weight of cement.
- H. Admixtures: Use admixtures according to manufacturer's written instructions.
1. Use water-reducing admixture or high-range water-reducing admixture (superplasticizer) in concrete, as required, for placement and workability.
 2. Use water-reducing and retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.

2.13 FABRICATING REINFORCEMENT

- A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

2.14 CONCRETE MIXING

- A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94, and furnish batch ticket information.
1. When air temperature is between 85 and 90 deg F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.

PART 3 - EXECUTION

3.1 FORMWORK

- A. Design, erect, shore, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until concrete structure can support such loads.
- B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.
- C. Limit concrete surface irregularities, designated by ACI 347R as abrupt or gradual, as follows:
1. Class A, 1/8 inch, at all floors.
 2. Class B, 1/4 inch, at all other work.
- D. Construct forms tight enough to prevent loss of concrete mortar.
- E. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical. Kerf wood inserts for forming keyways, reglets, recesses, and the like, for easy removal.

1. Do not use rust-stained steel form-facing material.
- F. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces. Provide and secure units to support screed strips; use strike-off templates or compacting-type screeds.
- G. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations.
- H. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work. Determine sizes and locations from trades providing such items.
- I. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.
- J. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.
- K. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

3.2 EMBEDDED ITEMS

- A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use Setting Drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 1. Install anchor bolts, accurately located, to elevations required.

3.3 REMOVING AND REUSING FORMS

- A. General: Formwork, for sides of beams, walls, columns, and similar parts of the Work, that does not support weight of concrete may be removed after cumulatively curing at not less than 50 deg F for 24 hours after placing concrete provided concrete is hard enough to not be damaged by form-removal operations and provided curing and protection operations are maintained.
- B. Leave formwork, for beam soffits, joists, slabs, and other structural elements, that supports weight of concrete in place until concrete has achieved the following:
 1. At least 70 percent of 28-day design compressive strength.
 2. Determine compressive strength of in-place concrete by testing representative field-cured test specimens according to ACI 301.
 3. Remove forms only if shores have been arranged to permit removal of forms without loosening or disturbing shores.
- C. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing material will not be acceptable for exposed surfaces. Apply new form-release agent.
- D. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints. Align and secure joints to avoid offsets. Do not use patched forms for exposed concrete surfaces unless approved by Architect.

3.4 VAPOR BARRIERS

- A. Vapor Barriers: Place, protect, and repair vapor-barrier sheets according to ASTM E 1643 and manufacturer's written instructions. Seal seams, tears and penetrations with vapor barrier seam tape or manufacturer's mastic. Tape perimeter of all vapor barrier penetrations.

3.5 STEEL REINFORCEMENT

- A. General: Comply with CRSI's "Manual of Standard Practice" for placing reinforcement.
 - 1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.
- B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials.
- C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover. Do not tack weld crossing reinforcing bars.
 - 1. Shop- or field-weld reinforcement according to AWS D1.4, where indicated.
- D. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.
- E. Install welded wire fabric in longest practicable lengths on bar supports spaced to minimize sagging. Lap edges and ends of adjoining sheets at least one mesh spacing. Offset laps of adjoining sheet widths to prevent continuous laps in either direction. Lace overlaps with wire.

3.6 JOINTS

- A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.
 - 1. Match joints in slab with control joints in walls
 - 2. Match joints in slab with joints in terrazzo.
- B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.
 - 1. Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints, unless otherwise indicated. Do not continue reinforcement through sides of strip placements of floors and slabs.
 - 2. Form from preformed galvanized steel, plastic keyway-section forms, or bulkhead forms with keys, unless otherwise indicated. Embed keys at least 1-1/2 inches into concrete.
 - 3. Space vertical joints in walls as indicated. Locate joints beside piers integral with walls, near corners, and in concealed locations where possible.
 - 4. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
 - 5. Use epoxy-bonding adhesive at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
- C. Contraction Joints in Slabs-on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of concrete thickness, as follows:
 - 1. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch- wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks.
 - 2. Match joints in slab with control joints in walls
 - 3. Match joints in slab with joints in terrazzo.
- D. Isolation Joints in Slabs-on-Grade: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.
 - 1. Extend joint-filler strips full width and depth of joint, terminating flush with finished concrete surface, unless otherwise indicated.

2. Terminate full-width joint-filler strips not less than 1/2 inch or more than 1 inch below finished concrete surface where joint sealants, specified in Division 07, Section "Joint Protection," are indicated.
 3. Install joint-filler strips in lengths as long as practicable. Where more than one length is required, lace or clip sections together.
- E. Dowel Joints: Install dowel sleeves and dowels or dowel bar and support assemblies at joints where indicated.
1. Use dowel sleeves or lubricate or asphalt-coat one-half of dowel length to prevent concrete bonding to one side of joint.

3.7 CONCRETE PLACEMENT

- A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections have been performed.
- B. Before placing concrete, water may be added at Project site, subject to limitations of ACI 301.
1. Do not add water to concrete after adding high-range water-reducing admixtures to mix.
- C. Deposit concrete continuously or in layers of such thickness that no new concrete will be placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as specified. Deposit concrete to avoid segregation.
- D. Deposit concrete in forms in horizontal layers no deeper than 24 inches and in a manner to avoid inclined construction joints. Place each layer while preceding layer is still plastic, to avoid cold joints.
1. Consolidate placed concrete with mechanical vibrating equipment. Use equipment and procedures for consolidating concrete recommended by ACI 309R.
 2. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations no farther than the visible effectiveness of the vibrator. Place vibrators to rapidly penetrate placed layer and at least 6 inches into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mix constituents to segregate.
- E. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.
1. Consolidate concrete during placement operations so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
 2. Maintain reinforcement in position on chairs during concrete placement.
 3. Screed slab surfaces with a straightedge and strike off to correct elevations.
 4. Slope surfaces uniformly to drains where required.
 5. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, free of humps or hollows, before excess moisture or bleedwater appears on the surface. Do not further disturb slab surfaces before starting finishing operations.
- F. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.

1. When air temperature has fallen to or is expected to fall below 40 deg F, uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 deg F and not more than 80 deg F at point of placement.
 2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
 3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators, unless otherwise specified and approved in mix designs.
- G. Hot-Weather Placement: Place concrete according to recommendations in ACI 305R and as follows, when hot-weather conditions exist:
1. Cool ingredients before mixing to maintain concrete temperature below 90 deg F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
 2. Cover steel reinforcement with water-soaked burlap so steel temperature will not exceed ambient air temperature immediately before embedding in concrete.
 3. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade moisture uniform without standing water, soft spots, or dry areas.

3.8 FINISHING FORMED SURFACES

- A. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defective areas. Remove fins and other projections exceeding 1/8 inch in height.
1. Apply to concrete surfaces exposed to public view or to be covered with a coating or covering material applied directly to concrete, such as waterproofing, dampproofing, veneer plaster, or painting.
 2. Do not apply rubbed finish to smooth-formed finish.
- B. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces, unless otherwise indicated.

3.9 FINISHING FLOORS AND SLABS

- A. General: Comply with recommendations in ACI 302.1R for screeding, restraighening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.
- B. Scratch Finish: While still plastic, texture concrete surface that has been screeded and bull-floated or darbied. Use stiff brushes, brooms, or rakes.
1. Apply scratch finish to surfaces indicated and to surfaces to receive concrete floor topping and other bonded cementitious floor finishes.
- C. Float Finish: Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power driven floats. Restraighten, cut down high spots, and fill low spots. Repeat float passes and restraighening until surface is left with a uniform, smooth, granular texture.
1. Apply float finish to surfaces indicated, to surfaces to receive trowel finish, and to floor and slab surfaces to be covered with fluid-applied or sheet waterproofing, built-up or membrane roofing, or sand-bed terrazzo.
- D. Trowel Finish: After applying float finish, apply first trowel finish and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restraighten until surface is free of

trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.

1. Apply a trowel finish to surfaces indicated and to floor and slab surfaces exposed to view or to be covered with resilient flooring, carpet, ceramic or quarry tile set over a cleavage membrane, paint, or another thin film-finish coating system
 2. Finish and measure surface so gap at any point between concrete surface and an unlevelled freestanding 10-foot- long straightedge, resting on two high spots and placed anywhere on the surface, does not exceed the following:
 - a. 1/8 inch.
- E. Trowel and Fine-Broom Finish: Apply a partial trowel finish, stopping after second troweling, to surfaces indicated, to surfaces to receive resinous flooring, and to surfaces where ceramic or quarry tile is to be installed by either thickset or thin-set method. Immediately after second troweling, and when concrete is still plastic, slightly scarify surface with a fine broom.
- F. Floor Surface Polishing and Treatment:
1. Provide polished concrete floor treatment in entirety of slab indicated in the drawings. Provide consistent finish in all contiguous areas.
 2. Apply floor finish prior to installation of fixtures and accessories.
 3. Diamond polish concrete floor surface with power disc machine recommended by the floor finish manufacturer. Sequence with coarse to fine grit. Installer to determine the optimum starting grit in order to achieve the specified aggregate exposure.
 4. Apply Dry Shake Color Hardener or Liquid Floor Hardener as directed by the product manufacturer.
 5. Remove defects and re-polish defective areas.
 6. Finish edges of floor finish adjoining other materials in a clean and sharp manner.

3.10 MISCELLANEOUS CONCRETE ITEMS

- A. Filling In: Fill in holes and openings left in concrete structures, unless otherwise indicated, after work of other trades is in place. Mix, place, and cure concrete, as specified, to blend with in-place construction. Provide other miscellaneous concrete filling indicated or required to complete Work.
- B. Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and by steel-troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.
- C. Equipment Bases and Foundations: Provide machine and equipment bases and foundations as shown on Drawings. Set anchor bolts for machines and equipment at correct elevations, complying with diagrams or templates of manufacturer furnishing machines and equipment.

3.11 CONCRETE PROTECTION AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and with recommendations in ACI 305R for hot-weather protection during curing.
- B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.

- C. Formed Surfaces: Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces. If forms remain during curing period, moist cure after loosening forms. If removing forms before end of curing period, continue curing by one or a combination of the following methods:
- D. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces, including floors and slabs, concrete floor toppings, and other surfaces, by one or a combination of the following methods:

Concrete Slabs -On-Grade Shall be cured using method No. 1 only.

- 1. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
 - a. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive floor coverings.
 - b. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive penetrating liquid floor treatments.
- 2. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.

3.12 LIQUID FLOOR TREATMENTS

- A. Penetrating Silicant Floor Hardener: Prepare, apply, and finish penetrating liquid floor treatment according to manufacturer's written instructions and ACI 308.
 - 1. Apply at interior concrete floors to receive sealer; loading docks if applicable; dumpster/compactor pads if applicable; and where otherwise indicated.
 - 2. Remove curing compounds, sealers, oil, dirt, laitance, and other contaminants and complete surface repairs.
 - 3. Do not apply to concrete that is less than seven days old unless approved by manufacturer.
 - 4. Apply liquid until surface is saturated, scrubbing into surface until a gel forms; rewet; and repeat brooming or scrubbing. Rinse with water; remove excess material until surface is dry. Apply a second coat in a similar manner if surface is rough or porous.
- B. Concrete Floor Sealer: Prepare, apply, and finish concrete floor sealer according to manufacturer's written instructions and ACI 308.

3.13 JOINT FILLING

- A. Prepare, clean, and install joint filler according to manufacturer's written instructions.
 - 1. Defer joint filling until concrete has aged at least six months. Do not fill joints until construction traffic has permanently ceased.
- B. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact faces of joint clean and dry.
- C. Install semirigid epoxy joint filler full depth in saw-cut joints and at least 2 inches deep in formed joints. Overfill joint and trim joint filler flush with top of joint after hardening.

3.14 CONCRETE SURFACE REPAIRS

- A. Defective Concrete: Repair and patch defective areas when approved by Architect. Remove and replace concrete that cannot be repaired and patched to Architect's approval.
- B. Patching Mortar: Mix dry-pack patching mortar, consisting of one part portland cement to two and one-half parts fine aggregate passing a No. 16 sieve, using only enough water for handling and placing.
- C. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.
 - 1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch in any dimension in solid concrete but not less than 1 inch in depth. Make edges of cuts perpendicular to concrete surface. Clean, dampen with water, and brush-coat holes and voids with bonding agent. Fill and compact with patching mortar before bonding agent has dried. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.
 - 2. Repair defects on surfaces exposed to view by blending white portland cement and standard portland cement so that, when dry, patching mortar will match surrounding color. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching. Compact mortar in place and strike off slightly higher than surrounding surface.
 - 3. Repair defects on concealed formed surfaces that affect concrete's durability and structural performance as determined by Architect.
- D. Repairing Unformed Surfaces: Test unformed surfaces, such as floors and slabs, for finish and verify surface tolerances specified for each surface. Correct low and high areas. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.
 - 1. Repair finished surfaces containing defects. Surface defects include spalls, popouts, honeycombs, rock pockets, crazing and cracks in excess of 0.01 inch wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.
 - 2. After concrete has cured at least 14 days, correct high areas by grinding.
 - 3. Correct localized low areas during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete.
 - 4. Repair defective areas, except random cracks and single holes 1 inch or less in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose steel reinforcement with at least 3/4 inch clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mix as original concrete except without coarse aggregate. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.
 - 5. Repair random cracks and single holes 1 inch or less in diameter with patching mortar. Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Place patching mortar before bonding agent has dried. Compact patching mortar and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.
- E. Perform structural repairs of concrete, subject to Architect's approval, using epoxy adhesive and patching mortar.
- F. Repair materials and installation not specified above may be used, subject to Architect's approval

3.15 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will employ and pay for a qualified independent testing and inspecting agency to sample materials, perform tests, and submit test reports during concrete placement. Sampling and testing for quality control may include those specified in this Article.
- B. Testing Services: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:
 - 1. Testing Frequency: Obtain at least one composite sample for each 100 cu. yd. or fraction thereof of each concrete mix placed each day.
 - a. When frequency of testing will provide fewer than five compressive-strength tests for each concrete mix, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.
 - 2. Slump: ASTM C 143; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mix. Perform additional tests when concrete consistency appears to change.
 - 3. Air Content: ASTM C 231, pressure method, for normal-weight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mix.
 - 4. Concrete Temperature: ASTM C 1064; one test hourly when air temperature is 40 deg F and below and when 80 deg F and above, and one test for each composite sample.
 - 5. Compression Test Specimens: ASTM C 31/C 31M; cast and laboratory cure one set of five standard cylinder specimens for each composite sample.
 - a. Cast and field cure one set of five standard cylinder specimens for each composite sample.
 - b. Two cylinders shall be broken at 7 and 28 days. The fifth cylinder shall be held in reserve and broken at the direction of the structural engineer.
- C. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, Contractor shall evaluate operations and provide corrective procedures for protecting and curing in-place concrete.
- D. Strength of each concrete mix will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi.
- E. Test results shall be reported in writing to Architect, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mix proportions and materials, compressive breaking strength, and type of break for both 7-and 28-day tests.
- F. Nondestructive Testing: Impact hammer, sonoscope, Windsor probe or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.
- G. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42 or by other methods as directed by Architect.

END OF SECTION 033000

SECTION 033543 – POLISHED CONCRETE FINISHING**PART 1 - GENERAL****1.1 SUMMARY**

- A. Section includes polished concrete finishing.
 - 1. Concrete for polished concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, initial finishing, and curing is specified in Section 033000“Cast-in-Place Concrete.”

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include product data for each grinding machine, including types of grinding heads, dust extraction system, joint fillers, concrete densifying impregnators, penetrating sealer, and any other chemicals used in the process.
- B. Polishing Schedule: Submit plan showing polished concrete surfaces and schedule of polishing operations for each area of polished concrete before start of polishing operations. Include locations of joints, including construction joints.
- C. Samples for Verification: For each type of exposed color.

1.3 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
 - 1. Include certification of Installer’s experience.
- B. Material Certificates: For each of the following, signed by manufacturers:
 - 1. Repair materials.
 - 2. Liquid floor treatments.

1.4 QUALITY ASSURANCE

- A. Installer's Qualifications: Firm with not less than three years’ experience in grinding and polishing of concrete flooring similar in complexity to Work required for this Project, including specific requirements indicated.
 - 1. Successfully completed not less than five comparable scale projects using this equipment.
- B. Field Sample Panels: After approval of verification sample and before casting concrete, produce field sample panels to demonstrate the approved range of selections made under Sample submittals. Produce a minimum of three sets of full-scale panels, approximately 48 by 48 inches minimum, to demonstrate the expected range of finish, color, and appearance variations.
 - 1. Locate panels as indicated or, if not indicated, as directed by Architect.
 - 2. Maintain field sample panels during construction in an undisturbed condition as a standard for judging the completed Work.
 - 3. Demolish and remove field sample panels when directed.

- C. Mockups: Before casting concrete, build mockups to verify selections made under Sample submittals and to demonstrate typical joints, surface finish, tolerances, and standard of workmanship. Build mockups to comply with the following requirements, using materials indicated for completed Work:
1. Build mockups in location and of size indicated or, if not indicated, as directed by Architect.
 2. Demonstrate curing, finishing, and protecting of polished concrete.
 3. Subject to compliance with requirements, approved mockups may become part of completed Work if undisturbed at time of Substantial Completion.

PART 2 - PRODUCTS

2.1 LIQUID FLOOR TREATMENTS

- A. Penetrating Liquid Floor Treatments for Polished Concrete Finish: Clear, waterborne solution of inorganic silicate or silicate materials and proprietary components; odorless; that penetrates, hardens, and is suitable for polished concrete surfaces.
1. Basis-of-Design Product: Subject to compliance with requirements, provide Consolideck LS by Prosoco, Inc. or approved substitution by one the following:
 - a. Prosoco, Inc; Consolideck LS (Basis-of-Design).
 - b. ARDEX Americas: PC 50 Lithium Densifier.
 - c. Euclid Chemical Company (The): Euco Diamond Hard.
 - d. L&M Construction Chemicals, Inc.: FGS Hardener Plus.
 - e. QuestMark, a div. of CentiMark Corporation: DiamondQuest Densifying Impregnator.
 - f. W.R. Meadows, Inc.: Induroshine.

PART 3 - EXECUTION

3.1 POLISHING

- A. Polish: Match design reference sample.
- B. Apply polished concrete finish system to cured and prepared slabs to match accepted mockup.
1. Machine grind floor surfaces to receive polished finishes level and smooth and to depth required to reveal aggregate to match approved mockup.
 2. Apply penetrating liquid floor treatment for polished concrete in polishing sequence and per manufacturer's written instructions, allowing recommended drying time between successive coats.
 3. Continue polishing with progressively finer grit diamond polishing pads to gloss level to match approved mockup.
 4. Control and dispose of waste products produced by grinding and polishing operations.
 5. Neutralize and clean polished floor surfaces.

END OF SECTION 033543

SECTION 042000 - UNIT MASONRY**PART 1 - GENERAL****1.1 SUMMARY****A. Section Includes:**

1. Concrete masonry units.
2. Clay face brick.
3. Mortar and grout.
4. Steel reinforcing bars.
5. Masonry-joint reinforcement.
6. Ties and anchors.
7. Embedded flashing.
8. Miscellaneous masonry accessories.

B. Products Installed but not Furnished under This Section:

1. Cast-stone trim in unit masonry.
2. Steel lintels in unit masonry.
3. Steel shelf angles for supporting unit masonry.
4. Cavity wall insulation.

C. Related Requirements:

1. Section 051200 "Structural Steel Framing" for installing anchor sections of adjustable masonry anchors for connecting to structural steel frame.
2. Section 072100 "Thermal Insulation" for cavity wall insulation.
3. Section 076200 "Sheet Metal Flashing and Trim" for exposed sheet metal flashing and for furnishing manufactured reglets installed in masonry joints.

1.2 DEFINITIONS

- A. CMU(s):** Concrete masonry unit(s).
- B. Reinforced Masonry:** Masonry containing reinforcing steel in grouted cells.

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference:** Conduct conference at Project site.
1. Construction sequencing and required time allotted for inspections prior to grouting.
 2. ACI 530 tolerance for placement of reinforcing steel.
 3. Hot and cold weather procedures.
 4. Typical details for reinforcement requirements.
 5. Requirements for horizontal joint reinforcement.
 6. Reinforcement placement tolerance.
 7. Reinforcement anchorage requirements.
 8. Reinforcement lap requirements.
 9. Reinforced masonry construction sequence.
 10. Limits on embedded items in grouted masonry.
 11. Grouting procedures and requirement for mechanical vibration.
 12. Requirements for masonry protection.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For the following:
1. Masonry Units: Show sizes, profiles, coursing, and locations of special shapes.
 2. Stone Trim Units: Show sizes, profiles, and locations of each stone trim unit required.
 3. Reinforcing Steel: Detail bending, lap lengths, and placement of unit masonry reinforcing bars. Comply with ACI 315. Show elevations of reinforced walls.
 - a. Show elevations of all reinforced walls including reinforcing per typical details for all openings including but not limited to openings for ductwork and piping.
 - b. Dowels shall match typical wall reinforcing unless noted otherwise.
 - c. Dowels shall extend a lap distance above finished floor, unless top of footing is more than typical bar lift below finished floor. In such an instance dowel shall extend a lap distance out of footing.
 - d. Coordinate bar lift detailing with sequencing requirements of part 3 of this specification section.
 - e. Layout CMU control joints per contract documents and show associated typical reinforcing.
 - f. General Contractor shall coordinate all necessary openings in masonry walls with all subcontractors and shall provide information to reinforcing steel detailer for preparation of shop drawings.
 - g. Where above the ceiling coordination drawings are a project requirement, the coordination drawings shall be provided to the reinforcing steel detailer to aid in developing elevation of reinforced walls.
 4. Fabricated Flashing: Detail corner units, end-dam units, and other special applications.
- C. Samples for Verification: For each type and color of the following:
1. Clay face brick, in the form of straps of five or more bricks.
 2. Special brick shapes.
 3. Stone trim.
 4. Colored-aggregate mortar. Make Samples using same sand and mortar ingredients to be used on Project.
 5. Weep holes and cavity vents.
 6. Accessories embedded in masonry.

1.5 INFORMATIONAL SUBMITTALS

- A. List of Materials Used in Constructing Mockups: List generic product names together with manufacturers, manufacturers' product names, model numbers, lot numbers, batch numbers, source of supply, and other information as required to identify materials used. Include mix proportions for mortar and grout and source of aggregates.
1. Submittal is for information only. Receipt of list does not constitute approval of deviations from the Contract Documents unless such deviations are specifically brought to the attention of Architect and approved in writing.
- B. Qualification Data: For Installer and testing agency. Material Certificates: For each type and size of the following:
1. Masonry units.
 - a. Include material test reports substantiating compliance with requirements.

- b. For brick, include size-variation data verifying that actual range of sizes falls within specified tolerances.
 - c. For exposed brick, include test report for efflorescence according to ASTM C67.
 - d. For masonry units, include data and calculations establishing average net-area compressive strength of units.
2. Integral water repellent used in CMUs.
 3. Cementitious materials. Include name of manufacturer, brand name, and type.
 4. Mortar admixtures.
 5. Preblended, dry mortar mixes. Include description of type and proportions of ingredients.
 6. Grout mixes. Include description of type and proportions of ingredients.
 7. Reinforcing bars.
 8. Joint reinforcement.
 9. Anchors, ties, and metal accessories.
- C. Mix Designs: For each type of mortar and grout. Include description of type and proportions of ingredients.
1. Include test reports for mortar mixes required to comply with property specification. Test according to ASTM C109/C109M for compressive strength, ASTM C1506 for water retention, and ASTM C91/C91M for air content.
 2. Include test reports, according to ASTM C1019, for grout mixes required to comply with compressive strength requirement.
- D. Statement of Compressive Strength of Masonry: For each combination of masonry unit type and mortar type, provide statement of average net-area compressive strength of masonry units, mortar type, and resulting net-area compressive strength of masonry determined according to TMS 602/ACI 530.1/ASCE 6.
- E. Cold-Weather and Hot-Weather Procedures: Detailed description of methods, materials, and equipment to be used to comply with requirements.

1.6 QUALITY ASSURANCE

- A. Bonded Masonry Installer: A single, experienced firm specializing in masonry construction with a minimum five year record of successful completion of projects of similar scope, capable of providing labor and material and performance bonds for its portion of the Work that are acceptable to the Owner. Installer shall furnish all required materials and equipment and perform the work of this Section with its own regular employees.
1. The masonry supervisor/foreman shall have had at least 5 years of experience with at least 5 projects of similar size and nature; he shall not act as or become a production worker.
 2. The lead/crew chief masons shall have had at least 3 years of experience with at least 5 projects of similar size and nature;
 3. Installer shall have experienced superintendent and crew chiefs on site supervising the work whenever work is in progress.
 4. Contractor's Own Forces: Contractor may utilize own forces for work of this Section when Contractor and Contractor's superintendent and crew chiefs meet the above qualifications.
- B. Installer Qualifications: Engage an experienced installer who specializes in masonry construction and has completed similar projects in material, design, and extent to that indicated for this Project and with a record of successful in-service performance.

1. Submit list including minimum of five similar projects, including Project name, description of project size and scope, and name and contact information for architect, for Installer, superintendent, and crew chiefs. Indicate total years for experience for each.
- C. Testing Agency Qualifications: An independent agency acceptable to authorities having jurisdiction and qualified according to ASTM C1093 for testing indicated.
- D. Limitations on Aggregates: For concrete masonry units containing recycled materials or post-industrial waste, provide units free of impurities that will cause rusting, staining, or popouts and with a record of successful in-service performance in conditions similar to those expected at Project site.
1. Ferrous material shall be removed by magnetic separation.
 2. Aggregates shall contain no combustible materials or coal cinders.
 3. Aggregates shall be graded and supplied in consistent gradations from batch to batch.
 4. Materials shall be tested according to the following:
 - a. ASTM C40: Organic Impurities in Fine Aggregates for Concrete.
 - b. ASTM C136: Sieve Analysis of Fine and Course Aggregate.
 - c. ASTM C641: Iron Staining Materials in Lightweight Concrete Aggregates.
 - d. ASTM C151: Autoclave Expansion of Hydraulic Cement (for popouts).
 - e. ASTM C331: Lightweight Aggregates for Concrete Masonry Units.
- E. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.
1. Build mockup of typical wall area as shown on Drawings.
 2. Build mockups for each type of exposed unit masonry construction of typical exterior wall in sizes approximately 72 inches long by 96 inches high by full thickness, including face and backup wythes and accessories.
 - a. Include a sealant-filled joint at least 16 inches long in exterior wall mockup.
 - b. Include lower corner of window opening at upper corner of exterior wall mockup. Make opening approximately 12 inches wide by 16 inches high.
 - c. Include through-wall flashing installed for a 24-inch length in corner of exterior wall mockup approximately 16 inches down from top of mockup, with a 12-inch length of flashing left exposed to view (omit masonry above half of flashing).
 - d. Include metal studs, sheathing, sheathing joint-and-penetration treatment air barrier, veneer anchors, flashing, cavity drainage material, and weep holes in exterior masonry-veneer wall mockup.
 - e. Include clay face brick on one face of interior unit masonry wall mockup.
 3. Clean one-half of exposed faces of mockups with masonry cleaner as indicated.
 4. Protect accepted mockups from the elements with weather-resistant membrane.
 5. Approval of mockups is for color, texture, and blending of masonry units; relationship of mortar and sealant colors to masonry unit colors; tooling of joints; and aesthetic qualities of workmanship.
 - a. Approval of mockups is also for other material and construction qualities specifically approved by Architect in writing.
 - b. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 6. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Store masonry units on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied. If units become wet, do not install until they are dry.
- B. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.
- C. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.
- D. Deliver preblended, dry mortar mix in moisture-resistant containers. Store preblended, dry mortar mix in delivery containers on elevated platforms in a dry location or in covered weatherproof dispensing silos.
- E. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

1.8 FIELD CONDITIONS

- A. Protection of Masonry: During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.
 - 1. Extend cover a minimum of 24 inches down both sides of walls, and hold cover securely in place.
 - 2. Where one wythe of multiwythe masonry walls is completed in advance of other wythes, secure cover a minimum of 24 inches down face next to unconstructed wythe, and hold cover in place.
- B. Do not apply uniform floor or roof loads for at least 12 hours and concentrated loads for at least three days after building masonry walls or columns.
- C. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Immediately remove grout, mortar, and soil that come in contact with such masonry.
 - 1. Protect base of walls from rain-splashed mud and from mortar splatter by spreading coverings on ground and over wall surface.
 - 2. Protect sills, ledges, and projections from mortar droppings.
 - 3. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.
 - 4. Turn scaffold boards near the wall on edge at the end of each day to prevent rain from splashing mortar and dirt onto completed masonry.
- D. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace unit masonry damaged by frost or by freezing conditions. Comply with cold-weather construction requirements contained in TMS 602/ACI 530.1/ASCE 6.
 - 1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F and higher and will remain so until masonry has dried, but not less than seven days after completing cleaning.
- E. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in TMS 602/ACI 530.1/ASCE 6.
- F. Cleaning Masonry Surfaces: Comply with manufacturer's requirements and environmental conditions.

PART 2 - PRODUCTS**2.1 MANUFACTURERS**

- A. Source Limitations for Masonry Units: Obtain exposed masonry units of a uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, from single source from single manufacturer for each product required.
- B. Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from single manufacturer for each cementitious component and from single source or producer for each aggregate.

2.2 PERFORMANCE REQUIREMENTS

- A. Provide unit masonry that develops indicated net-area compressive strengths at 28 days.
 - 1. Determine net-area compressive strength of masonry from average net-area compressive strengths of masonry units and mortar types (unit-strength method) according to TMS 602/ACI 530.1/ASCE 6.
 - a. For Concrete Masonry Units: $f'_m = 2000$ psi.
 - 2. Determine net-area compressive strength of masonry by testing masonry prisms according to ASTM C1314.

2.3 UNIT MASONRY, GENERAL

- A. Masonry Standard: Comply with TMS 602/ACI 530.1/ASCE 6, except as modified by requirements in the Contract Documents.
- B. Defective Units: Referenced masonry unit standards may allow a certain percentage of units to contain chips, cracks, or other defects exceeding limits stated. Do not use units where such defects are exposed in the completed Work.
- C. Fire-Resistance Ratings: Comply with requirements for fire-resistance-rated assembly designs indicated.
 - 1. Where fire-resistance-rated construction is indicated, units shall be listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction.

2.4 CONCRETE MASONRY UNITS

- A. Shapes: Provide shapes indicated and as follows, with exposed surfaces matching exposed faces of adjacent units unless otherwise indicated.
 - 1. Provide special shapes for lintels, corners, jambs, sashes, movement joints, headers, bonding, and other special conditions.
 - 2. Provide square-edged units for outside corners unless otherwise indicated.
- B. Integral Water Repellent: Provide units made with integral water repellent for exposed units and where indicated.
 - 1. Integral Water Repellent: Liquid polymeric, integral water-repellent admixture that does not reduce flexural bond strength. Units made with integral water repellent, when tested according to ASTM E514/E514M as a wall assembly made with mortar containing integral water-repellent

manufacturer's mortar additive, with test period extended to 24 hours, shall show no visible water or leaks on the back of test specimen.

- a. Products: Subject to compliance with requirements, provide one of the following:
- 1) Euclid Chemical Company (The); Eucon Blocktite.
 - 2) GCP Applied Technologies; Dry-Block Block Admixture.
 - 3) Master Builders Solutions; an MBCC Group company; MasterPel 240.

C. CMUs: ASTM C90.

1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 2000 psi.
2. Density Classification: Lightweight unless otherwise indicated.
3. Size (Width): Manufactured to dimensions 3/8 inch less than nominal dimensions.

2.5 BRICK

A. General: Provide shapes indicated and as follows, with exposed surfaces matching finish and color of exposed faces of adjacent units:

1. For ends of sills and caps and for similar applications that would otherwise expose unfinished brick surfaces, provide units without cores or frogs and with exposed surfaces finished.
2. Provide special shapes for applications where stretcher units cannot accommodate special conditions, including those at corners, movement joints, bond beams, sashes, and lintels.
3. Provide special shapes for applications requiring brick of size, form, color, and texture on exposed surfaces that cannot be produced by sawing.
4. Provide special shapes for applications where shapes produced by sawing would result in sawed surfaces being exposed to view.

B. Clay Face Brick: Facing brick complying with ASTM C216.

1. Basis-of-Design: Subject to compliance with requirements, provide the Basis-of-Design products indicated on Drawings or comparable products by one of the following:
 - a. General Shale Brick, Inc.
 - b. Red River Brick.
 - c. Taylor Clay Products, Inc.
2. Grade: SW.
3. Type: FBS.
4. Initial Rate of Absorption: Less than 30 g/30 sq. in. per minute when tested according to ASTM C67.
5. Efflorescence: Provide brick that has been tested according to ASTM C67 and is rated "not effloresced."
6. Brick Sizes: As indicated on Drawings.
7. Application: Use where brick is exposed unless otherwise indicated.
8. Color and Texture: As indicated on Drawings.

2.6 MORTAR AND GROUT MATERIALS

A. Portland Cement: ASTM C150/C150M, Type I or II, except Type III may be used for cold-weather construction. Provide natural color or white cement as required to produce mortar color indicated.

1. Alkali content shall not be more than 0.1 percent when tested according to ASTM C114.

B. Hydrated Lime: ASTM C207, Type S.

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- C. Portland Cement-Lime Mix: Packaged blend of portland cement and hydrated lime containing no other ingredients.
1. Manufacturers: Subject to compliance with requirements, provide one of the following:
 - a. Argos USA; Eaglebond Portland Cement Lime.
 - b. Holcim U.S.; Cement-Lime.
 - c. SPEC MIX, Inc.; Portland Lime & Sand Masonry Mortar.
- D. Masonry Cement: Not permitted.
- E. Mortar Cement: ASTM C1329/C1329M.
1. Manufacturers: Subject to compliance with requirements, provide one of the following:
 - a. Argos USA; Superbond Mortar Cement.
 - b. Holcim U.S.; Mortar Cement.
 - c. SPEC MIX, Inc.; Mortar Cement and Sand Mortar.
- F. Colored Cement Products: Packaged blend made from portland cement and hydrated lime and mortar pigments, all complying with specified requirements, and containing no other ingredients.
1. Manufacturers: Subject to compliance with requirements, provide one of the following:
 - a. Argos USA; Eaglebond Mortar Cement.
 - b. Holcim U.S.; Holcim Mortamix Custom Color Mortar Cement.
 - c. SPEC MIX, Inc.; Colored Mortar.
 2. Formulate blend as required to produce color indicated or, if not indicated, as selected from manufacturer's standard colors.
 3. Pigments shall not exceed 10 percent of portland cement by weight.
 4. Pigments shall not exceed 5 percent of mortar cement by weight.
- G. Aggregate for Mortar: ASTM C144.
1. For mortar that is exposed to view, use washed aggregate consisting of natural sand or crushed stone.
 2. White-Mortar Aggregates: Natural white sand or crushed white stone.
 3. Colored-Mortar Aggregates: Natural sand or crushed stone of color necessary to produce required mortar color.
- H. Aggregate for Grout: ASTM C404.
- I. Cold-Weather Admixture: Nonchloride, noncorrosive, accelerating admixture complying with ASTM C494/C494M, Type C, and recommended by manufacturer for use in masonry mortar of composition indicated.
1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Euclid Chemical Company (The); Accelguard 80.
 - b. GCP Applied Technologies; Morset.
- J. Water-Repellent Admixture: Liquid water-repellent mortar admixture intended for use with CMUs containing integral water repellent from same manufacturer.
1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Euclid Chemical Company (The); Eucon Blocktite.
 - b. GCP Applied Technologies; Dry-Block Block Admixture.
 - c. Master Builders Solutions; a BASF company; MasterPel 240.

- K. Water: Potable.

2.7 REINFORCEMENT

- A. Uncoated-Steel Reinforcing Bars: ASTM A615/A615M or ASTM A996/A996M, Grade 60.
- B. Reinforcing Bar Positioners: Wire units designed to fit into mortar bed joints spanning masonry unit cells and to hold reinforcing bars in center of cells. Units are formed from 0.148-inch steel wire, hot-dip galvanized after fabrication. Provide units designed for number of bars indicated.
- C. Masonry-Joint Reinforcement, General: ASTM A951/A951M.
1. Interior Walls: Hot-dip galvanized carbon steel.
 2. Exterior Walls: Hot-dip galvanized carbon steel.
 3. Wire Size for Side Rods: 0.187-inch diameter.
 4. Wire Size for Cross Rods: 0.187-inch diameter.
 5. Wire Size for Veneer Ties: 0.187-inch diameter.
 6. Spacing of Cross Rods, Tabs, and Cross Ties: Not more than 16 inches o.c.
 7. Provide in lengths of not less than 10 feet, with prefabricated corner and tee units.
- D. Masonry-Joint Reinforcement for Single-Wythe Masonry: Ladder or truss type with single pair of side rods.
- E. Masonry-Joint Reinforcement for Multiwythe Masonry:
1. Ladder type with one side rod at each face shell of hollow masonry units more than 4 inches wide, plus one side rod at each wythe of masonry 4 inches wide or less.
 2. Adjustable (two-piece) type, either ladder or truss design, with one side rod at each face shell of backing wythe and with separate adjustable ties with pintle-and-eye connections having a maximum horizontal play of 1/16 inch and maximum vertical adjustment of 1-1/4 inches. Size ties to extend at least halfway through facing wythe but with at least 5/8-inch cover on outside face.

2.8 TIES AND ANCHORS

- A. General: Ties and anchors shall extend at least 1-1/2 inches into veneer but with at least a 5/8-inch cover on outside face.
- B. Materials: Provide ties and anchors specified in this article that are made from materials that comply with the following unless otherwise indicated:
1. Hot-Dip Galvanized, Carbon-Steel Wire: ASTM A82/A82M, with ASTM A153/A153M, Class B-2 coating.
 2. Galvanized-Steel Sheet: ASTM A653/A653M, Commercial Steel, G60 zinc coating.
 3. Steel Sheet, Galvanized after Fabrication: ASTM A1008/A1008M, Commercial Steel, with ASTM A153/A153M, Class B coating.
 4. Steel Plates, Shapes, and Bars: ASTM A36/A36M.
- C. Individual Wire Ties: Rectangular units with closed ends and not less than 4 inches wide.
1. Z-shaped ties with ends bent 90 degrees to provide hooks not less than 2 inches long may be used for masonry constructed from solid units.
 2. Where wythes do not align, use adjustable ties with pintle-and-eye connections having a maximum adjustment of 1-1/4 inches.
 3. Wire: Fabricate from 3/16-inch- diameter, hot-dip galvanized steel wire. Mill-galvanized wire ties may be used in interior walls unless otherwise indicated.

- D. Adjustable Anchors for Connecting to Structural Steel Framing: Provide anchors that allow vertical or horizontal adjustment but resist tension and compression forces perpendicular to plane of wall.
1. Anchor Section for Welding to Steel Frame: Crimped 1/4-inch- diameter, hot-dip galvanized steel wire. Mill-galvanized wire may be used at interior walls unless otherwise indicated.
 2. Tie Section: Triangular-shaped wire tie made from 0.187-inch- diameter, hot-dip galvanized steel wire. Mill-galvanized wire may be used at interior walls unless otherwise indicated.
- E. Partition Top Anchors: 0.105-inch- thick metal plate with a 3/8-inch- diameter metal rod 6 inches long welded to plate and with closed-end plastic tube fitted over rod that allows rod to move in and out of tube. Fabricate from steel, hot-dip galvanized after fabrication.
- F. Rigid Anchors: Fabricate from steel bars 1-1/2 inches wide by 1/4 inch thick by 24 inches long, with ends turned up 2 inches or with cross pins unless otherwise indicated.
1. Corrosion Protection: Hot-dip galvanized to comply with ASTM A153/A153M.
- G. Adjustable Masonry-Veneer Anchors:
1. General: Provide anchors that allow vertical adjustment but resist a 100-lbf load in both tension and compression perpendicular to plane of wall without deforming or developing play in excess of 1/16 inch.
 2. Fabricate wire ties from 0.187-inch- diameter, hot-dip galvanized-steel wire unless otherwise indicated.
 3. Screw-Attached, Masonry-Veneer Anchors: Units consisting of a wire tie and a metal anchor section. Provide gasketed anchor or separate self-adhering tape to seal penetrations in air barrier. Confirm tape is compatible with fluid-applied air barrier.
 - a. Products: Subject to compliance with requirements, provide one of the following:
 - 1) Hohmann & Barnard, Inc.; X-Seal Veneer Anchor with x-seal tape.
 - 2) Heckman Building Products; #315D anchor plate with #316 triangular ties and
 - 3) Wire Mold; Type III Screw-on Veneer Anchor with Anchorseal tape.
 4. Polymer-Coated, Steel Drill Screws for Steel Studs: ASTM C954 except manufactured with hex washer head and neoprene or EPDM washer, No. 10 diameter by length required to penetrate steel stud flange with not less than three exposed threads, and with organic polymer coating with salt-spray resistance to red rust of more than 800 hours according to ASTM B117.
 5. Stainless Steel Drill Screws for Steel Studs: ASTM C954 except manufactured with hex washer head and neoprene or EPDM washer, No. 10 diameter by length required to penetrate steel stud flange with not less than three exposed threads; either made from Type 410 stainless steel or made with a carbon-steel drill point and 300 Series stainless steel shank.

2.9 EMBEDDED FLASHING MATERIALS

- A. Metal Flashing: As specified in Section 076200 "Sheet Metal Flashing and Trim."
- B. Flexible Flashing: Use one of the following unless otherwise indicated:
1. Copper-Laminated Flashing: 5-oz./sq. ft. copper core with polymer fabric laminated to copper face on both sides with non-asphaltic adhesive. Use only where flashing is fully concealed in masonry.
 - a. Products: Subject to compliance with requirements, provide one of the following:
 - 1) STS Coatings; Wall Guard Copper TWF.
 - 2) Wire-Bond; Copper Seal.
 - 3) York Manufacturing, Inc.; Multi-Flash 500.

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2. Laminated Stainless Steel Fabric Flashing, Non-Asphaltic: Stainless steel core with polymer fabric laminated to one stainless steel face with non-asphalt adhesive. Provide with manufacturer recommended accessory items for a complete compatible system.
- a. Products: Subject to compliance with requirements, provide one of the following:
- 1) Hohman and Barnard, Inc.; Mighty-Flash Stainless Steel Fabric Flashing.
 - 2) Illinois Products, Inc.; IPCO Stainless Steel Fabric Flashing
 - 3) STS Coatings, Inc.; Gorilla Flash Stainless Fabric
 - 4) TK Products, Inc.; TK TWF
 - 5) York Manufacturing, Inc.; Multi-Flash SS
3. Self-Adhering Stainless-Steel Flashing: 2-mil, Type 304 stainless steel core with one uncoated stainless steel face with butyl block copolymer adhesive. Use where flashing is fully concealed in masonry.
- a. Products: Subject to compliance with requirements, provide one of the following:
- 1) Hohman and Bernard, Inc.; Mighty-Flash SA.
 - 2) Illinois Products, Inc.; IPCO Self-Adhesive Stainless Steel.
 - 3) TK Products, Inc.; TK Self-Adhering Stainless Steel TWF.
 - 4) Vapro Shield, Inc.; Vapro Thru-Wall Flashing SA.
 - 5) Wire-Bond; Bond'n Flash.
 - 6) York Manufacturing, Inc.; York 304 SS.
- C. Application: Unless otherwise indicated, use the following:
1. Where flashing is indicated to receive counterflashing, use metal flashing.
 2. Where flashing is indicated to be turned down at or beyond the wall face, use metal flashing.
 3. Where flashing is partly exposed and is indicated to terminate at the wall face, use metal flashing with a drip edge.
 4. Where flashing is fully concealed, use metal flashing or flexible flashing.
- D. Solder and Sealants for Sheet Metal Flashings: As specified in Section 076200 "Sheet Metal Flashing and Trim."
1. Solder for Stainless Steel: ASTM B32, Grade Sn60, with acid flux of type recommended by stainless steel sheet manufacturer.
 2. Elastomeric Sealant: ASTM C920, chemically curing silicone sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and remain watertight.
- E. Accessories: Provide preformed inside and outside corners, end dams, other special shapes, and seaming materials produced by flashing manufacturer.
- F. Adhesives, Primers, and Seam Tapes for Flashings: Flashing manufacturer's standard products or products recommended by flashing manufacturer for bonding flashing sheets to each other and to substrates.
- G. Drip Edges: Stainless-steel, 0.016-inch thick.
- H. Termination Bars for Flexible Flashing: Stainless steel sheet 0.019 inch by 1-1/2 inches with a 3/8 inch sealant flange at top.
- 2.10 MISCELLANEOUS MASONRY ACCESSORIES
- A. Compressible Filler: Premolded filler strips complying with ASTM D1056, Grade 2A1; compressible up to 35 percent; of width and thickness indicated; formulated from neoprene, urethane, or PVC.

- B. Preformed Control-Joint Gaskets: Made from styrene-butadiene-rubber compound, complying with ASTM D2000, Designation M2AA-805 or PVC, complying with ASTM D2287, Type PVC-65406 and designed to fit standard sash block and to maintain lateral stability in masonry wall; size and configuration as indicated.
- C. Weep/Cavity Vent Products: Use one of the following unless otherwise indicated:
1. Cellular Plastic Weep/Vent: One-piece, flexible extrusion made from UV-resistant polypropylene copolymer, full height and width of head joint and depth 1/8 inch less than depth of outer wythe, in color selected from manufacturer's standard.
 - a. Products: Subject to compliance with requirements, provide 1 of the following:
 - 1) Advanced Building Products Inc.: Mortar Maze Cell Vent.
 - 2) Heckmann Building Products Inc.: No. 85 Cell Vent.
 - 3) Hohmann & Barnard, Inc.: Quadro-Vent.
 - 4) Mortar Net Solutions: CellVent.
 - 5) Wire-Bond: Cell Vent.
 2. Vinyl Weep Hole/Vent: Units made from flexible PVC, designed to fit into a head joint and consisting of a louvered vertical leg, flexible wings to seal against ends of masonry units, and a top flap to keep mortar out of the head joint; in color selected by Architect.
 - a. Products: Subject to compliance with requirements, provide the following:
 - 1) Hohmann & Barnard, Inc.: #343 Louvered Weep Hole.
 - 2) Williams Products, Inc.: Williams-Goodco Brick Vent.
 - 3) Wire-Bond: Louvered Weepholes.
 - D. Cavity Drainage Material: Free-draining mesh, made from polymer strands that will not degrade within the wall cavity.
 1. Manufacturers: Subject to compliance with requirements, provide one of the following:
 - a. Advanced Building Products Inc.
 - b. Hohmann & Barnard, Inc.
 - c. Mortar Net Solutions.
 2. Configuration: Provide one of the following:
 - a. Strips, full depth of cavity and 10 inches high, with dovetail-shaped notches 7 inches deep that prevent clogging with mortar droppings.

2.11 MASONRY-CELL FILL

- A. Loose-Fill Insulation: Perlite complying with ASTM C549, Type II (surface treated for water repellency and limited moisture absorption) or Type IV (surface treated for water repellency and to limit dust generation).
- B. Lightweight-Aggregate Fill: ASTM C331/C331M.
- C. Insulation Fill (Foam Insulation): Two-component foamed insulation consisting of aqueous resin and foaming agent; containing no polyurethane, polystyrene, polyisocyanurate or petrochemicals;
1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Core-Fill 500 Foam Insulation; Tailored Foam, Inc.
 - b. Tripolymer Insulation; C.P. Chemical Co.
 - c. Polymaster Foam Insulation; Polymaster, Inc.

- D. Sand Fill: Fine-Graded Granular Material: Clean mixture of crushed stone, crushed gravel, and manufactured or natural sand; ASTM D 448, Size 10, with 100 percent passing a 3/8-inch sieve, 10 to 30 percent passing a No. 100 sieve, and at least 5 percent passing No. 200 sieve; complying with deleterious substance limits of ASTM C 33 for fine aggregates.

2.12 MASONRY CLEANERS

- A. Proprietary Acidic Cleaner: Manufacturer's standard-strength cleaner designed for removing mortar/grout stains, efflorescence, and other new construction stains from new masonry without discoloring or damaging masonry surfaces. Use product expressly approved for intended use by cleaner manufacturer and manufacturer of masonry units being cleaned.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Diedrich Technologies, Inc.; a Hohmann & Barnard company.
 - b. EaCo Chem, Inc.
 - c. PROSOCO, Inc.

2.13 MORTAR AND GROUT MIXES

- A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures unless otherwise indicated.
1. Do not use calcium chloride in mortar or grout.
 2. Use portland cement-lime or mortar cement mortar unless otherwise indicated.
 3. For exterior masonry, use portland cement-lime or mortar cement mortar.
 4. For reinforced masonry, use portland cement-lime or] mortar cement mortar.
 5. Add cold-weather admixture (if used) at same rate for all mortar that will be exposed to view, regardless of weather conditions, to ensure that mortar color is consistent.
- B. Preblended, Dry Mortar Mix: Furnish dry mortar ingredients in form of a preblended mix. Measure quantities by weight to ensure accurate proportions, and thoroughly blend ingredients before delivering to Project site.
- C. Mortar for Unit Masonry: Comply with ASTM C270, Proportion Specification. Provide the following types of mortar for applications stated unless another type is indicated or needed to provide required compressive strength of masonry.
1. For reinforced masonry, use Type S.
 2. For mortar parge coats, use Type S.
 3. For exterior, above-grade, load-bearing and nonload-bearing walls and parapet walls; for interior load-bearing walls; for interior nonload-bearing partitions; and for other applications where another type is not indicated, use Type N.
 4. For interior nonload-bearing partitions, Type O may be used instead of Type N.
- D. Colored-Aggregate Mortar: Produce required mortar color by using colored aggregates and natural color or white cement as necessary to produce required mortar color.
1. Mix to match Architect's sample.
 2. Application: Use colored-aggregate mortar for exposed mortar joints with the following units:
 - a. Clay face brick.
 - b. Cast-stone trim units.
- E. Grout for Unit Masonry: Comply with ASTM C476.

1. Use grout of type indicated or, if not otherwise indicated, of type (fine or coarse) that will comply with TMS 602/ACI 530.1/ASCE 6 for dimensions of grout spaces and pour height.
2. Proportion grout in accordance with ASTM C476, Table 1 or paragraph 4.2.2 for specified 28-day compressive strength indicated, but not less than 2000 psi.
3. Provide grout with a slump of 8 to 11 inches as measured according to ASTM C143/C143M.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
 1. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
 2. Verify that foundations are within tolerances specified.
 3. Verify that reinforcing dowels are properly placed.
 4. Verify that substrates are free of substances that impair mortar bond.
- B. Before installation, examine rough-in and built-in construction for piping systems to verify actual locations of piping connections.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

- A. Thickness: Build cavity and composite walls and other masonry construction to full thickness shown. Build single-wythe walls to actual widths of masonry units, using units of widths indicated.
- B. Build chases and recesses to accommodate items specified in this and other Sections.
- C. Leave openings for equipment to be installed before completing masonry. After installing equipment, complete masonry to match construction immediately adjacent to opening.
- D. Use full-size units without cutting if possible. If cutting is required to provide a continuous pattern or to fit adjoining construction, cut units with motor-driven saws; provide clean, sharp, unchipped edges. Allow units to dry before laying unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.
- E. Select and arrange units for exposed unit masonry to produce a uniform blend of colors and textures. Mix units from several pallets or cubes as they are placed.
- F. Wetting of Brick: Wet brick before laying if initial rate of absorption exceeds 30 g/30 sq. in. per minute when tested according to ASTM C67. Allow units to absorb water so they are damp but not wet at time of laying.

3.3 TOLERANCES

- A. Dimensions and Locations of Elements:
 1. For dimensions in cross section or elevation, do not vary by more than plus 1/2 inch or minus 1/4 inch.

2. For location of elements in plan, do not vary from that indicated by more than plus or minus 1/2 inch.
3. For location of elements in elevation, do not vary from that indicated by more than plus or minus 1/4 inch in a story height or 1/2 inch total.

B. Lines and Levels:

1. For bed joints and top surfaces of bearing walls, do not vary from level by more than 1/4 inch in 10 feet, or 1/2-inch maximum.
2. For conspicuous horizontal lines, such as lintels, sills, parapets, and reveals, do not vary from level by more than 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2-inch maximum.
3. For vertical lines and surfaces, do not vary from plumb by more than 1/4 inch in 10 feet, 3/8 inch in 20 feet, or 1/2-inch maximum.
4. For conspicuous vertical lines, such as external corners, door jambs, reveals, and expansion and control joints, do not vary from plumb by more than 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2-inch maximum.
5. For lines and surfaces, do not vary from straight by more than 1/4 inch in 10 feet, 3/8 inch in 20 feet, or 1/2-inch maximum.
6. For vertical alignment of exposed head joints, do not vary from plumb by more than 1/4 inch in 10 feet or 1/2-inch maximum.
7. For faces of adjacent exposed masonry units, do not vary from flush alignment by more than 1/16 inch except due to warpage of masonry units within tolerances specified for warpage of units.

C. Joints:

1. For bed joints, do not vary from thickness indicated by more than plus or minus 1/8 inch, with a maximum thickness limited to 1/2 inch.
2. For exposed bed joints, do not vary from bed-joint thickness of adjacent courses by more than 1/8 inch.
3. For head and collar joints, do not vary from thickness indicated by more than plus 3/8 inch or minus 1/4 inch.
4. For exposed head joints, do not vary from thickness indicated by more than plus or minus 1/8 inch. Do not vary from adjacent bed-joint and head-joint thicknesses by more than 1/8 inch.
5. For exposed bed joints and head joints of stacked bond, do not vary from a straight line by more than 1/16 inch from one masonry unit to the next.

3.4 LAYING MASONRY WALLS

- A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint thicknesses and for accurate location of openings, movement-type joints, returns, and offsets. Avoid using less-than-half-size units, particularly at corners, jambs, and, where possible, at other locations.
- B. Bond Pattern for Exposed Masonry: Unless otherwise indicated, lay exposed masonry in bond pattern indicated on Drawings; do not use units with less-than-nominal 4-inch horizontal face dimensions at corners or jambs.
- C. Lay concealed masonry with all units in a wythe in running bond or bonded by lapping not less than 4 inches. Bond and interlock each course of each wythe at corners. Do not use units with less-than-nominal 4-inch horizontal face dimensions at corners or jambs.
- D. Stopping and Resuming Work: Stop work by stepping back units in each course from those in course below; do not tooth. When resuming work, clean masonry surfaces that are to receive mortar, remove loose masonry units and mortar, and wet brick if required before laying fresh masonry.

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- E. Built-in Work: As construction progresses, build in items specified in this and other Sections. Fill in solidly with masonry around built-in items.
 - F. Fill space between steel frames and masonry solidly with mortar unless otherwise indicated.
 - G. Where built-in items are to be embedded in cores of hollow masonry units, place a layer of metal lath, wire mesh, or plastic mesh in the joint below, and rod mortar or grout into core.
 - H. Fill cores in hollow CMUs with grout 24 inches under bearing plates, beams, lintels, posts, and similar items unless otherwise indicated.
 - I. Build nonload-bearing interior partitions full height of story to underside of solid floor or roof structure above unless otherwise indicated.
 - 1. Install compressible filler in joint between top of partition and underside of structure above.
 - 2. Fasten partition top anchors to structure above and build into top of partition. Grout cells of CMUs solidly around plastic tubes of anchors and push tubes down into grout to provide 1/2-inch clearance between end of anchor rod and end of tube. Space anchors 48 inches o.c. unless otherwise indicated.
 - 3. Wedge nonload-bearing partitions against structure above with small pieces of tile, slate, or metal. Fill joint with mortar after dead-load deflection of structure above approaches final position.
 - 4. At fire-rated partitions, treat joint between top of partition and underside of structure above to comply with Section 078443 "Joint Firestopping."

3.5 MORTAR BEDDING AND JOINTING

- A. General: Prepare mortar in accordance with current Portland Cement Association publications.
- B. Prepare fresh mortar at the rate it will be used, in order to maintain consistent color and workability. Do not use mortar that has stiffened because of hydration. Discard when not used within the time recommended by mortar manufacturer or PCA publications, whichever is shorter. Retemper mortar carefully to avoid color changes, no more than twice per batch.
- C. Measure mortar materials using cubic foot measuring box or other approved container of known volume, of size appropriate for operation. Use a consistent ratio of water to mortar materials, within the range recommended by the mortar manufacturer's written instructions.
 - 1. Measurement of sand by shovel shall not be permitted.
- D. Lay brick and CMUs as follows:
 - 1. Bed face shells in mortar and make head joints of depth equal to bed joints.
 - 2. Bed webs in mortar in all courses of piers, columns, and pilasters.
 - 3. Bed webs in mortar in grouted masonry, including starting course on footings.
 - 4. Fully bed entire units, including areas under cells, at starting course on footings where cells are not grouted.
 - 5. Fully bed units and fill cells with mortar at anchors and ties as needed to fully embed anchors and ties in mortar.
- E. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness unless otherwise indicated.
 - 1. For glazed masonry units, use a nonmetallic jointer 3/4 inch or more in width.

3.6 COMPOSITE MASONRY

- A. Bond wythes of composite masonry together using one of the following methods:
 - 1. Masonry-Joint Reinforcement: Installed in horizontal mortar joints.
 - a. Where bed joints of both wythes align, use ladder-type reinforcement extending across both wythes.
 - b. Where bed joints of wythes do not align, use adjustable-type (two-piece-type) reinforcement with continuous horizontal wire in facing wythe attached to ties.
- B. Bond wythes of composite masonry together using bonding system indicated on Drawings.
- C. Collar Joints: Solidly fill collar joints by parging face of first wythe that is laid and shoving units of other wythe into place.
- D. Corners: Provide interlocking masonry unit bond in each wythe and course at corners unless otherwise indicated.
 - 1. Provide continuity with masonry-joint reinforcement at corners by using prefabricated L-shaped units as well as masonry bonding.
- E. Intersecting and Abutting Walls: Unless vertical expansion or control joints are shown at juncture, bond walls together as follows:
 - 1. Provide rigid metal anchors not more than 48 inches o.c. If used with hollow masonry units, embed ends in mortar-filled cores.

3.7 CAVITY WALLS

- A. Bond wythes of cavity walls together using one of the following methods:
 - 1. Masonry-Joint Reinforcement: Installed in horizontal mortar joints.
 - a. Where bed joints of wythes do not align, use adjustable-type (two-piece-type) reinforcement with continuous horizontal wire in facing wythe attached to ties.
- B. Bond wythes of cavity walls together using bonding system indicated on Drawings.
- C. Keep cavities clean of mortar droppings and other materials during construction. Bevel beds away from cavity, to minimize mortar protrusions into cavity. Do not attempt to trowel or remove mortar fins protruding into cavity.

3.8 ANCHORED MASONRY VENEERS

- A. Anchor masonry veneers to wall framing and concrete and masonry backup with masonry-veneer anchors to comply with the following requirements:
 - 1. Fasten screw-attached anchors through sheathing to wall framing and to concrete and masonry backup with metal fasteners of type indicated. Use two fasteners unless anchor design only uses one fastener.
 - 2. Embed tie sections in masonry joints.
 - 3. Locate anchor sections to allow maximum vertical differential movement of ties up and down.
 - 4. Space anchors as indicated, but not more than 16 inches o.c. vertically and 25 inches o.c. horizontally, with not less than one anchor for each 2.67 sq. ft. of wall area. Install additional anchors within 12 inches of openings and at intervals, not exceeding 36 inches, around perimeter.

- B. Provide not less than 2 inches of airspace between back of masonry veneer and face of sheathing.
 - 1. Keep airspace clean of mortar droppings and other materials during construction. Bevel beds away from airspace, to minimize mortar protrusions into airspace. Do not attempt to trowel or remove mortar fins protruding into airspace.

3.9 MASONRY-JOINT REINFORCEMENT

- A. General: Install entire length of longitudinal side rods in mortar with a minimum cover of 5/8 inch on exterior side of walls, 1/2 inch elsewhere. Lap reinforcement a minimum of 6 inches.
 - 1. Space reinforcement not more than 16 inches o.c.
 - 2. Space reinforcement not more than 8 inches o.c. in foundation walls and parapet walls.
 - 3. Provide reinforcement not more than 8 inches above and below wall openings and extending 12 inches beyond openings in addition to continuous reinforcement.
- B. Interrupt joint reinforcement at control and expansion joints unless otherwise indicated.
- C. Provide continuity at wall intersections by using prefabricated T-shaped units.
- D. Provide continuity at corners by using prefabricated L-shaped units.
- E. Cut and bend reinforcing units as directed by manufacturer for continuity at[**corners,**] returns, offsets, column fireproofing, pipe enclosures, and other special conditions.

3.10 ANCHORING MASONRY TO STRUCTURAL STEEL AND CONCRETE

- A. Anchor masonry to structural steel and concrete, where masonry abuts or faces structural steel or concrete, to comply with the following:
 - 1. Provide an open space not less than 1/2 inch wide between masonry and structural steel or concrete unless otherwise indicated. Keep open space free of mortar and other rigid materials.
 - 2. Anchor masonry with anchors embedded in masonry joints and attached to structure.
 - 3. Space anchors as indicated, but not more than 24 inches o.c. vertically and 36 inches o.c. horizontally.

3.11 CONTROL AND EXPANSION JOINTS

- A. General: Install control- and expansion-joint materials in unit masonry as masonry progresses. Do not allow materials to span control and expansion joints without provision to allow for in-plane wall or partition movement.
- B. Form control joints in concrete masonry using one of the following methods:
 - 1. Fit bond-breaker strips into hollow contour in ends of CMUs on one side of control joint. Fill resultant core with grout, and rake out joints in exposed faces for application of sealant.
 - 2. Install preformed control-joint gaskets designed to fit standard sash block.
 - 3. Install interlocking units designed for control joints. Install bond-breaker strips at joint. Keep head joints free and clear of mortar, or rake out joint for application of sealant.
 - 4. Install temporary foam-plastic filler in head joints, and remove filler when unit masonry is complete for application of sealant.
- C. Form expansion joints in brick as follows:

1. Build flanges of metal expansion strips into masonry. Lap each joint 4 inches in direction of water flow. Seal joints below grade and at junctures with horizontal expansion joints if any.
 2. Build flanges of factory-fabricated, expansion-joint units into masonry.
 3. Build in compressible joint fillers where indicated.
 4. Form open joint full depth of brick wythe and of width indicated, but not less than 3/8 inch for installation of sealant and backer rod specified in Section 079200 "Joint Sealants."
- D. Provide horizontal, pressure-relieving joints by either leaving an airspace or inserting a compressible filler of width required for installing sealant and backer rod specified in Section 079200 "Joint Sealants," but not less than 3/8 inch.
1. Locate horizontal, pressure-relieving joints beneath shelf angles supporting masonry.

3.12 LINTELS

- A. Install steel lintels where indicated.
- B. Provide minimum bearing of 8 inches at each jamb unless otherwise indicated.

3.13 FLASHING, WEEP HOLES, AND CAVITY VENTS

- A. General: Install embedded flashing and weep holes in masonry at shelf angles, lintels, ledges, other obstructions to downward flow of water in wall, and where indicated. Install cavity vents at shelf angles, ledges, and other obstructions to upward flow of air in cavities, and where indicated.
- B. Install flashing as follows unless otherwise indicated:
 1. Prepare masonry surfaces so they are smooth and free from projections that could puncture flashing. Where flashing is within mortar joint, place through-wall flashing on sloping bed of mortar and cover with mortar. Before covering with mortar, seal penetrations in flashing with adhesive, sealant, or tape as recommended by flashing manufacturer.
 2. At multiwythe masonry walls, including cavity walls, extend flashing through outer wythe, turned up a minimum of 4 inches, and through inner wythe to within 1/2 inch of the interior face of wall in exposed masonry. Where interior face of wall is to receive furring or framing, carry flashing completely through inner wythe and turn flashing up approximately 2 inches on interior face.
 3. At masonry-veneer walls, extend flashing through veneer, across airspace behind veneer, and up face of sheathing at least 8 inches; with upper edge tucked under air barrier, lapping at least 4 inches. Fasten upper edge of flexible flashing to sheathing through termination bar.
 4. At lintels and shelf angles, extend flashing a minimum of 6 inches into masonry at each end. At heads and sills, extend flashing 6 inches at ends and turn up not less than 2 inches to form end dams.
 5. Interlock end joints of ribbed sheet metal flashing by overlapping ribs not less than 1-1/2 inches or as recommended by flashing manufacturer, and seal lap with elastomeric sealant complying with requirements in Section 079200 "Joint Sealants" for application indicated.
 6. Install metal drip edges with ribbed sheet metal flashing by interlocking hemmed edges to form hooked seam. Seal seam with elastomeric sealant complying with requirements in Section 079200 "Joint Sealants" for application indicated.
 7. Install metal drip edges beneath flexible flashing at exterior face of wall. Stop flexible flashing 1/2 inch back from outside face of wall, and adhere flexible flashing to top of metal drip edge.
 8. Install metal flashing termination beneath flexible flashing at exterior face of wall. Stop flexible flashing 1/2 inch back from outside face of wall, and adhere flexible flashing to top of metal flashing termination.
 9. Cut flexible flashing off flush with face of wall after masonry wall construction is completed.

- C. Install single-wythe CMU flashing system in bed joints of CMU walls where indicated to comply with manufacturer's written instructions. Install CMU cell pans with upturned edges located below face shells and webs of CMUs above and with weep spouts aligned with face of wall. Install CMU web covers so that they cover upturned edges of CMU cell pans at CMU webs and extend from face shell to face shell.
- D. Install reglets and nailers for flashing and other related construction where they are shown to be built into masonry.
- E. Install weep holes in exterior wythes and veneers in head joints of first course of masonry immediately above embedded flashing.
 - 1. Use specified weep/cavity vent products or open-head joints to form weep holes.
 - 2. Use wicking material to form weep holes above flashing under brick sills. Turn wicking down at lip of sill to be as inconspicuous as possible.
 - 3. Space weep holes 24 inches o.c. unless otherwise indicated.
 - 4. Space weep holes formed from plastic tubing 16 inches o.c.
 - 5. Cover cavity side of weep holes with plastic insect screening at cavities insulated with loose-fill insulation.
 - 6. Trim wicking material flush with outside face of wall after mortar has set.
- F. Place cavity drainage material in airspace behind veneers to comply with configuration requirements for cavity drainage material in "Miscellaneous Masonry Accessories" Article.
- G. Install cavity vents in head joints in exterior wythes at spacing indicated. Use specified weep/cavity vent products to form cavity vents.
 - 1. Close cavities off vertically and horizontally with blocking in manner indicated. Install through-wall flashing and weep holes above horizontal blocking.

3.14 REINFORCED UNIT MASONRY

- A. Temporary Formwork and Shores: Construct formwork and shores as needed to support reinforced masonry elements during construction.
 - 1. Construct formwork to provide shape, line, and dimensions of completed masonry as indicated. Make forms sufficiently tight to prevent leakage of mortar and grout. Brace, tie, and support forms to maintain position and shape during construction and curing of reinforced masonry.
 - 2. Do not remove forms and shores until reinforced masonry members have hardened sufficiently to carry their own weight and that of other loads that may be placed on them during construction.
- B. Placing Reinforcement: Comply with requirements in TMS 602/ACI 530.1/ASCE 6.
- C. Grouting: Do not place grout until entire height of masonry to be grouted has attained enough strength to resist grout pressure.
 - 1. Comply with requirements in TMS 602/ACI 530.1/ASCE 6 for cleanouts and for grout placement, including minimum grout space and maximum pour height.
 - 2. Limit height of vertical grout pours to not more than 60 inches.

3.15 KEY LOCK BOX INSTALLATION

- A. Coordinate location with local fire department.
- B. Install in accordance with manufacturer's written installation instructions.

3.16 FIELD QUALITY CONTROL

- A. Testing and Inspecting: Owner will engage special inspectors to perform tests and inspections and prepare reports. Allow inspectors access to scaffolding and work areas as needed to perform tests and inspections. Retesting of materials that fail to comply with specified requirements shall be done at Contractor's expense.

3.17 PARGING

- A. Use a steel-trowel finish to produce a smooth, flat, dense surface with a maximum surface variation of 1/8 inch per foot. Form a wash at top of parging and a cove at bottom.
- B. Damp-cure parging for at least 24 hours and protect parging until cured.

3.18 REPAIRING, POINTING, AND CLEANING

- A. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Install new units to match adjoining units; install in fresh mortar, pointed to eliminate evidence of replacement.
- B. Pointing: During the tooling of joints, enlarge voids and holes, except weep holes, and completely fill with mortar. Point up joints, including corners, openings, and adjacent construction, to provide a neat, uniform appearance. Prepare joints for sealant application, where indicated.
- C. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.
- D. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:
1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
 2. Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes. Obtain Architect's approval of sample cleaning before proceeding with cleaning of masonry.
 3. Wet wall surfaces with water before applying cleaners; remove cleaners promptly by rinsing surfaces thoroughly with clear water.
 4. Clean brick by bucket-and-brush hand-cleaning or pressurized water cleaning methods described in BIA Technical Notes 20.
 5. Clean masonry with a proprietary acidic cleaner applied according to manufacturer's written instructions.

3.19 MASONRY WASTE DISPOSAL

- A. Excess Masonry Waste: Remove excess clean masonry waste and legally dispose of off Owner's property.

END OF SECTION 042000

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SECTION 047200 - CAST STONE MASONRY**PART 1 - GENERAL****1.1 SUMMARY****A. Section Includes:**

1. Cast-stone trim as indicated on Drawings.

B. Related Sections:

1. Section 042000 "Unit Masonry" for installing cast-stone units in unit masonry.

1.2 ACTION SUBMITTALS**A. Product Data:** For each type of product.

1. For cast-stone units, include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Shop Drawings: Show fabrication and installation details for cast-stone units. Include dimensions, details of reinforcement and anchorages if any, and indication of finished faces.

1. Include building elevations showing layout of units and locations of joints and anchors.

C. Samples for Verification:

1. For each color and texture of cast stone required, 10 inches square in size.
2. For each trim shape required, 10 inches in length.
3. For colored mortar, make Samples using same sand and mortar ingredients to be used on Project. Label Samples to indicate types and amounts of pigments used.

D. Full-Size Samples: For each color, texture, and shape of cast-stone unit required.

1. Make available for Architect's review at Project site.
2. Make Samples from materials to be used for units used on Project immediately before beginning production of units for Project.
3. Approved Samples may be installed in the Work.

1.3 INFORMATIONAL SUBMITTALS**A. Qualification Data:** For manufacturer and testing agency.

1. Include copies of material test reports for completed projects, indicating compliance of cast stone with ASTM C 1364 and of cast-stone masonry veneer with ASTM C 90.

B. Material Test Reports: For each mix required to produce cast stone, based on testing according to ASTM C 1364, including test for resistance to freezing and thawing.

1. Provide test reports based on testing within previous two years.

C. Material Test Reports: For each mix required to produce cast stone masonry veneer, based on testing according to ASTM C 90, including test for resistance to freezing and thawing.

1.4 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A qualified manufacturer of cast-stone units similar to those indicated for this Project, that has sufficient production capacity to manufacture required units, and is a plant certified by the Cast Stone Institute or the Architectural Precast Association.
- B. Testing Agency Qualifications: Qualified according to ASTM E 329 for testing indicated.
- C. Mockups: Furnish cast stone for installation in mockups specified in Section 042000 "Unit Masonry."

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Coordinate delivery of cast stone with unit masonry work to avoid delaying the Work.
- B. Pack, handle, and ship cast-stone units in suitable packs or pallets.
 - 1. Lift with wide-belt slings; do not use wire rope or ropes that might cause staining. Move cast-stone units if required, using dollies with wood supports.
 - 2. Store cast-stone units on wood skids or pallets with nonstaining, waterproof covers, securely tied. Arrange to distribute weight evenly and to prevent damage to units. Ventilate under covers to prevent condensation.
- C. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.
- D. Store mortar aggregates where grading and other required characteristics can be maintained and contamination can be avoided.

1.6 PROJECT CONDITIONS

- A. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Comply with cold-weather construction requirements in TMS 602/ACI 530.1/ASCE 6.
 - 1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F and above and will remain so until cast stone has dried, but no fewer than seven days after completing cleaning.
- B. Hot-Weather Requirements: Comply with hot-weather construction requirements in TMS 602/ACI 530.1/ASCE 6.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations for Cast Stone: Obtain cast-stone units from single source from single manufacturer.
- B. Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color, from one manufacturer for each cementitious component and from one source or producer for each aggregate.

2.2 CAST-STONE MATERIALS

- A. General: Comply with ASTM C 1364.
- B. Portland Cement: ASTM C 150/C 150M, Type I or Type III, containing not more than 0.60 percent total alkali when tested according to ASTM C 114. Provide natural color or white cement as required to produce cast-stone color indicated.
- C. Coarse Aggregates: Granite, quartz, or limestone complying with ASTM C 33/C 33M; gradation and colors as needed to produce required cast-stone textures and colors.
- D. Fine Aggregates: Natural sand or crushed stone complying with ASTM C 33/C 33M, gradation and colors as needed to produce required cast-stone textures and colors.
- E. Color Pigment: ASTM C 979/C 979M, synthetic mineral-oxide pigments or colored water-reducing admixtures; color stable, free of carbon black, nonfading, and resistant to lime and other alkalis.
- F. Admixtures: Use only admixtures specified or approved in writing by Architect.
 - 1. Do not use admixtures that contain more than 0.1 percent water-soluble chloride ions by mass of cementitious materials. Do not use admixtures containing calcium chloride.
 - 2. Use only admixtures that are certified by manufacturer to be compatible with cement and other admixtures used.
 - 3. Air-Entraining Admixture: ASTM C 260/C 260M.
 - 4. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
 - 5. Water-Reducing, Retarding Admixture: ASTM C 494/C 494M, Type D.
 - 6. Water-Reducing, Accelerating Admixture: ASTM C 494/C 494M, Type E.
- G. Reinforcement: Deformed steel bars complying with ASTM A 615/A 615M, Grade 60. Use galvanized or epoxy-coated reinforcement when covered with less than 1-1/2 inches of cast-stone material.
 - 1. Epoxy Coating: ASTM A 775/A 775M.
 - 2. Galvanized Coating: ASTM A 767/A 767M.
- H. Embedded Anchors and Other Inserts: Fabricated from steel complying with ASTM A 36/A 36M and hot-dip galvanized to comply with ASTM A 123/A 123M.

2.3 CAST-STONE UNITS

- A. Cast-Stone Units: Comply with ASTM C 1364.
 - 1. Manufacturers: Subject to compliance with requirements, provide cast stone by ReadingRock or comparable products by one of the following:
 - a. Cast Stone Systems, Inc.
 - b. Continental Cast Stone.
 - c. ReadingRock; RockCast Custom Cast Stone Series.
 - d. Bassco Caststone; Bamastone Corp.
 - 2. Units shall be manufactured using the wet-cast method.
 - 3. Units shall be resistant to freezing and thawing as determined by laboratory testing according to ASTM C 666/C 666M, Procedure A, as modified by ASTM C 1364.
- B. Fabricate units with sharp arris and accurately reproduced details, with indicated texture on all exposed surfaces unless otherwise indicated.

1. Slope exposed horizontal surfaces 1:12 to drain unless otherwise indicated.
2. Provide raised fillets at backs of sills and at ends indicated to be built into jambs.
3. Provide drips on projecting elements unless otherwise indicated.

C. Fabrication Tolerances:

1. Variation in Cross Section: Do not vary from indicated dimensions by more than 1/8 inch.
2. Variation in Length: Do not vary from indicated dimensions by more than 1/360 of the length of unit or 1/8 inch, whichever is greater, but in no case by more than 1/4 inch.
3. Warp, Bow, and Twist: Not to exceed 1/360 of the length of unit or 1/8 inch, whichever is greater.
4. Location of Grooves, False Joints, Holes, Anchorages, and Similar Features: Do not vary from indicated position by more than 1/8 inch on formed surfaces of units and 3/8 inch on unformed surfaces.

D. Cure Units as Follows:

1. Cure units in enclosed, moist curing room at 95 to 100 percent relative humidity and temperature of 100 deg F for 12 hours or 70 deg F for 16 hours.
2. Keep units damp and continue curing to comply with one of the following:
 - a. No fewer than five days at mean daily temperature of 70 deg F or above.
 - b. No fewer than six days at mean daily temperature of 60 deg F or above.
 - c. No fewer than seven days at mean daily temperature of 50 deg F or above.
 - d. No fewer than eight days at mean daily temperature of 45 deg F or above.

E. Acid etch units after curing to remove cement film from surfaces to be exposed to view.

F. Color: Cream.

2.4 MORTAR MATERIALS

A. Provide mortar materials that comply with Section 042000 "Unit Masonry."

B. Portland Cement: ASTM C 150/C 150M, Type I or II, except Type III may be used for cold-weather construction. Provide natural color or white cement as required to produce mortar color indicated.

C. Hydrated Lime: ASTM C 207, Type S.

D. Portland Cement-Lime Mix: Packaged blend of portland cement and hydrated lime containing no other ingredients.

E. Masonry Cement: Not permitted.

F. Colored Cement Product: Packaged blend made from portland cement and hydrated lime or mortar cement and mortar pigments, all complying with specified requirements, and containing no other ingredients.

1. Colored Portland Cement-Lime Mix:

- a. Capital Materials Corporation; Riverton Portland Cement Lime Custom Color.
- b. Essroc Italcementi Group; flamingo-Brixment Portland & Lime Blend in Color.
- c. Holcim (US) Inc.; Rainbow Mortamix Custom Color Cement/Lime.
- d. York Building Products; Workrite Colored Portland Cement & Hydrated Lime.

2. Formulate blend as required to produce color indicated or, if not indicated, as selected from manufacturer's standard colors.

3. Pigments shall not exceed 10 percent of portland cement by weight.
4. Pigments shall not exceed 5 percent of mortar cement by weight.

G. Aggregate for Mortar: ASTM C 144.

1. For mortar that is exposed to view, use washed aggregate consisting of natural sand or crushed stone.
2. For joints less than 1/4 inch thick, use aggregate graded with 100 percent passing the No. 16 sieve.
3. White-Mortar Aggregates: Natural white sand or crushed white stone.

H. Water: Potable.

2.5 ACCESSORIES

- A. Anchors: Type and size indicated, fabricated from steel complying with ASTM A 36/A 36M and hot-dip galvanized to comply with ASTM A 123/A 123M.
- B. Dowels: 1/2-inch- diameter round bars, fabricated from steel complying with ASTM A 36/A 36M and hot-dip galvanized to comply with ASTM A 123/A 123M.
- C. Proprietary Acidic Cleaner: Manufacturer's standard-strength cleaner designed for removing mortar/grout stains, efflorescence, and other new construction stains from new masonry without discoloring or damaging masonry surfaces. Use product expressly approved for intended use by cast-stone manufacturer and expressly approved by cleaner manufacturer for use on cast stone and adjacent masonry materials.
 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Diedrich Technologies, Inc.
 - b. EaCo Chem, Inc.
 - c. ProSoCo, Inc.

2.6 MORTAR MIXES

- A. Comply with requirements in Section 042000 "Unit Masonry" for mortar mixes.
- B. Do not use admixtures including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures unless otherwise indicated.
 1. Do not use calcium chloride in mortar or grout.
 2. Use portland cement-lime or mortar cement mortar unless otherwise indicated.
- C. Comply with ASTM C 270, Proportion Specification.
 1. For setting mortar, use Type S.
- D. Colored-Aggregate Mortar: Produce required mortar color by using colored aggregates and natural color or white cement as necessary to produce required mortar color.
 1. Mix to match color of cast stone.

PART 3 - EXECUTION**3.1 EXAMINATION**

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 SETTING CAST STONE IN MORTAR

- A. Install cast-stone units and cast-stone masonry veneer to comply with requirements in Section 042000 "Unit Masonry."
- B. Set cast stone as indicated on Drawings. Set units accurately in locations indicated, with edges and faces aligned according to established relationships and indicated tolerances.
 - 1. Install anchors, supports, fasteners, and other attachments indicated or necessary to secure units in place.
 - 2. Coordinate installation of cast stone with installation of flashing specified in other Sections.
- C. Wet joint surfaces thoroughly before applying mortar or setting in mortar.
- D. Set units in full bed of mortar with full head joints unless otherwise indicated.
 - 1. Set units with joints 1/4 to 3/8 inch wide unless otherwise indicated.
 - 2. Build anchors and ties into mortar joints as units are set.
 - 3. Fill dowel holes and anchor slots with mortar.
 - 4. Fill collar joints solid as units are set.
 - 5. Build concealed flashing into mortar joints as units are set.
 - 6. Keep head joints in copings and between other units with exposed horizontal surfaces open to receive sealant.
 - 7. Keep joints at shelf angles open to receive sealant.
- E. Rake out joints for pointing with mortar to depths of not less than 3/4 inch. Rake joints to uniform depths with square bottoms and clean sides. Scrub faces of units to remove excess mortar as joints are raked.
- F. Point mortar joints by placing and compacting mortar in layers not greater than 3/8 inch. Compact each layer thoroughly and allow it to become thumbprint hard before applying next layer.
- G. Tool exposed joints slightly concave when thumbprint hard. Use a smooth plastic jointer larger than joint thickness.
- H. Point joints with sealant to comply with applicable requirements in Section 079200 "Joint Sealants."
 - 1. Prime cast-stone surfaces to receive sealant and install compressible backer rod in joints before applying sealant unless otherwise indicated.
- I. Provide sealant joints at head joints of copings and other horizontal surfaces; at expansion, control, and pressure-relieving joints; and at locations indicated.
 - 1. Keep joints free of mortar and other rigid materials.
 - 2. Build in compressible foam-plastic joint fillers where indicated.
 - 3. Form joint of width indicated, but not less than 3/8 inch.

4. Prime cast-stone surfaces to receive sealant and install compressible backer rod in joints before applying sealant unless otherwise indicated.
5. Prepare and apply sealant of type and at locations indicated to comply with applicable requirements in Section 079200 "Joint Sealants."

3.3 SETTING ANCHORED CAST STONE WITH SEALANT-FILLED JOINTS

- A. Set cast stone as indicated on Drawings. Set units accurately in locations indicated, with edges and faces aligned according to established relationships and indicated tolerances.
 1. Install anchors, supports, fasteners, and other attachments indicated or necessary to secure units in place.
 2. Shim and adjust anchors, supports, and accessories to set cast stone in locations indicated with uniform joints.
- B. Keep cavities open where unfilled space is indicated between back of cast-stone units and backup wall; do not fill cavities with mortar or grout.
- C. Fill anchor holes with sealant.
 1. Where dowel holes occur at pressure-relieving joints, provide compressible material at ends of dowels.
- D. Set cast stone supported on clip or continuous angles on resilient setting shims. Use material of thickness required to maintain uniform joint widths. Hold shims back from face of cast stone a distance at least equal to width of joint.
- E. Keep joints free of mortar and other rigid materials. Remove temporary shims and spacers from joints after anchors and supports are secured in place and cast-stone units are anchored. Do not begin sealant installation until temporary shims and spacers are removed.
 1. Form open joint of width indicated, but not less than 3/8 inch.
- F. Prime cast-stone surfaces to receive sealant and install compressible backer rod in joints before applying sealant unless otherwise indicated.
- G. Prepare and apply sealant of type and at locations indicated to comply with applicable requirements in Section 079200 "Joint Sealants."

3.4 INSTALLATION TOLERANCES

- A. Variation from Plumb: Do not exceed 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2 inch maximum.
- B. Variation from Level: Do not exceed 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2 inch maximum.
- C. Variation in Joint Width: Do not vary joint thickness more than 1/8 inch in 36 inches or one-fourth of nominal joint width, whichever is less.
- D. Variation in Plane between Adjacent Surfaces (Lipping): Do not vary from flush alignment with adjacent units or adjacent surfaces indicated to be flush with units by more than 1/16 inch, except where variation is due to warpage of units within tolerances specified.

3.5 ADJUSTING AND CLEANING

- A. Remove and replace stained and otherwise damaged units and units not matching approved Samples. Cast stone may be repaired if methods and results are approved by Architect.
- B. Replace units in a manner that results in cast stone matching approved Samples, complying with other requirements, and showing no evidence of replacement.
- C. In-Progress Cleaning: Clean cast stone as work progresses.
 - 1. Remove mortar fins and smears before tooling joints.
 - 2. Remove excess sealant immediately, including spills, smears, and spatter.
- D. Final Cleaning: After mortar is thoroughly set and cured, clean exposed cast stone as follows:
 - 1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
 - 2. Test cleaning methods on sample; leave one sample uncleaned for comparison purposes. Obtain Architect's approval of sample cleaning before proceeding with cleaning of cast stone.
 - 3. Protect adjacent surfaces from contact with cleaner by covering them with liquid strippable masking agent or polyethylene film and waterproof masking tape.
 - 4. Wet surfaces with water before applying cleaners; remove cleaners promptly by rinsing thoroughly with clear water.
 - 5. Clean cast stone by bucket-and-brush hand-cleaning method described in BIA Technical Notes 20.
 - 6. Clean cast stone with proprietary acidic cleaner applied according to manufacturer's written instructions.

END OF SECTION 047200

SECTION 051200 - STRUCTURAL STEEL FRAMING

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes structural steel and architecturally exposed structural steel.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
 - 1. Division 01, Section "Quality Requirements" for independent testing agency procedures and administrative requirements.
 - 2. Division 05, Section "Steel Decking" for field installation of shear connectors.
 - 3. Division 05, Section "Metal Fabrications" for loose steel bearing plates and miscellaneous steel framing.
 - 4. Division 09 Section "Painting" for surface preparation and priming requirements.

1.2 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Engineer structural steel connections required by the Contract Documents to be selected or completed by the fabricator to withstand design loadings indicated.
- B. Engineering Responsibility: Engage a fabricator who utilizes a qualified professional engineer to prepare calculations, Shop Drawings, and other structural data for structural steel connections.

1.3 SUBMITTALS

- A. Product Data for each type of product specified.
- B. Shop Drawings detailing fabrication of structural steel components.
 - 1. Include details of cuts, connections, splices, camber, holes, and other pertinent data.
 - 2. Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length, and type of each weld.
 - 3. Indicate type, size, and length of bolts, distinguishing between shop and field bolts. Identify high-strength bolted slip-critical, direct-tension, or tensioned shear/bearing connections.
 - 4. Include Shop Drawings signed and sealed by a qualified professional engineer responsible for their preparation.
- C. Qualification data for firms and persons specified in the "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.
- D. Mill test reports signed by manufacturers certifying that their products, including the following, comply with requirements.
 - 1. Structural steel, including chemical and physical properties.
 - 2. Bolts, nuts, and washers, including mechanical properties and chemical analysis.
 - 3. Direct-tension indicators.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: Engage an experienced Installer who has completed structural steel work similar in material, design, and extent to that indicated for this Project and with a record of successful in-service performance.

- B. Fabricator Qualifications: Engage a firm experienced in fabricating structural steel similar to that indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to fabricate structural steel without delaying the Work.
- C. Comply with applicable provisions of the following specifications and documents:
 - 1. AISC's AISC 360-05 "Specification for Structural Steel Buildings."
 - 2. AISC's AISC 341-05 "Seismic Provisions for Structural Steel Buildings (Including Supplement no. 1)."
 - 3. ASTM A 6 "Specification for General Requirements for Rolled Steel Plates, Shapes, Sheet Piling, and Bars for Structural Use."
 - 4. Research Council on Structural Connections' (RCSC) "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."
- D. Professional Engineer Qualifications: A professional engineer who is legally authorized to practice in the jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for projects with structural steel framing that are similar to that indicated for this Project in material, design, and extent.
- E. Welding Standards: Comply with applicable provisions of AWS D1.1 "Structural Welding Code--Steel."
 - 1. Present evidence that each welder has satisfactorily passed AWS qualification tests for welding processes involved and, if pertinent, has undergone recertification.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver structural steel to Project site in such quantities and at such times to ensure continuity of installation.
- B. Store materials to permit easy access for inspection and identification. Keep steel members off ground by using pallets, platforms, or other supports. Protect steel members and packaged materials from erosion and deterioration.
 - 1. Store fasteners in a protected place. Clean and relubricate bolts and nuts that become dry or rusty before use.
 - 2. Do not store materials on structure in a manner that might cause distortion or damage to members or supporting structures. Repair or replace damaged materials or structures as directed.

1.6 SEQUENCING

- A. Supply anchorage items to be embedded in or attached to other construction without delaying the Work. Provide setting diagrams, templates, instructions, and directions, as required, for installation.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Structural Steel W-Shapes
 - 1. High Strength Low Alloy Steel: ASTM A992 (Fy=50 ksi)
- B. Other Structural Steel Shapes, Plates, and Bars: As follows:
 - 1. Carbon Steel: ASTM A36 (Fy = 36 ksi)
 - 2. High Strength Low Alloy Steel: ASTM A572, Grade 50 (Fy = 50 ksi)

- C. Rectangular HSS: ASTM A500, Grade C (Fy = 50 ksi)
- D. Round HSS: ASTM A500, Grade C (Fy = 46 ksi)
- E. Steel Pipe: ASTM A53, Grade B (Fy = 35 ksi)
 - 1. Weight Class: As indicated on the Structural Drawings.
 - 2. Finish: Black.
- F. Shear Connectors: ASTM A 108, Grade 1015 through 1020, headed-stud type, cold-finished carbon steel, AWS D1.1, Type B.
- G. Anchor Rods, Bolts, Nuts, and Washers: As follows:
 - 1. Anchor Rods: ASTM F1554 Grade 36 or Grade 55 with Weldability Supplement S1
 - 2. Common Bolts: ASTM A307, Grade A; carbon-steel, hex-head bolts
 - 3. High Strength Bolts: ASTM A325 or A490, heavy hex steel structural bolts
 - 4. Nuts:
 - 1. Carbon Steel Nuts – with non-high strength bolts
 - 2. Heavy Hex Nuts: ASTM A563 with high strength bolts
 - 5. Washers:
 - 1. Carbon Steel Washers - ASTM A36 with non-high strength bolts.
 - 2. Hardened Steel Washers - ASTM F436 with high strength bolts
 - 3. Direct-Tension Indicators: ASTM F 959.
- H. Welding Electrodes: Comply with AWS requirements.

2.2 PRIMER

- A. Primer: Fabricator's standard lead- and chromate-free, nonasphaltic, rust-inhibiting primer.

2.3 GROUT

- A. Nonmetallic, Shrinkage-Resistant Grout: Premixed, nonmetallic, noncorrosive, nonstaining grout containing selected silica sands, portland cement, shrinkage compensating agents, plasticizing and water-reducing agents, complying with ASTM C 1107, of consistency suitable for application, and a 30-minute working time.

2.4 FABRICATION

- A. Fabricate and assemble structural steel in shop to greatest extent possible. Fabricate structural steel according to AISC specifications referenced in this Section and in Shop Drawings.
 - 1. Camber structural steel members where indicated.
 - 2. Mark and match-mark materials for field assembly.
 - 3. Fabricate for delivery a sequence that will expedite erection and minimize field handling of structural steel.
 - 4. Complete structural steel assemblies, including welding of units, before starting shop-priming operations.
 - 5. Comply with fabrication tolerance limits of AISC's "Code of Standard Practice for Steel Buildings and Bridges" for structural steel.
- B. Fabricate architecturally exposed structural steel with exposed surfaces smooth, square, and free of surface blemishes, including pitting, rust and scale seam marks, roller marks, rolled trade names, and roughness.

1. Remove blemishes by filling, grinding, or by welding and grinding, prior to cleaning, treating, and shop priming.
 2. Comply with fabrication requirements, including tolerance limits, of AISC's "Code of Standard Practice for Steel Buildings and Bridges" for architecturally exposed structural steel.
- C. Thermal Cutting: Perform thermal cutting by machine to greatest extent possible.
1. Plane thermally cut edges to be welded.
- D. Finishing: Accurately mill ends of columns and other members transmitting loads in bearing.
- E. Shear Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Use automatic end welding of headed-stud shear connectors according to AWS D1.1 and manufacturer's printed instructions.
- F. Steel Wall Framing: Select true and straight members for fabricating steel wall framing to be attached to structural steel framing. Straighten as required to provide uniform, square, and true members in completed wall framing.
- G. Welded Door Frames: Build up welded door frames attached to structural steel framing. Weld exposed joints continuously and grind smooth. Plug-weld fixed steel bar stops to frames. Secure removable stops to frames with countersunk, cross-recessed head machine screws, uniformly spaced not more than 10 inches o.c., unless otherwise indicated.
- H. Holes: Provide holes required for securing other work to structural steel framing and for passage of other work through steel framing members, as shown on Shop Drawings.
1. Cut, drill, or punch holes perpendicular to metal surfaces. Do not flame-cut holes or enlarge holes by burning. Drill holes in bearing plates.
 2. Weld threaded nuts to framing and other specialty items as indicated to receive other work.

2.5 SHOP CONNECTIONS

- A. Shop install and tighten non-high-strength bolts, except where high-strength bolts are indicated.
- B. Design, install and tighten high-strength bolts according to RCSC's "Load and Resistance Factor Design - Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."
1. Bolts: ASTM A 325 high-strength bolts, unless otherwise indicated.
 2. Connection Type: Snug tightened, unless indicated as slip-critical, direct-tension, or tensioned shear/bearing connections.
 3. Connection Type: Slip-critical, direct-tension, or tensioned shear/bearing connections as indicated.
- C. Weld Connections: Comply with AWS D1.1 for procedures, appearance and quality of welds, and methods used in correcting welding work.
1. Assemble and weld built-up sections by methods that will maintain true alignment of axes without warp.
 2. Verify that weld sizes, fabrication sequence, and equipment used for architecturally exposed structural steel will limit distortions to allowable tolerances. Prevent surface bleeding of back-side welding on exposed steel surfaces. Grind smooth exposed fillet welds 1/2 inch and larger. Grind flush butt welds. Dress exposed welds.

2.6 SHOP PRIMING

- A. Shop primer is not required on structural steel except:
1. as specified in the architectural drawings .

2. steel to receive a finished paint or is architecturally exposed.
- B. The following steel surfaces shall not receive a shop primer.
 1. Surfaces embedded in concrete or mortar. Extend priming of partially embedded members to a depth of 2 inches.
 2. Surfaces to be field welded.
 3. Surfaces to be high-strength bolted with slip-critical connections.
 4. Surfaces to receive sprayed-on fireproofing.
- C. Surface Preparation: Clean surfaces to be painted. Remove loose rust, loose mill scale, and spatter, slag, or flux deposits. Prepare surfaces according to SSPC specifications as follows:
 1. SSPC-SP 2 "Hand Tool Cleaning."
 2. SSPC-SP 11 "Power Tool Cleaning to Bare Metal."
- D. Priming: Immediately after surface preparation, apply primer according to manufacturer's instructions and at rate recommended by SSPC to provide a dry film thickness of not less than 1.5 mils. Use priming methods that result in full coverage of joints, corners, edges, and exposed surfaces.
 1. Stripe paint corners, crevices, bolts, welds, and sharp edges.
 2. Apply 2 coats of shop paint to inaccessible surfaces after assembly or erection. Change color of second coat to distinguish it from first.

2.7 GALVANIZING

- A. Hot-Dip Galvanized Finish: Apply zinc coating by the hot dip process to structural steel indicated for galvanizing according to ASTM A 123.
- B. Items to receive galvanized finish:
 1. Angle Lintels for brick veneer
 2. Beam Lintels in exterior walls
 3. Members exposed to moisture
 4. Members exposed to exterior conditions
 5. Members identified in the drawings.

2.8 SOURCE QUALITY CONTROL

- A. Owner will engage an independent testing and inspecting agency to perform shop inspections and tests and to prepare test reports.
 1. Testing agency will conduct and interpret tests and state in each report whether test specimens comply with or deviate from requirements.
 2. Provide testing agency with access to places where structural steel Work is being fabricated or produced so required inspection and testing can be accomplished.
- B. Correct deficiencies in or remove and replace structural steel that inspections and test reports indicate do not comply with specified requirements.
- C. Additional testing, at Contractor's expense, will be performed to determine compliance of corrected Work with specified requirements.
- D. Shop-bolted connections will be tested and inspected according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."
 1. Direct-tension indicator gaps will be verified to comply with ASTM F 959, Table 2.
- E. Shop-welded connections will be visually inspected according to AWS D1.1.

- F. In addition to visual inspection, 100% of shop-welded moment weld connections (CJP welds) will be inspected and tested according to AWS D1.1 and the inspection procedures listed below, at testing agency's option.
1. Liquid Penetrant Inspection: ASTM E 165.
 2. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration will not be accepted.
 3. Radiographic Inspection: ASTM E 94 and ASTM E 142; minimum quality level "2-2T."
 4. Ultrasonic Inspection: ASTM E 164.
- G. In addition to visual inspection, shop-welded shear connectors will be inspected and tested according to requirements of AWS D1.1 for stud welding and as follows:
1. Bend tests will be performed when visual inspections reveal either less than a continuous 360-degree flash or welding repairs to any shear connector.
 2. Tests will be conducted on additional shear connectors when weld fracture occurs on shear connectors already tested, according to requirements of AWS D1.1.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Before erection proceeds, and with the steel erector present, verify elevations of concrete and masonry bearing surfaces and locations of anchorages for compliance with requirements.
- B. Do not proceed with erection until unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Provide temporary shores, guys, braces, and other supports during erection to keep structural steel secure, plumb, and in alignment against temporary construction loads and loads equal in intensity to design loads. Remove temporary supports when permanent structural steel, connections, and bracing are in place, unless otherwise indicated.
 1. Do not remove temporary shoring supporting composite deck construction until cast-in-place concrete has attained its design compressive strength.

3.3 ERECTION

- A. Set structural steel accurately in locations and to elevations indicated and according to AISC specifications referenced in this Section.
- B. Base and Bearing Plates: Clean concrete and masonry bearing surfaces of bond-reducing materials and roughen surfaces prior to setting base and bearing plates. Clean bottom surface of base and bearing plates.
 1. Set base and bearing plates for structural members on wedges, shims, or setting nuts as required.
 2. Tighten anchor bolts after supported members have been positioned and plumbed. Do not remove wedges or shims but, if protruding, cut off flush with edge of base or bearing plate prior to packing with grout.
 3. Pack grout solidly between bearing surfaces and plates so no voids remain. Finish exposed surfaces, protect installed materials, and allow to cure.
 1. Comply with manufacturer's instructions for proprietary grout materials.
- C. Maintain erection tolerances of structural steel within AISC's "Code of Standard Practice for Steel Buildings and Bridges."

1. Maintain erection tolerances of architecturally exposed structural steel within AISC's "Code of Standard Practice for Steel Buildings and Bridges."
- D. Align and adjust various members forming part of complete frame or structure before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that will be in permanent contact. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.
 1. Level and plumb individual members of structure.
 2. Establish required leveling and plumbing measurements on mean operating temperature of structure. Make allowances for difference between temperature at time of erection and mean temperature at which structure will be when completed and in service.
- E. Splice members only where indicated.
- F. Remove erection bolts on welded, architecturally exposed structural steel; fill holes with plug welds; and grind smooth at exposed surfaces.
- G. Do not use thermal cutting during erection.
- H. Finish sections thermally cut during erection equal to a sheared appearance.
- I. Do not enlarge unfair holes in members by burning or by using drift pins. Ream holes that must be enlarged to admit bolts.

3.4 FIELD CONNECTIONS

- A. Install and tighten non-high-strength bolts, except where high-strength bolts are indicated.
- B. Design, install and tighten high-strength bolts according to RCSC's "Load and Resistance Factor Design - Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."
 1. Bolts: ASTM A 325 high-strength bolts, unless otherwise indicated.
 2. Connection Type: Snug tightened, unless indicated as slip-critical, direct-tension, or tensioned shear/bearing connections.
 3. Connection Type: Slip-critical, direct-tension, or tensioned shear/bearing connections as indicated.
- C. Weld Connections: Comply with AWS D1.1 for procedures, appearance and quality of welds, and methods used in correcting welding work.
 1. Comply with AISC specifications referenced in this Section for bearing, adequacy of temporary connections, alignment, and removal of paint on surfaces adjacent to field welds.
 2. Assemble and weld built-up sections by methods that will maintain true alignment of axes without warp.
 3. Verify that weld sizes, fabrication sequence, and equipment used for architecturally exposed structural steel will limit distortions to allowable tolerances. Prevent surface bleeding of back-side welding on exposed steel surfaces. Grind smooth exposed fillet welds 1/2 inch and larger. Grind flush butt welds. Dress exposed welds.

3.5 FIELD QUALITY CONTROL

- A. Owner will engage and pay for an independent testing and inspecting agency to perform field inspections and tests and to prepare test reports.
 1. Testing agency will conduct and interpret tests and state in each report whether tested Work complies with or deviates from requirements.
- B. Correct deficiencies in or remove and replace structural steel that inspections and test reports indicate do not comply with specified requirements.

- C. Additional testing, at Contractor's expense, will be performed to determine compliance of corrected Work with specified requirements.
- D. Field-bolted connections will be tested and inspected according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."
 - 1. Direct-tension indicator gaps will be verified to comply with ASTM F 959, Table 2.
- E. Field-welded connections, including deck welds, will be visually inspected according to AWS D1.1.
- F. In addition to visual inspection, 100% of field-welded moment weld connections (CJP welds) will be inspected and tested according to AWS D1.1 and the inspection procedures listed below, at testing agency's option.
 - 1. Liquid Penetrant Inspection: ASTM E 165.
 - 2. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration will not be accepted.
 - 3. Radiographic Inspection: ASTM E 94 and ASTM E 142; minimum quality level "2-2T."
 - 4. Ultrasonic Inspection: ASTM E 164.
- G. In addition to visual inspection, field-welded shear connectors will be inspected and tested according to requirements of AWS D1.1 for stud welding and as follows:
 - 1. Bend tests will be performed when visual inspections reveal either less than a continuous 360-degree flash or welding repairs to any shear connector.
 - 2. Tests will be conducted on additional shear connectors when weld fracture occurs on shear connectors already tested, according to requirements of AWS D1.1.

3.6 CLEANING

- A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint. Apply paint to exposed areas using same material as used for shop painting.
 - 1. Apply by brush or spray to provide a minimum dry film thickness of 1.5 mils.
- B. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on structural steel are included in Division 9 Section "Painting."

END OF SECTION 051200

SECTION 052100 - STEEL JOISTS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Open-web K-series steel joists.
 - 2. Joist accessories.
- B. Related Sections include the following:
 - 1. Division 03, Section "Cast-in-Place Concrete" for installing bearing plates in concrete.
 - 2. Division 04, Section "Unit Masonry" for installing bearing plates in unit masonry.
 - 3. Division 05, Section "Metal Fabrications" for furnishing steel bearing plates.

1.2 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Provide special joists and connections capable of withstanding design loads within limits and under conditions indicated.
- B. Design joists to withstand design loads with total load deflections no greater than the following:
 - 1. Roof Joists: Vertical deflection of $1/240$ of the span.

1.3 SUBMITTALS

- A. Shop Drawings: Show layout, mark, number, type, location, and spacings of joists. Include joining and anchorage details, bracing, bridging, accessories; splice and connection locations and details; and attachments to other construction.
 - 1. Comprehensive engineering analysis signed and sealed by the qualified professional engineer responsible for its preparation.
- B. Welding Certificates: Copies of certificates for welding procedures and personnel.
- C. Mill certificates signed by manufacturers of bolts certifying that their products comply with specified requirements.

1.4 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A firm experienced in manufacturing joists similar to those indicated for this Project and with a record of successful in-service performance.
 - 1. Manufacturer must be certified by SJI to manufacture joists complying with SJI standard specifications and load tables.
 - 2. Assumes responsibility for engineering special joists to comply with performance requirements. This responsibility includes preparation of Shop Drawings and comprehensive engineering analysis by a qualified professional engineer.
 - 3. Professional Engineer Qualifications: A professional engineer who is legally authorized to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of joists that are similar to those indicated for this Project in material, design, and extent.
- B. SJI Specifications: Comply with SJI's "Standard Specifications Load Tables and Weight Tables for Steel Joists and Joist Girders" (hereafter, "Specifications"), applicable to types of joists indicated.

- C. Welding: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code--Steel"; and AWS D1.3 "Structural Welding Code--Sheet Steel."

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, and handle joists as recommended in SJI's "Specifications."
- B. Protect joists from corrosion, deformation, and other damage during delivery, storage, and handling.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Steel: Comply with SJI's "Specifications" for chord and web members.
- B. High-Strength Bolts and Nuts: ASTM A 325, Type 1, heavy hex steel structural bolts, heavy hex carbon-steel nuts, and hardened carbon-steel washers.
 - 1. Finish: Plain, uncoated.
- C. Welding Electrodes: Comply with AWS standards.

2.2 PRIMERS

- A. Primer: Fabricator's standard lead- and chromate-free, nonasphaltic, rust-inhibiting primer.

2.3 OPEN-WEB K-SERIES STEEL JOISTS

- A. Manufacture steel joists according to "Standard Specifications for Open Web Steel Joists, K-Series," in SJI's "Specifications," with steel-angle top- and bottom-chord members, underslung ends, and parallel top chord; of joist type indicated.
 - 1. Joist Type: K-series steel joists.
- B. Comply with AWS requirements and procedures for shop welding, appearance, quality of welds, and methods used in correcting welding work.
- C. Provide holes in chord members for connecting and securing other construction to joists.
- D. Top-Chord Extensions: Extend top chords of joists with SJI's Type S top-chord extensions where indicated, complying with SJI's "Specifications."
- E. Extended Ends: Extend bearing ends of joists with SJI's Type R extended ends where indicated, complying with SJI's "Specifications."
- F. Camber joists according to SJI's "Specifications."
- G. Equip bearing ends of joists with manufacturer's standard beveled ends or sloped shoes if joist slope exceeds 1/4 inch per 12 inches.

2.4 LONG-SPAN STEEL JOISTS

- A. Manufacture steel joists according to "Standard Specifications for Longspan Steel Joists, LH-Series and Deep Longspan Steel Joists, DLH-Series," in SJI's "Specifications," with steel-angle top- and bottom-chord members; of joist type and end and top-chord arrangements as indicated.
 - 1. Joist Type: LH and DLH
- B. Comply with AWS requirements and procedures for shop welding, appearance, quality of welds, and methods used in correcting welding work.
- C. Provide holes in chord members for connecting and securing other construction to joists.
- D. Camber long-span steel joists according to SJI's "Specifications."

- E. Equip bearing ends of joists with manufacturer's standard beveled ends or sloped shoes if joist slope exceeds 1/4 inch per 12 inches.

2.5 JOIST GIRDERS

- A. Manufacture joist girders according to "Standard Specifications for Joist Girders," in SJI's "Specifications," with steel-angle top- and bottom-chord members; with end and top-chord arrangements as indicated.
- B. Comply with AWS requirements and procedures for shop welding, appearance, quality of welds, and methods used in correcting welding work.
- C. Provide holes in chord members for connecting and securing other construction to joist girders.
- D. Camber joist girders according to SJI's "Specifications."
- E. Equip bearing ends of joists with manufacturer's standard beveled ends or sloped shoes if joist slope exceeds 1/4 inch per 12 inches.

2.6 JOIST ACCESSORIES

- A. Bridging: Provide bridging anchors and number of rows of horizontal or diagonal bridging of material, size, and type required by SJI's "Specifications" for type of joist, chord size, spacing, and span.
 - 1. Furnish additional erection bridging if required.
- B. Steel bearing plates with integral anchorages are specified in Division 05, Section "Metal Fabrications."
- C. Supply ceiling extensions, either extended bottom-chord elements or a separate extension unit of enough strength to support ceiling construction. Extend ends to within 1 inch of finished wall surface, unless otherwise indicated.
- D. Supply miscellaneous accessories, including splice plates and bolts required by joist manufacturer to complete joist installation.

2.7 CLEANING AND SHOP PAINTING

- A. Clean and remove loose scale, heavy rust, and other foreign materials from fabricated joists and accessories to be primed by hand-tool cleaning, SSPC-SP 2 or power-tool cleaning, SSPC-SP 3.
- B. Apply one shop coat of primer to joists and joist accessories to be primed to provide a continuous, dry paint film not less than 0.5 mil thick.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine supporting substrates, embedded bearing plates, and abutting structural framing, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Do not install joists until supporting construction is in place and secured.
- B. Install joists and accessories plumb, square, and true to line; securely fasten to supporting construction according to SJI's "Specifications," joist manufacturer's written recommendations, and requirements in this Section.

1. Before installation, splice joists delivered to Project site in more than one piece.
 2. Space, adjust, and align joists accurately in location before permanently fastening.
 3. Install temporary bracing and erection bridging, connections, and anchors to ensure that joists are stabilized during construction.
 4. Delay rigidly connecting bottom-chord extensions to columns or supports until dead loads have been applied.
- C. Field weld joists to supporting steel bearing plates. Coordinate welding sequence and procedure with placement of joists. Comply with AWS requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
- D. Bolt joists to supporting steel framework using high-strength structural bolts, unless otherwise indicated. Comply with RCSC's "Allowable Stress Design Specification for Structural Joints Using ASTM A 325 or ASTM A 490 Bolts" for high-strength structural bolt installation and tightening requirements.
- E. Install and connect bridging concurrently with joist erection, before construction loads are applied. Anchor ends of bridging lines at top and bottom chords if terminating at walls or beams.

3.3 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage and pay for a qualified independent testing and inspecting agency to inspect field welds and high-strength bolted connections.
- B. Field welds will be visually inspected according to AWS D1.1.
- C. In addition to visual inspection, field welds will be tested according to AWS D1.1 and the following procedures, as applicable:
1. Radiographic Testing: ASTM E 94 and ASTM E 142.
 2. Magnetic Particle Inspection: ASTM E 709.
 3. Ultrasonic Testing: ASTM E 164.
 4. Liquid Penetrant Inspection: ASTM E 165.
- D. Bolted connections will be visually inspected.
1. High-strength, field-bolted connections will be tested and verified according to procedures in RCSC's "Allowable Stress Design Specification for Structural Joints Using ASTM A 325 or ASTM A 490 Bolts."
- E. Correct deficiencies in Work that inspections and test reports have indicated are not in compliance with specified requirements.
- F. Additional testing will be performed to determine compliance of corrected Work with specified requirements.

3.4 REPAIRS AND PROTECTION

- A. Repair damaged galvanized coatings on galvanized items with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.
- B. Touchup Painting: After installation, promptly clean, prepare, and prime or reprime field connections, rust spots, and abraded surfaces of prime-painted joists and accessories, bearing plates and abutting structural steel.
1. Clean and prepare surfaces by hand-tool cleaning, SSPC-SP 2, or power-tool cleaning, SSPC-SP 3.
 2. Apply a compatible primer of the same type as the shop primer used on adjacent surfaces.

- C. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure joists and accessories are without damage or deterioration at time of Substantial Completion.

END OF SECTION 052100

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SECTION 053100 - STEEL DECKING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Roof deck.
2. Composite floor deck.

B. Related Sections include the following:

1. Division 03, Section "Cast-in-Place Concrete" for concrete fill and reinforcing steel.
2. Division 05, Section "Structural Steel Framing" for shop-welded shear connectors.
3. Division 05, Section "Metal Fabrications" for framing deck openings with miscellaneous steel shapes.

1.2 SUBMITTALS

- A. Shop Drawings: Show layout and types of deck panels, anchorage details, reinforcing channels, pans, deck openings, special jointing, accessories, and attachments to other construction.
- B. Product Certificates: Signed by steel deck manufacturers certifying that products furnished comply with requirements.
- C. Welding Certificates: Copies of certificates for welding procedures and personnel.

1.3 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who has completed steel deck similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.
- B. Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, qualified according to ASTM E 329 to conduct the testing indicated, as documented according to ASTM E 548.
- C. Welding: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code--Steel," and AWS D1.3, "Structural Welding Code--Sheet Steel."
- D. AISI Specifications: Calculate structural characteristics of steel deck according to AISI's "Specification for the Design of Cold-Formed Steel Structural Members."
- E. FM Listing: Provide steel roof deck evaluated by FM and listed in FM's "Approval Guide, Building Materials" for Class 1 fire rating and Class 1-90 windstorm ratings.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Protect steel deck from corrosion, deformation, and other damage during delivery, storage, and handling.
- B. Stack steel deck on platforms or pallets and slope to provide drainage. Protect with a waterproof covering and ventilate to avoid condensation.

1.5 COORDINATION

- A. Coordinate installation of sound-absorbing insulation strips in topside ribs of acoustical deck with roofing installation specified in the applicable Division 07 roofing section to ensure protection of insulation strips against damage from effects of weather and other causes.

PART 2 - PRODUCTS

2.1 ROOF DECK

- A. Steel Roof Deck: Fabricate panels, without top-flange stiffening grooves, to comply with "SDI Specifications and Commentary for Steel Roof Deck," in SDI Publication No. 29, and the following:
1. Galvanized Steel Sheet: ASTM A 653/A 653M, Structural Steel (SS), Grade **33**, G60 zinc coating.
 2. Type WR, wide rib.
 3. Profile Depth: 1-1/2 inches.
 4. Design Uncoated-Steel Thickness: As indicated.
 5. Side Laps: Nested (Overlapped).

2.2 ACOUSTICAL ROOF DECK

- A. Acoustical Steel Roof Deck: Fabricate panels, with or without top-flange stiffening grooves, to comply with "SDI Specifications and Commentary for Steel Roof Deck," in SDI Publication No. 30, and with the following:
1. Galvanized and Shop-Primed Steel Sheet: ASTM A 653/A 653M, Structural Steel (SS), Grade 50 or higher, minimum ASTM A 924 G60 zinc coating; cleaned, pretreated, and painted with manufacturer's standard primer coating.
 2. ~~Type 1.5 BIA~~ Type 1.5 BA (1-1/2" deep, wide rib, ~~interlocking-nested~~ side lap, acoustical, 36" panel width)
 3. Design Uncoated-Steel Thickness: As indicated on Drawings
 4. Span Condition: As indicated on Drawings.
 5. Side Laps: ~~Interlocking-sea~~ Nested (Overlapped).
 6. Acoustical Perforations: Deck units with manufacturer's standard perforated vertical webs
 7. Acoustical Batt Insulation: Manufacturer's standard pre-molded roll or strip of glass or mineral fiber.
 - a. Acoustical batts packed into each flute of deck, furnished for non-cellular acoustical deck.
 - b. Furnished and Not Installed by the deck manufacturer.
 - c. Installation of sound-absorbing insulation is specified in Division 075216
 8. Acoustical Performance: NRC = 0.90, tested according to ASTM C 423.

2.3 COMPOSITE FLOOR DECK

- A. Composite Steel Floor Deck: Fabricate panels, with integrally embossed or raised pattern ribs and interlocking side laps, to comply with "SDI Specifications and Commentary for Composite Steel Floor Deck," in SDI Publication No. 29, the minimum section properties indicated, and the following:
1. Galvanized Steel Sheet: ASTM A 653/A 653M, Structural Steel (SS), Grade 33, G60 zinc coating.
 2. Profile Depth: As indicated.
 3. Design Uncoated-Steel Thickness: As indicated.

2.4 ACCESSORIES

- A. General: Provide manufacturer's standard accessory materials for deck that comply with requirements indicated.

- B. Side-Lap Fasteners: Corrosion-resistant, hexagonal washer head; self-drilling, carbon-steel screws, No. 10 minimum diameter.
- C. Flexible Closure Strips: Vulcanized, closed-cell, synthetic rubber.
- D. Miscellaneous Sheet Metal Deck Accessories: Steel sheet, minimum yield strength of 33,000 psi, not less than 0.0359-inch design uncoated thickness, of same material and finish as deck; of profile indicated or required for application.
- E. Steel Sheet Accessories: Steel sheet, of same material, finish, and thickness as deck, unless otherwise indicated.
- F. Pour Stops and Girder Fillers: Steel sheet, minimum yield strength of 33,000 psi, of same material and finish as deck, and of thickness and profile recommended by SDI Publication No. 29 for overhang and slab depth.
- G. Column Closures, End Closures, Z-Closures, and Cover Plates: Steel sheet, of same material, finish, and thickness as deck, unless otherwise indicated.
- H. Galvanizing Repair Paint: ASTM A 780.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine supporting frame and field conditions for compliance with requirements for installation tolerances and other conditions affecting performance.

3.2 INSTALLATION, GENERAL

- A. Install deck panels and accessories according to applicable specifications and commentary in SDI Publication No. 29, manufacturer's written instructions, and requirements in this Section.
- B. Install temporary shoring before placing deck panels, if required to meet deflection limitations.
- C. Locate decking bundles to prevent overloading of supporting members.
- D. Place deck panels on supporting frame and adjust to final position with ends accurately aligned and bearing on supporting frame before being permanently fastened. Do not stretch or contract side-lap interlocks.
- E. Place deck panels flat and square and fasten to supporting frame without warp or deflection.
- F. Cut and neatly fit deck panels and accessories around openings and other work projecting through or adjacent to decking.
- G. Provide additional reinforcement and closure pieces at openings as required for strength, continuity of decking, and support of other work.
- H. Comply with AWS requirements and procedures for manual shielded metal arc welding, appearance and quality of welds, and methods used for correcting welding work.
- I. Fasten deck to structure by welding. Do not use mechanical fasteners.

3.3 ROOF DECK INSTALLATION

- A. Fasten roof deck panels to steel supporting members by arc spot (puddle) welds of the surface diameter indicated or arc seam welds with an equal perimeter, but not less than 1-1/2 inches long, and as follows:
 - 1. Weld Diameter: 5/8 inch, nominal.
 - 2. Weld Spacing: As shown on structural drawings but not less than the following: Weld edge and interior ribs of deck units with a minimum of two welds per deck unit at each support.

Space welds 12 inches apart in the field of the roof and 6 inches apart in roof corners and perimeter, based on roof-area definitions of FM Loss Prevention Data Sheet 1-28.

- B. Side-Lap and Perimeter Edge Fastening: As shown on structural drawings but not less than the following: Fasten side laps and perimeter edges of panels between supports, at intervals not exceeding the lesser of 1/2 of the span or 18 inches, and as follows:
 - 1. Mechanically fasten with self-drilling No. 10 diameter or larger carbon-steel screws.
- C. End Bearing: Install deck ends over supporting frame with a minimum end bearing of 1-1/2 inches, with end joints as follows:
 - 1. End Joints: Lapped 2 inches minimum.
- D. Miscellaneous Roof Deck Accessories: Install ridge and valley plates, finish strips, cover plates, end closures, and reinforcing channels according to deck manufacturer's written instructions. Weld to substrate to provide a complete deck installation.
- E. Flexible Closure Strips: Install flexible closure strips over partitions, walls, and where indicated. Install with adhesive according to manufacturer's written instructions to ensure complete closure.
 - 1. Do not install flexible closure strips at top of fire-resistance rated walls where firestopping is required.

3.4 FLOOR DECK INSTALLATION

- A. Fasten floor deck panels to steel supporting members by arc spot (puddle) welds of the surface diameter indicated and as follows:
 - 1. Weld Diameter: 5/8 inch, nominal.
 - 2. Weld Spacing: Weld edge ribs of panels at each support. Space additional welds an average of 12 inches apart, but not more than 18 inches apart, unless otherwise indicated.
- B. Side-Lap and Perimeter Edge Fastening: Fasten side laps and perimeter edges of panels between supports, at intervals not exceeding the lesser of 1/2 of the span or 18 inches, and as follows:
 - 1. Mechanically fasten with self-drilling No. 10 diameter or larger carbon-steel screws.
- C. End Bearing: Install deck ends over supporting frame with a minimum end bearing of 1-1/2 inches, with end joints as follows:
 - 1. End Joints: Lapped.
- D. Shear Connectors: Weld shear connectors through deck to supporting frame according to AWS D1.1 and manufacturer's written instructions. Butt end joints of deck panels; do not overlap. Remove and discard arc shields after welding shear connectors.
- E. Pour Stops and Girder Fillers: Weld steel sheet pour stops and girder fillers to supporting structure according to SDI recommendations, unless otherwise indicated.
- F. Floor Deck Closures: Weld steel sheet column closures, cell closures, and Z-closures to deck, according to SDI recommendations, to provide tight-fitting closures at open ends of ribs and sides of decking. Weld cover plates at changes in direction of floor deck panels, unless otherwise indicated.
- G. Install piercing hanger tabs not more than 14 inches apart in both directions, within 9 inches of walls at ends, and not more than 12 inches from walls at sides, unless otherwise indicated.

3.5 FIELD QUALITY CONTROL

- A. Testing: Owner will employ and pay for a qualified independent testing agency to perform field quality-control testing.
- B. Field welds will be subject to inspection.

- C. Shear connector stud welds will be inspected and tested according to AWS D1.1 for stud welding and as follows:
 - 1. Shear connector stud welds will be visually inspected.
 - 2. Bend tests will be performed if visual inspections reveal less than a full 360-degree flash or welding repairs to any shear connector stud.
 - 3. Tests will be conducted on additional shear connector studs if weld fracture occurs on shear connector studs already tested according to AWS D1.1.
- D. Testing agency will report test results promptly and in writing to Contractor and Architect.
- E. Remove and replace work that does not comply with specified requirements.
- F. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of corrected work with specified requirements.

3.6 REPAIRS AND PROTECTION

- A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on both surfaces of deck with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.
- B. Provide final protection and maintain conditions to ensure that steel deck is without damage or deterioration at time of Substantial Completion.

END OF SECTION 053100

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SECTION 055000 - METAL FABRICATIONS**PART 1 - GENERAL****1.1 SUMMARY****A. Section Includes:**

1. Steel framing and supports for countertops.
2. Steel framing and supports for mechanical and electrical equipment.
3. Elevator machine beams.
4. Steel shapes for supporting elevator door sills.
5. Shelf angles.
6. Metal ladders.
7. Metal ships' ladders.
8. Elevator pit sump covers.
9. Metal bollards.
10. Loose bearing and leveling plates for applications where they are not specified in other Sections.

B. Products Furnished, but Not Installed, under this Section include the following:

1. Loose steel lintels.
2. Anchor bolts, steel pipe sleeves, slotted-channel inserts, and wedge-type inserts indicated to be cast into concrete or built into unit masonry.
3. Steel weld plates and angles for casting into concrete for applications where they are not specified in other Sections.

1.2 ACTION SUBMITTALS

- A. Shop Drawings: Show fabrication and installation details. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items.
- B. Delegated-Design Submittal: For ladders indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by qualified professional engineer responsible for preparation.

1.3 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified professional engineer.
- B. Welding Certificates: For installer and fabricator for shop and field welds verifying AWS qualification within previous 12 months, submit prior to start of welding.
- C. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers certifying that shop primers are compatible with topcoats.
- D. Research/Evaluation Reports: For post-installed anchors, from ICC-ES.

1.4 QUALITY ASSURANCE

- A. Welding Qualifications: Qualify procedures and personnel per the following:
 1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."

- B. Prepare Shop Drawings under direct supervision of a Professional Structural Engineer experienced in design of this Work and licensed in the State of North Carolina.

1.5 field CONDITIONS

- A. Field Measurements: Verify actual locations of walls and other construction contiguous with metal fabrications by field measurements before fabrication.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on exterior metal fabrications by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects.
 - 1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

2.2 METALS

- A. Metal Surfaces, General: Provide materials with smooth, flat surfaces unless otherwise indicated. For metal fabrications exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.
- B. Steel Plates, Shapes, and Bars: ASTM A 36.
- C. Steel Tubing: ASTM A500, cold-formed steel tubing.
- D. Steel Pipe: ASTM A53, standard weight (Schedule 40) unless otherwise indicated.

2.3 FASTENERS

- A. General: Unless otherwise indicated, provide Type 304 stainless-steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B633 or ASTM F1941, Class Fe/Zn 5, at exterior walls. Select fasteners for type, grade, and class required.
 - 1. Provide stainless-steel fasteners for fastening aluminum.
 - 2. Provide stainless-steel fasteners for fastening stainless steel.
 - 3. Provide stainless-steel fasteners for fastening nickel silver.
- B. Anchors, General: Anchors capable of sustaining, without failure, load equal to 6 times load imposed when installed in unit masonry and 4 times load imposed when installed in concrete, as determined by testing per ASTM E488, conducted by qualified independent testing agency.
- C. Cast-in-Place Anchors in Concrete: Either threaded type or wedge type unless otherwise indicated; galvanized ferrous castings, either ASTM A47 malleable iron or ASTM A27 cast steel. Provide bolts, washers, and shims as needed, all hot-dip galvanized per ASTM F2329.

2.4 MISCELLANEOUS MATERIALS

- A. Shop Primers: Provide primers that comply with Section 099123 – Interior Painting and Section 099600 – High-Performance Coatings.
- B. Epoxy Zinc-Rich Primer: Complying with MPI#20 and compatible with topcoat.
- C. Shop Primer for Galvanized Steel: Primer formulated for exterior use over zinc-coated metal and compatible with finish paint systems indicated.
- D. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.
- E. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D1187.
- F. Nonsrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.
- G. Concrete: Comply with requirements in Section 033000 – Cast-in-Place Concrete for normal-weight, air-entrained, concrete with minimum 28 day compressive strength of 3,000 psi.

2.5 FABRICATION, GENERAL

- A. Shop Assembly: Preassemble items in shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.
- B. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to radius of approximately 1/32 inch unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.
- C. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing Work.
- D. Form exposed Work with accurate angles and surfaces and straight edges.
- E. Weld corners and seams continuously to comply with the following:
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove welding flux immediately.
 - 4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing.
- F. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners or welds where possible. Where exposed fasteners are required, use Phillips flat-head (countersunk) fasteners unless otherwise indicated. Locate joints where least conspicuous.
- G. Fabricate seams and other connections that will be exposed to weather in manner to exclude water. Provide weep holes where water may accumulate.
- H. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.

- I. Provide for anchorage of type indicated; coordinate with supporting structure. Space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.
- J. Where units are indicated to be cast into concrete or built into masonry, equip with integrally welded steel strap anchors, 1/8 by 1-1/2 inches, with minimum 6 inch embedment and 2 inch hook, not less than 8 inches from ends and corners of units and 24 inches on center, unless otherwise indicated.

2.6 MISCELLANEOUS FRAMING AND SUPPORTS

- A. General: Provide steel framing and supports not specified in other Sections as needed to complete Work.
- B. Fabricate units from steel shapes, plates, and bars of welded construction unless otherwise indicated. Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction.
 - 1. Furnish inserts for units installed after concrete is placed.
- C. Fabricate supports for operable partitions from continuous steel beams of sizes indicated or as recommended by partition manufacturer, with attached bearing plates, anchors, and braces as indicated or as recommended by partition manufacturer.. Drill or punch bottom flanges of beams to receive partition track hanger rods; locate holes where indicated on operable partition Shop Drawings.
- D. Vanity Top Supports and Countertop Supports: 3/8 inch by 2 inch bent steel support supports as detailed. Pre-drill holes. Profile as indicated on Drawings. Prime paint finish.
- E. Flat Strap and Backing Plate: Steel sheet for blocking and bracing in length and width indicated.
 - 1. Minimum Base-Metal Thickness: 0.018 inch.
- F. Prime miscellaneous framing and supports with zinc-rich primer where indicated.

2.7 SHELF ANGLES

- A. Fabricate shelf angles from steel angles of sizes indicated and for attachment to concrete framing. Provide horizontally slotted holes to receive 3/4-inch bolts, spaced not more than 6 inches from ends and 24 inches o.c., unless otherwise indicated.
- B. For cavity walls, provide vertical channel brackets to support angles from backup masonry and concrete.
- C. Galvanize shelf angles located in exterior walls.
- D. Furnish wedge-type concrete inserts, complete with fasteners, to attach shelf angles to cast-in-place concrete.

2.8 METAL LADDERS

- A. General:
 - 1. Comply with ANSI A14.3, except for elevator pit ladders.
 - 2. For elevator pit ladders, comply with ASME A17.1/CSA B44.
- B. Steel Ladders (Interior):
 - 1. Space siderails 18 inches apart unless otherwise indicated.
 - 2. Siderails: Continuous, 1/2-by-2-1/2-inch steel flat bars, with eased edges.

3. Rungs: 1-inch- square steel bars.
4. Fit rungs in centerline of siderails; plug-weld and grind smooth on outer rail faces.
5. Provide nonslip surfaces on top of each rung, either by coating rung with aluminum-oxide granules set in epoxy-resin adhesive or by using a type of manufactured rung filled with aluminum-oxide grout.
6. Provide nonslip surfaces on top of each rung by coating with abrasive material metallically bonded to rung.
7. Provide platforms as indicated fabricated from welded or pressure-locked steel bar grating, supported by steel angles. Limit openings in gratings to no more than 3/4 inch in least dimension.
8. Support each ladder at top and bottom and not more than 60 inches o.c. with welded or bolted steel brackets.
9. Prime ladders, including brackets and fasteners, with zinc-rich primer.

C. Aluminum Ladders (Exterior/Roof):

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. O'Keeffe's Inc.
 - b. Precision Ladders, LLC.
 - c. Royalite Skylight & Ladder Manufacturing, Inc.
 - d. Thompson Fabricating, LLC.
2. Space siderails 18 inches apart unless otherwise indicated.
3. Siderails: Continuous extruded-aluminum channels or tubes, not less than 2-1/2 inches deep, 3/4 inch wide, and 1/8 inch thick.
4. Rungs: Extruded-aluminum tubes, not less than 3/4 inch deep and not less than 1/8 inch thick, with ribbed tread surfaces.
5. Fit rungs in centerline of siderails; fasten by welding or with stainless-steel fasteners or brackets and aluminum rivets.
6. Provide platforms as indicated fabricated from pressure-locked aluminum bar grating or extruded-aluminum plank grating, supported by extruded-aluminum framing. Limit openings in gratings to no more than 1/2 inch in least dimension.
7. Support each ladder at top and bottom and not more than 60 inches o.c. with welded or bolted aluminum brackets.
8. Provide minimum 72-inch- high, hinged security door with padlock hasp at foot of ladder to prevent unauthorized ladder use.

2.9 METAL SHIPS' LADDERS

- A. Provide metal ships' ladders where indicated. Design ships' ladder to be installed at an angle of between 50 and 60 degrees measured from horizontal plane.
1. Fabricate of open-type construction with channel or plate stringers and pipe and tube railings unless otherwise indicated. Provide brackets and fittings for installation.
 2. Width: Clear width of a minimum of 18 inches.
 3. Tread Depth: Not less than 5 inches exclusive of nosing or less than 8-1/2 inches including nosing, and riser height shall be not more than 9-1/2 inches.
 4. Handrails: Continuous, minimum 3/8 inch by 3 inch steel flat bars, with eased edges, spaced 18 inches apart unless otherwise indicated.
 5. Fabricate ships' ladders, including railings from steel.
 6. Fabricate treads from welded or pressure-locked steel bar grating. Limit openings in gratings to no more than 1/2 inch in least dimension.
 7. Comply with applicable railing requirements in Section 055213 – Pipe and Tube Railings.
 8. Terminate interior ships' ladder at underside of roof at a hatch or scuttle unless indicated otherwise.

- B. Galvanize exterior steel ships' ladders, including treads, railings, brackets, and fasteners.

2.10 ELEVATOR PIT SUMP COVERS

- A. Fabricate from 1/8 inch rolled-steel floor plate with four 1 inch diameter holes for water drainage and for lifting.
- B. Provide steel angle supports as indicated.

2.11 METAL BOLLARDS

- A. Fabricate metal bollards from Schedule 40 steel pipe.
 - 1. Where bollards are indicated to receive controls for door operators, provide necessary cutouts for controls and holes for wire.
 - 2. Where bollards are indicated to receive light fixtures, provide necessary cutouts for fixtures and holes for wire.
- B. Fabricate sleeves for bollard anchorage from steel pipe or tubing with 1/4 inch thick steel plate welded to bottom of sleeve. Make sleeves not less than 8 inches deep and 3/4 inch larger than OD of bollard.
- C. Weld 12 inch long pieces of reinforcing bars to bollard spaced as indicated on Drawings. Provide total of 2 reinforcing bars per bollard.
- D. Galvanize exterior bollards.

2.12 MISCELLANEOUS STEEL TRIM

- A. Unless otherwise indicated, fabricate units from steel shapes, plates, and bars of profiles shown with continuously welded joints and smooth exposed edges. Miter corners and use concealed field splices where possible.
- B. Provide cutouts, fittings, and anchorages as needed to coordinate assembly and installation with other work.
- C. Galvanize exterior miscellaneous steel trim.

2.13 LOOSE BEARING AND LEVELING PLATES

- A. Provide loose bearing and leveling plates for steel items bearing on masonry or concrete construction. Drill plates to receive anchor bolts and for grouting.

2.14 LOOSE STEEL LINTELS

- A. Fabricate loose steel lintels from steel angles and shapes of size indicated for openings and recesses in masonry walls and partitions at locations indicated.
- B. Galvanize loose steel lintels located in exterior walls.

2.15 STEEL WELD PLATES AND ANGLES

- A. Provide steel weld plates and angles not specified in other Sections, for items supported from concrete construction as needed to complete the Work. Provide each unit with no fewer than two integrally welded steel strap anchors for embedding in concrete.

2.16 FINISHES, GENERAL

- A. Finish metal fabrications after assembly.
- B. Finish exposed surfaces to remove tool and die marks and stretch lines, and to blend into surrounding surface.

2.17 STEEL AND IRON FINISHES

- A. Galvanizing: Hot-dip galvanize items as indicated to comply with ASTM A 153/A 153M for steel and iron hardware and with ASTM A 123/A 123M for other steel and iron products.
- B. Shop prime iron and steel items not indicated to be galvanized with universal shop primer unless they are to be embedded in concrete, sprayed-on fireproofing, or masonry, or unless otherwise indicated.
- C. Preparation for Shop Priming: Prepare surfaces to comply with SSPC-SP 3, "Power Tool Cleaning."
- D. Shop Priming: Apply shop primer to comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.

PART 3 - EXECUTION**3.1 INSTALLATION, GENERAL**

- A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.
- B. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.
- C. Field Welding: Comply with the following requirements:
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove welding flux immediately.
 - 4. Finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
- D. Fastening to In-Place Construction: Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction.

- E. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.

3.2 INSTALLING MISCELLANEOUS FRAMING AND SUPPORTS

- A. General: Install framing and supports to comply with requirements of items being supported, including manufacturers' written instructions and requirements indicated on Shop Drawings.
- B. Anchor supports for ceiling hung toilet partitions, operable partitions, and overhead coiling doors securely to, and rigidly brace from, building structure.

3.3 INSTALLING METAL BOLLARDS

- A. Anchor bollards in concrete in formed or core-drilled holes not less than 8 inches deep and 3/4 inch larger than OD of bollard. Fill annular space around bollard solidly with nonshrink, nonmetallic grout; mixed and placed to comply with grout manufacturer's written instructions. Slope grout up approximately 1/8 inch toward bollard.
- B. Fill bollards solidly with concrete, mounding top surface to shed water.
 - 1. Do not fill removable bollards with concrete.

3.4 INSTALLING BEARING AND LEVELING PLATES

- A. Clean concrete and masonry bearing surfaces of bond-reducing materials, and roughen to improve bond to surfaces. Clean bottom surface of plates.
- B. Set bearing and leveling plates on wedges, shims, or leveling nuts. After bearing members have been positioned and plumbed, tighten anchor bolts. Do not remove wedges or shims but, if protruding, cut off flush with edge of bearing plate before packing with nonshrink grout. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

3.5 ADJUSTING AND CLEANING

- A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas. Paint uncoated and abraded areas with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
- B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780/A 780M.

END OF SECTION 055000

SECTION 055113 – METAL PAN STAIRS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Preassembled steel stairs with concrete-filled treads.

1.2 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.
 - 2. Coordinate installation of anchorages for metal stairs. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

1.3 ACTION SUBMITTALS

- A. Product Data: For metal stairs and the following:
 - 1. Prefilled metal-pan stair treads.
 - 2. Paint products.
- B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other Work.
 - 1. Submit Shop Drawings that have been engineered and certified by professional engineer licensed in the State of North Carolina. Include seal and signature of professional engineer on Shop Drawings.
- C. Delegated-Design Submittal: For stairs, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.4 INFORMATIONAL SUBMITTALS

- A. Welding certificates.
- B. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers certifying that shop primers are compatible with topcoats.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Fabricator of products.
- B. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code - Steel" and AWS D1.3, "Structural Welding Code - Sheet Steel."

PART 2 - PRODUCTS**2.1 PERFORMANCE REQUIREMENTS**

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 – Quality Requirements, to design stairs.
- B. Structural Performance of Stairs: Metal stairs shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:
 - 1. Uniform Load: 100 pound-force per square foot.
 - 2. Concentrated Load: 300 pound-force applied on an area of 4 square inches.
 - 3. Uniform and concentrated loads need not be assumed to act concurrently.
 - 4. Stair Framing: Capable of withstanding stresses resulting from railing loads in addition to loads specified above.
 - 5. Limit deflection of treads, platforms, and framing members to $L/360$ or $1/4$ inch, whichever is less.

2.2 METALS

- A. Metal Surfaces, General: Provide materials with smooth, flat surfaces unless otherwise indicated. For components exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.
- B. Steel Plates, Shapes, and Bars: ASTM A36.
- C. Steel Tubing: ASTM A500 (cold formed) or ASTM A513.
- D. Uncoated, Cold-Rolled Steel Sheet: ASTM A1008, structural steel, Grade 25, unless another grade is required by design loads; exposed.
- E. Woven-Wire Mesh: Intermediate-crimp, diamond or square pattern, 2 inch woven-wire mesh, made from 0.135 inch nominal diameter wire complying with ASTM A510.

2.3 FASTENERS

- A. General: Provide zinc-plated fasteners with coating complying with ASTM B633 or ASTM F1941, Class Fe/Zn 12 for exterior use, and Class Fe/Zn 5 where built into exterior walls. Select fasteners for type, grade, and class required.
- B. Bolts and Nuts: Regular hexagon-head bolts, ASTM A307, Grade A; with hex nuts, ASTM A563; and, where indicated, flat washers.
- C. Anchor Bolts: ASTM F1554, Grade 36, of dimensions indicated; with nuts, ASTM A563; and, where indicated, flat washers.

2.4 MISCELLANEOUS MATERIALS

- A. Shop Primers: Provide primers that comply with Section 099123 – Interior Painting and Section 099600 – High Performance Coatings.

- B. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI #79 and compatible with topcoat.
 - 1. Use primer containing pigments that make it easily distinguishable from zinc-rich primer.
- C. Epoxy Zinc-Rich Primer: Complying with MPI #20 and compatible with intermediate and topcoat specified in Section 099600 – High Performance Coatings.
- D. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D1187.
- E. Concrete Materials and Properties: Comply with requirements in Section 033000 – Cast-in-Place Concrete for normal-weight, air-entrained, ready-mix concrete with a minimum 28-day compressive strength of 3,000 psi unless otherwise indicated.
- F. Welded Wire Reinforcement: ASTM A1064, 6 by 6 inches, W1.4 by W1.4, unless otherwise indicated.

2.5 FABRICATION, GENERAL

- A. Provide complete stair assemblies, including metal framing, hangers, struts, clips, brackets, bearing plates, and other components necessary to support and anchor stairs and platforms on supporting structure.
 - 1. Join components by welding unless otherwise indicated.
 - 2. Use connections that maintain structural value of joined pieces.
- B. Preassembled Stairs: Assemble stairs in shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.
- C. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.
- D. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing Work.
- E. Weld connections to comply with the following:
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove welding flux immediately.
 - 4. Weld exposed corners and seams continuously unless otherwise indicated.
 - 5. At exposed connections, finish exposed welds to comply with NOMMA's "Voluntary Joint Finish Standards" for the following:
 - a. Preassembled Stairs – Service Class: Type 3 welds, partially dressed weld with spatter removed.
- F. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible. Where exposed fasteners are required, use Phillips flat-head (countersunk) screws or bolts unless otherwise indicated. Locate joints where least conspicuous.

2.6 STEEL-FRAMED STAIRS

- A. NAAMM Stair Standard: Comply with "Recommended Voluntary Minimum Standards for Fixed Metal Stairs" in NAAMM AMP 510, "Metal Stairs Manual," Commercial Class, unless more stringent requirements are indicated.
- B. Stair Framing:
 - 1. Fabricate stringers of steel plates or channels.
 - a. Provide closures for exposed ends of channel stringers.
 - 2. Construct platforms of steel plate or channel headers and miscellaneous framing members as needed to comply with performance requirements unless indicated otherwise.
 - 3. Weld stringers to headers; weld framing members to stringers and headers.
 - 4. Where stairs are enclosed by gypsum board and shaft-wall assemblies, provide hanger rods or struts to support landings from floor construction above or below. Locate hanger rods and struts where they will not encroach on required stair width and will be within fire-resistance-rated stair enclosure.
 - 5. Where masonry walls support metal stairs, provide temporary supporting struts designed for erecting steel stair components before installing masonry.
- C. Metal Pan Stairs: Form risers, subread pans, and subplatforms to configurations shown from steel sheet of thickness needed to comply with performance requirements, but not less than 0.067 inch.
 - 1. Steel Sheet: Uncoated cold-rolled steel sheet unless otherwise indicated. Hot-rolled steel sheet may be used for locations unexposed to view.
 - 2. Steel Sheet: Galvanized-steel sheet.
 - 3. Preassembled Stairs – Commercial Class: Directly weld metal pans to stringers; locate welds on top of subreads where they will be concealed by concrete fill. Do not weld risers to stringers.
 - 4. Shape metal pans to include nosing integral with riser.

2.7 STAIR RAILINGS

- A. Comply with applicable requirements in Section 055213 – Pipe and Tube Railings.

2.8 FINISHES

- A. Finish metal stairs after assembly.
- B. Preparation for Shop Priming: Prepare uncoated ferrous-metal surfaces to comply with SSPC-SP 3, "Power Tool Cleaning."
- C. Apply shop primer to uncoated surfaces of metal stair components, except those with galvanized finishes and those to be embedded in concrete or masonry unless otherwise indicated. Comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.

PART 3 - EXECUTION**3.1 INSTALLING METAL PAN STAIRS**

- A. **Fastening to In-Place Construction:** Provide anchorage devices and fasteners where necessary for securing metal stairs to in-place construction. Include threaded fasteners for concrete and masonry inserts, through-bolts, lag bolts, and other connectors
- B. **Cutting, Fitting, and Placement:** Perform cutting, drilling, and fitting required for installing metal stairs. Set units accurately in location, alignment, and elevation, measured from established lines and levels and free of rack.
- C. Install metal stairs by welding stair framing to steel structure or to weld plates cast into concrete unless otherwise indicated.
- D. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.
- E. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations.
- F. **Field Welding:** Comply with requirements for welding in "Fabrication, General" Article.
- G. Place and finish concrete fill for treads and platforms to comply with Section 033000 – Cast-in-Place Concrete.

3.2 INSTALLING RAILINGS

- A. Comply with applicable requirements in Section 055213 – Pipe and Tube Railings.

3.3 ADJUSTING AND CLEANING

- A. **Touchup Painting:** Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Section 099123 – Interior Painting and Section 099600 – High Performance Coatings.
- B. **Galvanized Surfaces:** Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A780.

END OF SECTION 055113

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SECTION 055213 - PIPE AND TUBE RAILINGS**PART 1 - GENERAL****1.1 SUMMARY**

- A. Section includes steel pipe and tube railings.

1.2 ADMINISTRATIVE REQUIREMENTS**A. Coordination:**

1. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.
2. Coordinate installation of anchorages for railings. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

B. Scheduling:

1. Schedule installation so wall attachments are made only to completed walls. Do not support railings temporarily by any means that do not satisfy structural performance requirements.

1.3 ACTION SUBMITTALS**A. Product Data For the following:**

1. Railing brackets.
2. Grout, anchoring cement, and paint products.

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.**C. Samples: For each type of exposed finish required.**

1. Sections of each distinctly different linear railing member, including handrails, top rails, posts, and balusters.
2. Fittings and brackets.
3. Assembled Sample of railing system, made from full-size components, including top rail, post, handrail, and infill. Sample need not be full height.
 - a. Show method of connecting and finishing members at intersections.

1.4 INFORMATIONAL SUBMITTALS**A. Qualification Data: For testing agency.****B. Welding certificates.****C. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers certifying that shop primers are compatible with topcoats.**

- D. Product Test Reports: For pipe and tube railings, for tests performed by a qualified testing agency, according to ASTM E 894 and ASTM E 935.
- E. Evaluation Reports: For post-installed anchors, from ICC-ES.

1.5 QUALITY ASSURANCE

- A. Welding Qualifications: Qualify procedures and personnel according to the following:
 - 1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design railings, including attachment to building construction.
- B. Structural Performance: Railings, including attachment to building construction, shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:
 - 1. Handrails and Top Rails of Guards:
 - a. Uniform load of 50 pound-force per foot applied in any direction.
 - b. Concentrated load of 200 pound-force applied in any direction.
 - c. Uniform and concentrated loads need not be assumed to act concurrently.
 - 2. Infill of Guards:
 - a. Concentrated load of 50 pound-force applied horizontally on an area of 1 square foot.
 - b. Infill load and other loads need not be assumed to act concurrently.
- C. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.
 - 1. Temperature Change: 120 degrees F, ambient; 180 degrees F, material surfaces.

2.2 METALS, GENERAL

- A. Metal Surfaces, General: Provide materials with smooth surfaces, without seam marks, roller marks, rolled trade names, stains, discolorations, or blemishes.
- B. Brackets, Flanges, and Anchors: Cast or formed metal of same type of material and finish as supported rails unless otherwise indicated.
 - 1. Provide type of bracket with predrilled hole for exposed bolt anchorage and that provides 1-1/2 inch clearance from inside face of handrail to finished wall surface.

2.3 STEEL AND IRON

- A. Tubing: ASTM A500 (cold formed) or ASTM A513 unless indicated otherwise.
- B. Pipe: ASTM A53, Type F or Type S, Grade A, Standard Weight (Schedule 40), unless another grade and weight are required by structural loads.
 - 1. Provide galvanized finish for exterior installations and where indicated.
- C. Plates, Shapes, and Bars: ASTM A36.

2.4 FASTENERS

- A. General: Provide the following:
 - 1. Hot-Dip Galvanized Railings: Type 304 stainless-steel or hot-dip zinc-coated steel fasteners complying with ASTM A153 or ASTM F2329 for zinc coating.
 - 2. Provide exposed fasteners with finish matching appearance, including color and texture, of railings.
- B. Fasteners for Anchoring Railings to Other Construction: Select fasteners of type, grade, and class required to produce connections suitable for anchoring railings to other types of construction indicated and capable of withstanding design loads.
- C. Fasteners for Interconnecting Railing Components:
 - 1. Provide concealed fasteners for interconnecting railing components and for attaching them to other Work, unless otherwise indicated.
 - 2. Provide concealed fasteners for interconnecting railing components and for attaching them to other Work, unless exposed fasteners are unavoidable or are standard fastening method for railings indicated.
 - 3. Provide tamper-resistant flat-head machine screws for exposed fasteners unless otherwise indicated.
- D. Post-Installed Anchors: Torque-controlled expansion anchors or chemical anchors capable of sustaining, without failure, a load equal to 6 times load imposed when installed in unit masonry and 4 times the load imposed when installed in concrete, as determined by testing per ASTM E488, conducted by a qualified independent testing agency.
 - 1. Material for Interior Locations: Carbon-steel components zinc-plated to comply with ASTM B633 or ASTM F1941, Class Fe/Zn 5, unless otherwise indicated.

2.5 MISCELLANEOUS MATERIALS

- A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.
- B. Etching Cleaner for Galvanized Metal: Complying with MPI #25.
- C. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.
- D. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79 and compatible with topcoat.
 - 1. Use primer containing pigments that make it easily distinguishable from zinc-rich primer.

- E. Epoxy Zinc-Rich Primer: Complying with MPI #20 and compatible with intermediate and topcoat specified in Section 099600 – High Performance Coatings.
- F. Shop Primer for Galvanized Steel: Primer formulated for exterior use over zinc-coated metal and compatible with finish paint systems indicated.
- G. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187/D 1187M.
- H. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107/C 1107M. Provide grout specifically recommended by manufacturer for interior and exterior applications.
- I. Anchoring Cement: Factory-packaged, nonshrink, nonstaining, hydraulic-controlled expansion cement formulation for mixing with water at Project site to create pourable anchoring, patching, and grouting compound.

2.6 FABRICATION

- A. General: Fabricate railings to comply with requirements indicated for design, dimensions, member sizes and spacing, details, finish, and anchorage, but not less than that required to support structural loads.
- B. Shop-assemble railings to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation. Use connections that maintain structural value of joined pieces.
- C. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.
- D. Form Work true to line and level with accurate angles and surfaces.
- E. Fabricate connections that are exposed to weather in a manner that excludes water. Provide weep holes where water may accumulate.
- F. Cut, reinforce, drill, and tap as indicated to receive finish hardware, screws, and similar items.
- G. Connections: Fabricate railings with welded connections unless otherwise indicated.
- H. Welded Connections: Cope components at connections to provide close fit, or use fittings designed for this purpose. Weld all around at connections, including at fittings.
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove flux immediately.
 - 4. At exposed connections, finish exposed surfaces smooth and blended so no roughness shows after finishing and welded surface matches contours of adjoining surfaces.
- I. Nonwelded Connections: Connect members with concealed mechanical fasteners and fittings. Fabricate members and fittings to produce flush, smooth, rigid, hairline joints.
- J. Form changes in direction as follows:
 - 1. Form rail-to-end post connections and changes in rail direction by radius bends, unless mitered corners are indicated.

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2. Form elbow and wall returns by bending or by inserting prefabricated elbow fittings.
- K. For changes in direction made by bending, use jigs to produce uniform curvature for each repetitive configuration required. Maintain cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of components.
- L. Close exposed ends of railing members with prefabricated end fittings.
- M. Provide wall returns at ends of wall-mounted handrails unless otherwise indicated. Close ends of returns unless clearance between end of rail and wall is 1/4 inch or less.
- N. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, flanges, miscellaneous fittings, and anchors to interconnect railing members to other work unless otherwise indicated.
1. At brackets and fittings fastened to plaster or gypsum board partitions, provide crush-resistant fillers or other means to transfer loads through wall finishes to structural supports and prevent bracket or fitting rotation and crushing of substrate.
- O. Provide inserts and other anchorage devices for connecting railings to concrete or masonry work. Fabricate anchorage devices capable of withstanding loads imposed by railings. Coordinate anchorage devices with supporting structure.
- P. For railing posts set in concrete, provide steel sleeves not less than 6 inches long with inside dimensions not less than 1/2 inch greater than outside dimensions of post, with metal plate forming bottom closure.
- Q. For removable railing posts, fabricate slip-fit sockets from steel tube or pipe whose ID is sized for a close fit with posts; limit movement of post without lateral load, measured at top, to not more than 1/40 of post height. Provide socket covers designed and fabricated to resist being dislodged.
1. Provide chain with eye, snap hook, and staple across gaps formed by removable railing sections at locations indicated. Fabricate from same metal as railings.
- R. Toe Boards: Where indicated, provide toe boards at railings around openings and at edge of open-sided floors and platforms. Fabricate to dimensions and details indicated.
- 2.7 STEEL AND IRON FINISHES
- A. Galvanized Railings:
1. Hot-dip galvanize exterior steel railings, and other railings where indicated, including hardware, after fabrication.
2. Comply with ASTM A123 for hot-dip galvanized railings.
3. Comply with ASTM A153 for hot-dip galvanized hardware.
4. Do not quench or apply galvanizing treatments that might interfere with paint adhesion.
5. Fill vent and drain holes that will be exposed in finished Work, unless indicated to remain as weep holes, by plugging with zinc solder and filing off smooth.
6. Provide hot-dip galvanized fittings, brackets, fasteners, sleeves, and other ferrous components.
7. After galvanizing, thoroughly clean railings of grease, dirt, oil, flux, and other foreign matter, and treat with etching cleaner.
- B. For nongalvanized steel railings, provide nongalvanized ferrous-metal fittings, brackets, fasteners, and sleeves, except galvanize anchors to be embedded in exterior concrete or masonry.
- C. Preparation for Shop Priming: Prepare surfaces to comply with SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."

- D. Primer Application: Apply shop primer to prepared surfaces of railings, except those with galvanized finishes and those to be embedded in concrete or masonry unless otherwise indicated. Comply with requirements in SSPC-PA 1, "Shop, Field, and Maintenance Painting of Steel," for shop painting. Primer need not be applied to surfaces to be embedded in concrete or masonry.
1. Shop prime uncoated railings with universal shop primer unless zinc-rich primer is indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine gypsum board assemblies, where reinforced to receive anchors, to verify that locations of concealed reinforcements are clearly marked for Installer. Locate reinforcements and mark locations if not already done.

3.2 INSTALLATION, GENERAL

- A. Fit exposed connections together to form tight, hairline joints.
- B. Perform cutting, drilling, and fitting required for installing railings. Set railings accurately in location, alignment, and elevation; measured from established lines and levels and free of rack.
1. Do not weld, cut, or abrade surfaces of railing components that have been coated or finished after fabrication and that are intended for field connection by mechanical or other means without further cutting or fitting.
 2. Set posts plumb within a tolerance of 1/16 inch in 3 feet.
 3. Align rails so variations from level for horizontal members and variations from parallel with rake of steps and ramps for sloping members do not exceed 1/4 inch in 12 feet.
- C. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.
1. Coat, with a heavy coat of bituminous paint, concealed surfaces of aluminum that are in contact with grout, concrete, masonry, wood, or dissimilar metals.
- D. Adjust railings before anchoring to ensure matching alignment at abutting joints.
- E. Fastening to In-Place Construction: Use anchorage devices and fasteners where necessary for securing railings and for properly transferring loads to in-place construction.

3.3 RAILING CONNECTIONS

- A. Nonwelded Connections: Use mechanical or adhesive joints for permanently connecting railing components. Seal recessed holes of exposed locking screws using plastic cement filler colored to match finish of railings.
- B. Welded Connections: Use fully welded joints for permanently connecting railing components. Comply with requirements for welded connections in "Fabrication" Article whether welding is performed in the shop or in the field.

3.4 ANCHORING POSTS

- A. Use metal sleeves preset and anchored into concrete for installing posts. After posts have been inserted into sleeves, fill annular space between post and sleeve with nonshrink, nonmetallic grout, mixed and placed to comply with anchoring material manufacturer's written instructions.
- B. Form or core-drill holes not less than 5 inches deep and 3/4 inch larger than OD of post for installing posts in concrete. Clean holes of loose material, insert posts, and fill annular space between post and concrete with nonshrink, nonmetallic grout, mixed and placed to comply with anchoring material manufacturer's written instructions.
- C. Cover anchorage joint with flange of same metal as post, welded to post after placing anchoring material unless attaching to post with set screws is acceptable.
- D. Anchor posts to metal surfaces with oval flanges, angle type, or floor type as required by conditions, connected to posts and to metal supporting members as follows:
 - 1. For steel pipe railings, weld flanges to post and bolt to metal supporting surfaces.
- E. Install removable railing sections, where indicated, in slip-fit metal sockets cast in concrete.

3.5 ATTACHING RAILINGS

- A. Anchor railing ends at walls with round flanges anchored to wall construction and welded to railing ends.
- B. Anchor railing ends to metal surfaces with flanges bolted to metal surfaces and welded to railing ends.
- C. Attach railings to wall with wall brackets, except where end flanges are used. Locate brackets as indicated or, if not indicated, at spacing required to support structural loads.
- D. Secure wall brackets and railing end flanges to building construction as follows:
 - 1. For concrete and solid masonry anchorage, use drilled-in expansion shields and hanger or lag bolts.
 - 2. For hollow masonry anchorage, use toggle bolts.
 - 3. Steel-Framed Partitions: At steel framed partitions, use one of the following methods:
 - a. Set hanger or lag bolts into wood backing between studs. Coordinate with stud installation to locate backing members.
 - b. Self-tapping screws fastened to steel framing or to concealed steel reinforcements.
 - c. Toggle bolts installed through flanges of steel framing or through concealed steel reinforcements.

3.6 ADJUSTING AND CLEANING

- A. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Section 099123 – Interior Painting and Section 099600 – High Performance Coatings.
- B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A780.

3.7 PROTECTION

- A. Protect finishes of railings from damage during construction period with temporary protective coverings approved by railing manufacturer. Remove protective coverings at time of Substantial Completion.

END OF SECTION 055213

SECTION 061053 - MISCELLANEOUS ROUGH CARPENTRY**PART 1 - GENERAL****1.1 SUMMARY**

- A. Section Includes:
1. Rooftop equipment bases and support curbs.
 2. Wood blocking, cants, and nailers.
 3. Plywood backing panels.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.
1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used and net amount of preservative retained.
 2. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Include physical properties of treated materials based on testing by a qualified independent testing agency.
 3. For fire-retardant treatments, include physical properties of treated lumber both before and after exposure to elevated temperatures, based on testing by a qualified independent testing agency according to ASTM D 5664.
 4. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.

1.3 QUALITY ASSURANCE

- A. Testing Agency Qualifications: For testing agency providing classification marking for fire-retardant-treated material, an inspection agency acceptable to authorities having jurisdiction that periodically performs inspections to verify that the material bearing the classification marking is representative of the material tested.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Stack lumber flat with spacers beneath and between each bundle to provide air circulation. Protect lumber from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS**2.1 WOOD PRODUCTS, GENERAL**

- A. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, provide lumber that complies with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Provide lumber graded by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.
1. Factory mark each piece of lumber with grade stamp of grading agency.

2. Dress lumber, S4S, unless otherwise indicated.

B. Maximum Moisture Content of Lumber: 19 percent unless otherwise indicated.

2.2 WOOD-PRESERVATIVE-TREATED MATERIALS

A. Preservative Treatment by Pressure Process: AWP A U1; Use Category UC2 for interior construction not in contact with ground, Use Category UC3b for exterior construction not in contact with ground, and Use Category UC4a for items in contact with ground.

1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.

B. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Do not use material that is warped or does not comply with requirements for untreated material.

C. Application: Treat items indicated on Drawings, and the following:

1. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
2. Wood sills, sleepers, blocking, and similar concealed members in contact with masonry or concrete.

2.3 FIRE-RETARDANT-TREATED MATERIALS

A. General: Where fire-retardant-treated materials are indicated, materials shall comply with requirements in this article, that are acceptable to authorities having jurisdiction, and with fire-test-response characteristics specified as determined by testing identical products per test method indicated by a qualified testing agency.

B. Identify fire-retardant-treated wood with appropriate classification marking of qualified testing agency.

C. Application: Treat items indicated on Drawings, and the following:

1. Concealed blocking.
2. Roof framing and blocking.
3. Plywood backing panels.

2.4 MISCELLANEOUS LUMBER

A. General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:

1. Blocking.
2. Nailers.
3. Rooftop equipment bases and support curbs.

B. Dimension Lumber Items: Construction or No. 2 grade lumber of any species.

C. Concealed Boards: 19 percent maximum moisture content of the following species and grades:

1. Spruce-pine-fir (south) or spruce-pine-fir, Construction or No. 2 Common grade; NeLMA, NLGA, WCLIB, or WWPA.
2. Eastern softwoods, No. 2 Common grade; NELMA.

- D. For blocking not used for attachment of other construction, Utility, Stud, or No. 3 grade lumber of any species may be used provided that it is cut and selected to eliminate defects that will interfere with its attachment and purpose.
- E. For blocking and nailers used for attachment of other construction, select and cut lumber to eliminate knots and other defects that will interfere with attachment of other work.

2.5 PLYWOOD BACKING PANELS

- A. Equipment Backing Panels: Plywood, DOC PS 1, fire-retardant treated, in thickness indicated or, if not indicated, not less than 1/2-inch nominal thickness.

2.6 FASTENERS

- A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.
 - 1. Where carpentry is exposed to weather, in ground contact, pressure-preservative treated, or in area of high relative humidity, provide fasteners of Type 304 stainless steel.
- B. Nails, Brads, and Staples: ASTM F 1667.
- C. Screws for Fastening to Metal Framing: ASTM C 954, length as recommended by screw manufacturer for material being fastened.
- D. Power-Driven Fasteners: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Set carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit carpentry accurately to other construction. Locate nailers, blocking, and similar supports to comply with requirements for attaching other construction.
- B. Provide blocking and framing as indicated and as required to support facing materials, fixtures, specialty items, and trim.
- C. Provide fire blocking in furred spaces, stud spaces, and other concealed cavities as indicated and as follows:
 - 1. Fire block concealed spaces behind combustible cornices and exterior trim at not more than 20 feet o.c.
- D. Sort and select lumber so that natural characteristics do not interfere with installation or with fastening other materials to lumber. Do not use materials with defects that interfere with function of member or pieces that are too small to use with minimum number of joints or optimum joint arrangement.
- E. Comply with AWWA M4 for applying field treatment to cut surfaces of preservative-treated lumber.
 - 1. Use inorganic boron for items that are continuously protected from liquid water.
 - 2. Use copper naphthenate for items not continuously protected from liquid water.

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- F. Securely attach carpentry work to substrate by anchoring and fastening as indicated, complying with the following:
1. Table 2304.9.1, "Fastening Schedule," in ICC's International Building Code.
 2. ICC-ES evaluation report for fastener.
- G. Use steel common nails unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting wood. Drive nails snug but do not countersink nail heads unless otherwise indicated.

3.2 WOOD BLOCKING AND NAILER INSTALLATION

- A. Install where indicated and where required for attaching other work. Form to shapes indicated and cut as required for true line and level of attached work. Coordinate locations with other work involved.
- B. Attach items to substrates to support applied loading. Recess bolts and nuts flush with surfaces unless otherwise indicated.

3.3 PROTECTION

- A. Protect wood that has been treated with inorganic boron (SBX) from weather. If, despite protection, inorganic boron-treated wood becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.
- B. Protect miscellaneous rough carpentry from weather. If, despite protection, miscellaneous rough carpentry becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

END OF SECTION 061053

SECTION 061600 - SHEATHING**PART 1 - GENERAL****1.1 SUMMARY**

- A. Section includes wall sheathing, and sheathing joint and penetration treatment.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.

1.3 DELIVERY, STORAGE, AND HANDLING

- A. Stack panels flat with spacers beneath and between each bundle to provide air circulation. Protect sheathing from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS**2.1 WOOD PANEL PRODUCTS**

- A. Factory mark panels to indicate compliance with applicable standard.

2.2 WALL SHEATHING

- A. Glass-Mat Gypsum Wall Sheathing: ASTM C1177.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. CertainTeed Corporation: GlasRoc.
 - b. Continental Building Products, LLC: Weather Defense Platinum Sheathing.
 - c. Georgia-Pacific Gypsum LLC: DensGlass Gold Sheathing.
 - d. National Gypsum Company: Gold Bond eXP Extended Exposure Sheathing.
 - e. United States Gypsum Company: Securock Glass-Mat Sheathing Panels.
 - 2. Type and Thickness: Regular, 1/2 inch thick.
 - 3. Size: 48 inches by longest practical length for vertical installation.
 - 4. Maximum framing spacing is 16 inches on center.

2.3 FASTENERS

- A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture. Provide fasteners with hot-dip zinc coating complying with ASTM A153.
- B. Nails, Brads, and Staples: ASTM F1667.
- C. Power-Driven Fasteners: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.

- D. Screws for Fastening Gypsum Sheathing to Cold-Formed Metal Framing: Steel drill screws, in length recommended by sheathing manufacturer for thickness of sheathing to be attached, with organic-polymer or other corrosion-protective coating having a salt-spray resistance of more than 800 hours per ASTM B117.

2.4 SHEATHING JOINT-AND-PENETRATION TREATMENT MATERIALS

- A. Sealant for Glass-Mat Gypsum Sheathing: Silicone emulsion sealant complying with ASTM C 834, compatible with sheathing tape and sheathing and recommended by tape and sheathing manufacturers for use with glass-fiber sheathing tape and for covering exposed fasteners.
1. Sheathing Tape: Self-adhering glass-fiber tape, minimum 2 inches wide, 10 by 10 or 10 by 20 threads per inch, of type recommended by sheathing and tape manufacturers for use with silicone emulsion sealant in sealing joints in glass-mat gypsum sheathing and with a history of successful in-service use.
- B. Joint Compound for Exterior Applications:
1. Exterior Gypsum Soffit Board: Use setting-type taping and setting-type, sandable topping compounds.
 2. Glass-Mat Gypsum Sheathing Board: As recommended by manufacturer.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Do not use materials with defects that impair quality of sheathing or pieces that are too small to use with minimum number of joints or optimum joint arrangement. Arrange joints so that pieces do not span between fewer than three support members.
- B. Cut panels at penetrations, edges, and other obstructions of work; fit tightly against abutting construction unless otherwise indicated.
- C. Securely attach to substrate by fastening as indicated, complying with the following:
1. Table 2304.9.1, "Fastening Schedule," in the ICC's International Building Code.
 2. ICC-ES evaluation report for fastener.
- D. Coordinate wall sheathing installation with flashing and joint-sealant installation, so these materials are installed in sequence and manner that prevent exterior moisture from passing through completed assembly.
- E. Do not bridge building expansion joints; cut and space edges of panels to match spacing of structural support elements.
- F. Coordinate sheathing installation with installation of materials installed over sheathing so sheathing is not exposed to precipitation or left exposed at end of the workday when rain is forecast.

3.2 GYPSUM SHEATHING INSTALLATION

- A. Comply with GA-253 and with manufacturer's written instructions.
1. Fasten gypsum sheathing to cold-formed metal framing with screws.
 2. Install boards with a 3/8 inch gap where non-load-bearing construction abuts structural elements.

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3. Install boards with a 1/4 inch gap where they abut masonry or similar materials that might retain moisture, to prevent wicking.
- B. Apply fasteners so heads bear tightly against face of sheathing, but do not cut into facing.
 - C. Vertical Installation: Install board vertical edges centered over studs. Abut ends and edges of each board with those of adjacent boards. Attach boards at perimeter and within field of board to each stud.
 1. Space fasteners approximately 8 inches on center and set back a minimum of 3/8 inch from edges and ends of boards.
 - D. Seal sheathing joints according to sheathing manufacturer's written instructions.
 1. Apply elastomeric sealant to joints and fasteners and trowel flat. Apply sufficient amount of sealant to completely cover joints and fasteners after troweling. Seal other penetrations and openings.
 2. Apply glass-fiber sheathing tape to glass-mat gypsum sheathing joints and apply and trowel sealant to embed entire face of tape in sealant. Apply sealant to exposed fasteners with a trowel so fasteners are completely covered. Seal other penetrations and openings.

END OF SECTION 061600

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SECTION 064116 - PLASTIC-LAMINATE-FACED ARCHITECTURAL CABINETS**PART 1 - GENERAL****1.1 SUMMARY****A. Section Includes:**

1. Plastic-laminate-faced architectural cabinets.
2. Wood furring, blocking, shims, and hanging strips for installing plastic-laminate-faced architectural cabinets unless concealed within other construction before cabinet installation.
3. Tackable surfaces.

1.2 ACTION SUBMITTALS**A. Product Data:** For each type of product, including panel products, high-pressure decorative laminate, adhesive for bonding plastic laminate, and cabinet hardware and accessories.**B. Shop Drawings:** Show location of each item, dimensioned plans and elevations, large-scale details, attachment devices, and other components.

1. Show details full size.
2. Show locations and sizes of furring, blocking, and hanging strips, including concealed blocking and reinforcement specified in other Sections.
3. Show locations and sizes of cutouts and holes for installed in architectural plastic-laminate cabinets.
4. Apply AWI Quality Certification Program label to Shop Drawings.

C. Samples for Verification:

1. Plastic laminates, 8 by 10 inches, for each type, color, pattern, and surface finish, with 1 sample applied to core material and specified edge material applied to 1 edge.
2. Thermoset decorative-panels, 8 by 10 inches, for each type, color, pattern, and surface finish, with edge banding on one edge.
3. Corner pieces as follows:
 - a. Cabinet-front frame joints between stiles and rails, as well as exposed end pieces, 18 inches high by 18 inches wide by 6 inches deep.
 - b. Miter joints for standing trim.
4. Exposed cabinet hardware and accessories, one unit for each type and finish.

1.3 INFORMATIONAL SUBMITTALS**A. Qualification Data:** For fabricator.**B. Product Certificates:** For each type of product.**C. Woodwork Quality Standard Compliance Certificates:** AWI Quality Certification Program certificates.

1.4 QUALITY ASSURANCE

- A. Fabricator Qualifications: Shop that employs skilled workers who custom fabricate products similar to those required for this Project and whose products have a record of successful in-service performance. Shop is a certified participant in AWI's Quality Certification Program.
- B. Installer Qualifications: Fabricator of products who is certified participant in AWI's Quality Certification Program.
- C. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
 - 1. Build mockups of typical plastic-laminate-faced cabinets as shown on Drawings unless indicated otherwise.
 - 2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Do not deliver cabinets until painting and similar operations that could damage woodwork have been completed in installation areas. If cabinets must be stored in other than installation areas, store only in areas where environmental conditions comply with requirements specified in "Field Conditions" Article.

1.6 FIELD CONDITIONS

- A. Environmental Limitations for Interior Work: Do not deliver or install interior wood frames until building is enclosed, wet Work is complete, and HVAC system is operating and maintaining temperature between 60 and 90 degrees F and relative humidity between 43 and 70 percent during remainder of construction period.
- B. Field Measurements: Where cabinets are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication, and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
 - 1. Locate concealed framing, blocking, and reinforcements that support cabinets by field measurements before being enclosed, and indicate measurements on Shop Drawings.
- C. Established Dimensions: Where cabinets are indicated to fit to other construction, establish dimensions for areas where cabinets are to fit. Provide allowance for trimming at site, and coordinate construction to ensure that actual dimensions correspond to established dimensions.

PART 2 - PRODUCTS

2.1 PLASTIC-LAMINATE-FACED ARCHITECTURAL CABINETS

- A. Quality Standard: Unless otherwise indicated, comply with the "Architectural Woodwork Standards" for grades of architectural plastic-laminate cabinets indicated for construction, finishes, installation, and other requirements.
 - 1. Provide labels and certificates from AWI certification program indicating that woodwork complies with requirements of grades specified.

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2. Contract Documents may contain selections chosen from options in quality standard and additional requirements beyond those of the quality standard. Comply with those selections and requirements in addition to the quality standard.
- B. Grade: Premium.
- C. Type of Construction: Frameless.
- D. Cabinet, Door, and Drawer Front Interface Style: Flush overlay.
- E. High-Pressure Decorative Laminate: NEMA LD 3, grades as indicated or if not indicated, as required by woodwork quality standard.
1. Manufacturers: Subject to compliance with requirements, provide Basis-of-Design indicated on Drawings or comparable products by one of the following:
 - a. Formica Corporation (Basis-of-Design).
 - b. Wilsonart International (Basis-of-Design).
 - c. Lamin-Art, Inc.
 - d. Panolam Industries International, Inc.
- F. Laminate Cladding for Exposed Surfaces: High-pressure decorative laminate as follows:
1. Horizontal Surfaces Other Than Tops: Grade HGS.
 2. Postformed Surfaces: Grade HGP.
 3. Vertical Surfaces: Grade VGS.
 4. Edges: PVC edge banding, 0.12 inch thick, matching laminate in color, pattern, and finish.
 5. Pattern Direction: Vertically for doors, drawers, and sides. Horizontally on top, bottom, and exposed shelves.
- G. Materials for Semiexposed Surfaces:
1. Surfaces Other Than Drawer Bodies: Thermoset decorative panels.
 - a. Edges of Plastic-Laminate Shelves: PVC edge banding, 0.12 inch thick, matching laminate in color, pattern, and finish.
 - b. Edges of Thermoset Decorative Panel Shelves: PVC or polyester edge banding.
 - c. For semiexposed backs of panels with exposed plastic-laminate surfaces, provide surface of high-pressure decorative laminate, NEMA LD 3, Grade CLS.
 2. Drawer Sides and Backs: Solid-hardwood lumber, minimum 1/2 inch thick.
 3. Drawer Bottoms: Thermoset decorative panels, minimum 1/4 inch thick.
- H. Concealed Backs of Panels with Exposed Plastic-Laminate Surfaces: High-pressure decorative laminate, NEMA LD 3, Grade BKL.
- I. Drawer Construction: Fabricate with exposed fronts fastened to subfront with mounting screws from interior of body.
1. Join subfronts, backs, and sides with glued dovetail joints.
- J. Colors, Patterns, and Finishes: Provide materials and products that result in colors and textures of exposed laminate surfaces as indicated in Interior Finish Legend.

2.2 WOOD MATERIALS

- A. Wood Products: Provide materials that comply with requirements of referenced quality standard for each type of woodwork and quality grade specified unless otherwise indicated.
1. Wood Moisture Content: 8 to 13 percent.
- B. Composite Wood and Agrifiber Products: Provide materials that comply with requirements of referenced quality standard for each type of woodwork and quality grade specified unless otherwise indicated.
1. Hardboard: AHA A135.4.
 2. Medium-Density Fiberboard: ANSI A208.2, Grade 130, made with binder containing no urea formaldehyde.
 3. Particleboard: ANSI A208.1, Grade M-2, made with binder containing no urea formaldehyde.
 - a. Panel Size and Thickness: As indicated on Drawings.
 4. Softwood Plywood: DOC PS 1.
 5. Veneer-Faced Panel Products (Hardwood Plywood): HPVA HP-1 made with adhesive containing no urea formaldehyde.
 6. Thermoset Decorative Panels: Particleboard or medium-density fiberboard finished with thermally fused, melamine-impregnated decorative paper and complying with requirements of NEMA LD 3, Grade VGL.

2.3 CABINET HARDWARE AND ACCESSORIES

- A. General: Provide cabinet hardware and accessory materials associated with architectural woodwork, except for items specified in Section 087100 – Door Hardware.
- B. Frameless Concealed Hinges (European Type): BHMA A156.9, B01602, self-closing type, 135 degrees of opening, with soft-close function.
- C. Drawer Pulls: Back-mounted style, BHMA A156.9, B02011.
- D. Catches: Push-in magnetic catches, BHMA A156.9, B03131.
- E. Door Locks: BHMA A156.11, E07121.
- F. Drawer Locks: BHMA A156.11, E07041.
- G. Door and Drawer Silencers: BHMA A156.16, L03011.
- H. Commercial Grade Standards and Brackets: BHMA A156.9, B04102.
- I. Drawer Slides: BHMA A156.9, B05091. Provide drawer slides with soft or quite close functions, in Grades indicated.
1. Heavy Duty (Grade 1HD-100 and Grade 1HD-200): Side mounted; full-overtravel-extension type; zinc-plated steel ball-bearing slides.
 2. Grade 1HD-200: Concealed; full-extension type; zinc-plated steel ball-bearing slides.
 3. Box Drawers (Grade 1HD-100): More than 3 inches high but not more than 6 inches high and not more than 24 inches wide.
 4. File Drawers (Grade 1HD-200): More than 6 inches high or more than 24 inches wide.
- J. Exposed Hardware Finishes: For exposed hardware, provide finish that complies with BHMA A156.18 for BHMA finish number indicated.

1. Satin Stainless Steel: BHMA 630 unless indicated otherwise.
2. For concealed hardware, provide manufacturer's standard finish that complies with product class requirements in BHMA A156.9.

2.4 TACKABLE SURFACES (TS-1)

- A. Cork Tack Surfaces: Seamless sheet, 1/4 inch ground natural cork compressed with a resinous binder with washable vinyl finish and integral color throughout, laminated to burlap backing. Provide color and texture as selected from manufacturer's standards.
 1. Basis-of-Design Product: Subject to compliance with requirements, provide Bulletin Board by Forbo Flooring Systems or approved substitution.

2.5 MISCELLANEOUS MATERIALS

- A. Furring, Blocking, Shims, and Hanging Strips: Softwood or hardwood lumber, kiln-dried to less than 15 percent moisture content.
- B. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide metal expansion sleeves or expansion bolts for post-installed anchors. Use nonferrous-metal or hot-dip galvanized anchors and inserts at inside face of exterior walls and at floors.
- C. Adhesive for Bonding Plastic Laminate: Unpigmented or pigmented contact cement.
 1. Adhesive for Bonding Edges: Hot-melt adhesive or adhesive specified above for faces.

2.6 FABRICATION

- A. Fabricate cabinets to dimensions, profiles, and details indicated.
- B. Complete fabrication, including assembly and hardware application, to maximum extent possible before shipment to Project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.
 1. Notify Architect seven days in advance of the dates and times woodwork fabrication will be complete.
 2. Trial fit assemblies at fabrication shop that cannot be shipped completely assembled. Install dowels, screws, bolted connectors, and other fastening devices that can be removed after trial fitting. Verify that various parts fit as intended and check measurements of assemblies against field measurements before disassembling for shipment.
- C. Shop-cut openings to maximum extent possible to receive hardware, appliances, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Before installation, condition cabinets to average prevailing humidity conditions in installation areas.
- B. Before installing cabinets, examine shop-fabricated work for completion and complete work as required.

3.2 INSTALLATION

- A. Grade: Install cabinets to comply with requirements for same grade as item to be installed.
- B. Assemble cabinets and complete fabrication at Project site extent that it was not completed in shop.
- C. Install cabinets level, plumb, true, and straight. Shim as required with concealed shims. Install to a tolerance of 1/8 inch in 96 inches.
- D. Scribe and cut cabinets to fit adjoining Work, refinish cut surfaces, and repair damaged finish at cuts.
- E. Anchor cabinets to anchors or blocking built in or directly attached to substrates. Secure with countersunk, concealed fasteners and blind nailing as required for complete installation. Use fine finishing nails or finishing screws for exposed fastening, countersunk and filled flush with woodwork.
 - 1. Use filler matching finish of items being installed.
- F. Cabinets: Install without distortion so doors and drawers fit openings properly and are accurately aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation. Complete installation of hardware and accessory items as indicated.
 - 1. Install cabinets with no more than 1/8 inch in 96 inch sag, bow, or other variation from a straight line.
 - 2. Fasten wall cabinets through back, near top and bottom, at ends and not more than 16 inches on center with fasteners appropriate for anchoring to structure.

3.3 TACKABLE SURFACES

- A. Where indicated on Drawings, attach tack surface to substrate with concealed metal “Z” clips or as indicated on Drawings.

3.4 ADJUSTING AND CLEANING

- A. Repair damaged and defective cabinets, where possible, to eliminate functional and visual defects; where not possible to repair, replace woodwork. Adjust joinery for uniform appearance.
- B. Clean, lubricate, and adjust hardware.
- C. Clean cabinets on exposed and semiexposed surfaces.

END OF SECTION 064116

SECTION 071113 – BITUMINOUS DAMPPROOFING**PART 1 - GENERAL****1.1 SUMMARY**

- A. Section Includes:
 - 1. Cold-applied, emulsified-asphalt dampproofing.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.

1.3 FIELD CONDITIONS

- A. Weather Limitations: Proceed with application only when existing and forecasted weather conditions permit dampproofing to be performed according to manufacturers' written instructions.

PART 2 - PRODUCTS**2.1 MATERIALS, GENERAL**

- A. Source Limitations: Obtain primary dampproofing materials and primers from single source from single manufacturer. Provide protection course and auxiliary materials recommended in writing by manufacturer of primary materials.

2.2 COLD-APPLIED, EMULSIFIED-ASPHALT DAMPPROOFING

- A. Manufacturers: Subject to compliance with requirements, provide 1 of the specified products:
 - 1. ChemMasters, Inc: Mastergard 400.
 - 2. Euclid Chemical Company (The); an RPM company: Dehydratine 75.
 - 3. Henry Company: 307 Fibered Asphalt Emulsion.
 - 4. Karnak Corporation: 220 Fibered Emulsion Dampproofing.
 - 5. Meadows, W. R., Inc.: Sealmastic Emulsion.
- B. Trowel Coats: ASTM D1227, Type II, Class 1.
- C. Fibered Brush and Spray Coats: ASTM D1227, Type II, Class 1.
- D. Brush and Spray Coats: ASTM D1227, Type III, Class 1.
- E. VOC Content: 30 g/L or less.

2.3 AUXILIARY MATERIALS

- A. General: Furnish auxiliary materials recommended in writing by dampproofing manufacturer for intended use and compatible with bituminous dampproofing.

- B. Emulsified-Asphalt Primer: ASTM D1227, Type III, Class 1, except diluted with water as recommended by manufacturer.
- C. Asphalt-Coated Glass Fabric: ASTM D1668, Type I.
- D. Patching Compound: Manufacturer's fibered mastic of type recommended by dampproofing manufacturer.

2.4 MOLDED-SHEET DRAINAGE PANELS

- A. Nonwoven-Geotextile-Faced, Molded-Sheet Drainage Panel: Composite subsurface drainage panel consisting of a studded, nonbiodegradable, molded-plastic-sheet drainage core; with a nonwoven, needle-punched geotextile facing with an apparent opening size not exceeding No. 70 sieve laminated to 1 side of core; and with vertical flow rate of 9 to 15 gpm per foot.
- B. Manufacturers: Subject to compliance with requirements, provide one of the specified products:
 - 1. American Hydrotech, Inc.
 - 2. Carlisle Coatings & Waterproofing Inc.
 - 3. GCP Applied Technologies.
 - 4. Protecto Wrap Company.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, with Installer present, for compliance with requirements for surface smoothness and other conditions affecting performance of Work.
 - 1. Proceed with dampproofing application only after substrate construction and penetrating Work have been completed and unsatisfactory conditions have been corrected.
 - 2. Test for surface moisture per ASTM D4263.

3.2 PREPARATION

- A. Mask or otherwise protect adjoining exposed surfaces from being stained, spotted, or coated with dampproofing. Prevent dampproofing materials from entering and clogging weep holes and drains.
- B. Clean substrates of projections and substances detrimental to work; fill voids, seal joints, and apply bond breakers if any, as recommended by prime material manufacturer.
- C. Apply patching compound for filling and patching tie holes, honeycombs, reveals, and other imperfections.

3.3 APPLICATION, GENERAL

- A. Comply with manufacturer's written recommendations unless more stringent requirements are indicated or required by Project conditions to ensure satisfactory performance of dampproofing.
 - 1. Apply dampproofing to provide continuous plane of protection.
 - 2. Apply additional coats if recommended in writing by manufacturer or to achieve a smooth surface and uninterrupted coverage.

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- B. Where dampproofing footings and foundation walls, apply from finished-grade line to top of footing; extend over top of footing and down a minimum of 6 inches over outside face of footing.
1. Extend dampproofing 12 inches onto intersecting walls and footings, but do not extend onto surfaces exposed to view when Project is completed.
 2. Install flashings and corner protection stripping at internal and external corners, changes in plane, construction joints, cracks, and where shown as "reinforced," by embedding an 8 inch wide strip of asphalt-coated glass fabric in a heavy coat of dampproofing. Dampproofing coat for embedding fabric is in addition to other coats required.
- C. Where dampproofing interior face of above-grade, exterior masonry single-wythe masonry walls, continue dampproofing through intersecting walls by keeping vertical mortar joints at intersection temporarily open or by dampproofing wall before constructing intersecting walls.

3.4 COLD-APPLIED, EMULSIFIED-ASPHALT DAMPPROOFING

- A. On Unparged Masonry Foundation Walls: Apply primer and 1 trowel coat at not less than 5 gallons per 100 square feet.
- B. On Exterior Face of Inner Wythe of Cavity Walls: Apply primer and 1 brush or spray coat at not less than 1 gallon per 100 square feet.

3.5 INSTALLATION OF PROTECTION COURSE

- A. Where indicated, install protection course over completed-and-cured dampproofing. Comply with dampproofing material manufacturer's written recommendations for attaching protection course.
1. Support protection course with spot application of adhesive of type recommended by protection board manufacturer over cured coating.
 2. Install protection course on same day of installation of dampproofing (while coating is tacky) to ensure adhesion.

3.6 CLEANING

- A. Remove dampproofing materials from surfaces not intended to receive dampproofing.

END OF SECTION 071113

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SECTION 072100 - THERMAL INSULATION**PART 1 - GENERAL****1.1 SUMMARY**

- A. Section Includes:
1. Extruded polystyrene foam-plastic board.
 2. Glass-fiber blanket.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.

1.3 INFORMATIONAL SUBMITTALS

- A. Product Test Reports: For each product, for tests performed by a qualified testing agency.
- B. Evaluation Reports: For foam-plastic insulation, from ICC-ES.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Protect insulation materials from physical damage and from deterioration due to moisture, soiling, and other sources. Store inside and in a dry location. Comply with manufacturer's written instructions for handling, storing, and protecting during installation.

PART 2 - PRODUCTS**2.1 EXTRUDED POLYSTYRENE FOAM-PLASTIC BOARD**

- A. Extruded-Polystyrene Board: ASTM C578, unfaced, of type and minimum compressive strength indicated below.
1. Manufacturers: Subject to compliance with requirements, provide products from one of the following:
 - a. DuPont; STYROFOAM XPS.
 - b. Owens Corning; Foamular.
 - c. Kingspan Group; GreenGuard Type IV 25 PSI Insulation Board.
 2. Thickness: As indicated on Drawings.
 3. R-Value: 5.00 per inch.
 4. Surface-Burning Characteristics: Comply with ASTM E84; testing by qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - a. Flame-Spread Index: 25 or less.
 - b. Smoke-Developed Index: 450 or less.
 5. Fire Propagation Characteristics: Passes NFPA 285 testing as part of an approved assembly.

2.2 GLASS-FIBER BLANKET

- A. Glass-Fiber Blanket, Unfaced: ASTM C665, Type I; passing ASTM E136 for combustion characteristics.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. CertainTeed Corporation.
 - b. Johns Manville.
 - c. Knauf Insulation, LLC. recovered
 - d. Owens Corning.
 2. Thermal Values: Provide insulation at the following locations with minimum R-Value of 4.5 per inch at 32 degrees F.
 - a. Cavities of 3-1/2 inches: R-15.
 - b. Cavities of 6-1/4 inches: R-19.
 3. Surface Burning Characteristics per ASTM E84:
 - a. Flame Spread: 25.
 - b. Smoke Developed: 50.
 4. Fire Propagation Characteristics: Passes NFPA 285 testing as part of an approved assembly.
- B. Glass-Fiber Blanket, Foil Faced: ASTM C665, Type III (reflective faced), Class B (faced surface with a flame-propagation resistance of 0.12 W/sq. cm); Category 1 (membrane is a vapor barrier), faced with foil scrim, foil-scrim kraft, or foil-scrim polyethylene.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. CertainTeed Corporation
 - b. Johns Manville.
 - c. Knauf Insulation, LLC.
 - d. Owens Corning.

2.3 INSULATION FASTENERS

- A. Adhesively Attached, Spindle-Type Anchors: Plate welded to projecting spindle; capable of holding insulation of specified thickness securely in position indicated with self-locking washer in place.
1. Products: Subject to compliance with requirements, provide one of the following:
 - a. AGM Industries, Inc.: Series T TACTOO Insul-Hangers.
 - b. Gemco: Spindle Type.
 2. Plate: Perforated, galvanized carbon-steel sheet, 0.030 inch thick by 2 inches square.
 3. Spindle: Copper-coated, low-carbon steel; fully annealed; 0.105 inch in diameter; length to suit depth of insulation indicated.
- B. Insulation-Retaining Washers: Self-locking washers formed from 0.016 inch thick galvanized-steel sheet, with beveled edge for increased stiffness, sized as required to hold insulation securely in place, but not less than 1-1/2 inches square or in diameter.
1. Products: Subject to compliance with requirements, provide one of the following:
 - a. AGM Industries, Inc.: RC150 or SC150.
 - b. Gemco: R-150 or S-150.

- C. Insulation Standoff: Spacer fabricated from galvanized mild-steel sheet for fitting over spindle of insulation anchor to maintain air space of between face of insulation and substrate to which anchor is attached.
1. Products: Subject to compliance with requirements, provide the following:
 - a. Gemco: Clutch Clip.
- D. Anchor Adhesive: Product with demonstrated capability to bond insulation anchors securely to substrates indicated without damaging insulation, fasteners, and substrates.
1. Products: Subject to compliance with requirements, provide one of the following:
 - a. AGM Industries, Inc.: TACTOO Adhesive.
 - b. Gemco: Tuff Bond Hanger Adhesive.
- E. Insulation Support Anchors: Continuous, galvanized metal support strip, 0.032 inch thickness by 1 inch wide, with approximately 2-1/2 inches long pre-punched arrow shaped tabs at 8 inches on center.
1. Products: Subject to compliance with requirements, provide the following:
 - a. Insul-Hold Co., Inc. a div of J/R Metal Frames Manufacturing, Inc.: Insul-Hold.

2.4 ACCESSORIES

- A. Insulation for Miscellaneous Voids:
1. Glass-Fiber Insulation: ASTM C764, Type II, loose fill; with maximum flame-spread and smoke-developed indexes of 5, per ASTM E84.
 2. Spray Polyurethane Foam Insulation: ASTM C1029, Type II, closed cell, with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, per ASTM E84.
- B. Adhesive for Bonding Insulation: Product compatible with insulation and air and water barrier materials, and with demonstrated capability to bond insulation securely to substrates without damaging insulation and substrates.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Comply with insulation manufacturer's written instructions applicable to products and applications. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed to ice, rain, or snow at any time.
- B. Extend insulation to envelop entire area to be insulated. Fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.
- C. Provide sizes to fit applications and selected from manufacturer's standard thicknesses, widths, and lengths. Apply single layer of insulation units unless multiple layers are otherwise shown or required to make up total thickness or to achieve R-value.

3.2 INSTALLATION OF CAVITY-WALL INSULATION

- A. Foam-Plastic Board Insulation: Install pads of adhesive spaced approximately 24 inches o.c. both ways on inside face and as recommended by manufacturer. Fit courses of insulation between wall ties and other obstructions, with edges butted tightly in both directions. Press units firmly against inside substrates.
1. Supplement adhesive attachment of insulation by securing boards with two-piece wall ties designed for this purpose and specified in Section 042000 – Unit Masonry.

3.3 INSTALLATION OF INSULATION IN FRAMED CONSTRUCTION

- A. Blanket Insulation: Install in cavities formed by framing members according to the following requirements:
1. Use insulation widths and lengths that fill the cavities formed by framing members. If more than one length is required to fill the cavities, provide lengths that will produce a snug fit between ends.
 2. Place insulation in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members.
 3. Maintain 3-inch clearance of insulation around recessed lighting fixtures not rated for or protected from contact with insulation.
 4. For metal-framed wall cavities where cavity heights exceed 96 inches, support unfaced blankets mechanically.
- B. Miscellaneous Voids: Install insulation in miscellaneous voids and cavity spaces where required to prevent gaps in insulation using glass-fiber insulation or spray polyurethane insulation.

3.4 PROTECTION

- A. Protect installed insulation from damage due to harmful weather exposures, physical abuse, and other causes. Provide temporary coverings or enclosures where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

END OF SECTION 072100

SECTION 072726 - FLUID-APPLIED MEMBRANE AIR BARRIERS**PART 1 - GENERAL****1.1 SUMMARY****A. Section Includes:**

1. Vapor-permeable, fluid-applied air barriers.

B. Related Requirements:

1. Section 061600 "Sheathing" for wall sheathings and wall sheathing joint-and-penetration treatments.

1.2 DEFINITIONS

A. Air-Barrier Material: A primary element that provides a continuous barrier to the movement of air.

B. Air-Barrier Accessory: A transitional component of the air barrier that provides continuity.

C. Air-Barrier Assembly: The collection of air-barrier materials and accessories applied to an opaque wall, including joints and junctions to abutting construction, to control air movement through the wall.

1.3 PREINSTALLATION MEETINGS**A. Preinstallation Conference: Conduct conference at Project site.**

1. Review air-barrier requirements and installation, special details, mockups, air-leakage and bond testing, air-barrier protection, and work scheduling that covers air barriers.
2. Include Owner, Architect, Installer, Manufacturer's technical representative, and installers of other construction affecting or connecting to air barrier, including roofing, waterproofing, architectural precast concrete, masonry, sealants, windows, glazed curtain walls, and door frames.
3. Review air barrier requirements including surface preparation, substrate condition and pretreatment, minimum substrate curing period, forecasted weather conditions, special details and sheet flashings, mockups, installation procedures including wet and dry film thicknesses and verification of thicknesses, sequence of installation, testing and inspecting procedures, and protection and repairs.

B. Review test assembly for compliance with NFPA 285.**1.4 ACTION SUBMITTALS****A. Product Data: For each type of product.**

1. Include manufacturer's written instructions for evaluating, preparing, and treating each substrate; technical data; dry film thickness; and tested physical and performance properties of products.

B. Shop Drawings: For air-barrier assemblies.

1. Show locations and extent of air-barrier materials, accessories, and assemblies specific to Project conditions.
2. Include details for substrate joints and cracks, counterflashing strips, penetrations, inside and outside corners, terminations, and tie-ins with adjoining construction.

3. Include details of interfaces with other materials that form part of air barrier.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer. Include list of ABAA-certified installers and supervisors employed by Installer, who work on Project.
 1. Include copy of Installer's ABAA license and verification of manufacturer's training of installers and supervisors on Project.
- B. Product Certificates: From air-barrier manufacturer, certifying compatibility of air barriers and accessory materials with Project materials that connect to or that come in contact with the barrier.
- C. Product Test Reports: For each air-barrier assembly, for tests performed by a qualified testing agency.
- D. Field quality-control reports.

1.6 QUALITY ASSURANCE

- A. Manufacturer's Technical Representative Qualification: An authorized full-time employee representative of manufacturer experienced in the installation and maintenance of the specified system and qualified to determine Installer's compliance with the requirements of this Project.
- B. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.
 1. Installer to be licensed by ABAA according to ABAA's Quality Assurance Program and to employ ABAA-certified installers and supervisors on Project.
- C. Installer Limitations: Each type of air barrier system material, fluid-applied and sheet membrane shall be installed by a single installation firm.
- D. All associated products used in conjunction with air barrier membranes and forming an integral part of the waterproofing system must be furnished and approved by the air barrier manufacturer and covered by the applicable total system warranties.
- E. Mockups: Build mockups to set quality standards for materials and execution.
 1. Build integrated mockups of exterior wall assembly as indicated on Drawings, incorporating backup wall construction, external cladding, window, storefront, door frame and sill, insulation, ties and other penetrations, and flashing to demonstrate surface preparation, crack and joint treatment, application of air barriers, and sealing of gaps, terminations, and penetrations of air-barrier assembly.
 - a. Coordinate construction of mockups to permit inspection and testing of air barrier before external insulation and cladding are installed.
 - b. Include junction with roofing membrane, building corner condition, and foundation wall intersection.
 - c. If Architect determines mockups do not comply with requirements, reconstruct mockups and apply air barrier until mockups are approved.
 2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials in their original undamaged packages, with labels intact and legible.
- B. Store liquid materials in their original undamaged packages in a clean, dry, protected location and within temperature range required by air barrier manufacturer.
- C. Remove and replace liquid materials that cannot be applied within their stated shelf life.
- D. Protect stored materials from direct sunlight.

1.8 FIELD CONDITIONS

- A. Environmental Limitations: Apply air barrier within the range of ambient and substrate temperatures recommended in writing by air-barrier manufacturer.
 - 1. Protect substrates from environmental conditions that affect air-barrier performance.
 - 2. Do not apply air barrier to a damp or wet substrate or during snow, rain, fog, or mist.
- B. Product and system selection shall be coordinated with construction sequence to ensure that manufacturer's exposure limits are adequate for anticipated schedule. Air barrier membrane exposed beyond the manufacturer's exposure limits shall be recoated or removed and reinstalled, per manufacturer's written instructions, re-inspected and reapproved at Contractor's own expense.

PART 2 - PRODUCTS**2.1 MATERIALS**

- A. Source Limitations: Obtain primary air-barrier materials and air-barrier accessories from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

- A. Air-Barrier Performance: Air-barrier assembly and seals with adjacent construction to be capable of performing as a continuous air barrier and as a liquid-water drainage plane flashed to discharge to the exterior incidental condensation or water penetration. Air-barrier assemblies to be capable of accommodating substrate movement and of sealing substrate expansion and control joints, construction material changes, penetrations, tie-ins to installed waterproofing, and transitions at perimeter conditions without deterioration and air leakage exceeding specified limits.
- B. Air-Barrier Assembly Air Leakage: Maximum 0.04 cfm/sq. ft. of surface area at 1.57 lbf/sq. ft., when tested according to ASTM E2357.
- C. Water Resistance: Material shall resist 21.6 in water for 5 hours before and after aging when tested per ICC-ES 212.
- D. Nail Sealability: Material shall allow no water found on nail shanks, on underside of sheathing and/or between sheathing and product coating when tested per ASTM D 1970.
- E. Flammability: Material shall allow a Flame Spread of less than 25 and Smoke Development of less than 450 when tested per ASTM E 84.

- F. Adhesion: Material shall exhibit a minimum adhesion of 15 psi when tested per ASTM D 4541.
- G. Compatibility: Material shall be compatible with adjacent materials.
- H. UV Stability: Material shall survive a minimum of 6 months UV Exposure during construction.
- I. System Continuity: Material Manufacturer shall provide materials/system, including flashings, for an interface with windows, door and other penetrations that integrate into a compatible and continuous air barrier assembly.

2.3 HIGH-BUILD AIR BARRIERS, VAPOR PERMEABLE

- A. High-Build, Vapor-Permeable Air Barrier Synthetic Polymer Type: Synthetic polymer membrane with an installed dry film thickness, according to manufacturer's written instructions, of 35 mils or thicker over smooth, void-free substrates.
 - 1. Synthetic Polymer Type:
 - a. Products: Subject to compliance with requirements, provide one of the following:
 - 1) Carlisle Coatings & Waterproofing; Barritech VP.
 - 2) GCP Applied Technologies Inc.; Perm-A-Barrier VPL.
 - 3) Henry Company; Air-Bloc 17MR.
 - 4) Meadows, W.R.; Air-Shield LMP.
 - 5) Tremco Incorporated; ExoAir 230.
 - 6) W.R. Meadows; Air-Shield LMP.
 - 2. Physical and Performance Properties:
 - a. Air Permeance: Maximum 0.004 cfm/sq. ft. of surface area at 1.57-lbf/sq. ft. pressure difference; ASTM E2178.
 - b. Vapor Permeance: Minimum 10 perms; ASTM E96/E96M, Procedure A, Desiccant Method.
 - c. Ultimate Elongation: Minimum 200 percent; ASTM D412, Die C.
 - d. Fire Propagation Characteristics: Passes NFPA 285 testing as part of an approved assembly.
 - e. UV Resistance: Can be exposed to sunlight for recommended number of days according to manufacturer's written instructions.

2.4 ACCESSORY MATERIALS

- A. Provide primers, transition strips, termination strips, joint reinforcing fabric and strips, joint sealants, counterflashing strips, flashing sheets and metal termination bars, termination mastic, substrate patching materials, adhesives, tapes, foam sealants, lap sealants, and other accessory materials that are recommended in writing by air-barrier manufacturer to produce a complete air-barrier assembly and that are compatible with primary air-barrier material and adjacent construction to which they may seal.
- B. Primer: Liquid waterborne primer recommended for substrate by air-barrier material manufacturer.
- C. Stainless Steel Sheet: ASTM A240/A240M, Type 304, 0.0187 inch thick, and Series 300 stainless steel fasteners.
- D. Self-Adhering Transition Membrane: Composite, self-adhesive, flashing product consisting of a pliable, rubberized-asphalt compound, bonded to a high-density, cross-laminated polyethylene film to produce an overall thickness of not less than 0.030 inch.

1. Products: Subject to compliance with requirements, provide products by one of the following:
 - a. Carlisle Coatings & Waterproofing.
 - b. GCP Applied Technologies.
 - c. Henry Company; Blueskin SA.
 - d. Meadows, W.R.
 - e. Tremco Incorporated.
- E. Primer for Transition Membrane: Product recommended by manufacturer of transition membrane for substrate.
- F. Preformed Silicone Extrusion: Manufacturer's standard system consisting of cured low-modulus silicone extrusion, sized to fit opening widths, with a single-component, neutral-curing, Class 100/50 (low-modulus) silicone sealant for bonding extrusions to substrates.
 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. GE Construction Sealants; Momentive Performance Materials Inc.
 - b. Pecora Corporation; Pecora XL-Span.
 - c. The Dow Chemical Company; Dow Corning® 123 Silicone Seal.
 - d. Tremco Incorporated; Spectrem Simple Seal.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance of the Work.
 1. Verify that substrates are sound and free of oil, grease, dirt, excess mortar, or other contaminants.
 2. Verify that substrates have cured and aged for minimum time recommended in writing by air-barrier manufacturer.
 3. Verify that substrates are visibly dry and free of moisture. Test concrete substrates for capillary moisture by plastic sheet method according to ASTM D4263.
 4. Verify that masonry joints are flush and completely filled with mortar.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 SURFACE PREPARATION

- A. Clean, prepare, treat, fill, and seal substrate and joints and cracks in substrate according to manufacturer's written instructions and details. Provide clean, dust-free, and dry substrate for air-barrier application.
- B. Mask off adjoining surfaces not covered by air barrier to prevent spillage and overspray affecting other construction.
- C. Remove grease, oil, bitumen, form-release agents, paints, curing compounds, and other penetrating contaminants or film-forming coatings from concrete.
- D. Remove fins, ridges, mortar, and other projections and fill honeycomb, aggregate pockets, holes, and other voids in concrete with substrate-patching material.
- E. Remove excess mortar from masonry ties, shelf angles, and other obstructions.

- F. At changes in substrate plane, apply sealant or termination mastic beads at sharp corners and edges to form a smooth transition from one plane to another.
- G. Cover gaps in substrate plane and form a smooth transition from one substrate plane to another with stainless steel sheet mechanically fastened to structural framing to provide continuous support for air barrier.
- H. Bridge isolation joints, expansion joints and discontinuous wall-to-wall, deck-to-wall, and deck-to-deck joints with air-barrier accessory material that accommodates joint movement according to manufacturer's written instructions and details.

3.3 ACCESSORIES INSTALLATION

- A. Install accessory materials according to air-barrier manufacturer's written instructions and details to form a seal with adjacent construction and ensure continuity of air and water barrier.
 - 1. Coordinate the installation of air barrier with installation of roofing membrane and base flashing to ensure continuity of air barrier with roofing membrane.
 - 2. Install transition strip on roofing membrane or base flashing so that a minimum of 3 inches of coverage is achieved over each substrate.
 - 3. Unless manufacturer recommends in writing against priming, apply primer to substrates at required rate and allow it to dry.
 - 4. Apply primer to substrates at required rate and allow it to dry. Limit priming to areas that will be covered by air-barrier material on same day. Reprime areas exposed for more than 24 hours.
- B. Connect and seal exterior wall air-barrier material continuously to roofing-membrane air barrier, concrete below-grade structures, floor-to-floor construction, exterior glazing and window systems, glazed curtain-wall systems, storefront systems, exterior louvers, exterior door framing, and other construction used in exterior wall openings, using accessory materials.
- C. At end of each working day, seal top edge of strips and transition strips to substrate with termination mastic.
- D. Apply joint sealants forming part of air-barrier assembly within manufacturer's recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges.
- E. Wall Openings: Prime concealed, perimeter frame surfaces of windows, curtain walls, storefronts, and doors. Apply [**transition strip**] [**preformed silicone extrusion**] so that a minimum of 3 inches of coverage is achieved over each substrate. Maintain 3 inches of full contact over firm bearing to perimeter frames, with not less than 1 inch of full contact.
 - 1. Transition Strip: Roll firmly to enhance adhesion.
 - 2. Preformed Silicone Extrusion: Set in full bed of silicone sealant applied to walls, frame, and air-barrier material.
- F. Fill gaps in perimeter frame surfaces of windows, curtain walls, storefronts, and doors, and miscellaneous penetrations of air-barrier material with foam sealant.
- G. Seal strips and transition strips around masonry reinforcing or ties and penetrations with termination mastic.
- H. Seal top of through-wall flashings to air barrier with an additional 6-inch- wide, transition strip.

- I. Seal exposed edges of strips at seams, cuts, penetrations, and terminations not concealed by metal counterflashings or ending in reglets with termination mastic.
- J. Repair punctures, voids, and deficient lapped seams in strips and transition strips. Slit and flatten fishmouths and blisters. Patch with transition strips extending 6 inches beyond repaired areas in strip direction.

3.4 PRIMARY AIR-BARRIER MATERIAL INSTALLATION

- A. Apply air-barrier material to form a seal with strips and transition strips and to achieve a continuous air barrier according to air-barrier manufacturer's written instructions and details. Apply air-barrier material within manufacturer's recommended application temperature ranges.
 - 1. Unless manufacturer recommends in writing against priming, apply primer to substrates at required rate and allow it to dry.
 - 2. Limit priming to areas that will be covered by air-barrier material on same day. Reprime areas exposed for more than 24 hours.
 - 3. Where multiple prime coats are needed to achieve required bond, allow adequate drying time between coats.
- B. High-Build Air Barriers: Apply continuous unbroken air-barrier material to substrates according to the following thickness. Apply air-barrier material in full contact around protrusions such as masonry ties.
 - 1. Vapor-Permeable, High-Build Air Barrier: Total dry film thickness as recommended in writing by manufacturer to comply with performance requirements, but not less than 35 mils, applied in two or more equal coats.
- C. Do not cover air barrier until it has been tested and inspected by testing agency.
- D. Correct deficiencies in or remove air barrier that does not comply with requirements; repair substrates and reapply air-barrier components.

3.5 FIELD QUALITY CONTROL

- A. ABAA Quality Assurance Program: Perform examinations, preparation, installation, testing, and inspections under ABAA's Quality Assurance Program.
- B. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- C. Inspections: Air-barrier materials, accessories, and installation are subject to inspection for compliance with requirements. Inspections may include the following:
 - 1. Continuity of air-barrier system has been achieved throughout the building envelope with no gaps or holes.
 - 2. Air-barrier dry film thickness.
 - 3. Continuous structural support of air-barrier system has been provided.
 - 4. Masonry and concrete surfaces are smooth, clean, and free of cavities, protrusions, and mortar droppings.
 - 5. Site conditions for application temperature and dryness of substrates have been maintained.
 - 6. Maximum exposure time of materials to UV deterioration has not been exceeded.
 - 7. Surfaces have been primed, if applicable.
 - 8. Laps in strips and transition strips have complied with minimum requirements and have been shingled in the correct direction (or mastic has been applied on exposed edges), with no fishmouths.

9. Termination mastic has been applied on cut edges.
10. Strips and transition strips have been firmly adhered to substrate.
11. Compatible materials have been used.
12. Transitions at changes in direction and structural support at gaps have been provided.
13. Connections between assemblies (air-barrier and sealants) have complied with requirements for cleanliness, surface preparation and priming, structural support, integrity, and continuity of seal.
14. All penetrations have been sealed.

D. Tests: As determined by testing agency from among the following tests:

1. Air-Leakage-Location Testing: Air-barrier assemblies will be tested for evidence of air leakage according to ASTM E1186, chamber pressurization or depressurization with smoke tracers.
2. Air-Leakage-Volume Testing: Air-barrier assemblies will be tested for air-leakage rate according to ASTM E783 or ASTM E2357.
3. Adhesion Testing: Air-barrier assemblies will be tested for required adhesion to substrate according to ASTM D4541 for each 600 sq. ft. of installed air barrier or part thereof.

E. Air barriers will be considered defective if they do not pass tests and inspections.

1. Apply additional air-barrier material, according to manufacturer's written instructions, where inspection results indicate insufficient thickness.
2. Remove and replace deficient air-barrier components for retesting as specified above.

F. Repair damage to air barriers caused by testing; follow manufacturer's written instructions.

G. Prepare test and inspection reports and submit to Architect and Owner.

3.6 CLEANING AND PROTECTION

A. Protect air-barrier system from damage during application and remainder of construction period, according to manufacturer's written instructions.

1. Protect air barrier from exposure to UV light and harmful weather exposure as recommended in writing by manufacturer. If exposed to these conditions for longer than recommended, remove and replace air barrier or install additional, full-thickness, air-barrier application after repairing and preparing the overexposed materials according to air-barrier manufacturer's written instructions.
2. Protect air barrier from contact with incompatible materials and sealants not approved by air-barrier manufacturer.

B. Clean spills, stains, and soiling from construction that would be exposed in the completed work using cleaning agents and procedures recommended in writing by manufacturer of affected construction.

C. Remove masking materials after installation.

END OF SECTION 072726

SECTION 075216 – SBS MODIFIED BITUMINOUS MEMBRANE ROOFING**PART 1 - GENERAL****1.1 SUMMARY****A. Section Includes:**

1. Styrene-butadiene-styrene (SBS) modified bituminous membrane roofing system.
2. Roof insulation and accessories.

1.2 DEFINITIONS

- A. Roofing Terminology: See ASTM D 1079 and glossary of NRCA's "The NRCA Roofing and Waterproofing Manual" for definition of terms related to roofing work in this Section.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.

- B. Shop Drawings: For roofing system. Include plans, elevations, sections, details, and attachments to other Work.

1. Base flashings and membrane terminations.
2. Tapered insulation, including slopes.
3. Crickets, saddles, and tapered edge strips, including slopes.
4. Insulation fastening patterns for corner, perimeter, and field-of-roof locations.

- C. Samples for Verification: For the following products:

1. Sheet roofing materials, including base sheet roofing membrane sheet flashing backer sheet membrane cap sheet and flashing sheet, of color specified.
2. Roof insulation and cover board.
3. Walkway pads or rolls.
4. Six insulation fasteners and plates of each type, length, and finish.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified Installer and manufacturer.

- B. Manufacturer Certificates: Signed by roofing manufacturer certifying that roofing system complies with requirements specified in "Performance Requirements" Article.

1. Submit evidence of complying with performance requirements.

- C. Product Test Reports: Based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified testing agency, for components of membrane roofing system.

- D. Warranties: Sample of special warranties.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For roofing system to include in maintenance manuals.

1.6 QUALITY ASSURANCE

- A. Roofing work shall be directly sub-contracted by the General Contractor to a roofing company that specializes in the required type of roofing and has an on-going business relationship with the specified manufacturer, whose product is to be supplied. Brokering or sub-subcontracting of roofing work is unacceptable and will not be allowed.
- B. Manufacturer Qualifications: A qualified manufacturer that has FM, Miami Dade or Florida Building Code Approvals approved for membrane roofing system identical to that used for this Project.
1. The manufacturer shall provide all materials marketed and labeled by a single source for a complete system; sheet goods, flashings, coated metals, corrosion resistant fastenings, sealants, adhesives, primers, seam caulk, and all other components which may be required for this roof to receive a 20 year warranty.
 2. Manufacturer shall provide the technical inspection such that manufacturer's intent and contractor's efforts remain coordinated.
- C. Installer Qualifications: A qualified firm that is approved, authorized, or licensed by membrane roofing system manufacturer to install manufacturer's product and that is eligible to receive manufacturer's special warranty.
1. The installer shall demonstrate and offer written attested certification that he has installed; a minimum of 500 squares (50,000 sq. ft.) per year for each of the past three years of the material that he is bidding.
 - a. Installation of other types of membranes, or another manufacturer's goods is not considered as meeting the above requirement.
 2. The installer shall substantiate a track record of working with the manufacturer for three consecutive years, and at a scale of operations cited above.
- D. Exterior Fire-Test Exposure: ASTM E 108, UL, and FM, Class A; for application and roof slopes indicated, as determined by testing identical membrane roofing materials by a qualified testing agency. Materials shall be identified with appropriate markings of applicable testing agency.
- E. Fire-Resistance Ratings: Where indicated, provide fire-resistance-rated roof assemblies identical to those of assemblies tested for fire resistance per ASTM E 119 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
- F. Preliminary Roofing Conference: Before starting roof deck construction, conduct conference at Project site.
1. Meet with Owner, Architect, Owner's insurer if applicable, testing and inspecting agency representative, roofing Installer, roofing system manufacturer's representative, deck Installer, and installers whose work interfaces with or affects roofing, including installers of roof accessories and roof-mounted equipment.
 2. Review methods and procedures related to roofing installation, including manufacturer's written instructions.
 3. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
 4. Review deck substrate requirements for conditions and finishes, including flatness and fastening.
 5. Review structural loading limitations of roof deck during and after roofing.

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6. Review base flashings, special roofing details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that will affect roofing system.
 7. Review governing regulations and requirements for insurance and certificates if applicable.
 8. Review temporary protection requirements for roofing system during and after installation.
 9. Review roof observation and repair procedures after roofing installation.
- G. Preinstallation Roofing Conference: Conduct conference at Project site.
1. Meet with Owner, Architect, Owner's insurer if applicable, testing and inspecting agency representative, roofing Installer, roofing system manufacturer's representative, deck Installer, and installers whose work interfaces with or affects roofing, including installers of roof accessories and roof-mounted equipment.
 2. Review methods and procedures related to roofing installation, including manufacturer's written instructions.
 3. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
 4. Examine deck substrate conditions and finishes for compliance with requirements, including flatness and fastening.
 5. Review structural loading limitations of roof deck during and after roofing.
 6. Review base flashings, special roofing details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that will affect roofing system.
 7. Review governing regulations and requirements for insurance and certificates if applicable.
 8. Review temporary protection requirements for roofing system during and after installation.
 9. Review roof observation and repair procedures after roofing installation.
- H. Roofing Inspections: Make required notifications, secure required inspections and pay fees such that the specified systems warranty is assured at the time of completion of the Work.
1. Contractor and Manufacturer's assigned representative shall inspect and warrant the Work as a condition of acceptance.
 2. Manufacturer shall provide project start-up guidance and direction at start of installation and then provide inspections by manufacturer's technical inspector at 25 percent, 50 percent and final, with inspection reports submitted to the Roofing Installer, General Contractor and Architect/Owner. Deficiencies shall be listed on the inspection reports and all repairs/corrections made and certified completed and approved by the inspector submitted with next and final report.
 3. Manufacturer's Final Completion/Warranty Inspection: Upon completion of the Work and prior to final payment, the roofing manufacturer's representative, in the presence of the Owner and Architect, shall inspect the roofing Work. Discrepancies shall be recorded and immediately rectified. Final payment will not be issued until the manufacturer's representative has given his certification/approval of the Work and close-out submittals, including Roofing Warranties and roof maintenance instructions, have been received by the Architect. Warranties issued prior to final inspection are not acceptable and shall not qualify for release of final payment for roofing work.
- 1.7 DELIVERY, STORAGE, AND HANDLING
- A. Deliver roofing materials to Project site in original containers with seals unbroken and labeled with manufacturer's name, product brand name and type, date of manufacture, approval or listing agency markings, and directions for storing and mixing with other components.
 - B. Store liquid materials in their original undamaged containers in a clean, dry, protected location and within the temperature range required by roofing system manufacturer. Protect stored liquid material from direct sunlight.
 1. Discard and legally dispose of liquid material that cannot be applied within its stated shelf life.

- C. Protect roof insulation materials from physical damage and from deterioration by sunlight, moisture, soiling, and other sources. Store in a dry location. Comply with insulation manufacturer's written instructions for handling, storing, and protecting during installation.
 - 1. Store insulation bundles off the ground beneath breathable weatherproof tarps. Manufacturer's plastic wraps alone are not sufficient protection.
- D. Handle and store roofing materials and place equipment in a manner to avoid permanent deflection of deck.

1.8 PROJECT CONDITIONS

- A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit roofing system to be installed according to manufacturer's written instructions and warranty requirements.

1.9 WARRANTIES

- A. Special Manufacturer's System Warranty: Manufacturer's standard or customized warranty, without monetary limitation, warranty, in which manufacturer agrees to repair or replace components of roofing system that fail in materials or workmanship within specified warranty period. Failure includes roof leaks.
 - 1. Special warranty includes membrane roofing, base flashings, roof insulation, fasteners, mfg. supplied edge metal, liquid applied flashing, cover boards, roofing accessories, and other components of membrane roofing system.
 - 2. Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 SBS-MODIFIED ASPHALT-SHEET MATERIALS

- A. SBS-Modified Bituminous Membrane Roofing:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Johns Manville.
 - b. Polyglass USA, Inc.
 - c. Siplast (Basis-of-Design).
 - d. Soprema.
 - 2. Roofing Membrane System:
 - a. Deck Type: I (insulated).
 - b. Adhering Method: L (cold-applied adhesive).
 - c. Number of SBS Modified Asphalt Roofing Membrane Sheets: Two.
 - d. Surfacing Type: M (mineral-granule-surfaced cap sheet).
 - e. Thickness of complete roofing membrane system shall be minimum 60 mil.
- B. Source Limitations: Obtain components including roof insulation, cover board, fasteners, flashing, and edge metal for roofing system from same manufacturer as membrane roofing or approved and warranted by membrane roofing manufacturer.

2.2 PERFORMANCE REQUIREMENTS

- A. General Performance: Installed membrane roofing and base flashings shall withstand specified uplift pressures, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Membrane roofing and base flashings shall remain watertight.
 - 1. Accelerated Weathering: Roofing system shall withstand 2000 hours of exposure when tested according to ASTM G 152, ASTM G 154, or ASTM G 155.
- B. Material Compatibility: Provide roofing materials that are compatible with one another under conditions of service and application required, as demonstrated by membrane roofing manufacturer based on testing and field experience.
- C. Roofing System Design: Provide membrane roofing system that is identical to systems that have been successfully tested by a qualified testing and inspecting agency to resist uplift pressure calculated according to ASCE/SEI 7.
 - 1. Field-of-Roof Uplift Pressure: Refer to structural drawings for load requirements.
 - 2. Perimeter Uplift Pressure: Refer to structural drawings for load requirements.
 - 3. Corner Uplift Pressure: Refer to structural drawings for load requirements.

2.3 ROOFING SHEET MATERIALS

- A. Sheathing Paper: Red-rosin type, minimum 3 lb/100 sq. ft..
- B. Roofing Membrane Sheet: ASTM D 6164, Grade S, Type II, SBS-modified asphalt sheet (reinforced with polyester fabric) ASTM D 6163, Grade S, Type I, SBS-modified asphalt sheet (reinforced with glass fibers); smooth surfaced; suitable for application method specified.
- C. Granule-Surfaced Roofing Cap Sheet: ASTM D 6164, Grade G, Type II, SBS-modified asphalt sheet (reinforced with polyester fabric) or ASTM D 6163, Grade G, Type I, SBS-modified asphalt sheet (reinforced with glass fibers); granule surfaced; suitable for application method specified, and as follows:
 - 1. Granule Color: White.

2.4 BASE FLASHING SHEET MATERIALS

- A. Backer Sheet: ASTM D 6164, Grade S, Type II, SBS-modified asphalt sheet (reinforced with polyester fabric) ASTM D 6163, Grade S, Type I, SBS-modified asphalt sheet (reinforced with glass fibers; smooth surfaced; suitable for application method specified.
- B. Granule-Surfaced Flashing Sheet: ASTM D 6164, Grade G, Type II, SBS-modified asphalt sheet (reinforced with polyester fabric) or ASTM D 6163, Grade G, Type I, SBS-modified asphalt sheet (reinforced with glass fibers); granule surfaced; suitable for application method specified, and as follows:
 - 1. Granule Color: White.
- C. Liquid Flashing System: Roof membrane manufacturer's standard one- or two-part moisture curing resin with low solvent content, consisting of a primer, flashing cement, and scrim.

2.5 AUXILIARY ROOFING MEMBRANE MATERIALS

- A. General: Auxiliary materials recommended by roofing system manufacturer for intended use and compatible with roofing membrane.
 - 1. Liquid-type auxiliary materials shall comply with VOC limits of authorities having jurisdiction.
- B. Asphalt Primer: ASTM D 41.
- C. Cold-Applied Adhesive: Roofing system manufacturer's standard asphalt-based, two-part, asbestos-free, cold-applied adhesive specially formulated for compatibility and use with roofing membrane and base flashings.
- D. Mastic Sealant: Polyisobutylene, plain or modified bitumen; nonhardening, nonmigrating, nonskinning, and nondrying.
- E. Fasteners: Corrosion-resistant, factory-coated steel fasteners and metal or plastic plates designed for fastening roofing membrane components to substrate; tested by manufacturer for required pullout strength, and acceptable to roofing system manufacturer.
- F. Metal Flashing Sheet: As specified in Section 076200 – Sheet Metal Flashing and Trim.
- G. Coping System: Manufacturer's factory fabricated coping consisting of a base piece and a snap-on cap. Provide product manufactured and marketed by single-source membrane supplier that is included in the No Dollar Limit guarantee.
- H. Fascia System: Manufacturer's factory fabricated fascia consisting of a base piece and a snap-on cover. Retain first paragraph below if field-applied granules are required for incidental repairs. Revise to other granule types if applicable.
- I. Roofing Granules: Ceramic-coated roofing granules, No. 11 screen size with 100 percent passing No. 8 sieve and 98 percent of mass retained on No. 40 sieve, color to match roofing.
- J. Miscellaneous Accessories: Provide those recommended by roofing system manufacturer.

2.6 ROOF INSULATION

- A. General: Preformed roof insulation boards manufactured or approved and warranted by roofing manufacturer, selected from manufacturer's standard sizes suitable for application, of thicknesses indicated.
- B. Polyisocyanurate Board Insulation: ASTM C1289, Type II, Class 2, Grade 2, felt or glass-fiber mat facer on both major surfaces
 - 1. Manufacturers: Subject to compliance with requirements, provide one of the following:
 - a. Atlas Roofing Corporation; ACFoam II.
 - b. Carlisle SynTec Incorporated; HP-H Polyiso or SecurShield CD.
 - c. GAF Materials Corporation; EnergyGuard or EnergyGuard Ultra Polyiso.
 - d. Hunter Panels; H-Shield or H-Shield CG.
 - e. Johns Manville; R-Panel.
 - f. Sika USA; Multi-Max FA-3.
 - g. Siplast; Paratherm.
 - h. Soprema; SOPRA-ISO.

- C. Tapered Insulation: Factory- tapered insulation boards fabricated to slope of 1/4 inch per 12 inches, unless otherwise indicated. Provide mitered boards for changes in slope direction.
 - 1. Minimum 1 inch coverage over polyisocyanurate board insulation.
- D. Provide preformed saddles, crickets, and other insulation shapes where indicated for sloping to drain. Fabricate to slopes indicated.

2.7 INSULATION ACCESSORIES

- A. General: Furnish roof insulation accessories recommended by insulation manufacturer for intended use and compatibility with membrane roofing.
- B. Fasteners: Corrosion-resistant, factory-coated steel fasteners and metal or plastic plates designed for fastening roof insulation to substrate, and acceptable to roofing system manufacturer.
- C. Modified Asphaltic Insulation Adhesive: Insulation manufacturer's recommended modified asphaltic, asbestos-free, cold-applied adhesive formulated to attach roof insulation to substrate or to another insulation layer.
- D. Full-Spread Applied Insulation Adhesive: Insulation manufacturer's recommended spray-applied, low-rise, two-component urethane adhesive formulated to attach roof insulation to substrate or to another insulation layer.
- E. Insulation Cant Strips: ASTM C 208, Type II, Grade 1, cellulosic-fiber insulation board.
- F. Wood Nailer Strips: Comply with Section 061053 – Miscellaneous Rough Carpentry.
- G. Tapered Edge Strips: ASTM C 208, Type II, Grade 1, cellulosic-fiber insulation board.
- H. Cover Board: ASTM C1177, glass-mat, water-resistant gypsum substrate, factory primed.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. CertainTeed Gypsum, Inc.: GlasRoc Roof Board.
 - b. Georgia-Pacific Gypsum LLC: DensDeck Prime.
 - c. National Gypsum Company: DEXcell FA Glass Mat Roof Board.
 - 2. Thickness: 1/4 inch.

2.8 ROOF PAVERS

- A. Roof Pavers: Heavyweight, hydraulically pressed concrete units, squared edged with top edges beveled 3/16 inch, factory cast for use as roof pavers; absorption not greater than 5 percent, ASTM C 140; no breakage and maximum 1 percent mass loss when tested for freeze-thaw resistance, ASTM C 67; and as follows:
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide Guardian Pavers by Hanover Architectural Products or comparable product by one of the following:
 - a. Roofblok Limited.
 - b. Sunny Brook Pressed Concrete Co.
 - c. Wausau Tile Inc.
 - d. Westile Roofing Products.
 - 2. Provide roof paver system and pedestal components to meet required elevations.

3. Size: 24 by 24 inches; manufacturer pavers to dimensional tolerances of plus or minus 1/16 inch in length, height, and thickness.
4. Colors and Textures: As selected by Architect from manufacturer's full range.

2.9 WALKWAYS

- A. Walkway Pads: Polymer-modified, reconstituted rubber pads with slip-resisting textured surface, manufactured as a traffic pad for foot traffic and acceptable to roofing system manufacturer, 1/2 inch thick, minimum.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with the following requirements and other conditions affecting performance of roofing system:
 1. Verify that roof openings and penetrations are in place and curbs are set and braced and that roof drain bodies are securely clamped in place.
 2. Verify that wood cants, blocking, curbs, and nailers are securely anchored to roof deck at penetrations and terminations and that nailers match thicknesses of insulation.
 3. Verify that surface plane flatness and fastening of steel roof deck complies with requirements in Section 053100 – Steel Decking.
 4. Verify that minimum concrete drying period recommended by roofing system manufacturer has passed.
 5. Verify that deck is securely fastened with no projecting fasteners and with no adjacent units in excess of 1/16 inch out of plane relative to adjoining deck.

3.2 PREPARATION

- A. Clean substrate of dust, debris, moisture, and other substances detrimental to roofing installation according to roofing system manufacturer's written instructions. Remove sharp projections.
- B. Prevent materials from entering and clogging roof drains and conductors and from spilling or migrating onto surfaces of other construction. Remove roof-drain plugs when no work is taking place or when rain is forecast.
- C. Install insulation strips in ribs of acoustical roof decks according to acoustical roof deck manufacturer's written instructions.

3.3 INSULATION INSTALLATION

- A. Comply with roofing system manufacturer's written instructions for installing roof insulation.
- B. Install one lapped base-sheet course and mechanically fasten to substrate according to roofing system manufacturer's written instructions.
- C. Nailer Strips: Mechanically fasten 4-inch nominal- width wood nailer strips of same thickness as insulation perpendicular to sloped roof deck at the following spacing:
 1. 16 feet apart for roof slopes steeper than 1 inch per 12 inches but less than 3 inches per 12 inches.
 2. 48 inches apart for roof slopes steeper than 3 inches per 12 inches.

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- D. Insulation Cant Strips: Install and secure preformed 45-degree insulation cant strips at junctures of roofing membrane system with vertical surfaces or angle changes more than 45 degrees.
- E. Install insulation with long joints of insulation in a continuous straight line with end joints staggered between rows, abutting edges and ends between boards. Fill gaps exceeding 1/4 inch with insulation.
1. Cut and fit insulation within 1/4 inch of nailers, projections, and penetrations.
- F. Install insulation under area of roofing to achieve required thickness. Where overall insulation thickness is 2.7 inches or more, install two or more layers with joints of each succeeding layer staggered from joints of previous layer a minimum of 6 inches in each direction.
1. Where installing composite and noncomposite insulation in two or more layers, install noncomposite board insulation for bottom layer and intermediate layers, if applicable, and install composite board insulation for top layer.
- G. Trim surface of insulation where necessary at roof drains so completed surface is flush and does not restrict flow of water.
- H. Install tapered edge strips at perimeter edges of roof that do not terminate at vertical surfaces.
- I. Mechanically Fastened and Adhered Insulation: Install first layer of insulation to deck using mechanical fasteners specifically designed and sized for fastening specified board-type roof insulation to deck type.
1. Fasten first layer of insulation to resist uplift pressure at corners, perimeter, and field of roof.
 2. Set each subsequent layer of insulation in a solid mopping of hot roofing asphalt.
 3. Set each subsequent layer of insulation in ribbons of bead-applied insulation adhesive, firmly pressing and maintaining insulation in place.
 4. Set each subsequent layer of insulation in a uniform coverage of full-spread insulation adhesive, firmly pressing and maintaining insulation in place.
- J. Install cover boards over insulation with long joints in continuous straight lines with end joints staggered between rows. Offset joints a minimum of 6 inches in each direction from joints of insulation below. Loosely butt cover boards together and fasten or adhere to roof deck. Tape joints if required by roofing system manufacturer.
1. Adhere cover boards to insulation substrate with manufacturer recommended adhesive compatible with the insulation and cover board.
 2. Place temporary ballast on each corner of insulation board to ensure intimate bond.

3.4 ROOFING INSTALLATION, GENERAL

- A. Install roofing membrane system according to roofing system manufacturer's written instructions and applicable recommendations in ARMA/NRCA's "Quality Control Guidelines for the Application of Polymer Modified Bitumen Roofing."
1. Install roofing system according to roof assembly layout illustrations in NRCA's "The NRCA Roofing and Waterproofing Manual" and to requirements in this Section.
- B. Install roofing system according to roofing system manufacturer's written instructions and applicable recommendations in ARMA/NRCA's "Quality Control Guidelines for the Application of Polymer Modified Bitumen Roofing" and as follows:
1. Deck Type: I (insulated).
 2. Adhering Method: L (cold-applied adhesive).
 3. Base Sheet: One.

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4. Number of SBS-Modified Asphalt Sheets: Two.
 5. Surfacing Type: M (mineral-granule-surfaced cap sheet).
- C. Start installation of roofing membrane in presence of roofing system manufacturer's technical personnel.
 - D. Where roof slope exceeds 1/2 inch per 12 inches, install roofing membrane sheets parallel with slope.
 1. Backnail roofing membrane sheets to substrate according to roofing system manufacturer's written instructions.
 - E. Cooperate with testing agencies engaged or required to perform services for installing roofing system.
 - F. Coordinate installation of roofing system so insulation and other components of the roofing membrane system not permanently exposed are not subjected to precipitation or left uncovered at the end of the workday or when rain is forecast.
 1. At end of each day's work, provide tie-offs to cover exposed roofing membrane sheets and insulation with a course of coated felt set in roofing cement or hot roofing asphalt, with joints and edges sealed.
 2. Complete terminations and base flashings and provide temporary seals to prevent water from entering completed sections of roofing system.
 3. Remove and discard temporary seals before beginning work on adjoining roofing.
 - G. Substrate-Joint Penetrations: Prevent roofing adhesives from penetrating substrate joints, entering building, or damaging roofing system components or adjacent building construction.

3.5 BASE-SHEET INSTALLATION

- A. Loosely lay one course of sheathing paper, lapping edges and ends a minimum of 2 inches and 6 inches, respectively.
- B. Install lapped base-sheet course, extending sheet over and terminating beyond cants. Attach base sheet as follows:
 1. Adhere to substrate in a uniform coating of cold-applied adhesive.

3.6 SBS-MODIFIED BITUMINOUS MEMBRANE INSTALLATION

- A. Install modified bituminous roofing membrane sheet and cap sheet according to roofing manufacturer's written instructions, starting at low point of roofing system. Extend roofing membrane sheets over and terminate beyond cants, installing as follows:
 1. Adhere to substrate in cold-applied adhesive.
 2. Unroll roofing membrane sheets and allow them to relax for minimum time period required by manufacturer.
- B. Laps: Accurately align roofing membrane sheets, without stretching, and maintain uniform side and end laps. Stagger end laps. Completely bond and seal laps, leaving no voids.
 1. Repair tears and voids in laps and lapped seams not completely sealed.
 2. Apply roofing granules to cover exuded bead at laps while bead is tacky.
- C. Install roofing membrane sheets so side and end laps shed water.

3.7 FLASHING AND STRIPPING INSTALLATION

- A. Install base flashing over cant strips and other sloped and vertical surfaces, at roof edges, and at penetrations through roof; secure to substrates according to roofing system manufacturer's written instructions, and as follows:
 - 1. Prime substrates with asphalt primer if required by roofing system manufacturer.
 - 2. Backer Sheet Application: Adhere backer sheet to substrate in cold-applied adhesive at rate required by roofing system manufacturer. Mechanically attach where necessary.
 - 3. Flashing Sheet Application: Adhere flashing sheet to substrate in cold-applied adhesive at rate required by roofing system manufacturer.
- B. Extend base flashing up walls or parapets a minimum of 8 inches above roofing membrane and 4 inches onto field of roofing membrane.
- C. Mechanically fasten top of base flashing securely at terminations and perimeter of roofing.
- D. Install roofing membrane cap-sheet stripping where metal flanges and edgings are set on membrane roofing according to roofing system manufacturer's written instructions.
- E. Roof Drains: Set 30-by-30-inch- square metal flashing in bed of asphalt roofing cement on completed roofing membrane. Cover metal flashing with roofing membrane cap-sheet stripping and extend a minimum of 6 inches beyond edge of metal flashing onto field of roofing membrane. Clamp roofing membrane, metal flashing, and stripping into roof-drain clamping ring.
 - 1. Install stripping according to roofing system manufacturer's written instructions.
- F. Install two-course application of base ply of fiberglass felt and roofing membrane cap-sheet stripping where metal flanges and edgings are set on membrane roofing. Install according to roofing system manufacturer's written instructions; or manufacturer approved fluid applied flashing system.
- G. Penetrations, Low Flashing Heights, Similar Difficult Flashing details
 - 1. Install liquid applied flashing using three-step process according to manufacturer's written instructions.

3.8 ROOF PAVER INSTALLATION

- A. Roof Pavers: Install roof pavers in accordance with manufacturers written recommendations.

3.9 WALKWAY INSTALLATION

- A. Walkway Pads: Install walkway pads using units of size indicated or, if not indicated, of manufacturer's standard size according to walkway pad manufacturer's written instructions.
 - 1. Set walkway pads in cold-applied adhesive.
- B. Walkways: Install walkway cap sheet strips over roofing membrane using manufacturer recommended adhesive or same application method as used for roofing membrane cap sheet.

3.10 FIELD QUALITY CONTROL

- A. Testing Agency: Owner may engage a qualified testing agency to perform tests and inspections and to prepare test reports.

-
- B. Test Cuts: Test specimens will be removed to evaluate problems observed during quality-assurance inspections of roofing membrane as follows:
1. Approximate quantities of components within roofing membrane will be determined according to ASTM D 3617.
 2. Test specimens will be examined for interply voids according to ASTM D 3617 and to comply with criteria established in Appendix 3 in ARMA/NRCA's "Quality Control Guidelines for the Application of Polymer Modified Bitumen Roofing."
 3. Repair areas where test cuts were made according to roofing system manufacturer's written instructions.
- C. Final Roof Inspection: Arrange for roofing system manufacturer's technical personnel to inspect roofing installation on completion.
1. Notify Architect and Owner 48 hours in advance of date and time of inspection.
- D. Roofing system will be considered defective if it does not pass tests and inspections.
1. Additional testing and inspecting, at Contractor's expense, will be performed to determine if replaced or additional work complies with specified requirements.

3.11 PROTECTING AND CLEANING

- A. Protect roofing system from damage and wear during remainder of construction period. When remaining construction will not affect or endanger roofing, inspect roofing for deterioration and damage, describing its nature and extent in a written report, with copies to Architect and Owner.
- B. Correct deficiencies in or remove roofing system that does not comply with requirements, repair substrates, and repair or reinstall roofing system to a condition free of damage and deterioration at time of Substantial Completion and according to warranty requirements.
- C. Clean overspray and spillage from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

END OF SECTION 075216

ROOFING INSTALLER'S WARRANTY

- D. WHEREAS <Insert name> of <Insert address>, herein called the "Roofing Installer," has performed roofing and associated work ("work") on the following project:
1. Owner: <Insert name of Owner>.
 2. Address: <Insert address>.
 3. Building Name/Type: <Insert information>.
 4. Address: <Insert address>.
 5. Area of Work: <Insert information>.
 6. Acceptance Date: <Insert date>.
 7. Warranty Period: <Insert time>.
 8. Expiration Date: <Insert date>.
- E. AND WHEREAS Roofing Installer has contracted (either directly with Owner or indirectly as a subcontractor) to warrant said work against leaks and faulty or defective materials and workmanship for designated Warranty Period,
- F. NOW THEREFORE Roofing Installer hereby warrants, subject to terms and conditions herein set forth, that during Warranty Period he will, at his own cost and expense, make or cause to be made such repairs to or replacements of said work as are necessary to correct faulty and defective work and as are necessary to maintain said work in a watertight condition.
- G. This Warranty is made subject to the following terms and conditions:
1. Specifically excluded from this Warranty are damages to work and other parts of the building, and to building contents, caused by:
 - a. Lightning;
 - b. Peak gust wind speed exceeding 110 mph;
 - c. Fire;
 - d. Failure of roofing system substrate, including cracking, settlement, excessive deflection, deterioration, and decomposition;
 - e. Faulty construction of parapet walls, copings, chimneys, skylights, vents, equipment supports, and other edge conditions and penetrations of the work;
 - f. Vapor condensation on bottom of roofing; and
 - g. Activity on roofing by others, including construction contractors, maintenance personnel, other persons, and animals, whether authorized or unauthorized by Owner.
 2. When work has been damaged by any of foregoing causes, Warranty shall be null and void until such damage has been repaired by Roofing Installer and until cost and expense thereof have been paid by Owner or by another responsible party so designated.
 3. Roofing Installer is responsible for damage to work covered by this Warranty but is not liable for consequential damages to building or building contents resulting from leaks or faults or defects of work.
 4. During Warranty Period, if Owner allows alteration of work by anyone other than Roofing Installer, including cutting, patching, and maintenance in connection with penetrations, attachment of other work, and positioning of anything on roof, this Warranty shall become null and void on date of said alterations, but only to the extent said alterations affect work covered by this Warranty. If Owner engages Roofing Installer to perform said alterations, Warranty shall not become null and void unless Roofing Installer, before starting said work, shall have notified Owner in writing, showing reasonable cause for claim, that said alterations would likely damage or deteriorate work, thereby reasonably justifying a limitation or termination of this Warranty.
 5. During Warranty Period, if original use of roof is changed and it becomes used for, but was not originally specified for, a promenade, work deck, spray-cooled surface, flooded basin, or other use

or service more severe than originally specified, this Warranty shall become null and void on date of said change, but only to the extent said change affects work covered by this Warranty.

6. Owner shall promptly notify Roofing Installer of observed, known, or suspected leaks, defects, or deterioration and shall afford reasonable opportunity for Roofing Installer to inspect work and to examine evidence of such leaks, defects, or deterioration.
7. This Warranty is recognized to be the only warranty of Roofing Installer on said work and shall not operate to restrict or cut off Owner from other remedies and resources lawfully available to Owner in cases of roofing failure. Specifically, this Warranty shall not operate to relieve Roofing Installer of responsibility for performance of original work according to requirements of the Contract Documents, regardless of whether Contract was a contract directly with Owner or a subcontract with Owner's General Contractor.

H. IN WITNESS THEREOF, this instrument has been duly executed this **<Insert day>** day of **<Insert month>**, **<Insert year>**.

1. Authorized Signature: **<Insert signature>**.
2. Name: **<Insert name>**.
3. Title: **<Insert title>**.

SECTION 075419 – POLYVINYL-CHLORIDE (PVC) ROOFING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
1. Adhered polyvinyl-chloride (PVC) roofing system.
 2. Roof insulation.

1.2 DEFINITIONS

- A. Roofing Terminology: Definitions in ASTM D1079 and glossary in NRCA's "The NRCA Roofing and Waterproofing Manual" apply to Work of this Section.
- B. Total System Warranty: Roofing system manufacturer's no dollar limit (NDL) warranty covering the repairing of leaks in a total roofing system installed by the roofing system manufacturer's authorized roofing installer that occurs during the warranty period as indicated in the Specifications. This also includes repairing or replacing roofing system defects and failures.

1.3 ADMINISTRATIVE REQUIREMENTS

- A. Preliminary Roofing Conference: Before starting roof deck construction, conduct conference at Project site.
1. Meet with Owner, Architect, Owner's insurer if applicable, testing and inspecting agency representative, roofing installer, roofing system manufacturer's representative, deck installer, and installers whose Work interfaces with or affects roofing, including installers of roof accessories and roof-mounted equipment.
 2. Review methods and procedures related to roofing installation, including manufacturer's written instructions.
 3. Review and finalize construction schedule and verify availability of materials, installer's personnel, equipment, and facilities needed to make progress and avoid delays.
 4. Review deck substrate requirements for conditions and finishes, including flatness and fastening.
 5. Review structural loading limitations of roof deck during and after roofing.
 6. Review base flashings, special roofing details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that will affect roofing system.
 7. Review governing regulations and requirements for insurance and certificates if applicable.
 8. Review temporary protection requirements for roofing system during and after installation.
 9. Review roof observation and repair procedures after roofing installation.
- B. Preinstallation Roofing Conference: Conduct conference at Project site to comply with requirements in Section 013100 – Project Management and Coordination.
1. Meet with Owner, Architect, Owner's insurer if applicable, testing and inspecting agency representative, roofing Installer, roofing system manufacturer's representative, deck Installer, and installers whose Work interfaces with or affects roofing, including installers of roof accessories and roof-mounted equipment.
 2. Review methods and procedures related to roofing installation, including manufacturer's written instructions.
 3. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.

4. Examine deck substrate conditions and finishes for compliance with requirements, including flatness and fastening.
5. Review structural loading limitations of roof deck during and after roofing.
6. Review base flashings, special roofing details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that will affect roofing system.
7. Review governing regulations and requirements for insurance and certificates if applicable.
8. Review temporary protection requirements for roofing system during and after installation.
9. Review roof observation and repair procedures after roofing installation.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For roofing system. Include plans, elevations, sections, details, and attachments to other work, including:
 1. Base flashings and membrane terminations.
 2. Tapered insulation, including slopes.
 3. Roof plan showing orientation of steel roof deck and orientation of roofing, fastening spacings, and patterns for mechanically fastened roofing.
 4. Insulation fastening patterns for corner, perimeter, and field-of-roof locations.
- C. Samples for Verification: For the following products:
 1. Sheet roofing, of color required.
 2. Walkway pads or rolls, of color required.
- D. Installer's Qualification Data: Within seven days of Notice to Proceed, submit name and qualification data for roofing Installer and membrane manufacturer, indicating full compliance with Specification requirements. Manufacturers who are not able to provide this information within the allotted time period may be rejected. Architect and Owner reserve the right to reject roof Installer and/or membrane manufacturer if documentation of full compliance with Specifications is not provided.
 1. Submit certificate from manufacturer certifying that Installer has been trained by the manufacturer and is an authorized/certified installer of the specific roof membrane proposed for this Project.
 2. Submit Installer's references stating satisfactory performance of installation, from five different Architects or Owners for projects of similar scope to this Project that the Installer has completed and have been in service for a minimum of two years. Include complete contact information, completion dates, sizes, and locations of projects.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer and manufacturer.
- B. Manufacturer Certificates: Signed by roofing manufacturer certifying that roofing system complies with requirements specified in "Performance Requirements" Article.
 1. Submit evidence of compliance with performance requirements.
- C. Product Test Reports: For components of roofing system, for tests performed by manufacturer and witnessed by a qualified testing agency.
- D. Research/Evaluation Reports: For components of roofing system, from ICC-ES.
- E. Sample Warranties: For manufacturer's special warranties.

1.6 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For roofing system to include in maintenance manuals.
- B. QUALITY ASSURANCE
- C. Manufacturer Qualifications: A qualified manufacturer that is UL listed for roofing system identical to that used for this Project.
- D. Installer Qualifications: A qualified firm that is approved, authorized, or licensed by roofing system manufacturer to install manufacturer's product and that is eligible to receive manufacturer's special warranty.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver roofing materials to Project site in original containers with seals unbroken and labeled with manufacturer's name, product brand name and type, date of manufacture, approval or listing agency markings, and directions for storing and mixing with other components.
- B. Store liquid materials in their original undamaged containers in a clean, dry, protected location and within the temperature range required by roofing system manufacturer. Protect stored liquid material from direct sunlight.
 - 1. Discard and legally dispose of liquid material that cannot be applied within its stated shelf life.
- C. Protect roof insulation materials from physical damage and from deterioration by sunlight, moisture, soiling, and other sources. Store in a dry location. Comply with insulation manufacturer's written instructions for handling, storing, and protecting during installation.
- D. Handle and store roofing materials, and place equipment in a manner to avoid permanent deflection of deck.

1.8 FIELD CONDITIONS

- A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit roofing system to be installed according to manufacturer's written instructions and warranty requirements.

1.9 WARRANTY

- A. Special Project Warranty: Manufacturer's Total System Warranty, on signed form acceptable to Architect and Owner covering Work of this Section, including components of roofing system indicated as follows:
 - 1. Materials as manufactured or authorized by roofing system manufacturer including membrane, flashings, counterflashings, adhesives and sealants, insulation, cover boards, fasteners, fastener plates, fastening bars, metal work, insulation adhesives, and other products utilized in this installation.
 - 2. Warranty Period: years from date of Substantial Completion.

PART 2 - PRODUCTS**2.1 MANUFACTURERS**

- A. Source Limitations: Obtain components, including roof insulation, fasteners, and other components for roofing system, from same manufacturer as membrane roofing or manufacturer approved by membrane roofing manufacturer.

2.2 PERFORMANCE REQUIREMENTS

- A. General Performance: Installed roofing and base flashings shall withstand specified uplift pressures, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Roofing and base flashings shall remain watertight.
1. Accelerated Weathering: Roofing system shall withstand 2,000 hours of exposure when tested per ASTM G 152, ASTM G154, or ASTM G155.
 2. Impact Resistance: Roofing system shall resist impact damage when tested per ASTM D3746 or ASTM D4272.
- B. Material Compatibility: Roofing materials shall be compatible with one another and adjacent materials under conditions of service and application required, as demonstrated by roofing manufacturer based on testing and field experience.
- C. Roofing System Design: Tested by qualified testing and inspecting agency to resist uplift pressure:
1. Corner Uplift Pressure: As indicated on Structural Drawings.
 2. Perimeter Uplift Pressure: As indicated on Structural Drawings.
 3. Field-of-Roof Uplift Pressure: As indicated on Structural Drawings.
- D. Exterior Fire-Test Exposure: ASTM E108 or UL 790, Class A; for application and roof slopes indicated; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
- E. Fire-Resistance Ratings: Comply with fire-resistance-rated assembly designs indicated. Identify products with appropriate markings of applicable testing agency.

2.3 PVC ROOFING

- A. PVC Sheet: ASTM D 4434, Type II, Grade I, glass-fiber reinforced, felt backed.
1. Basis-of-Design Product: Subject to compliance with requirements, provide the Basis-of-Design indicated or comparable system by one of the following:
 - a. Sika Sarnafil; Sarnafil G410-60 with Décor System (Basis-of-Design).
 - b. Carlisle SynTec Incorporated: Sure-Flex PVC.
 - c. Siplast; Parasolo PVC.
 - d. Soprema Sentinel P150
 2. Thickness: 60 mils, nominal.
 3. Exposed Face Color: Standard colors as selected by Architect.

2.4 AUXILIARY ROOFING MATERIALS

- A. General: Auxiliary materials recommended by roofing system manufacturer for intended use and compatible with roofing.
 - 1. Liquid-type auxiliary materials shall comply with VOC limits of authorities having jurisdiction.
- B. Sheet Flashing: Manufacturer's standard sheet flashing of same material, type, reinforcement, thickness, and color as PVC sheet.
- C. Bonding Adhesive: Manufacturer's standard, water based.
- D. Metal Termination Bars: Manufacturer's standard, predrilled stainless-steel or aluminum bars, approximately 1 inch by 1/8 inch thick; with anchors.
- E. Metal Battens: Manufacturer's standard, aluminum-zinc-alloy-coated or zinc-coated steel sheet, approximately 1 inch wide by 0.05 inch thick, prepunched.
- F. Fasteners: Corrosion-resistant, factory-coated steel fasteners and metal or plastic plates designed for fastening roofing, roof insulation, and cover boards to substrate, and acceptable to roofing system manufacturer.
- G. Miscellaneous Accessories: Provide pourable sealers, preformed cone and vent sheet flashings, preformed inside and outside corner sheet flashings, T-joint covers, lap sealants, termination reglets, and other accessories.
- H. Standing Seam Profile: Roofing manufacturer's PVC extrusion used to emulate the appearance of a standing seam metal rib roof system.
 - 1. Basis-of-Design Product: Subject to compliance with requirements, Décor Profile by Sika Sarnafil or approved substitution.
 - 2. Rib Size: Approximately 1 inch high with a base width of 1-3/8 inch and a profile width of 1/2 inch.
 - 3. Rib Length: 10 feet.
 - 4. Color: Matching PVC membrane roofing color.

2.5 ROOF INSULATION

- A. General: Preformed roof insulation boards manufactured or approved by TPO roofing manufacturer, selected from manufacturer's standard sizes suitable for application, of thicknesses indicated.
- B. Polyisocyanurate Board Insulation: ASTM C1289, Type II, Class 2, Grade 2, felt or glass-fiber mat facer on both major surfaces
 - 1. Manufacturers: Subject to compliance with requirements, provide one of the following:
 - a. Atlas Roofing Corporation: ACFoam II.
 - b. Carlisle SynTec Incorporated: SecurShield HD.
 - c. Firestone Building Products: ISO 95+ GL.
 - d. Hunter Panels: H-Shield or H-Shield CG.
 - e. Sika; Rmax Pro Select Polyiso.
 - f. Siplast; Paratherm.
 - g. Soprema; SOPRA-ISO.

- C. Tapered Insulation: Factory- tapered insulation boards fabricated to slope of 1/4 inch per 12 inches, unless otherwise indicated. Provide mitered boards for changes in slope direction.
 - 1. Minimum 1 inch coverage over polyisocyanurate board insulation.
- D. Provide preformed saddles, crickets, and other insulation shapes where indicated for sloping to drain. Fabricate to slopes indicated.

2.6 INSULATION ACCESSORIES

- A. General: Furnish roof insulation accessories recommended by insulation manufacturer for intended use and compatibility with roofing.
- B. Fasteners: Corrosion-resistant, factory-coated steel fasteners and metal or plastic plates designed for fastening roof insulation to substrate, and acceptable to roofing system manufacturer.
- C. Insulation Adhesive: Insulation manufacturer's recommended adhesive formulated to attach roof insulation to substrate or to another insulation layer as follows:
 - 1. Full-spread spray-applied, low-rise, 2-component urethane adhesive.
- D. Cover Board: ASTM C1177, glass-mat, water-resistant gypsum substrate, factory primed.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. CertainTeed Gypsum, Inc.: GlasRoc Roof Board.
 - b. Georgia-Pacific Gypsum LLC: DensDeck Prime.
 - c. National Gypsum Company: DEXcell FA Glass Mat Roof Board.
 - 2. Thickness: 1/4 inch.

2.7 WALKWAYS

- A. Flexible Walkways: Factory-formed, nonporous, heavy-duty, solid-rubber, slip-resisting, surface-textured walkway pads or rolls, approximately 3/16 inch thick, and acceptable to roofing system manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with installer present, for compliance with the following requirements and other conditions affecting performance of roofing system:
 - 1. Verify that roof openings and penetrations are in place and curbs are set and braced and that roof drain bodies are securely clamped in place.
 - 2. Verify that wood blocking, curbs, and nailers are securely anchored to roof deck at penetrations and terminations and that nailers match thicknesses of insulation.
 - 3. Verify that surface plane flatness and fastening of steel roof deck complies with requirements in Section 053100 – Steel Decking.
 - 4. Verify that concrete substrate is visibly dry and free of moisture. Test for capillary moisture by plastic sheet method per ASTM D4263.
 - 5. Verify that concrete curing compounds that will impair adhesion of roofing components to roof deck have been removed.

- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean substrate of dust, debris, moisture, and other substances detrimental to roofing installation per roofing system manufacturer's written instructions. Remove sharp projections.
- B. Prevent materials from entering and clogging roof drains and conductors and from spilling or migrating onto surfaces of other construction. Remove roof-drain plugs when no Work is taking place or when rain is forecast.
- C. Install insulation strips per acoustical roof deck manufacturer's written instructions.

3.3 ROOFING INSTALLATION, GENERAL

- A. Install roofing system according to roofing system manufacturer's written instructions.
- B. Complete terminations and base flashings and provide temporary seals to prevent water from entering completed sections of roofing system at end of workday or when rain is forecast. Remove and discard temporary seals before beginning work on adjoining roofing.

3.4 INSULATION INSTALLATION

- A. Coordinate installing roofing system components so insulation is not exposed to precipitation or left exposed at the end of the workday.
- B. Comply with roofing system and insulation manufacturer's written instructions for installing roof insulation.
- C. Install tapered insulation under area of roofing to conform to slopes indicated.
- D. Install insulation under area of roofing to achieve required thickness. Where overall insulation thickness is 2.7 inches or greater, install two or more layers with joints of each succeeding layer staggered from joints of previous layer a minimum of 6 inches in each direction.
- E. Trim surface of insulation where necessary at roof drains so completed surface is flush and does not restrict flow of water.
- F. Install insulation with long joints of insulation in a continuous straight line with end joints staggered between rows, abutting edges and ends between boards. Fill gaps exceeding 1/4 inch with insulation.
 - 1. Cut and fit insulation within 1/4 inch of nailers, projections, and penetrations.
- G. Mechanically Fastened and Adhered Insulation: Install each layer of insulation and secure first layer of insulation to deck using mechanical fasteners specifically designed and sized for fastening specified board-type roof insulation to deck type.
 - 1. Fasten first layer of insulation to resist uplift pressure at corners, perimeter, and field of roof.
 - a. Set each subsequent layer of insulation in ribbons of bead-applied insulation adhesive, firmly pressing and maintaining insulation in place.
 - b. Set each subsequent layer of insulation in a uniform coverage of full-spread insulation adhesive, firmly pressing and maintaining insulation in place.

3.5 ADHERED ROOFING INSTALLATION

- A. Adhere roofing over area to receive roofing according to roofing system manufacturer's written instructions. Unroll roofing and allow to relax before retaining.
- B. Start installation of roofing in presence of roofing system manufacturer's technical personnel.
- C. Accurately align roofing, and maintain uniform side and end laps of minimum dimensions required by manufacturer. Stagger end laps.
- D. Bonding Adhesive: Apply to substrate and underside of roofing at rate required by manufacturer, and allow to partially dry before installing roofing. Do not apply to splice area of roofing.
- E. In addition to adhering, mechanically fasten roofing securely at terminations, penetrations, and perimeter of roofing.
- F. Apply roofing with side laps shingled with slope of roof deck where possible.
- G. Seams: Clean seam areas, overlap roofing, and hot-air weld side and end laps of roofing and sheet flashings according to manufacturer's written instructions, to ensure a watertight seam installation.
 - 1. Test lap edges with probe to verify seam weld continuity. Apply lap sealant to seal cut edges of sheet.
 - 2. Verify field strength of seams a minimum of twice daily, and repair seam sample areas.
 - 3. Repair tears, voids, and lapped seams in roofing that do not comply with requirements.
- H. Spread sealant bed over deck-drain flange at roof drains, and securely seal roofing in place with clamping ring.

3.6 BASE FLASHING INSTALLATION

- A. Install sheet flashings and preformed flashing accessories, and adhere to substrates according to roofing system manufacturer's written instructions.
- B. Apply bonding adhesive to substrate and underside of sheet flashing at required rate, and allow to partially dry. Do not apply to seam area of flashing.
- C. Flash penetrations and field-formed inside and outside corners with cured or uncured sheet flashing.
- D. Clean seam areas, overlap, and firmly roll sheet flashings into the adhesive. Hot-air weld side and end laps to ensure a watertight seam installation.
- E. Terminate and seal top of sheet flashings.

3.7 WALKWAY INSTALLATION

- A. Flexible Walkways: Install walkway products in locations indicated. Heat weld to substrate or adhere walkway products to substrate with compatible adhesive per roofing system manufacturer's written instructions.

3.8 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage qualified testing agency to inspect substrate conditions, surface preparation, membrane application, flashings, protection, and drainage components, and to furnish reports to Architect.
- B. Final Roof Inspection: Arrange for roofing system manufacturer's technical personnel to inspect roofing installation on completion of Work and prior to final payment in the presence of Architect and Owner. Record and immediately correct discrepancies. Final payment will not be issued until manufacturer has submitted written approval of the Work, and closeout submittals, including roof operation and maintenance manuals and warranties, have been received by Architect.
 - 1. Notify Architect and Owner 48 hours in advance of the date and time of inspection.
- C. Verify field strength of seams a minimum of twice daily per manufacturer's written instructions, and repair seam sample areas.
- D. Repair or remove and replace components of roofing system where inspections indicate that they do not comply with specified requirements.
- E. Additional testing and inspecting, at Contractor's expense, will be performed to determine if replaced or additional work complies with specified requirements.

3.9 PROTECTING AND CLEANING

- A. Protect roofing system from damage and wear during remainder of construction period. When remaining construction does not affect or endanger roofing, inspect roofing for deterioration and damage, describing its nature and extent in a written report, with copies to Architect and Owner.
- B. Correct deficiencies in or remove roofing system that does not comply with requirements, repair substrates, and repair or reinstall roofing system to a condition free of damage and deterioration at time of Substantial Completion and according to warranty requirements.

END OF SECTION 075419

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SECTION 076200 - SHEET METAL FLASHING AND TRIM**PART 1 - GENERAL****1.1 SUMMARY**

- A. Section Includes:
1. Formed roof-drainage sheet metal fabrications.
 2. Formed low-slope roof sheet metal fabrications.

1.2 COORDINATION

- A. Coordinate sheet metal flashing and trim layout and seams with sizes and locations of penetrations to be flashed, and joints and seams in adjacent materials.
- B. Coordinate sheet metal flashing and trim installation with adjoining roofing and wall materials, joints, and seams to provide leakproof, secure, and noncorrosive installation.

1.3 PERFORMANCE REQUIREMENTS

- A. General: Sheet metal flashing and trim assemblies shall withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Completed sheet metal flashing and trim shall not rattle, leak, or loosen, and shall remain watertight.
- B. Sheet Metal Standard for Flashing and Trim: Comply with NRCA's "The NRCA Roofing Manual" and SMACNA's "Architectural Sheet Metal Manual" requirements for dimensions and profiles shown unless more stringent requirements are indicated.
- C. SPRI Wind Design Standard: Manufacture and install copings and roof edge flashings tested according to SPRI ES-1 and capable of resisting the following design pressure:
1. Design Pressure: As indicated on Drawings.
- D. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes to prevent buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each manufactured product and accessory.
- B. Shop Drawings: For sheet metal flashing and trim.
1. Include identification of material, thickness, weight, and finish for each item and location in Project.
 2. Include details for forming, including profiles, shapes, seams, and dimensions.

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3. Include details for joining, supporting, and securing, including layout and spacing of fasteners, cleats, clips, and other attachments. Include pattern of seams.
 4. Include details of expansion joints and expansion-joint covers, including showing direction of expansion and contraction from fixed points.
- C. Samples for Verification: For each type of exposed finish.
1. Sheet Metal Flashing: 12 inches long by actual width of unit, including finished seam and in required profile. Include fasteners, cleats, clips, closures, and other attachments.
 2. Trim, Metal Closures, Expansion Joints, Joint Intersections, and Miscellaneous Fabrications: 12 inches long and in required profile. Include fasteners and other exposed accessories.
 3. Unit-Type Accessories and Miscellaneous Materials: Full-size Sample.
- 1.5 INFORMATIONAL SUBMITTALS
- A. Qualification Data: For fabricator.
 - B. Product Certificates: For each type of coping and roof edge flashing that is SPRI ES-1 tested.
 - C. Product Test Reports: For each product, for tests performed by a qualified testing agency.
 - D. Sample Warranty: For special warranty.
- 1.6 CLOSEOUT SUBMITTALS
- A. Maintenance Data: For sheet metal flashing and trim, and its accessories, to include in maintenance manuals.
- 1.7 QUALITY ASSURANCE
- A. Fabricator Qualifications: Employs skilled workers who custom fabricate sheet metal flashing and trim similar to that required for this Project and whose products have a record of successful in-service performance.
 1. For copings and roof edge flashings that are SPRI ES-1 tested, shop shall be listed as able to fabricate required details as tested and approved.
- 1.8 DELIVERY, STORAGE, AND HANDLING
- A. Do not store sheet metal flashing and trim materials in contact with other materials that might cause staining, denting, or other surface damage. Store sheet metal flashing and trim materials away from uncured concrete and masonry.
 - B. Protect strippable protective covering on sheet metal flashing and trim from exposure to sunlight and high humidity, except to extent necessary for period of sheet metal flashing and trim installation.
- 1.9 WARRANTY
- A. Special Warranty on Finishes: Manufacturer agrees to repair finish or replace sheet metal flashing and trim that shows evidence of deterioration of factory-applied finishes within specified warranty period.
 1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:

- a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
 - b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
 - c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
2. Finish Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE CRITERIA

- A. General: Sheet metal flashing and trim assemblies shall withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Completed sheet metal flashing and trim shall not rattle, leak, or loosen, and shall remain watertight.
- B. Sheet Metal Standard for Flashing and Trim: Comply with SMACNA's "Architectural Sheet Metal Manual" requirements for dimensions and profiles shown unless more stringent requirements are indicated.
- C. FM Approvals Listing: Manufacture and install copings and roof edge flashings that are listed in FM Approvals' "RoofNav" and approved for windstorm classification, Class 1-90. Identify materials with name of fabricator and design approved by FM Approvals.
- D. SPRI Wind Design Standard: Manufacture and install copings and roof edge flashing tested per SPRI ES-1 and capable of resisting design pressure as indicated on Drawings.
- E. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes to prevent buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
 1. Temperature Change (Range): 120 degrees F, ambient; 180 degrees F, material surfaces.

2.2 SHEET METALS

- A. General: Protect mechanical and other finishes on exposed surfaces from damage by applying strippable, temporary protective film before shipping.
- B. Aluminum Sheet: ASTM B 209, alloy as standard with manufacturer for finish required, with temper as required to suit forming operations and performance required; with smooth, flat surface.
 1. Exposed Coil-Coated Finish: Two-Coat Fluoropolymer: AAMA 2605. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
 2. Color: As selected by Architect from manufacturer's full range.
 3. Concealed Finish: Pretreat with manufacturer's standard white or light-colored acrylic or polyester backer finish, consisting of prime coat and wash coat with minimum total dry film thickness of 0.5 mil.

2.3 UNDERLAYMENT MATERIALS

- A. Self-Adhering, High-Temperature Underlayment: Self-adhering, cold-applied, sheet underlayment, a minimum of 30 mils thick, consisting of slip-resistant, polyethylene-film top surface laminated to a layer of butyl or SBS-modified asphalt adhesive, with release-paper backing. Provide primer when recommended by underlayment manufacturer
1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Atlas Roofing Corporation: WeatherMaster PolySeal.
 - b. Carlisle Coatings & Waterproofing Inc.: WIP 300HT.
 - c. CertainTeed Corporation: WinterGuard HT.
 - d. Drexel Metals Inc.: MetShield.
 - e. GAF Materials Corporation: Roof Pro.
 - f. Grace Construction Products; W. R. Grace & Co. – Conn: Grace Ice and Water Shield HT.
 - g. Henry Company: Blueskin PE200 HT.
 - h. InterWrap Inc.: Titanium PSU-30.
 - i. Kirsch Building Products, LLC: SharkSkin Ultra SA.
 - j. MFM Building Products Corp.: Ultra HT Wind and Water Seal.
 - k. Owens Corning: WeatherLock Specialty Tile & Metal.
 - l. Polyguard Products, Inc.: Deck Guard HT.
 - m. SPD Advanced Polymer Products, Inc.: Palisade-SA-HT.
 2. Thermal Stability: ASTM D 1970; stable after testing at 240 deg F or higher.
 3. Low-Temperature Flexibility: ASTM D1970; passes after testing at minus 20 degrees F.
- B. Synthetic Underlayment: UV-resistant, bitumen free; laminated or reinforced, polypropylene, polyolefin, or polyethylene polymer fabric with slip resistant surface coatings ~~or~~ treatments; evaluated and documented to be suitable for use as roof underlayment under applicable codes by testing and inspecting agency acceptable to authorities having jurisdiction.
1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Atlas Roofing Corporation: Summit Synthetic Underlayment.
 - b. Fiberweb, Inc.: Surround SR Underlayment.
 - c. GAF Materials Corporation: Tiger Paw Roof Deck Protection.
 - d. Grace Construction Products; a unit of Grace, W. R. & Co.: Tri-Flex.
 - e. InterTape Polymer Group Inc.: NovaSeal.
 - f. InterWrap Inc.: Titanium UDL Series..
 - g. Kirsch Building Products, LLC: SharkSkin Ultra.
 - h. MFM Building Products Corp.: Wind and Water Seal.
 - i. Owens Corning: Deck Defense High Performance Roof Underlayment..
 - j. Tamko Building Products, Inc.: Tam-Shield Synthetic Underlayment..
 - k. VaproShield LLC: SlopeShield Water-Resistive Roof Underlayment.
 - l. W. R. Grace & Co. - Conn.: Tri-Flex Xtreme.
 2. Permeability: 0.06 perms minimum per ASTM E96 (Procedure A).
 3. Water Transmission: Passes per ASTM D4869.
 4. Surface Burning: Class A Fire per ASTM E108.
 5. Minimum Thickness: 12 to 25 mils.

2.4 MISCELLANEOUS MATERIALS

- A. General: Provide materials and types of fasteners, protective coatings, sealants, and other miscellaneous items as required for complete sheet metal flashing and trim installation and as recommended by manufacturer of primary sheet metal unless otherwise indicated.

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- B. Fasteners: Wood screws, annular threaded nails, self-tapping screws, self-locking rivets and bolts, and other suitable fasteners designed to withstand design loads and recommended by manufacturer of primary sheet metal.
1. General: Blind fasteners or self-drilling screws, gasketed, with hex-washer head.
 - a. Exposed Fasteners: Heads matching color of sheet metal using plastic caps or factory-applied coating. Provide metal-backed EPDM or PVC sealing washers under heads of exposed fasteners bearing on weather side of metal.
 - b. Blind Fasteners: High-strength aluminum or stainless-steel rivets suitable for metal being fastened.
 - c. Spikes and Ferrules: Same material as gutter; with spike with ferrule matching internal gutter width.
 2. Fasteners for Aluminum Sheet: Aluminum or Series 300 stainless steel.
- C. Solder For Zinc-Coated (Galvanized) Steel: ASTM B32, Grade Sn50, 50 percent tin and 50 percent lead or Grade Sn60, 60 percent tin and 40 percent lead
- D. Sealant Tape: Pressure-sensitive, 100 percent solids, polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2 inch wide and 1/8 inch thick.
- E. Elastomeric Sealant: ASTM C 920, elastomeric silicone polymer sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.
- F. Butyl Sealant: ASTM C 1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for hooked-type expansion joints with limited movement.
- G. Epoxy Seam Sealer: Two-part, noncorrosive, aluminum seam-cementing compound, recommended by aluminum manufacturer for exterior nonmoving joints, including riveted joints.
- H. Bituminous Coating: Cold-applied asphalt emulsion according to ASTM D 1187.
- I. Asphalt Roofing Cement: ASTM D 4586, asbestos free, of consistency required for application.

2.5 FABRICATION, GENERAL

- A. General: Custom fabricate sheet metal flashing and trim to comply with details shown and recommendations in cited sheet metal standard that apply to design, dimensions, geometry, metal thickness, and other characteristics of item required. Fabricate sheet metal flashing and trim in shop to greatest extent possible.
1. Fabricate sheet metal flashing and trim in thickness or weight needed to comply with performance requirements, but not less than that specified for each application and metal.
- B. Fabricate sheet metal flashing and trim without excessive oil canning, buckling, and tool marks and true in line and levels indicated, with exposed edges folded back to form hems.
1. Seams for Aluminum: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with epoxy seam sealer. Rivet joints for additional strength.
- C. Expansion Provisions: Where lapped or bayonet-type expansion provisions in the Work cannot be used, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with elastomeric sealant concealed within joints.

- D. Conceal fasteners and expansion provisions where possible on exposed-to-view sheet metal flashing and trim, unless otherwise indicated.
- E. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal.
 - 1. Thickness: As recommended by SMACNA's "Architectural Sheet Metal Manual".

2.6 ROOF-DRAINAGE SHEET METAL FABRICATIONS

- A. Parapet Scuppers: Fabricate scuppers to dimensions required, with closure flange trim to exterior, 4-inch-wide wall flanges to interior, and base extending 4 inches beyond cant or tapered strip into field of roof. Fasten gravel guard angles to base of scupper. Fabricate from the following materials:
 - 1. Aluminum: 0.032 inch thick.
- B. Conductor Heads: Fabricate conductor heads with flanged back and stiffened top edge and of dimensions and shape indicated complete with outlet tubes. Fabricate from the following materials:
 - 1. Aluminum: 0.032 inch thick.

2.7 LOW-SLOPE ROOF SHEET METAL FABRICATIONS

- A. Copings: Fabricate in minimum 96-inch-long, but not exceeding 12-foot-long, sections. Fabricate joint plates of same thickness as copings. Furnish with continuous cleats to support edge of external leg and drill elongated holes for fasteners on interior leg. Miter corners, solder or weld watertight.
 - 1. Joint Style: Butted with expansion space and 6-inch-wide, concealed backup plate.
 - 2. Fabricate from the Following Materials:
 - a. Stainless steel: 0.025 inch thick.
- B. Base Flashing: Fabricate from the following materials:
 - 1. Stainless steel: 0.019 inch thick.
- C. Counterflashing: Fabricate from the following materials:
 - 1. Stainless steel: 0.019 inch thick.
- D. Flashing Receivers: Fabricate from the following materials:
 - 1. Stainless steel: 0.019 inch thick.
- E. Roof Drain Flashing: Fabricate from the following materials:
 - 1. Stainless steel: 0.016 inch thick.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, substrate, and other conditions affecting performance of the Work.
 - 1. Verify compliance with requirements for installation tolerances of substrates.

2. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.
3. Verify that air- or water-resistant barriers have been installed over sheathing or backing substrate to prevent air infiltration or water penetration.

3.2 INSTALLATION, GENERAL

- A. General: Anchor sheet metal flashing and trim and other components of the Work securely in place, with provisions for thermal and structural movement. Use fasteners, protective coatings, separators, sealants, and other miscellaneous items as required to complete sheet metal flashing and trim system.
1. Install sheet metal flashing and trim true to line, levels, and slopes. Provide uniform, neat seams with minimum exposure of solder, welds, and sealant.
 2. Install sheet metal flashing and trim to fit substrates and to result in watertight performance. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.
 3. Space cleats not more than 12 inches apart. Attach each cleat with at least two fasteners. Bend tabs over fasteners.
 4. Install exposed sheet metal flashing and trim with limited oil canning, and free of buckling and tool marks.
 5. Torch cutting of sheet metal flashing and trim is not permitted.
 6. Do not use graphite pencils to mark metal surfaces.
- B. Metal Protection: Where dissimilar metals contact each other, or where metal contacts pressure-treated wood or other corrosive substrates, protect against galvanic action or corrosion by painting contact surfaces with bituminous coating or by other permanent separation as recommended by sheet metal manufacturer or cited sheet metal standard.
1. Coat concealed side of uncoated-aluminum sheet metal flashing and trim with bituminous coating where flashing and trim contact wood, ferrous metal, or cementitious construction.
 2. Underlayment: Where installing sheet metal flashing and trim directly on cementitious or wood substrates, install underlayment and cover with slip sheet.
- C. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at maximum of 10 feet with no joints within 24 inches of corner or intersection.
1. Form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with sealant concealed within joints.
 2. Use lapped expansion joints only where indicated on Drawings.
- D. Fasteners: Use fastener sizes that penetrate wood blocking or sheathing not less than 1-1/4 inches for nails and not less than 3/4 inch for wood screws.
1. Aluminum: Use aluminum or stainless-steel fasteners.
- E. Conceal fasteners and expansion provisions where possible in exposed work and locate to minimize possibility of leakage. Cover and seal fasteners and anchors as required for a tight installation.
- F. Seal joints as required for watertight construction.
1. Use sealant-filled joints unless otherwise indicated. Embed hooked flanges of joint members not less than 1 inch into sealant. Form joints to completely conceal sealant. When ambient temperature at time of installation is between 40 and 70 deg F, set joint members for 50 percent movement each way. Adjust setting proportionately for installation at higher ambient temperatures. Do not install sealant-type joints at temperatures below 40 deg F.
 2. Prepare joints and apply sealants to comply with requirements in Section 079200 "Joint Sealants."

- G. Soldered Joints: Clean surfaces to be soldered, removing oils and foreign matter. Pre-tin edges of sheets with solder to width of 1-1/2 inches; however, reduce pre-tinning where pre-tinned surface would show in completed Work.
1. Do not solder aluminum sheet.
 2. Do not use torches for soldering.
 3. Heat surfaces to receive solder, and flow solder into joint. Fill joint completely. Completely remove flux and spatter from exposed surfaces.
 4. Stainless-Steel Soldering: Tin edges of uncoated sheets, using solder for stainless steel and acid flux. Promptly remove acid flux residue from metal after tinning and soldering. Comply with solder manufacturer's recommended methods for cleaning and neutralization.
- H. Rivets: Rivet joints in uncoated aluminum where necessary for strength.

3.3 ROOF-DRAINAGE SYSTEM INSTALLATION

- A. General: Install sheet metal roof-drainage items to produce complete roof-drainage system according to cited sheet metal standard unless otherwise indicated. Coordinate installation of roof perimeter flashing with installation of roof-drainage system.
- B. Parapet Scuppers: Continuously support scupper, set to correct elevation, and seal flanges to interior wall face, over cants or tapered edge strips, and under roofing membrane.
1. Anchor scupper closure trim flange to exterior wall and seal with elastomeric sealant to scupper.
 2. Loosely lock front edge of scupper with conductor head.
 3. Seal with elastomeric sealant exterior wall scupper flanges into back of conductor head.
- C. Conductor Heads: Anchor securely to wall with elevation of conductor head rim 1 inch below scupper discharge.

3.4 ROOF FLASHING INSTALLATION

- A. General: Install sheet metal flashing and trim to comply with performance requirements, sheet metal manufacturer's written installation instructions, and cited sheet metal standard. Provide concealed fasteners where possible, and set units true to line, levels, and slopes. Install work with laps, joints, and seams that are permanently watertight and weather resistant.
- B. Roof Edge Flashing: Anchor to resist uplift and outward forces according to recommendations in cited sheet metal standard unless otherwise indicated. Interlock bottom edge of roof edge flashing with continuous cleat anchored to substrate at intervals required by referenced standards to meet performance requirements.
- C. Copings: Anchor to resist uplift and outward forces according to recommendations in cited sheet metal standard unless otherwise indicated.
1. Interlock exterior bottom edge of coping with continuous cleat anchored to substrate at intervals required by reference standards to meet performance requirements.
 2. Anchor interior leg of coping with washers and screw fasteners through slotted holes at intervals required by reference standards to meet performance requirements.
- D. Pipe or Post Counterflashing: Install counterflashing umbrella with close-fitting collar with top edge flared for elastomeric sealant, extending minimum of 4 inches over base flashing. Install stainless-steel draw band and tighten.

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- E. Counterflashing: Coordinate installation of counterflashing with installation of base flashing. Insert counterflashing in reglets or receivers and fit tightly to base flashing. Extend counterflashing 4 inches over base flashing. Lap counterflashing joints minimum of 4 inches. Secure in waterproof manner by means of snap-in installation and sealant or lead wedges and sealant unless otherwise indicated.
 - F. Roof-Penetration Flashing: Coordinate installation of roof-penetration flashing with installation of roofing and other items penetrating roof. Seal with butyl sealant and clamp flashing to pipes that penetrate roof.

3.5 CLEANING AND PROTECTION

- A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.
- B. Clean and neutralize flux materials. Clean off excess solder.
- C. Clean off excess sealants.
- D. Remove temporary protective coverings and strippable films as sheet metal flashing and trim are installed unless otherwise indicated in manufacturer's written installation instructions. On completion of sheet metal flashing and trim installation, remove unused materials and clean finished surfaces as recommended by sheet metal flashing and trim manufacturer. Maintain sheet metal flashing and trim in clean condition during construction.
- E. Replace sheet metal flashing and trim that have been damaged or that have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 076200

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SECTION 077200 - ROOF ACCESSORIES**PART 1 - GENERAL****1.1 SUMMARY**

- A. Section Includes:
1. Roof curbs.
 2. Equipment supports.
 3. Preformed flashing sleeves.

1.2 COORDINATION

- A. Coordinate layout and installation of roof accessories with roofing membrane and base flashing and interfacing and adjoining construction to provide a leakproof, weathertight, secure, and noncorrosive installation.
1. Coordinate dimensions with rough-in information or Shop Drawings of equipment to be supported.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of roof accessory.
1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
- B. Shop Drawings: For roof accessories.
1. Include plans, elevations, keyed details, and attachments to other work. Indicate dimensions, loadings, and special conditions. Distinguish between plant- and field-assembled work.
- C. Delegated-Design Submittal: For roof curbs equipment supports indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
1. Detail mounting, securing, and flashing of roof-mounted items to roof structure. Indicate coordinating requirements with roof membrane system.
 2. Wind-Restraint Details: Detail fabrication and attachment of wind restraints. Show anchorage details and indicate quantity, diameter, and depth of penetration of anchors.

1.4 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Roof plans, drawn to scale, and coordinating penetrations and roof-mounted items. Show the following:
1. Size and location of roof accessories specified in this Section.
 2. Method of attaching roof accessories to roof or building structure.
 3. Other roof-mounted items including mechanical and electrical equipment, ductwork, piping, and conduit.
 4. Required clearances.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For roof accessories to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. General Performance: Roof accessories shall withstand exposure to weather and resist thermally induced movement without failure, rattling, leaking, or fastener disengagement due to defective manufacture, fabrication, installation, or other defects in construction.
- B. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design [roof curbs] [and] [equipment supports] to comply with wind performance requirements, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

2.2 ROOF CURBS

- A. Roof Curbs: Internally reinforced roof-curb units capable of supporting superimposed live and dead loads, including equipment loads and other construction indicated on Drawings, bearing continuously on roof structure, and capable of meeting performance requirements; with welded or mechanically fastened and sealed corner joints, straight sides, and integrally formed deck-mounting flange at perimeter bottom.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Curbs Plus, Inc.
 - b. Greenheck Fan Corporation.
 - c. LM Curbs.
 - d. Milcor; Commercial Products Group of Hart & Cooley, Inc.
 - e. Thybar Corporation.
 - 2. Size: Coordinate dimensions with roughing-in information or Shop Drawings of equipment to be supported.
- B. Supported Load Capacity: Based on equipment to be supported.
- C. Material: Aluminum-zinc alloy-coated steel sheet, 0.064 inch thick.
 - 1. Finish: Two-coat fluoropolymer in color as indicated by manufacturer's designations.
- D. Construction:
 - 1. Curb Profile: Manufacturer's standard compatible with roofing system.
 - 2. Fabricate curbs to minimum height of 12 inches above roofing surface unless otherwise indicated.
 - 3. Top Surface: Level top of curb, with roof slope accommodated by sloping deck-mounting flange.
 - 4. Insulation: Factory insulated with 1-1/2-inch- thick glass-fiber board insulation.
 - 5. Liner: Same material as curb, of manufacturer's standard thickness and finish.
 - 6. Nailer: Factory-installed wood nailer along top flange of curb, continuous around curb perimeter.

2.3 EQUIPMENT SUPPORTS

- A. Equipment Supports: Rail-type metal equipment supports capable of supporting superimposed live and dead loads between structural supports, including equipment loads and other construction indicated on

Drawings, spanning between structural supports; capable of meeting performance requirements; with welded corner joints, stepped integral metal cant raised the thickness of roof insulation, and integrally formed structure-mounting flange at bottom.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Air Balance, Inc.; a division of Mestek, Inc.
 - b. Curbs Plus, Inc.
 - c. Greenheck Fan Corporation.
 - d. LM Curbs.
 - e. Milcor; Commercial Products Group of Hart & Cooley, Inc.
 - f. Pate Company (The).
 - g. Thybar Corporation.
- B. Size: Coordinate dimensions with roughing-in information or Shop Drawings of equipment to be supported.
- C. Supported Load Capacity: As indicated on Drawings.
- D. Material: Aluminum-zinc alloy-coated steel sheet, 0.064 inch thick.
 1. Finish: Two-coat fluoropolymer in color as indicated by manufacturer's designations.
- E. Construction:
 1. Curb Profile: Manufacturer's standard compatible with roofing system.
 2. Insulation: Factory insulated with 1-1/2-inch- thick glass-fiber board insulation.
 3. Nailer: Factory-installed continuous wood nailers 5-1/2 inches wide on top flange of equipment supports, continuous around support perimeter.
 4. Wind Restraint Straps and Base Flange Attachment: Provide wind restraint straps, welded strap connectors, and base flange attachment to roof structure at perimeter of curb of size and spacing required to meet wind uplift requirements.
 5. Platform Cap: Where portion of equipment support is not covered by equipment, provide weathertight platform cap formed from 3/4-inch thick plywood covered with metal sheet of same type, thickness, and finish as required for curb.
 6. Metal Counterflashing: Manufacturer's standard, removable, fabricated of same metal and finish as equipment support.
 7. Fabricate equipment supports to minimum height of 12 inches above roofing surface unless otherwise indicated.

2.4 PREFORMED FLASHING SLEEVES

- A. Exhaust Vent Flashing: Double-walled metal flashing sleeve or boot, insulation filled, with integral deck flange, 12 inches high, with removable metal hood and slotted metal collar.
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Custom Solution Roof and Metal Products.
 - b. Thaler Metal Industries Ltd.
 2. Metal: Aluminum sheet, 0.063 inch thick.
 3. Diameter: As indicated on Drawings.
 4. Finish: Manufacturer's standard.
- B. Vent Stack Flashing: Metal flashing sleeve, uninsulated, with integral deck flange.
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

- a. Custom Solution Roof and Metal Products.
 - b. Milcor; Commercial Products Group of Hart & Cooley, Inc.
 - c. Thaler Metal Industries Ltd.
2. Metal: Aluminum sheet, 0.063 inch thick.
 3. Height: 13 inches.
 4. Diameter: As indicated on Drawings.
 5. Finish: Manufacturer's standard.

2.5 METAL MATERIALS

- A. Aluminum-Zinc Alloy-Coated Steel Sheet: ASTM A 792/A 792M, AZ50 coated.
 1. Factory Prime Coating: Where field painting is indicated, apply pretreatment and white or light-colored, factory-applied, baked-on epoxy primer coat, with a minimum dry film thickness of 0.2 mil.
 2. Exposed Coil-Coated Finish: Prepainted by the coil-coating process to comply with ASTM A 755/A 755M. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
 - a. Two-Coat Fluoropolymer Finish: AAMA 621. System consisting of primer and fluoropolymer color topcoat containing not less than 70 percent PVDF resin by weight.
 3. Concealed Finish: Pretreat with manufacturer's standard white or light-colored acrylic or polyester-backer finish consisting of prime coat and wash coat, with a minimum total dry film thickness of 0.5 mil.
- B. Aluminum Sheet: ASTM B 209, manufacturer's standard alloy for finish required, with temper to suit forming operations and performance required.
 1. Mill Finish: As manufactured.
- C. Aluminum Extrusions and Tubes: ASTM B 221, manufacturer's standard alloy and temper for type of use, finished to match assembly where used; otherwise mill finished.

2.6 MISCELLANEOUS MATERIALS

- A. General: Provide materials and types of fasteners, protective coatings, sealants, and other miscellaneous items required by manufacturer for a complete installation.
- B. Glass-Fiber Board Insulation: ASTM C 726, nominal density of 3 lb/cu. ft., thermal resistivity of 4.3 deg F x h x sq. ft./Btu x in. at 75 deg F, thickness as indicated.
- C. Wood Nailers: Softwood lumber, pressure treated with waterborne preservatives for aboveground use, acceptable to authorities having jurisdiction, [containing no arsenic or chromium,] and complying with AWWA C2; not less than 1-1/2 inches thick.
- D. Underlayment:
 1. Self-Adhering, High-Temperature Sheet: Minimum 30 to 40 mils thick, consisting of slip-resisting polyethylene-film top surface laminated to layer of butyl or SBS-modified asphalt adhesive, with release-paper backing; cold applied. Provide primer when recommended by underlayment manufacturer.
 2. Fasteners: Roof accessory manufacturer's recommended fasteners suitable for application and metals being fastened. Match finish of exposed fasteners with finish of material being fastened.

Provide nonremovable fastener heads to exterior exposed fasteners. Furnish the following unless otherwise indicated:

3. Fasteners for Zinc-Coated or Aluminum-Zinc Alloy-Coated Steel: Series 300 stainless steel or hot-dip zinc-coated steel according to ASTM A 153/A 153M or ASTM F 2329.
4. Fasteners for Aluminum Sheet: Aluminum or Series 300 stainless steel.
5. Fasteners for Stainless-Steel Sheet: Series 300 stainless steel.

- E. Butyl Sealant: ASTM C 1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for expansion joints with limited movement.

2.7 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. General: Install roof accessories according to manufacturer's written instructions.
1. Install roof accessories level; plumb; true to line and elevation; and without warping, jogs in alignment, buckling, or tool marks.
 2. Anchor roof accessories securely in place so they are capable of resisting indicated loads.
 3. Use fasteners, separators, sealants, and other miscellaneous items as required to complete installation of roof accessories and fit them to substrates.
 4. Install roof accessories to resist exposure to weather without failing, rattling, leaking, or loosening of fasteners and seals.
- B. Metal Protection: Protect metals against galvanic action by separating dissimilar metals from contact with each other or with corrosive substrates by painting contact surfaces with bituminous coating or by other permanent separation as recommended by manufacturer.
1. Underlayment: Where installing roof accessories directly on cementitious or wood substrates, install a course of underlayment and cover with manufacturer's recommended slip sheet.
 2. Bed flanges in thick coat of asphalt roofing cement where required by manufacturers of roof accessories for waterproof performance.
- C. Roof Curb Installation: Install each roof curb so top surface is level.
- D. Equipment Support Installation: Install equipment supports so top surfaces are level with each other.
- E. Preformed Flashing-Sleeve Installation: Secure flashing sleeve to roof membrane according to flashing-sleeve manufacturer's written instructions; flash sleeve flange to surrounding roof membrane according to roof membrane manufacturer's instructions.
- F. Seal joints with butyl sealant as required by roof accessory manufacturer.

3.2 REPAIR AND CLEANING

- A. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing according to ASTM A 780/A 780M.
- B. Touch up factory-primed surfaces with compatible primer ready for field painting according to Section 099113 "Exterior Painting."
- C. Clean exposed surfaces according to manufacturer's written instructions.
- D. Clean off excess sealants.
- E. Replace roof accessories that have been damaged or that cannot be successfully repaired by finish touchup or similar minor repair procedures.

END OF SECTION 077200

SECTION 078100 - APPLIED FIREPROOFING**PART 1 - GENERAL****1.1 SUMMARY**

- A. Section includes the following:
 - 1. Sprayed fire-resistive materials (SFRM).

1.2 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
 - 1. Review products, design ratings, restrained and unrestrained conditions, densities, thicknesses, bond strengths, and other performance requirements.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: Framing plans, schedules, or both, indicating the following:
 - 1. Extent of fireproofing for each construction and fire-resistance rating.
 - 2. Applicable fire-resistance design designations of a qualified testing and inspecting agency acceptable to authorities having jurisdiction.
 - 3. Minimum fireproofing thicknesses needed to achieve required fire-resistance rating of each structural component and assembly.
 - 4. Treatment of fireproofing after application.
- C. Samples: For each exposed product and for each color and texture specified, 4 in chessquare in size.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer and testing agency.
- B. Product Certificates: For each type of fireproofing, signed by product manufacturer.
- C. Evaluation Reports: For fireproofing, from ICC-ES.
- D. Preconstruction Test Reports: For fireproofing.
- E. Field quality-control reports.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: A firm or individual certified, licensed, or otherwise qualified by fireproofing manufacturer as experienced and with sufficient trained staff to install manufacturer's products according to specified requirements.

1.6 PRECONSTRUCTION TESTING

- A. Preconstruction Testing Service: Owner will engage a qualified testing agency to perform preconstruction testing on fireproofing.
 - 1. Provide test specimens and assemblies representative of proposed materials and construction.
- B. Preconstruction Adhesion and Compatibility Testing: Test for compliance with requirements for specified performance and test methods.
 - 1. Bond Strength: Test for cohesive and adhesive strength according to ASTM E 736. Provide bond strength indicated in referenced fire-resistance design, but not less than minimum specified in Part 2.
 - 2. Density: Test for density according to ASTM E 605. Provide density indicated in referenced fire-resistance design, but not less than minimum specified in Part 2.
 - 3. Verify that manufacturer, through its own laboratory testing or field experience, attests that primers or coatings are compatible with fireproofing.
 - 4. Schedule sufficient time for testing and analyzing results to prevent delaying the Work.
 - 5. For materials failing tests, obtain applied-fireproofing manufacturer's written instructions for corrective measures including the use of specially formulated bonding agents or primers.

1.7 FIELD CONDITIONS

- A. Environmental Limitations: Do not apply fireproofing when ambient or substrate temperature is 44 deg F or lower unless temporary protection and heat are provided to maintain temperature at or above this level for 24 hours before, during, and for 24 hours after product application.
- B. Ventilation: Ventilate building spaces during and after application of fireproofing, providing complete air exchanges according to manufacturer's written instructions. Use natural means or, if they are inadequate, forced-air circulation until fireproofing dries thoroughly.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

- A. Assemblies: Provide fireproofing, including auxiliary materials, according to requirements of each fire-resistance design and manufacturer's written instructions.
- B. Source Limitations: Obtain fireproofing from single source.
- C. Fire-Resistance Design: Indicated on Drawings, tested according to ASTM E 119 or UL 263 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - 1. Steel members are to be considered unrestrained unless specifically noted otherwise.
- D. VOC Content: Products shall comply with VOC content limits of authorities having jurisdiction.
 - 1. Flat Paints and Coatings: 50 g/L.
 - 2. Nonflat Paints and Coatings: 150 g/L.

3. Primers, Sealers, and Undercoaters: 200 g/L.
 4. Anticorrosive and Antirust Paints Applied to Ferrous Metals: 250 g/L.
- E. Asbestos: Provide products containing no detectable asbestos.
- F. Dry mix sprayed fire resistive materials containing mineral fibers are not allowed.

2.2 SPRAYED FIRE-RESISTIVE MATERIALS

- A. Standard Durability SFRM: Manufacturer's standard, factory-mixed, lightweight, dry formulation, complying with indicated fire-resistance design, and mixed with water at Project site to form a slurry or mortar before conveyance and application.
1. Products: Subject to compliance with requirements, provide the following:
 - a. Carboline Company; Fireproofing Products Div.; AD Southwest Fireproofing Type 5GP.
 - b. GCP Applied Technologies; Monokote MK-6.
 - c. Isolotek International, Inc; CAFCO 300 Series.
 2. Bond Strength: Minimum 150-lbf/sq. ft. cohesive and adhesive strength based on field testing according to ASTM E 736.
 3. Density: Not less than density specified in the approved fire-resistance design, according to ASTM E 605.
 4. Thickness: As required for fire-resistance design indicated, measured according to requirements of fire-resistance design or ASTM E 605.
 5. Combustion Characteristics: When tested in accordance with ASTM E 136 shall be noncombustible.
 6. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - a. Flame-Spread Index: 0.
 - b. Smoke-Developed Index: 0.
 7. Compressive Strength: Minimum 10 lbf/sq. in. according to ASTM E 761.
 8. Corrosion Resistance: No evidence of corrosion according to ASTM E 937.
 9. Deflection: No cracking, spalling, or delamination according to ASTM E 759.
 10. Effect of Impact on Bonding: No cracking, spalling, or delamination according to ASTM E 760.
 11. Air Erosion: Maximum weight loss of 0.025 g/sq. ft. in 24 hours according to ASTM E 859.
 12. Fungal Resistance: Treat products with manufacturer's standard antimicrobial formulation to result in no growth on specimens per ASTM G 21.
 13. Finish: Spray-textured finish.

2.3 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that are compatible with fireproofing and substrates and are approved by UL or another testing and inspecting agency acceptable to authorities having jurisdiction for use in fire-resistance designs indicated.
- B. Substrate Primers: Primers approved by fireproofing manufacturer and complying with one or both of the following requirements:

1. Primer and substrate are identical to those tested in required fire-resistance design by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.
 2. Primer's bond strength in required fire-resistance design complies with specified bond strength for fireproofing and with requirements in UL's "Fire Resistance Directory" or in the listings of another qualified testing agency acceptable to authorities having jurisdiction, based on a series of bond tests according to ASTM E 736.
- C. Bonding Agent: Product approved by fireproofing manufacturer and complying with requirements in UL's "Fire Resistance Directory" or in the listings of another qualified testing agency acceptable to authorities having jurisdiction.
- D. Metal Lath: Expanded metal lath fabricated from material of weight, configuration, and finish required, according to fire-resistance designs indicated and fireproofing manufacturer's written recommendations. Include clips, lathing accessories, corner beads, and other anchorage devices required to attach lath to substrates and to receive fireproofing.
- E. Reinforcing Fabric: Glass- or carbon-fiber fabric of type, weight, and form required to comply with fire-resistance designs indicated; approved and provided by fireproofing manufacturer.
- F. Reinforcing Mesh: Metallic mesh reinforcement of type, weight, and form required to comply with fire-resistance design indicated; approved and provided by fireproofing manufacturer. Include pins and attachment.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for substrates and other conditions affecting performance of the Work and according to each fire-resistance design. Verify compliance with the following:
1. Substrates are free of dirt, oil, grease, release agents, rolling compounds, mill scale, loose scale, incompatible primers, paints, and encapsulants, or other foreign substances capable of impairing bond of fireproofing with substrates under conditions of normal use or fire exposure.
 2. Objects penetrating fireproofing, including clips, hangers, support sleeves, and similar items, are securely attached to substrates.
 3. Substrates receiving fireproofing are not obstructed by ducts, piping, equipment, or other suspended construction that will interfere with fireproofing application.
- B. Verify that concrete work on steel deck has been completed before beginning fireproofing work.
- C. Verify that roof construction, installation of roof-top HVAC equipment, and other related work is complete before beginning fireproofing work.
- D. Conduct tests according to fireproofing manufacturer's written recommendations to verify that substrates are free of substances capable of interfering with bond.
- E. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
- F. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Cover other work subject to damage from fallout or overspray of fireproofing materials during application.
- B. Clean substrates of substances that could impair bond of fireproofing.
- C. Prime substrates where included in fire-resistance design and where recommended in writing by fireproofing manufacturer unless compatible shop primer has been applied and is in satisfactory condition to receive fireproofing.
- D. For applications visible on completion of Project, repair substrates to remove surface imperfections that could affect uniformity of texture and thickness in finished surface of fireproofing. Remove minor projections and fill voids that would telegraph through fire-resistive products after application.

3.3 APPLICATION

- A. Construct fireproofing assemblies that are identical to fire-resistance design indicated and products as specified, tested, and substantiated by test reports; for thickness, primers, sealers, topcoats, finishing, and other materials and procedures affecting fireproofing work.
- B. Comply with fireproofing manufacturer's written instructions for mixing materials, application procedures, and types of equipment used to mix, convey, and apply fireproofing; as applicable to particular conditions of installation and as required to achieve fire-resistance ratings indicated.
- C. Coordinate application of fireproofing with other construction to minimize need to cut or remove fireproofing.
 - 1. Do not begin applying fireproofing until clips, hangers, supports, sleeves, and other items penetrating fireproofing are in place.
 - 2. Defer installing ducts, piping, and other items that would interfere with applying fireproofing until application of fireproofing is completed.
- D. Metal Decks:
 - 1. Do not apply fireproofing to underside of metal deck substrates until concrete topping, if any, has been completed.
 - 2. Do not apply fireproofing to underside of metal roof deck until roofing has been completed; prohibit construction roof traffic during, or after the application of fireproofing.
- E. Install auxiliary materials as required, as detailed, and according to fire-resistance design and fireproofing manufacturer's written recommendations for conditions of exposure and intended use. For auxiliary materials, use attachment and anchorage devices of type recommended in writing by fireproofing manufacturer.
- F. Spray apply fireproofing to maximum extent possible. Following the spraying operation in each area, complete the coverage by trowel application or other placement method recommended in writing by fireproofing manufacturer.
- G. Extend fireproofing in full thickness over entire area of each substrate to be protected.

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- H. Install body of fireproofing in a single course unless otherwise recommended in writing by fireproofing manufacturer.
 - I. For applications over encapsulant materials, including lockdown (post-removal) encapsulants, apply fireproofing that differs in color from that of encapsulant over which it is applied.
 - J. Where sealers are used, apply products that are tinted to differentiate them from fireproofing over which they are applied.
 - K. Provide a uniform finish complying with description indicated for each type of fireproofing material and matching finish approved for required mockups.
 - L. Cure fireproofing according to fireproofing manufacturer's written recommendations.
 - M. Do not install enclosing or concealing construction until after fireproofing has been applied, inspected, and tested and corrections have been made to deficient applications.
 - N. Finishes: Where indicated, apply fireproofing to produce the following finishes:
 - 1. Manufacturer's Standard Finishes: Finish according to manufacturer's written instructions for each finish selected.
 - 2. Spray-Textured Finish: Finish left as spray applied with no further treatment.
 - 3. Rolled, Spray-Textured Finish: Even finish produced by rolling spray-applied finish with a damp paint roller to remove drippings and excessive roughness.
 - 4. Skip-Troweled Finish: Even leveled surface produced by troweling spray-applied finish to smooth out the texture and neaten edges.
 - 5. Skip-Troweled Finish with Corner Beads: Even, leveled surface produced by troweling spray-applied finish to smooth out the texture, eliminate surface markings, and square off edges.

3.4 FIELD QUALITY CONTROL

- A. Special Inspections: Engage a qualified special inspector to perform the following special inspections:
 - 1. Test and inspect as required by Chapter 17 of the applicable IBC.
- B. Perform the tests and inspections of completed Work in successive stages. Do not proceed with application of fireproofing for the next area until test results for previously completed applications of fireproofing show compliance with requirements. Tested values must equal or exceed values as specified and as indicated and required for approved fire-resistance design.
- C. Fireproofing will be considered defective if it does not pass tests and inspections.
 - 1. Remove and replace fireproofing that does not pass tests and inspections, and retest.
 - 2. Apply additional fireproofing, per manufacturer's written instructions, where test results indicate insufficient thickness, and retest.
- D. Prepare test and inspection reports.

3.5 CLEANING, PROTECTING, AND REPAIRING

- A. Cleaning: Immediately after completing spraying operations in each containable area of Project, remove material overspray and fallout from surfaces of other construction and clean exposed surfaces to remove evidence of soiling.
- B. Protect fireproofing, according to advice of manufacturer and Installer, from damage resulting from construction operations or other causes, so fireproofing will be without damage or deterioration at time of Substantial Completion.
- C. As installation of other construction proceeds, inspect fireproofing and repair damaged areas and fireproofing removed due to work of other trades.
- D. Repair fireproofing damaged by other work before concealing it with other construction.
- E. Repair fireproofing by reapplying it using same method as original installation or using manufacturer's recommended trowel-applied product.

END OF SECTION 078100

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SECTION 078413 - PENETRATION FIRESTOPPING**PART 1 - GENERAL****1.1 SUMMARY****A. Section Includes:**

1. Penetration firestopping systems for the following applications:
 - a. Penetrations in fire-resistance-rated walls.
 - b. Penetrations in horizontal assemblies.
 - c. Penetrations in smoke barriers.

B. Related Requirements:

1. Section 078443 "Joint Firestopping" for joints in or between fire-resistance-rated construction, at exterior curtain-wall/floor intersections, and in smoke barriers.

1.2 PREINSTALLATION MEETINGS**A. Preinstallation Conference: Conduct conference at Project site.**

1. Before installation of fire-resistance-rated assemblies and penetrating items, review penetration firestopping system and examine procedures for ensuring quality of installed systems. Require representatives of each entity directly concerned with penetration firestopping system to attend, including the following:
 - a. Contractor's superintendent.
 - b. Independent testing agency responsible for penetration firestopping system.
 - c. Penetration firestopping system manufacturer's field representative.
 - d. Penetration firestopping system Installer.
 - e. Fire-resistance-rated masonry Installer.
 - f. Fire-resistance-rated gypsum board assembly Installer.
 - g. Mechanical piping Installer.
 - h. HVAC ductwork Installer.
 - i. Electrical wireway Installer.
2. Review inspection and testing and inspecting agency procedures for field quality control, penetration firestopping system installation, and coordination of penetrating item configurations with available rated penetration firestopping system assemblies.

1.3 ACTION SUBMITTALS**A. Product Data: For each type of product.****B. Shop Drawings: For each penetration firestopping system, show each kind of construction condition penetrated, relationships to adjoining construction, and kind of penetrating item. Include firestop design designation of testing and inspecting agency acceptable to authorities having jurisdiction that demonstrates compliance with requirements for each condition indicated.**

1. Submit documentation, including illustrations, from a qualified testing and inspecting agency that is applicable to each penetration firestopping system configuration for construction and penetrating item.

2. Engineering Judgments: Where Project conditions require modification to a qualified testing and inspecting agency's illustration for a particular penetration firestopping system, submit illustration, with modifications marked, approved by penetration firestopping system manufacturer's fire-protection engineer as an engineering judgment or equivalent fire-resistance-rated assembly. Obtain approval of authorities having jurisdiction prior to submittal.
- C. Product Schedule: For each penetration firestopping system. Include location, illustration of firestopping system, and design designation of qualified testing and inspecting agency.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For firm and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.
- B. Product Test Reports: For each penetration firestopping system, for tests performed by a qualified testing agency.

1.5 CLOSEOUT SUBMITTALS

- A. Installer Certificates: From Installer indicating that penetration firestopping systems have been installed in compliance with requirements and manufacturer's written instructions.

1.6 QUALITY ASSURANCE

- A. Installation Responsibility: Assign installation of penetration firestopping systems and joint firestopping systems in Project to a single qualified firestop subcontractor.
- B. Source Limitations: Obtain penetration firestopping and joint firestopping systems through one source from a single manufacturer.
- C. Installer Qualifications: A firm who is qualified by having the necessary experience, staff, and training to install manufacturer's products per specified requirements. Firm shall hold current certification by third party attesting to its ability to select and install firestopping and employ trained supervisors to maintain oversight of firestopping installation.
 1. Certification of Firestopping Firms: Firm shall have a minimum of ten (10) years experience in firestopping and comply with the following:
 - a. UL Qualified Firestop Contractor Program.
 2. Qualification for Superintendent: Superintendent shall have a minimum of 3 years experience in firestopping.
 3. Qualification for Firestop Installer: Trained individual in accordance with requirements of certification of firm.
 - a. Firestop Installers Training (FIT) Level 1 by Specified Technologies, Inc.
 - b. Certified 3M Trained by 3M Fire Protection Products.
 - c. Hilti Basic Firestop Training
 - d. Similar training by manufacturers listed in Part 2.
 4. A manufacturer's willingness to sell its through-penetration firestop system products to Contractor or to an installer engaged by Contractor does not in itself confer qualification on buyer.

1.7 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install penetration firestopping system when ambient or substrate temperatures are outside limits permitted by penetration firestopping system manufacturers or when substrates are wet because of rain, frost, condensation, or other causes.
- B. Install and cure penetration firestopping materials per manufacturer's written instructions using natural means of ventilations or, where this is inadequate, forced-air circulation.

1.8 COORDINATION

- A. Coordinate construction of openings and penetrating items to ensure that penetration firestopping systems can be installed according to specified firestopping system design.
- B. Coordinate sizing of sleeves, openings, core-drilled holes, or cut openings to accommodate penetration firestopping systems.
- C. Notify Owner's inspecting agency at least seven days in advance of penetration firestopping system installations; confirm dates and times on days preceding each series of installations.
- D. Do not cover up penetration firestopping system installations that will become concealed behind other construction until Owner's inspecting agency and building inspector, if required by authorities having jurisdiction, have examined and approved each installation.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Test-Response Characteristics:
 - 1. Perform penetration firestopping system tests by a qualified testing agency acceptable to authorities having jurisdiction.
 - 2. Test per testing standards referenced in "Penetration Firestopping Systems" Article. Provide rated systems complying with the following requirements:
 - a. Penetration firestopping systems shall bear classification marking of a qualified testing agency.
 - 1) UL in its "Fire Resistance Directory."
 - 2) Intertek Group in its "Directory of Listed Building Products."
 - 3) FM Approval in its "Approval Guide."

2.2 PENETRATION FIRESTOPPING SYSTEMS

- A. Penetration Firestopping Systems: Systems that resist spread of fire, passage of smoke and other gases, and maintain original fire-resistance rating of construction penetrated. Penetration firestopping systems shall be compatible with one another, with the substrates forming openings, and with penetrating items if any.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. 3M Fire Protection Products.
 - b. Hilti North America.

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- c. Specified Technologies Inc.
 - d. Tremco Fire Protection Systems.
- B. Penetrations in Fire-Resistance-Rated Walls: Penetration firestopping systems with ratings determined per ASTM E814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg.
- 1. F-Rating: Not less than the fire-resistance rating of constructions penetrated.
- C. Penetrations in Horizontal Assemblies: Penetration firestopping systems with ratings determined per ASTM E814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg.
- 1. F-Rating: At least one hour, but not less than the fire-resistance rating of constructions penetrated.
 - 2. T-Rating: At least one hour, but not less than the fire-resistance rating of constructions penetrated except for floor penetrations within the cavity of a wall.
 - 3. W-Rating: Provide penetration firestopping systems showing no evidence of water leakage when tested according to UL 1479.
- D. Penetrations in Smoke Barriers: Penetration firestopping systems with ratings determined per UL 1479, based on testing at a positive pressure differential of 0.30-inch wg.
- 1. L-Rating: Not exceeding 5.0 cfm/sq. ft. of penetration opening at and no more than 50-cfm cumulative total for any 100 sq. ft. at both ambient and elevated temperatures.
- E. Exposed Penetration Firestopping Systems: Flame-spread and smoke-developed indexes of less than 25 and 450, respectively, per ASTM E84.
- F. Accessories: Provide components for each penetration firestopping system that are needed to install fill materials and to maintain ratings required. Use only those components specified by penetration firestopping system manufacturer and approved by qualified testing and inspecting agency for conditions indicated.
- 1. Permanent forming/damming/backing materials.
 - 2. Substrate primers.
 - 3. Collars.
 - 4. Steel sleeves.

2.3 FILL MATERIALS

- A. Cast-in-Place Firestop Devices: Factory-assembled devices for use in cast-in-place concrete floors and consisting of an outer sleeve lined with an intumescent strip, a flange attached to one end of the sleeve for fastening to concrete formwork, and a neoprene gasket.
- B. Latex Sealants: Single-component latex formulations that do not re-emulsify after cure during exposure to moisture.
- C. Firestop Devices: Factory-assembled collars formed from galvanized steel and lined with intumescent material sized to fit specific diameter of penetrant.
- D. Intumescent Composite Sheets: Rigid panels consisting of aluminum-foil-faced intumescent elastomeric sheet bonded to galvanized-steel sheet.
- E. Intumescent Putties: Nonhardening, water-resistant, intumescent putties containing no solvents or inorganic fibers.

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- F. Putty Pads: Release lined intumescent pad sized to fit single or double gang electrical boxes. Available products include the following:
1. AcoustiGuard; Putty Pad.
 2. Acoustical Solutions; Firestop Putty Pad.
 3. Hilti; CFS-P PA.
 4. Kenetics Noise Control; IsoBacker.
 5. STI; SpecSeal Series SSP Putty Pad.
- G. Intumescent Wrap Strips: Single-component intumescent elastomeric sheets with aluminum foil on one side.
- H. Mortars: Prepackaged dry mixes consisting of a blend of inorganic binders, hydraulic cement, fillers and lightweight aggregate formulated for mixing with water at Project site to form a nonshrinking, homogeneous mortar.
- I. Pillows/Bags: Reusable heat-expanding pillows/bags consisting of glass-fiber cloth cases filled with a combination of mineral-fiber, water-insoluble expansion agents, and fire-retardant additives. Where exposed, cover openings with steel-reinforcing wire mesh to protect pillows/bags from being easily removed.
- J. Silicone Foams: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam.
- K. Silicone Sealants: Single-component, silicone-based, neutral-curing elastomeric sealants.

2.4 MIXING

- A. Penetration Firestopping Materials: For those products requiring mixing before application, comply with penetration firestopping system manufacturer's written instructions for accurate proportioning of materials, water (if required), type of mixing equipment, selection of mixer speeds, mixing containers, mixing time, and other items or procedures needed to produce products of uniform quality with optimum performance characteristics for application indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for opening configurations, penetrating items, substrates, and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Surface Cleaning: Before installing penetration firestopping systems, clean out openings immediately to comply with manufacturer's written instructions and with the following requirements:
1. Remove from surfaces of opening substrates and from penetrating items foreign materials that could interfere with adhesion of penetration firestopping materials.
 2. Clean opening substrates and penetrating items to produce clean, sound surfaces capable of developing optimum bond with penetration firestopping materials. Remove loose particles remaining from cleaning operation.

3. Remove laitance and form-release agents from concrete.

- B. Prime substrates where recommended in writing by manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.

3.3 INSTALLATION

- A. General: Install penetration firestopping systems to comply with manufacturer's written installation instructions and published drawings for products and applications.
- B. Install forming materials and other accessories of types required to support fill materials during their application and in the position needed to produce cross-sectional shapes and depths required to achieve fire ratings.
1. After installing fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not forming permanent components of firestopping.
- C. Install fill materials by proven techniques to produce the following results:
1. Fill voids and cavities formed by openings, forming materials, accessories and penetrating items to achieve required fire-resistance ratings.
 2. Apply materials so they contact and adhere to substrates formed by openings and penetrating items.
 3. For fill materials that will remain exposed after completing the Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.4 IDENTIFICATION

- A. Wall Identification: Permanently label walls containing penetration firestopping systems with the words "FIRE AND/OR SMOKE BARRIER - PROTECT ALL OPENINGS," using lettering not less than 3 inches high and with minimum 0.375-inch strokes.
1. Locate in accessible concealed floor, floor-ceiling, or attic space at 15 feet from end of wall and at intervals not exceeding 30 feet.
- B. Penetration Identification: Identify each penetration firestopping system with legible metal or plastic labels. Attach labels permanently to surfaces adjacent to and within 6 inches of penetration firestopping system edge so labels are visible to anyone seeking to remove penetrating items or firestopping systems. Use mechanical fasteners or self-adhering-type labels with adhesives capable of permanently bonding labels to surfaces on which labels are placed. Include the following information on labels:
1. The words "Warning - Penetration Firestopping - Do Not Disturb. Notify Building Management of Any Damage."
 2. Contractor's name, address, and phone number.
 3. Designation of applicable testing and inspecting agency.
 4. Date of installation.
 5. Manufacturer's name.
 6. Installer's name.

3.5 FIELD QUALITY CONTROL

- A. Owner will engage a qualified testing agency to perform tests and inspections according to ASTM E2174.

- B. Where deficiencies are found or penetration firestopping system is damaged or removed because of testing, repair or replace penetration firestopping system to comply with requirements.
- C. Proceed with enclosing penetration firestopping systems with other construction only after inspection reports are issued and installations comply with requirements.

3.6 CLEANING AND PROTECTION

- A. Clean off excess fill materials adjacent to openings as the Work progresses by methods and with cleaning materials that are approved in writing by penetration firestopping system manufacturers and that do not damage materials in which openings occur.
- B. Provide final protection and maintain conditions during and after installation that ensure that penetration firestopping systems are without damage or deterioration at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, immediately cut out and remove damaged or deteriorated penetration firestopping material and install new materials to produce systems complying with specified requirements.

END OF SECTION 078413

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SECTION 078443 - JOINT FIRESTOPPING**PART 1 - GENERAL****1.1 SUMMARY****A. Section Includes:**

1. Joints in or between fire-resistance-rated constructions.
2. Joints at exterior curtain-wall/floor intersections.
3. Joints in smoke barriers.

1.2 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.

- B. Shop Drawings: For each joint firestopping system, show relationships to adjoining construction. Include firestop design designation of testing and inspecting agency acceptable to authorities having jurisdiction that evidences compliance with requirements for each condition indicated.

1. Submit documentation, including illustrations, from a qualified testing and inspecting agency that is applicable to each joint firestopping system configuration for construction and penetrating items.
2. Engineering Judgments: Where Project conditions require modification to a qualified testing agency's illustration for a particular joint firestopping system condition, submit illustration, with modifications marked, approved by joint firestopping system manufacturer's fire-protection engineer as an engineering judgment or equivalent fire-resistance-rated assembly.

- C. Product Schedule: For each joint firestopping system. Include location, illustration of firestopping system, and design designation of qualified testing agency.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

- B. Listed System Designs: For each joint firestopping system, for tests performed by a qualified testing agency.

1.5 CLOSEOUT SUBMITTALS

- A. Installer Certificates: From Installer indicating that joint firestopping systems have been installed in compliance with requirements and manufacturer's written instructions.

1.6 QUALITY ASSURANCE

- A. Installation Responsibility: Assign installation of penetration firestopping systems and joint firestopping systems in Project to a single qualified firestop subcontractor.
- B. Source Limitations: Obtain penetration firestopping and joint firestopping systems through one source from a single manufacturer.
- C. Installer Qualifications: A firm who is qualified by having the necessary experience, staff, and training to install manufacturer's products per specified requirements. Firm shall hold current certification by third party attesting to its ability to select and install firestopping and employ trained supervisors to maintain oversight of firestopping installation.
 - 1. Certification of Firestopping Firms: Firm shall have a minimum of ten (10) years experience in firestopping and comply with the following:
 - a. UL Qualified Firestop Contractor Program.
 - 2. Qualification for Superintendent: Superintendent shall have a minimum of 3 years experience in firestopping.
 - 3. Qualification for Firestop Installer: Trained individual in accordance with requirements of certification of firm.
 - a. Firestop Installers Training (FIT) Level 1 by Specified Technologies, Inc.
 - b. Certified 3M Trained by 3M Fire Protection Products.
 - c. Hilti Basic Firestop Training
 - d. Similar training by manufacturers listed in Part 2.
 - 4. A manufacturer's willingness to sell its joint firestop system products to Contractor or to an installer engaged by Contractor does not in itself confer qualification on buyer.

1.7 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install joint firestopping systems when ambient or substrate temperatures are outside limits permitted by joint firestopping system manufacturers or when substrates are wet due to rain, frost, condensation, or other causes.
- B. Install and cure joint firestopping systems per manufacturer's written instructions using natural means of ventilation or, where this is inadequate, forced-air circulation.

1.8 COORDINATION

- A. Coordinate construction of joints to ensure that joint firestopping systems can be installed according to specified firestopping system design.
- B. Coordinate sizing of joints to accommodate joint firestopping systems.
- C. Notify Owner's inspecting agency at least seven days in advance of joint firestopping system installations; confirm dates and times on days preceding each series of installations.
- D. Do not cover up joint firestopping system installations that will become concealed behind other construction until Owner's inspecting agency and building inspector, if required by authorities having jurisdiction, have examined each installation.

PART 2 - PRODUCTS**2.1 SOURCE LIMITATIONS**

- A. Obtain joint firestop systems for each type of joint opening indicated from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS**A. Fire-Test-Response Characteristics:**

1. Perform joint firestopping system tests by a qualified testing agency acceptable to authorities having jurisdiction.
2. Test per testing standards referenced in "Joint Firestopping Systems" Article. Provide rated systems complying with the following requirements:
 - a. Joint firestopping systems shall bear classification marking of a qualified testing agency.
 - 1) UL in its "Fire Resistance Directory."
 - 2) Intertek Group in its "Directory of Listed Building Products."

- B. Rain/Water Resistance: For perimeter fire-barrier system applications, where inclement weather or greater-than-transient water exposure is expected, use products that dry rapidly and cure in the presence of atmospheric moisture sufficient to pass ASTM D6904 early rain-resistance test (24-hour exposure).

2.3 JOINT FIRESTOPPING SYSTEMS

- A. Joint Firestopping Systems: Systems that resist spread of fire, passage of smoke and other gases, and maintain original fire-resistance rating of assemblies in or between which joint firestopping systems are installed. Joint firestopping systems shall accommodate building movements without impairing their ability to resist the passage of fire and hot gases.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. 3M Fire Protection Products.
 - b. Hilti North America.
 - c. Specified Technologies Inc.
 - d. Tremco Fire Protection Systems
2. Joint firestopping systems that are compatible with one another, with the substrates forming openings, and with penetrating items, if any.
3. Provide products that, upon curing, do not re-emulsify, dissolve, leach, breakdown, or otherwise deteriorate over time from exposure to atmospheric moisture, sweating pipes, ponding water or other forms of moisture.
4. Provide firestop products that do not contain ethylene glycol.

- B. Intumescent Gypsum Wall Framing Gaskets (Applied to Steel Tracks, Runners and Studs prior to Framing Installation): Provide products with fire, smoke, and acoustical ratings that allow movement up to 100 percent compression and/or extension in accordance with UL 2079 or ASTM E1966; have an L Rating less than 1 cfm/ft. in accordance with UL 2079; and a minimum Sound Transmission Class (STC) rating of 56 in accordance with ASTM E90 or ASTM C919.

- C. For aluminum curtain-wall assemblies with one- or two-piece rectangular mullions at least 2-1/2 by 5 inches, provide perimeter fire-barrier system that does not require direct screw attachment to mullions and transoms to support and fasten curtain-wall insulation.

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- D. Joints in or between Fire-Resistance-Rated Construction: Provide joint firestopping systems with ratings determined per ASTM E1966 or UL 2079.
1. Fire-Resistance Rating: Equal to or exceeding the fire-resistance rating of the wall, floor, or roof in or between which it is installed.
- E. Joints at Exterior Curtain-Wall/Floor Intersections: Provide joint firestopping systems with rating determined per ASTM E2307.
1. F-Rating: Equal to or exceeding the fire-resistance rating of the floor assembly.
- F. Joints in Smoke Barriers: Provide joint firestopping systems with ratings determined per UL 2079 based on testing at a positive pressure differential of 0.30-inch wg.
1. L-Rating: Not exceeding 5.0 cfm/ft. of joint at both ambient and elevated temperatures.
- G. Exposed Joint Firestopping Systems: Flame-spread and smoke-developed indexes of less than 25 and 450, respectively, as determined per ASTM E84.
- H. Accessories: Provide components of joint firestopping systems, including primers and forming materials, that are needed to install elastomeric fill materials and to maintain ratings required. Use only components specified by joint firestopping system manufacturer and approved by the qualified testing agency for conditions indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for joint configurations, substrates, and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Surface Cleaning: Before installing joint firestopping systems, clean joints immediately to comply with fire-resistive joint system manufacturer's written instructions and the following requirements:
 1. Remove from surfaces of joint substrates foreign materials that could interfere with adhesion of elastomeric fill materials or compromise fire-resistive rating.
 2. Clean joint substrates to produce clean, sound surfaces capable of developing optimum bond with elastomeric fill materials. Remove loose particles remaining from cleaning operation.
 3. Remove laitance and form-release agents from concrete.
- B. Prime substrates where recommended in writing by joint firestopping system manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.
- C. Apply a suitable bond-breaker to prevent three-sided adhesion in applications where this condition occurs, such as the intersection of a gypsum wall to floor or roof assembly where the joint is backed by a steel ceiling runner or track.

3.3 INSTALLATION

- A. General: Install joint firestopping systems to comply with manufacturer's written installation instructions and published drawings for products and applications indicated.
- B. Install forming materials and other accessories of types required to support elastomeric fill materials during their application and in position needed to produce cross-sectional shapes and depths required to achieve fire ratings indicated.
 - 1. After installing elastomeric fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not indicated as permanent components of fire-resistive joint system.
- C. Install elastomeric fill materials for joint firestopping systems by proven techniques to produce the following results:
 - 1. Elastomeric fill voids and cavities formed by joints and forming materials as required to achieve fire-resistance ratings indicated.
 - 2. Apply elastomeric fill materials so they contact and adhere to substrates formed by joints.
 - 3. For elastomeric fill materials that will remain exposed after completing the Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.4 IDENTIFICATION

- A. Wall Identification: Permanently label walls containing firestopping systems with the words "FIRE AND/OR SMOKE BARRIER - PROTECT ALL OPENINGS," using lettering not less than 3 inches high and with minimum 0.375-inch strokes.
 - 1. Locate in accessible concealed floor, floor-ceiling, or attic space at 15 ft. from end of wall and at intervals not exceeding 30 ft..
- B. Joint Identification: Identify joint firestopping systems with legible metal or plastic labels. Attach labels permanently to surfaces adjacent to and within 6 inches of joint edge so labels are visible to anyone seeking to remove or joint firestopping system. Use mechanical fasteners or self-adhering-type labels with adhesives capable of permanently bonding labels to surfaces on which labels are placed. Include the following information on labels:
 - 1. The words "Warning - Joint Firestopping - Do Not Disturb. Notify Building Management of Any Damage."
 - 2. Contractor's name, address, and phone number.
 - 3. Designation of applicable testing agency.
 - 4. Date of installation.
 - 5. Manufacturer's name.
 - 6. Installer's name.

3.5 FIELD QUALITY CONTROL

- A. Inspecting Agency: Owner will engage a qualified testing agency to perform tests and inspections according to ASTM E2393.
- B. Where deficiencies are found or joint firestopping systems are damaged or removed due to testing, repair or replace joint firestopping systems so they comply with requirements.
- C. Proceed with enclosing joint firestopping systems with other construction only after inspection reports are issued and installations comply with requirements.

3.6 CLEANING AND PROTECTION

- A. Clean off excess elastomeric fill materials adjacent to joints as the Work progresses by methods and with cleaning materials that are approved in writing by joint firestopping system manufacturers and that do not damage materials in which joints occur.
- B. Provide final protection and maintain conditions during and after installation that ensure joint firestopping systems are without damage or deterioration at time of Substantial Completion. If damage or deterioration occurs despite such protection, cut out and remove damaged or deteriorated joint firestopping systems immediately and install new materials to produce joint firestopping systems complying with specified requirements.

END OF SECTION 078443

SECTION 079200 - JOINT SEALANTS**PART 1 - GENERAL****1.1 SUMMARY**

This Section includes joint sealants for the following applications, including those specified by reference to this Section:

1. Exterior joints in vertical surfaces and horizontal nontraffic surfaces.
2. Exterior joints in horizontal traffic surfaces.
3. Interior joints in vertical surfaces and horizontal nontraffic surfaces.
4. Interior joints in horizontal traffic surfaces.

B. Related Sections include the following:

1. Division 04 Section 042000 "Unit Masonry" for masonry control and expansion joint fillers and gaskets.
2. Division 08 Section 088000 "Glazing" for glazing sealants.

1.2 PERFORMANCE REQUIREMENTS

A. Provide elastomeric joint sealants and joint sealants for interior applications that establish and maintain watertight and airtight continuous joint seals without staining or deteriorating joint substrates.

1.3 ACTION SUBMITTALS

A. Product Data: For each joint-sealant product indicated.

B. Samples: For each type and color of joint sealant required, provide Samples with joint sealants in 1/2-inch wide joints formed between two 6-inch long strips of material matching the appearance of exposed surfaces adjacent to joint sealants.

1.4 INFORMATIONAL SUBMITTALS

A. Preconstruction Compatibility and Adhesion Test Reports: From sealant manufacturer, indicating the following:

1. Materials forming joint substrates and joint-sealant backings have been tested for compatibility and adhesion with joint sealants.
2. Interpretation of test results and written recommendations for primers and substrate preparation needed for adhesion.

B. Qualification Data: For qualified installer.

C. Product Certificates: For each kind of joint sealant and accessory, from manufacturer.

D. Warranties: Sample of special warranties.

1.5 QUALITY ASSURANCE

- A. Preconstruction Compatibility and Adhesion Testing: Submit samples of materials that will contact or affect joint sealants to joint-sealant manufacturers for testing according to ASTM C 1087 to determine whether priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of joint sealants to joint substrates.
 - 1. Schedule sufficient time for testing and analyzing results to prevent delaying the Work.
 - 2. For materials failing tests, obtain joint-sealant manufacturer's written instructions for corrective measures including use of specially formulated primers.
- B. Installer Qualifications: Installer shall be a sealant and caulking subcontractor with a minimum of five years of successful experience in the application of the types of materials required, and who agrees to employ only skilled tradesmen for the Work.
- C. Mockups: Build mockups incorporating sealant joints, as follows, to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution:
 - 1. Joints in mockups of assemblies specified in other Sections that are indicated to receive elastomeric joint sealants, which are specified by reference to this Section.

1.6 PROJECT CONDITIONS

- A. Do not proceed with installation of joint sealants under the following conditions:
 - 1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer.
 - 2. When joint substrates are wet.
 - 3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
 - 4. Where contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

1.7 WARRANTY

- A. Special Installer's Warranty: Installer's standard form in which Installer agrees to repair or replace elastomeric joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
 - 1. Warranty Period: Two years from date of Substantial Completion.
- B. Special Manufacturer's Warranty: Manufacturer's standard form in which elastomeric sealant manufacturer agrees to furnish elastomeric joint sealants to repair or replace those that do not comply with performance and other requirements specified in this Section within specified warranty period.
 - 1. Warranty Period: Ten years from date of Substantial Completion for exterior elastomeric sealants.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

- A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by sealant manufacturer, based on testing and field experience.

- B. Stain-Test-Response Characteristics: Where elastomeric sealants are specified to be nonstaining to porous substrates, provide products that have undergone testing according to ASTM C 1248 and have not stained porous joint substrates indicated for Project.
- C. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range of available colors including premium colors.

2.2 ELASTOMERIC JOINT SEALANTS

- A. Elastomeric Sealants: Comply with ASTM C 920 and other requirements indicated for each liquid-applied chemically curing sealant specified, including those referencing ASTM C 920 classifications for type, grade, class, and uses related to exposure and joint substrates.
- B. Single Component, Nonsag, Neutral-Curing Silicone Sealant:
 - 1. Products:
 - a. Dow Corning Corporation; 790.
 - b. GE; Momentive Performance Materials; SilPruf LM SCS2700.
 - c. Pecora Corporation; 890.
 - d. Tremco Incorporated; Spectrem 1.
 - 2. Type and Grade: S (single component) and NS (nonsag).
 - 3. Class: 100/50.
 - 4. Use Related to Exposure: NT (nontraffic).
 - 5. Uses Related to Joint Substrates: M (Masonry), G (Glass), A (Aluminum), and, as applicable to joint substrates indicated, O (Other).
 - 6. Non-staining for natural stone substrates.
 - 7. Field-tintable to match adjacent substrates.
 - 8. Exterior Joint Locations:
 - a. Cast-in-place concrete, vertical construction joints.
 - b. Unit masonry, vertical control and expansion joints,
 - c. Exterior vertical joints between different materials listed above.
 - d. Exterior perimeter joints between materials listed above and frames of doors windows and louvers.
 - e. Exterior control and expansion joints in ceilings and other overhead surfaces.
 - f. Other vertical or horizontal non-traffic joints.
- C. Single-Component, Traffic Exposure, Neutral-Curing Silicone Sealant:
 - 1. Products:
 - a. Dow Corning Corporation; 890-SL.
 - b. Pecora Corporation; 300 SL.
 - c. Tremco Incorporated; Spectrem 900 SL.
 - 2. Type and Grade: S (single component) and P (pourable).
 - 3. Class: 100/50.
 - 4. Uses Related to Exposure: T (traffic).
 - 5. Uses Related to Joint Substrates: M, A, and O, as applicable to joint substrates indicated.
 - 6. Exterior Joint Locations:
 - a. Cast-in-place concrete slabs, horizontal nontraffic and traffic isolation and contraction joints.
 - b. Other exterior horizontal traffic joints.
 - 7. Interior Joint Locations:

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- a. Interior ceramic and porcelain stone tile expansion, control, contraction, and isolation joints in horizontal traffic surfaces.
- D. Single-Component, Mildew-Resistant, Neutral-Curing Silicone Sealant:
1. Products:
 - a. ChemLink; DuraSil.
 - b. Dow Corning Corporation; 786.
 - c. Pecora Corporation; 898.
 - d. Tremco Incorporated; Tremsil 600 White.
 2. Type and Grade: S (single component) and NS (nonsag).
 3. Class: 25.
 4. Use Related to Exposure: NT (nontraffic).
 5. Uses Related to Joint Substrates: M, G, A, and, as applicable to joint substrates indicated, O.
 6. Interior Joint Locations:
 - a. Interior joints between plumbing fixtures and adjoining walls, floors, and counters.
- E. Single-Component, Nonsag, Urethane Joint Sealant: ASTM C 920, Type S, Grade NS, Class 25, for Use NT.
1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Bostik, Inc.; Chem-Calk 900.
 - b. ITW Polymers Sealants; Permthane SM7120.
 - c. Master Builders Solutions; an MBCC Group company; MasterSeal NP 1.
 - d. Pecora Corporation; Dynatrol I-XL.
 - e. Sika Corporation, Construction Products Division; Sikaflex - 1a.
 - f. Tremco Incorporated; Dymonic.
 2. Joint Locations:
 - a. Control and expansion joints on exposed interior surfaces of exterior walls.
 - b. Perimeter joints of exterior openings where indicated.
 - c. Tile control and expansion joints.
 - d. Vertical joints on exposed surfaces of interior unit masonry walls and partitions.
 - e. Perimeter joints between interior wall surfaces and frames of interior doors windows and elevator entrances.
 - f. Other joints as indicated.
 3. Joint Sealant: Paintable.
 4. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

2.3 LATEX JOINT SEALANTS

- A. Latex Sealant: Acrylic latex or siliconized acrylic latex, ASTM C 834, Type OP, Grade NF.
1. Products:
 - a. GE; Momentive Performance Materials; RCS20.
 - b. Pecora Corporation; AC-20+.
 - c. Tremco Incorporated; Tremflex 834.
 2. Interior Joint Locations:
 - a. Perimeter joints between interior wall surfaces and frames of interior doors, windows and elevator entrances.
 - b. Other non-dynamic interior joints including between interior wall surfaces and casework.

2.4 ACOUSTICAL JOINT SEALANTS

- A. Acoustical Sealant for Exposed and Concealed Joints: Manufacturer's standard nonsag, paintable, nonstaining latex sealant complying with ASTM C 834 that effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.
1. Interior Joint Locations: Acoustical interior joints for concealed and exposed joints.
 2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Pecora Corporation.
 - b. Tremco Incorporated.
 - c. USG Interiors.

2.5 JOINT-SEALANT BACKING

- A. General: Provide sealant backings of material and type that are nonstaining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.
- B. Cylindrical Sealant Backings: ASTM C 1330, Type C (closed-cell material with a surface skin), or B (bicellular material with a surface skin), as approved in writing by joint-sealant manufacturer for joint application indicated, and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance. Consult the sealant manufacturer to confirm the specific backer material to be used for the specific project and application, and submit to Architect the manufacturer's written recommendations.
- C. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint where such adhesion would result in sealant failure. Provide self-adhesive tape where applicable.

2.6 MISCELLANEOUS MATERIALS

- A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.
- B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.
- C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint-sealant performance.

- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants.
1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
 2. Clean porous joint substrate surfaces by brushing, grinding, blast cleaning, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air.
 3. Remove laitance and form-release agents from concrete.
 4. Clean nonporous surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants.
- B. Joint Priming: Prime joint substrates, where recommended in writing by joint-sealant manufacturer, based on preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.
- C. Masking Tape: Use masking tape where required to prevent contact of sealant with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.3 INSTALLATION

- A. General: Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.
- B. Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.
- C. Install sealant backings of type recommended by manufacturer to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
1. Do not leave gaps between ends of sealant backings.
 2. Do not stretch, twist, puncture, or tear sealant backings.
 3. Remove absorbent sealant backings that have become wet before sealant application and replace them with dry materials.
- D. Install secondary seal at depth sufficient to allow installation of properly sized backer rod and liquid sealant in front of secondary seal. Comply with manufacturer's written instructions.
1. Install each length of sealant immediately after removing protective wrapping, taking care not to pull or stretch material, producing seal continuity at ends, turns, and intersections of joints. For applications at low ambient temperatures where expansion of sealant requires acceleration to produce seal, apply heat to sealant in compliance with sealant manufacturer's written instructions.
- E. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.

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- F. Install sealants using proven techniques that comply with the following and at the same time backings are installed:
1. Place sealants so they directly contact and fully wet joint substrates.
 2. Completely fill recesses in each joint configuration.
 3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.
- G. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.
1. Remove excess sealant from surfaces adjacent to joints.
 2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
 3. Provide concave joint configuration per Figure 5A in ASTM C 1193, unless otherwise indicated.
- H. Acoustical Sealant Installation: At sound-rated assemblies and elsewhere as indicated, seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C 919 and with manufacturer's written recommendations.

3.4 CLEANING

- A. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

3.5 PROTECTION

- A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Final Acceptance. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from original work.

END OF SECTION 079200

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SECTION 079219 – ACOUSTICAL JOINT SEALANTS**PART 1 - GENERAL****1.1 SUMMARY**

- A. Section includes acoustical joint sealants.

1.2 ACTION SUBMITTALS

- A. Product Data: For each acoustical joint sealant.
- B. Samples for Verification: For each kind and color of acoustical joint sealant required, provide Samples with joint sealants in 1/2 inch wide joints formed between two 6 inch long strips of material matching the appearance of exposed surfaces adjacent to joint sealants.
- C. Acoustical-Joint-Sealant Schedule: Include the following information:
 - 1. Joint-sealant application, joint location, and designation.
 - 2. Joint-sealant manufacturer and product name.
 - 3. Joint-sealant formulation.
 - 4. Joint-sealant color.

1.3 INFORMATIONAL SUBMITTALS

- A. Product Test Reports: For each kind of acoustical joint sealant, for tests performed by a qualified testing agency or by manufacturer and witnessed by a qualified testing agency.
- B. Sample Warranties: For special warranties.

1.4 WARRANTY

- A. Special Installer's Warranty: Installer agrees to repair or replace acoustical joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
 - 1. Warranty Period: Two years from date of Substantial Completion.
- B. Special Manufacturer's Warranty: Manufacturer agrees to furnish acoustical joint sealants to repair or replace those joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
 - 1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS**2.1 PERFORMANCE REQUIREMENTS**

- A. Provide acoustical joint-sealant products that effectively reduce airborne sound transmission through perimeter joints and openings in building construction, as demonstrated by testing representative assemblies per ASTM E90.

2.2 ACOUSTICAL JOINT SEALANTS

- A. Acoustical Sealant Joints: Manufacturer's standard nonsag, paintable, nonstaining latex acoustical sealant complying with ASTM C834.
1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Accumetric LLC: BOSS 826 Acoustical Smoke & Sound Sealant.
 - b. Franklin International: Titebond GREENchoice Acoustical Smoke & Sound Sealant'
 - c. Grabber Construction Products: Acoustical Sound & Smoke Sealant.
 - d. Hilti, Inc.: CP 506 Smoke and Acoustic Sealant.
 - e. OSI Sealants; Henkel Corporation: OSI Pro-Series SC175 Draft & Acoustical Sound Sealant.
 - f. Pecora Corporation: AIS-919.
 - g. Specified Technologies Inc.: SpecSeal SNS Smoke 'N' Sound Acoustical Sealant
 - h. Tremco Incorporated: Tremco Acoustical Sealant.
 - i. USG Company: Sheetrock Acoustical Sealant.
 2. Colors of Exposed Acoustical Joint Sealants: As selected by Architect from manufacturer's full range of colors.
- B. Acoustical Sealant for Concealed Joints: Manufacturer's standard nonsag, nondrying, nonhardening, nonskinning, nonstaining, gunnable, synthetic-rubber acoustical sealant.
1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Pecora Corporation: BA-98.
 - b. QuietRock; QuietSeal Pro.
- C. Primer: Material recommended by acoustical-joint-sealant manufacturer where required for adhesion of sealant to joint substrates.
- D. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.
- E. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine joints indicated to receive acoustical joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting performance of Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Surface Cleaning of Joints: Clean out joints immediately before installing acoustical joint sealants to comply with joint-sealant manufacturer's written instructions.

- B. Joint Priming: Prime joint substrates where recommended by acoustical-joint-sealant manufacturer. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.
- C. Masking Tape: Use masking tape where required to prevent contact of sealant or primer with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.3 INSTALLATION OF ACOUSTICAL JOINT SEALANTS

- A. Comply with acoustical joint-sealant manufacturer's written installation instructions unless more stringent requirements apply.
- B. STC-Rated Assemblies: Seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical joint sealant. Install acoustical joint sealants at both faces of partitions, at perimeters, and through penetrations. Comply with ASTM C919, ASTM C1193, and manufacturer's written recommendations for closing off sound-flanking paths around or through assemblies, including sealing partitions to underside of floor slabs above acoustical ceilings.
 - 1. Apply acoustical sealant to close gaps between service outlets and penetrations, and gypsum board.
 - 2. Apply acoustical sealant to back of electrical J-boxes for power, telephone, and data prior to installation of gypsum board.
 - 3. Tightly fill gaps around penetrations (ducts, pipes, and conduit) 1 inch or less with attenuation batt insulation.
 - 4. Fill gaps larger than 1 inch with putty pads or stick.
 - 5. Apply acoustical sealant at duct and piping penetrations.
- C. Acoustical Ceiling Areas: Apply acoustical joint sealant at perimeter edge moldings of acoustical ceiling areas in a continuous ribbon concealed on back of vertical legs of moldings before they are installed.

3.4 CLEANING

- A. Clean off excess sealant or sealant smears adjacent to joints as Work progresses by methods and with cleaning materials approved in writing by manufacturers of acoustical joint sealants and of products in which joints occur.

3.5 PROTECTION

- A. Protect acoustical joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out, remove, and repair damaged or deteriorated acoustical joint sealants immediately so installations with repaired areas are indistinguishable from original Work.

END OF SECTION 079219

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SECTION 081113 - HOLLOW METAL DOORS AND FRAMES**PART 1 - GENERAL****1.1 SUMMARY**

- A. Section includes hollow-metal work.

1.2 COORDINATION

- A. Coordinate anchorage installation for hollow-metal frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors. Deliver such items to Project site in time for installation.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, core descriptions, and finishes.
- B. Shop Drawings: Include the following:
 - 1. Elevations of each door type.
 - 2. Details of doors, including vertical- and horizontal-edge details and metal thicknesses.
 - 3. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
 - 4. Locations of reinforcement and preparations for hardware.
 - 5. Details of each different wall opening condition.
 - 6. Details of anchorages, joints, field splices, and connections.
 - 7. Details of accessories.
 - 8. Details of conduit and preparations for power, signal, and control systems.
- C. Schedule: Provide a schedule of hollow-metal work prepared by or under the supervision of supplier, using same reference numbers for details and openings as those on Drawings. Coordinate with final Door Hardware Schedule.

1.4 INFORMATIONAL SUBMITTALS

- A. Product Test Reports: For each type of hollow-metal door and frame assembly, for tests performed by a qualified testing agency.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver hollow-metal work palletized, packaged, or crated to provide protection during transit and Project-site storage. Do not use nonvented plastic.
 - 1. Provide additional protection to prevent damage to factory-finished units.
- B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.
- C. Store hollow-metal work vertically under cover at Project site with head up. Place on minimum 4-inch-high wood blocking. Provide minimum 1/4-inch space between each stacked door to permit air circulation.

PART 2 - PRODUCTS**2.1 MANUFACTURERS**

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Ceco Door Products; an ASSA ABLOY Group company.
 2. Curries Company; an ASSA ABLOY Group company.
 3. Deansteel Manufacturing Company, Inc..
 4. Fleming Door Products Ltd.; an ASSA ABLOY Group company.
 5. Pioneer Industries, Inc.; an ASSA ABLOY Group company.
 6. Republic Doors and Frames; an Allegion company.
 7. Steelcraft; an Allegion company.
- B. Source Limitations: Obtain hollow-metal work from single source from single manufacturer.

2.2 INTERIOR DOORS AND FRAMES

- A. Construct interior doors and frames to comply with the standards indicated for materials, fabrication, hardware locations, hardware reinforcement, tolerances, and clearances, and as specified.
- B. Extra-Heavy-Duty Doors and Frames: SDI A250.8, Level 3. At locations indicated in the Door and Frame Schedule.
1. Physical Performance: Level A according to SDI A250.4.
 2. Doors:
 - a. Type: As indicated in the Door and Frame Schedule.
 - b. Thickness: 1-3/4 inches.
 - c. Face: Uncoated cold-rolled steel sheet, minimum thickness of 0.053 inch.
 - d. Edge Construction: Model 2, Seamless.
 - e. Core: Manufacturer's standard kraft-paper honeycomb, polystyrene, polyurethane, polyisocyanurate, mineral-board, or vertical steel-stiffener core at manufacturer's discretion.
 3. Frames:
 - a. Materials: Uncoated steel sheet, minimum thickness of 0.053 inch.
 - b. Frames: Fabricated from same thickness material as adjacent door frame.
 - c. Construction: Face welded.
 4. Exposed Finish: Prime Factory.
 5. Exposed interior face of jamb at strike: Paint to match frame

2.3 EXTERIOR HOLLOW-METAL DOORS AND FRAMES

- A. Construct exterior doors and frames to comply with the standards indicated for materials, fabrication, hardware locations, hardware reinforcement, tolerances, and clearances, and as specified.
- B. Extra-Heavy-Duty Doors and Frames: SDI A250.8, Level 3.
1. Physical Performance: Level A according to SDI A250.4.
 2. Doors:
 - a. Type: As indicated in the Door and Frame Schedule.
 - b. Thickness: 1-3/4 inches

- c. Face: Metallic-coated steel sheet, minimum thickness of 0.053 inch, with minimum A40 coating.
 - d. Edge Construction: Model 2, Seamless.
 - e. Core: Manufacturer's standard kraft-paper honeycomb, polystyrene, polyurethane, polyisocyanurate, mineral-board, or vertical steel-stiffener core at manufacturer's discretion.
 - 1) Thermal-Rated Doors: Provide doors fabricated with thermal-resistance value (R-value) of not less than 12.3 degrees F per hour per square foot per Btu when tested per ASTM C1363.
3. Frames:
 - a. Materials: Metallic-coated steel sheet, minimum thickness of 0.053 inch, with minimum A40 coating.
 - b. Construction: Face welded.
 4. Exposed Finish: Prime Factory.
 5. Exposed interior face of jamb at strike: Paint to match frame.

2.4 FRAME ANCHORS

A. Jamb Anchors:

1. Masonry Type: Adjustable strap-and-stirrup or T-shaped anchors to suit frame size, not less than 0.042 inch thick, with corrugated or perforated straps not less than 2 inches wide by 10 inches long; or wire anchors not less than 0.177 inch thick.
2. Stud-Wall Type: Designed to engage stud, welded to back of frames; not less than 0.042 inch thick.

B. Floor Anchors: Formed from same material as frames, minimum thickness of 0.042 inch, and as follows:

1. Monolithic Concrete Slabs: Clip-type anchors, with two holes to receive fasteners.

2.5 MATERIALS

- A. Cold-Rolled Steel Sheet: ASTM A1008, Commercial Steel (CS), Type B; suitable for exposed applications.
- B. Metallic-Coated Steel Sheet: ASTM A653, Commercial Steel (CS), Type B.
- C. Frame Anchors: ASTM A879, Commercial Steel (CS), 04Z coating designation; mill phosphatized.
 1. For anchors built into exterior walls, steel sheet complying with ASTM A1008 or ASTM A1011, hot-dip galvanized per ASTM A153, Class B.
- D. Inserts, Bolts, and Fasteners: Hot-dip galvanized per ASTM A153.
- E. Grout: ASTM C 476, except with a maximum slump of 4 inches, as measured according to ASTM C 143/C 143M.
- F. Mineral-Fiber Insulation: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers manufactured from slag or rock wool; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively; passing ASTM E 136 for combustion characteristics.
- G. Bituminous Coating: Cold-applied asphalt mastic, compounded for 15-mil dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.

2.6 FABRICATION

- A. Fabricate hollow-metal work to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for metal thickness. Where practical, fit and assemble units in manufacturer's plant. To ensure proper assembly at Project site, clearly identify work that cannot be permanently factory assembled before shipment.
- B. Provide frames at exterior, and where specified in Section 087100, with 1/8 inch integral kerf formed into frame soffit to accept manufacturer's standard foam filled compression type gasket.
1. Ship gasket loose for installation after frames have been finished painted.
- C. Hollow-Metal Doors:
1. Steel-Stiffened Door Cores: Provide minimum thickness 0.026 inch, steel vertical stiffeners of same material as face sheets extending full-door height, with vertical webs spaced not more than 6 inches apart. Spot weld to face sheets no more than 5 inches o.c. Fill spaces between stiffeners with glass- or mineral-fiber insulation.
 2. Vertical Edges for Single-Acting Doors: Bevel edges 1/8 inch in 2 inches.
 3. Top Edge Closures: Close top edges of doors with inverted closures, except provide flush closures at exterior doors of same material as face sheets.
 4. Bottom Edge Closures: Close bottom edges of doors where required for attachment of weatherstripping with end closures or channels of same material as face sheets.
 5. Exterior Doors: Provide weep-hole openings in bottoms of exterior doors to permit moisture to escape. Seal joints in top edges of doors against water penetration.
- D. Hollow-Metal Frames: Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of same thickness metal as frames.
1. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.
 2. Grout Guards: Weld guards to frame at back of hardware mortises in frames to be grouted.
 3. Floor Anchors: Weld anchors to bottoms of jambs with at least four spot welds per anchor; however, for slip-on drywall frames, provide anchor clips or countersunk holes at bottoms of jambs.
 4. Provide welded frames with temporary spreader bars.
 - a. Materials: Uncoated and metallic-coated, cold steel sheet, minimum thickness of 0.053 inch, with minimum A40 coating. Provide metallic-coated spreaders for exterior frames.
 5. Jamb Anchors: Provide number and spacing of anchors as follows:
 - a. Masonry Type: Locate anchors not more than 16 inches from top and bottom of frame. Space anchors not more than 32 inches o.c., to match coursing, and as follows:
Two anchors per jamb up to 60 inches high.
 - 1) Three anchors per jamb from 60 to 90 inches high.
 - 2) Four anchors per jamb from 90 to 120 inches high.
 - 3) Four anchors per jamb plus one additional anchor per jamb for each 24 inches or fraction thereof above 120 inches high.
 - b. Stud-Wall Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:
Three anchors per jamb up to 60 inches high.
 - 1) Four anchors per jamb from 60 to 90 inches high.
 - 2) Five anchors per jamb from 90 to 96 inches high.
 - 3) Five anchors per jamb plus one additional anchor per jamb for each 24 inches or fraction thereof above 96 inches high.

6. Door Silencers: Except on weather-stripped frames, drill stops to receive door silencers as follows. Keep holes clear during construction.
 - a. Single-Door Frames: Drill stop in strike jamb to receive three door silencers.
 - b. Double-Door Frames: Drill stop in head jamb to receive two door silencers.

E. Fabricate concealed stiffeners and edge channels from either cold- or hot-rolled steel sheet.

F. Hardware Preparation: Factory prepare hollow-metal work to receive templated mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping according to SDI A250.6, the Door Hardware Schedule, and templates.

1. Reinforce doors and frames to receive nontemplated, mortised, and surface-mounted door hardware per the following minimum requirements:
 - a. Hinges: Uncoated, cold-rolled steel sheet, minimum thickness of 0.1793 inch.
 - b. Stops, Closers, and Holders; and Rim-Mounted Strikes: Uncoated, cold-rolled steel sheet, minimum thickness of 0.067 inch.
2. Comply with applicable requirements in SDI A250.6 and BHMA A156.115 for preparation of hollow-metal work for hardware.

2.7 STEEL FINISHES

A. Prime Finish: Clean, pretreat, and apply manufacturer's standard primer.

1. Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with SDI A250.10; recommended by primer manufacturer for substrate; compatible with substrate and field-applied coatings despite prolonged exposure.

2.8 ACCESSORIES

A. Grout Guards: Formed from same material as frames, not less than 0.016 inch thick.

B. Rubber Silencers: Resilient rubber.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Remove welded-in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces.
- B. Drill and tap doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.

3.2 INSTALLATION

- A. General: Install hollow-metal work plumb, rigid, properly aligned, and securely fastened in place. Comply with Drawings and manufacturer's written instructions.
- B. Hollow-Metal Frames: Install hollow-metal frames for doors, transoms, sidelites, borrowed lites, and other openings, of size and profile indicated. Comply with SDI A250.11 as required by standards specified.

1. Set frames accurately in position; plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces, leaving surfaces smooth and undamaged.
 - a. Where frames are fabricated in sections because of shipping or handling limitations, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces.
 - b. Install door silencers in frames before grouting.
 - c. Remove temporary braces necessary for installation only after frames have been properly set and secured.
 - d. Check plumb, square, and twist of frames as walls are constructed. Shim as necessary to comply with installation tolerances.
 - e. Field apply bituminous coating to backs of frames that will be filled with grout containing antifreezing agents.
 2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and secure with postinstalled expansion anchors.
 3. Metal-Stud Partitions: Solidly pack mineral-fiber insulation inside frames.
 4. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with grout.
 5. Installation Tolerances: Adjust hollow-metal door frames for squareness, alignment, twist, and plumb to the following tolerances:
 - a. Squareness: Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
 - b. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.
 - c. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
 - d. Plumbness: Plus or minus 1/16 inch, measured at jambs at floor.
- C. Hollow-Metal Doors: Fit hollow-metal doors accurately in frames, within clearances specified below. Shim as necessary.
1. Non-Fire-Rated Steel Doors:
 - a. Between Door and Frame Jambs and Head: 1/8 inch plus or minus 1/32 inch.
 - b. Between Edges of Pairs of Doors: 1/8 inch to 1/4 inch plus or minus 1/32 inch.
 - c. At Bottom of Door: 3/4 inch plus or minus 1/32 inch.
 - d. Between Door Face and Stop: 1/16 inch to 1/8 inch plus or minus 1/32 inch.

3.3 ADJUSTING AND CLEANING

- A. Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including hollow-metal work that is warped, bowed, or otherwise unacceptable.
- B. Remove grout and other bonding material from hollow-metal work immediately after installation.
- C. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying, rust-inhibitive primer.
- D. Metallic-Coated Surface Touchup: Clean abraded areas and repair with galvanizing repair paint according to manufacturer's written instructions.

END OF SECTION 081113

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SECTION 081416 - FLUSH WOOD DOORS**PART 1 - GENERAL****1.1 SUMMARY****A. Section Includes:**

1. Solid-core with wood-veneer faces.
2. Factory finishing of flush wood doors.
3. Factory fitting flush wood doors to frames and factory machining for hardware.

1.2 ACTION SUBMITTALS**A. Product Data:** For each type of door. Include details of core and edge construction and trim for openings.**B. Shop Drawings:** Indicate location, size, and hand of each door; elevation of each kind of door; construction details not covered in Product Data; and the following:

1. Dimensions and locations of blocking.
2. Dimensions and locations of mortises and holes for hardware.
3. Dimensions and locations of cutouts.
4. Requirements for veneer matching.
5. Doors to be factory finished and finish requirements.
6. Fire-protection ratings for fire-rated doors.

C. Samples for Verification:

1. Factory finishes applied to actual door face materials, approximately 8 by 10 inches, for each material and finish. For each wood species and transparent finish, provide set of 3 samples showing typical range of color and grain to be expected in finished Work.
2. Corner sections of doors, approximately 8 by 10 inches, with door faces and edges representing actual materials to be used.
 - a. Provide samples for each species of veneer and solid lumber required.
 - b. Finish veneer-faced door samples with same materials proposed for factory-finished doors.

D. Door Schedule: Use same reference designations indicated on Drawings in preparing schedule for doors and frames for each floor separately.**1.3 DELIVERY, STORAGE, AND HANDLING****A. Comply with requirements of referenced standard and manufacturer's written instructions.****B. Package doors individually in cardboard cartons and wrap bundles of doors in plastic sheeting**

1. Stack wood doors as recommended by door manufacturer.
2. Use opaque plastic sheeting for natural finished doors.

C. Mark each door on top and bottom rail with opening number used on Shop Drawings.

1.4 FIELD CONDITIONS

- A. Environmental Limitations: Do not deliver or install doors until spaces are enclosed and weathertight, wet work in spaces is complete and dry, and HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during remainder of construction period.

1.5 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace doors that fail in materials or workmanship within specified warranty period.
1. Failures include the following:
 - a. Warping (bow, cup, or twist) more than 1/4 inch in a 42-by-84-inch section.
 - b. Telegraphing of core construction in face veneers exceeding 0.01 inch in a 3-inch span.
 2. Warranty shall also include installation and finishing that may be required due to repair or replacement of defective doors.
 3. Warranty Period for Solid-Core Interior Doors: Life of installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Lambton Doors.
 2. Masonite Architectural Doors.
 3. Oshkosh Door Company.
 4. VT Industries, Inc.
- B. Source Limitations: Obtain flush wood doors from single manufacturer.

2.2 FLUSH WOOD DOORS, GENERAL

- A. Quality Standard: In addition to requirements specified, comply with WDMA I.S.1-A, "Architectural Wood Flush Doors."
- B. WDMA I.S.1-A Performance Grade.
1. Heavy Duty unless otherwise indicated.
 2. Extra Heavy Duty: Public toilets, janitor's closets, exits, and where indicated.
 3. Standard Duty: Private toilets.
- C. Fire-Rated Wood Doors: Doors complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at positive pressure per NFPA 252 or UL 10C.
1. Temperature-Rise Limit: At vertical exit enclosures and exit passageways, provide doors that have a maximum transmitted temperature end point of not more than 450 degrees F above ambient after 30 minutes of standard fire-test exposure.
 2. Cores: Provide core specified or mineral core as needed to provide fire-protection rating indicated.
 3. Edge Construction: Provide edge construction with intumescent seals concealed by outer stile. Comply with specified requirements for exposed edges.

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4. Pairs: Provide fire-retardant stiles that are listed and labeled for applications indicated without formed-steel edges and astragals. Provide stiles with concealed intumescent seals. Comply with specified requirements for exposed edges.
- D. Smoke- and Draft-Control Door Assemblies: Listed and labeled for smoke and draft control, based on testing per UL 1784.
- E. Structural-Composite-Lumber-Core Doors:
1. Structural Composite Lumber: WDMA I.S.10.
 - a. Screw Withdrawal, Face: 700 pound-force.
 - b. Screw Withdrawal, Edge: 400 pound-force.
- F. Mineral-Core Doors:
1. Core: Noncombustible mineral product complying with requirements of referenced quality standard and testing and inspecting agency for fire-protection rating indicated.
 2. Blocking: Provide composite blocking with improved screw-holding capability approved for use in doors of fire-protection ratings indicated as needed to eliminate through-bolting hardware.
 3. Edge Construction: At hinge stiles, provide laminated-edge construction with improved screw-holding capability and split resistance. Comply with specified requirements for exposed edges.
- 2.3 VENEERED-FACED DOORS FOR TRANSPARENT FINISH
- A. Interior Solid-Core Doors:
1. Grade: Premium, with Grade A faces.
 2. Species and Cut: As indicated on Drawings.
 3. Match between Veneer Leaves: Book match.
 4. Assembly of Veneer Leaves on Door Faces: Balance match.
 5. Pair and Set Match: Provide for doors hung in same opening or separated only by mullions.
 6. Door Edges: Match veneer of door faces.
 7. Core: Structural composite lumber.
 8. Construction: 5 plies. Stiles and rails are bonded to core, then entire unit abrasive planed before veneering.
- B. Interior Hollow-Core Doors:
1. Grade: Premium, with Grade A faces.
 2. Species and Cut: As indicated on Drawings.
 3. Match between Veneer Leaves: Book match.
 4. Assembly of Veneer Leaves on Door Faces: Balance match.
 5. Pair and Set Match: Provide for doors hung in same opening.
 6. Construction: 7 plies.
 7. WDMA I.S.1-A Performance Grade: Standard Duty.
- 2.4 LIGHT FRAMES
- A. Wood Beads for Light Openings in Wood Doors: Provide manufacturer's standard wood beads unless otherwise indicated.
1. Wood Species: Same species as door faces.
 2. Profile: As selected by Architect from manufacturer's full line of profiles.

- B. Wood-Veneered Beads for Light Openings in Fire-Rated Doors: Manufacturer's standard wood-veneered noncombustible beads matching veneer species of door faces and approved for use in doors of fire-protection rating indicated. Include concealed metal glazing clips where required for opening size and fire-protection rating indicated.

2.5 FABRICATION

- A. Factory fit doors to suit frame-opening sizes indicated. Comply with clearance requirements of referenced quality standard for fitting unless otherwise indicated.
 - 1. Comply with requirements in NFPA 80 for fire-rated doors.
- B. Factory machine doors for hardware that is not surface applied. Locate hardware to comply with DHI-WDHS-3. Comply with final hardware schedules, door frame Shop Drawings, BHMA-156.115-W, and hardware templates as furnished by door hardware supplier.
- C. Openings: Cut and trim openings through doors in factory.
 - 1. Light Openings: Trim openings with moldings of material and profile that matches door veneer.
 - 2. Glazing: Factory install glazing in doors indicated to be factory finished. Comply with applicable requirements in Section 088100 – Glass Glazing.

2.6 FACTORY FINISHING

- A. General: Comply with referenced quality standard for factory finishing. Complete fabrication, including fitting doors for openings and machining for hardware that is not surface applied, before finishing.
 - 1. Finish faces, all 4 edges, edges of cutouts, and mortises. Stains and fillers may be omitted on bottom edges, edges of cutouts, and mortises.
- B. Finish doors at factory to receive transparent finish.
- C. Transparent Finish:
 - 1. Grade: Premium.
 - 2. Finish: AWI catalyzed polyurethane system.
 - 3. Staining: None required.
 - 4. Sheen: Satin unless indicated otherwise.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine doors and installed door frames, with Installer present, before hanging doors.
 - 1. Verify that installed frames comply with indicated requirements for type, size, location, and swing characteristics and have been installed with level heads and plumb jambs.
 - 2. Reject doors with defects.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Hardware: For installation, see Section 087100 - Door Hardware.

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- B. Installation Instructions: Install doors to comply with manufacturer's written instructions and referenced quality standard, and as indicated.
1. Install fire-rated doors per NFPA 80.
 2. Install smoke- and draft-control doors per NFPA 105.
- C. Job-Fitted Doors: Align and fit doors in frames with uniform clearances and bevels as indicated below; do not trim stiles and rails in excess of limits set by manufacturer or permitted for fire-rated doors. Machine doors for hardware. Seal edges of doors, edges of cutouts, and mortises after fitting and machining.
1. Clearances: Provide 1/8 inch at heads, jambs, and between pairs of doors. Provide 1/8 inch from bottom of door to top of decorative floor finish or covering unless otherwise indicated. Where threshold is shown or scheduled, provide 1/4 inch from bottom of door to top of threshold unless otherwise indicated.
 - a. Comply with NFPA 80 for fire-rated doors.
 2. Bevel non-fire-rated doors 1/8 inch in 2 inches at lock and hinge edges.
 3. Bevel fire-rated doors 1/8 inch in 2 inches at lock edge; trim stiles and rails only to extent permitted by labeling agency.

3.3 ADJUSTING

- A. Operation: Rehang or replace doors that do not swing or operate freely. If door cannot be made to operate properly, remove and install new door.
- B. Finished Doors: Replace doors that are damaged or that do not comply with requirements. Doors may be repaired or refinished if Work complies with requirements and shows no evidence of repair or refinishing.
1. Restore finish before installation if fitting or machining is required at Project site.

3.4 PROTECTION

- A. Protect doors as recommended by door manufacturer to ensure that wood doors are without damage or deterioration at time of Substantial Completion.
1. Remove doors damaged during installation and install new doors.

END OF SECTION 081416

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SECTION 083113 - ACCESS DOORS AND FRAMES**PART 1 - GENERAL****1.1 SUMMARY**

- A. Section includes access doors and frames for walls and ceilings.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
1. Include construction details, fire ratings, material descriptions, dimensions of individual components and profiles, and finishes.
- B. Product Schedule: For access doors and frames. Use same designations indicated on Drawings.

PART 2 - PRODUCTS**2.1 PERFORMANCE REQUIREMENTS**

- A. Fire-Rated Access Doors and Frames: Units complying with NFPA 80 that are identical to access door and frame assemblies tested for fire-test-response characteristics according to the following test method and that are listed and labeled by UL or another testing and inspecting agency acceptable to authorities having jurisdiction:
1. NFPA 252 or UL 10B for fire-rated access door assemblies installed vertically.

2.2 ACCESS DOORS AND FRAMES

- A. Source Limitations: Obtain each type of access door and frame from single source from single manufacturer.
- B. Flush Access Doors with Exposed Flange:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Acudor Products, Inc.
 - b. Babcock-Davis.
 - c. J. L. Industries, Inc.; Div. of Activar Construction Products Group.
 - d. Karp Associates, Inc.
 - e. Larsen's Manufacturing Company.
 - f. Milcor Inc.
 2. Assembly Description: Fabricate door to fit flush to frame. Provide manufacturer's standard-width exposed flange, proportional to door size.
 3. Locations: Wall and ceiling.
 4. Door Size: 24 inch square.
 5. Uncoated Steel Sheet for Door: Nominal 0.060 inch.
 - a. Finish: Factory prime.
 6. Frame: Same material, thickness, and finish as door with 1-1/4 inch wide, surface-mounted trim.

7. Hinges: Concealed pin type, spring loaded to allow for door removal, set to open 175 Hinges: Manufacturer's standard continuous type.
8. Hardware: Lock.

C. Fire-Rated, Flush Access Doors with Exposed Flanges:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Acudor Products, Inc.
 - b. Babcock-Davis.
 - c. J. L. Industries, Inc.; Div. of Activar Construction Products Group.
 - d. Karp Associates, Inc.
 - e. Larsen's Manufacturing Company.
 - f. Milcor Inc.
2. Assembly Description: Fabricate door to fit flush to frame, with a core of mineral-fiber insulation enclosed in sheet metal. Provide manufacturer's standard-width exposed flange, proportional to door size.
3. Locations: Ceiling.
4. Fire-Resistance Rating: Not less than that of adjacent construction.
5. Temperature-Rise Rating: 250 degrees F at the end of 30 minutes.
6. Uncoated Steel Sheet for Door: Nominal 0.036 inch.
 - a. Finish: Factory prime.
7. Hinges: Manufacturer's standard continuous type.
8. Hardware: Lock.
9. Automatic Closure Device: Integral automatic spring closure device for each door.
10. Interior Latch Release: Mechanism to allow for panel to open from interior side.

D. Hardware:

1. Lock Cylinder Preparation: Prepare door panel to accept cylinder specified in Section 087100 – Door Hardware.

2.3 FABRICATION

- A. General: Provide access door and frame assemblies manufactured as integral units ready for installation.
- B. Metal Surfaces: For metal surfaces exposed to view in the completed Work, provide materials with smooth, flat surfaces without blemishes. Do not use materials with exposed pitting, seam marks, roller marks, rolled trade names, or roughness.
- C. Doors and Frames: Grind exposed welds smooth and flush with adjacent surfaces. Furnish mounting holes, attachment devices and fasteners of type required to secure access doors to types of supports indicated.
 1. For concealed flanges with drywall bead, provide edge trim for gypsum panels securely attached to perimeter of frames.
- D. Recessed Access Doors: Form face of panel to provide recess for application of applied finish. Reinforce panel as required to prevent buckling. Provide access sleeves for each latch operator and install in holes cut through finish.
 1. For recessed doors with plaster infill, provide self-furring expanded-metal lath attached to door panel.

E. Latch and Lock Hardware:

1. Quantity: Furnish number of latches and locks required to hold doors tightly closed.
2. Keys: Furnish two keys per lock and key all locks alike.
3. Mortise Cylinder Preparation: Where indicated, prepare door panel to accept cylinder specified in Section 087100 "Door Hardware."

2.4 FINISHES

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.
- D. Steel and Metallic-Coated-Steel Finishes:
 1. Factory Primed: Apply manufacturer's standard, lead- and chromate-free, universal primer immediately after surface preparation and pretreatment.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Comply with manufacturer's written instructions for installing access doors and frames.
- B. Set frames accurately in position and attach securely to supports with plane of face panels aligned with adjacent finish surfaces.
- C. Install doors flush with adjacent finish surfaces or recessed to receive finish material.

3.2 ADJUSTING

- A. Adjust doors and hardware after installation for proper operation.
- B. Remove and replace doors and frames that are warped, bowed, or otherwise damaged.

END OF SECTION 083113

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SECTION 083313 - COILING COUNTER DOORS**PART 1 - GENERAL****1.1 SUMMARY****A. Section Includes:**

1. Counter doors.

B. Related Requirements:

1. Section 055000 "Metal Fabrications" for door-opening framing and corner guards.
2. Section 083323 "Overhead Colling Doors."

1.2 ACTION SUBMITTALS**A. Product Data:** For each type and size of coiling counter door and accessory.

1. Include construction details, material descriptions, dimensions of individual components, profiles for slats, and finishes.

B. Shop Drawings: For each installation and for special components not dimensioned or detailed in manufacturer's product data.

1. Include plans, elevations, sections, and mounting details.
2. Include details of equipment assemblies, and indicate dimensions, required clearances, method of field assembly, components, and location and size of each field connection.
3. Include points of attachment and their corresponding static and dynamic loads imposed on structure.
4. Show locations of controls, locking devices, and other accessories.

C. Samples for Verification: For each type of exposed finish on the following components, in manufacturer's standard sizes:

1. Curtain slats.
2. Bottom bar.
3. Guides.
4. Brackets.
5. Hood.
6. Laminate-clad counter panel product for each type, color, pattern, and surface finish; laminated to core.
7. Locking device(s).
8. Include similar Samples of accessories involving color selection.

1.3 INFORMATIONAL SUBMITTALS**A. Qualification Data:** For Installer.**1.4 CLOSEOUT SUBMITTALS****A. Maintenance Data:** For coiling counter doors to include in maintenance manuals.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Minimum of ten (10) years experience in producing rolling doors of the type specified
- B. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer for both installation and maintenance of units required for this Project.
 - 1. Installer shall provide evidence of at least five (5) years experience with a minimum of three (3) projects of equivalent size and scope within the last two (2) years, and have the manufacturer's approval.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations: Obtain coiling counter doors from single source from single manufacturer.
 - 1. Obtain operators and controls from coiling counter door manufacturer.
- B. Manufacturers: Subject to compliance with requirements, provide products approved by Architect by one of the following:
 - 1. Cornell Iron Works, Inc. (Basis-of-Design).
 - a. Product: ESC20.
 - 2. Cookson Company (The).
 - 3. McKeon Door Company

2.2 PERFORMANCE REQUIREMENTS

2.3 COUNTER DOOR ASSEMBLY, GENERAL

- A. Counter Door: Coiling counter door formed with curtain of interlocking metal slats.
- B. Operation Cycles: Door components and operators capable of operating for not less than 20,000. One operation cycle is complete when a door is opened from the closed position to the fully open position and returned to the closed position.
 - 1. Include tamperproof cycle counter.
- C. Coiling Counter Door Assembly:
 - 1. Counter Door: Coiling counter door formed with curtain of interlocking metal slats.
 - 2. Operation Cycles: Door components and operators capable of operating for not less than 20,000. One operation cycle is complete when a door is opened from the closed position to the fully open position and returned to the closed position.
 - a. Include tamperproof cycle counter.
 - 3. Door Curtain Material: Stainless steel.
 - 4. Door Curtain Slats: Flat profile slats of 1-1/4-inch center-to-center height.
 - 5. Bottom Bar: Manufacturer's standard continuous channel or tubular shape, two angles, each not less than 2 inches by 1-1/4 inch; fabricated stainless steel and finished to match door.
 - 6. Curtain Jamb Guides: Stainless steel with exposed finish matching curtain slats.

7. Hood: Match curtain material and finish.
 - a. Shape: As indicated on Drawings.
 - b. Mounting: As indicated on Drawings.
8. Locking Devices: Equip door with locking device assembly.
 - a. Locking Device Assembly: Single-jamb side locking bars, operable from inside with thumbturn.
9. Manual Door Operator: Chain-hoist operator.
10. Door Finish:
 - a. Stainless Steel Finish: ASTM A480/A480M No. 4 (polished directional satin).
 - b. Interior Curtain-Slat Facing: Match finish of exterior curtain-slat face.

2.4 DOOR CURTAIN MATERIALS AND CONSTRUCTION

- A. Door Curtains: Fabricate coiling counter door curtain of interlocking metal slats in a continuous length for width of door without splices. Unless otherwise indicated, provide slats of thickness and mechanical properties recommended by door manufacturer for performance, size, and type of door indicated, and as follows:
 1. Stainless Steel Door Curtain Slats: ASTM A666, Type 304; sheet thickness of 0.025 inch; and as required.
 2. Insulation: Fill slats for insulated doors with manufacturer's standard thermal insulation complying with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, according to ASTM E84 or UL 723. Enclose insulation completely within slat faces.
 3. Metal Interior Curtain-Slat Facing: Match metal of exterior curtain-slat face.
- B. Curtain Jamb Guides: Manufacturer's standard angles or channels and angles of same material and finish as curtain slats unless otherwise indicated, with sufficient depth and strength to retain curtain, to allow curtain to operate smoothly, and to withstand loading. Slot bolt holes for guide adjustment. Provide removable stops on guides to prevent overtravel of curtain.

2.5 HOODS

- A. General: Form sheet metal hood to entirely enclose coiled curtain and operating mechanism at opening head. Contour to fit end brackets to which hood is attached. Roll and reinforce top and bottom edges for stiffness. Form closed ends for surface-mounted hoods and fascia for any portion of between-jamb mounting that projects beyond wall face. Equip hood with intermediate support brackets as required to prevent sagging.
 1. Match Curtain Material and finish:
 - a. Stainless Steel: 0.025-inch- thick, stainless steel sheet, Type 304, complying with ASTM A666.
- B. Integral Frame, Hood, and Fascia: Welded sheet metal assembly of the following sheet metal(s):
 1. Stainless Steel: Type 304, complying with ASTM A666.
- C. Removable Metal Soffit: Formed or extruded from same metal and with same finish as curtain if hood is mounted above ceiling unless otherwise indicated.

2.6 LOCKING DEVICES

- A. Slide Bolt: Fabricate with side-locking bolts to engage through slots in tracks for locking by padlock, located on both left and right jamb sides, operable from coil side.
- B. Locking Device Assembly: Fabricate with cylinder lock, spring-loaded dead bolt, operating handle, cam plate, and adjustable locking bars to engage through slots in tracks.
- C. Chain Lock Keeper: Suitable for padlock.
- D. Safety Interlock Switch: Equip power-operated doors with safety interlock switch to disengage power supply when door is locked.

2.7 CURTAIN ACCESSORIES

- A. Astragal: Equip each door bottom bar with a replaceable, adjustable, continuous, compressible gasket of flexible vinyl, rubber, or neoprene as a cushion bumper.

2.8 COUNTER DOOR ACCESSORIES

- A. Integral Metal Sill: Fabricate sills as integral part of frame assembly of Type 304 stainless steel in manufacturer's standard thickness with ASTM A480/A480M No. 4 finish.

2.9 COUNTERBALANCE MECHANISM

- A. General: Counterbalance doors by means of manufacturer's standard mechanism with an adjustable-tension, steel helical torsion spring mounted around a steel shaft and contained in a spring barrel connected to top of curtain with barrel rings. Use grease-sealed bearings or self-lubricating graphite bearings for rotating members.
- B. Counterbalance Barrel: Fabricate spring barrel of manufacturer's standard hot-formed, structural-quality, seamless carbon-steel pipe, of sufficient diameter and wall thickness to support rolled-up curtain without distortion of slats and to limit barrel deflection to not more than 0.03 in./ft. of span under full load.
- C. Counterbalance Spring: One or more oil-tempered, heat-treated steel helical torsion springs. Size springs to counterbalance weight of curtain, with uniform adjustment accessible from outside barrel. Secure ends of springs to barrel and shaft with cast-steel barrel plugs.
- D. Torsion Rod for Counterbalance Shaft: Fabricate of manufacturer's standard cold-rolled steel, sized to hold fixed spring ends and carry torsional load.
- E. Brackets: Manufacturer's standard mounting brackets of either cast iron or cold-rolled steel plate.

2.10 MANUAL DOOR OPERATORS

- A. General: Equip door with manual door operator by door manufacturer.
- B. Chain-Hoist Operator: Consisting of endless steel hand chain, chain-pocket wheel and guard, and gear-reduction unit with a maximum 25-lbf force for door operation. Provide alloy-steel hand chain with chain holder secured to operator guide.

- C. Crank Operator: Consisting of crank and crank gearbox, steel crank drive shaft, and gear-reduction unit, of type indicated. Size gears to require not more than 25-lbf force to turn crank. Fabricate gearbox to be oiltight and to completely enclose operating mechanism. Provide manufacturer's standard crank-locking device.

2.11 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM/NOMMA 500 for recommendations for applying and designating finishes.
- B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.12 STAINLESS STEEL FINISHES

- A. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.
- B. Polished Finishes: Grind and polish surfaces to produce uniform finish, free of cross scratches.
 1. Run grain of directional finishes with long dimension of each piece.
 2. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.
 3. Directional Satin Finish: ASTM A480/A480M No. 4.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates areas and conditions, with Installer present, for compliance with requirements for substrate construction and other conditions affecting performance of the Work.
- B. Examine locations of electrical connections.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install coiling counter doors and operating equipment complete with necessary hardware, anchors, inserts, hangers, and equipment supports; according to manufacturer's written instructions and as specified.
- B. Install coiling counter doors, hoods, controls, and operators at the mounting locations indicated for each door.

3.3 ADJUSTING

- A. Adjust hardware and moving parts to function smoothly so that doors operate easily, free of warp, twist, or distortion.
- B. Lubricate bearings and sliding parts as recommended by manufacturer.
- C. Adjust seals to provide tight fit around entire perimeter.

3.4 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain coiling counter doors.

END OF SECTION 083313

SECTION 083323 - OVERHEAD COILING DOORS**PART 1 - GENERAL****1.1 SUMMARY****A. Section Includes:**

1. Insulated service doors.

1.2 ACTION SUBMITTALS**A. Product Data:** For each type and size of overhead coiling door and accessory.

1. Include construction details, material descriptions, dimensions of individual components, profiles for slats, and finishes.
2. Include rated capacities, operating characteristics, electrical characteristics, and furnished accessories.
3. Include description of automatic-closing device and testing and resetting instructions.

B. Shop Drawings: For each installation and for special components not dimensioned or detailed in manufacturer's product data.

1. Include plans, elevations, sections, and mounting details.
2. Include details of equipment assemblies, and indicate dimensions, required clearances, method of field assembly, components, and location and size of each field connection.
3. Include points of attachment and their corresponding static and dynamic loads imposed on structure.
4. For exterior components, include details of provisions for assembly expansion and contraction and for excluding and draining moisture to the exterior.
5. Show locations of controls, locking devices, and other accessories.
6. Include diagrams for power, signal, and control wiring.

C. Samples for Verification: For each type of exposed finish on the following components, in manufacturer's standard sizes:

1. Curtain slats.
2. Bottom bar with sensor edge.
3. Guides.
4. Brackets.
5. Hood.
6. Locking device(s).
7. Include similar Samples of accessories involving color selection.

1.3 INFORMATIONAL SUBMITTALS**A. Qualification Data:** For Installer.

1. Submit copy of DHI Fire and Egress Door Assembly Inspector (FDAI) certificate.

B. Sample Warranty: For special warranty.

1.4 CLOSEOUT SUBMITTALS

- A. Special warranty.
- B. Maintenance Data: For overhead coiling doors to include in maintenance manuals.
- C. Record Documents: For fire-rated doors, list of door numbers and applicable room name and number to which door accesses.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer for both installation and maintenance of units required for this Project.
 - 1. Maintenance Proximity: Not more than two hours' normal travel time from Installer's place of business to Project site.

1.6 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of doors that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations: Obtain overhead coiling doors from single source from single manufacturer.
 - 1. Obtain operators and controls from overhead coiling-door manufacturer.

2.2 PERFORMANCE REQUIREMENTS

- A. Structural Performance, Exterior Doors: Capable of withstanding the following design wind loads:
 - 1. Design Wind Load: As indicated on Drawings.

2.3 DOOR ASSEMBLY (AT LOADING DOCK)

- A. Insulated Service Door: Overhead coiling door formed with curtain of interlocking metal slats.
 - 1. Basis-of-Design: Subject to compliance with requirements, provide the Basis-of-Design indicated or a comparable product by one the following:
 - a. Cornell (Basis-of-Design).
 - 1) Product: ESD20 Thermiser.
 - b. C.H.I. Overhead Doors.
 - c. Clopay Corporation.
 - d. Cookson.
 - e. Overhead Door Corporation.

-
- B. Operation Cycles: Door components and operators capable of operating for not less than 50,000. One operation cycle is complete when a door is opened from the closed position to the fully open position and returned to the closed position.
1. Include tamperproof cycle counter.
- C. Air Infiltration: Maximum rate of 0.4 cfm/sq. ft. at 15 and 25 mph when tested according to ASTM E283.
- D. Insulated Door Curtain R-Value: 6.0 deg F x h x sq. ft./Btu (0.792 K x sq. m/W).
- E. Door Curtain Material: Galvanized steel.
- F. Door Curtain Slats: Curved profile slats of 3-1/4-inch center-to-center height.
1. Insulated-Slat Interior Facing: Metal.
 2. Gasket Seal. Manufacturer's standard continuous gaskets between slats.
- G. Bottom Bar: Two angles, each not less than 1-1/2 by 1-1/2 by 1/8 inch thick; fabricated from hot-dip galvanized steel and finished to match door.
- H. Curtain Jamb Guides: Galvanized steel with exposed finish matching curtain slats.
- I. Hood: Match curtain material and finish.
1. Shape: As indicated on Drawings.
 2. Mounting: As indicated on Drawings.
- J. Locking Devices: Equip door with slide bolt for padlock.
- K. Electric Door Operator:
1. Usage Classification: Standard duty, up to 25 cycles per hour and up to 90 cycles per day.
 2. Operator Location: As indicated on Drawings.
 3. Safety: Listed according to UL 325 by a qualified testing agency for commercial or industrial use; moving parts of operator enclosed or guarded if exposed and mounted at 8 ft. or lower.
 4. Motor Exposure: Interior.
 5. Motor Electrical Characteristics:
 - a. Horsepower: 1/2 hp.
 - b. Voltage: 120 V ac, single phase, 60 Hz.
 6. Emergency Manual Operation: Chain type.
 7. Obstruction-Detection Device: Automatic photoelectric sensor and electric sensor edge on bottom bar.
 - a. Sensor Edge Bulb Color: As selected by Architect from manufacturer's full range.
 8. Control Station(s): Where indicated on Drawings.
 9. Other Equipment: Audible and visual signals.
- L. Curtain Accessories: Equip door with weatherseals.
- M. Door Finish:
1. Baked-Enamel or Powder-Coated Finish: Color as selected by Architect from manufacturer's full range.

2.4 MATERIALS, GENERAL

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.5 DOOR CURTAIN MATERIALS AND CONSTRUCTION

- A. Door Curtains: Fabricate overhead coiling-door curtain of interlocking metal slats, designed to withstand wind loading indicated, in a continuous length for width of door without splices. Unless otherwise indicated, provide slats of thickness and mechanical properties recommended by door manufacturer for performance, size, and type of door indicated, and as follows:
1. Steel Door Curtain Slats: Zinc-coated (galvanized), cold-rolled structural-steel sheet; complying with ASTM A653/A653M, with G90 zinc coating; nominal sheet thickness (coated) of 0.028 inch; and as required.
 2. Insulation: Fill slats for insulated doors with manufacturer's standard thermal insulation complying with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, according to ASTM E84 or UL 723. Enclose insulation completely within slat faces.
 3. Metal Interior Curtain-Slat Facing: Match metal of exterior curtain-slat face, with minimum steel thickness of 0.010 inch.
- B. Curtain Jamb Guides: Manufacturer's standard angles or channels and angles of same material and finish as curtain slats unless otherwise indicated, with sufficient depth and strength to retain curtain, to allow curtain to operate smoothly, and to withstand loading. Slot bolt holes for guide adjustment. Provide removable stops on guides to prevent overtravel of curtain, and a continuous bar for holding windlocks.

2.6 HOODS

- A. General: Form sheet metal hood to entirely enclose coiled curtain and operating mechanism at opening head. Contour to fit end brackets to which hood is attached. Roll and reinforce top and bottom edges for stiffness. Form closed ends for surface-mounted hoods and fascia for any portion of between-jamb mounting that projects beyond wall face. Equip hood with intermediate support brackets as required to prevent sagging.
1. Galvanized Steel: Nominal 0.028-inch- thick, hot-dip galvanized-steel sheet with G90 zinc coating, complying with ASTM A653/A653M.
 2. Stainless Steel: 0.025-inch- thick, stainless steel sheet, Type 304, complying with ASTM A240/A240M or ASTM A666.
 3. Aluminum: 0.040-inch- thick aluminum sheet complying with ASTM B209, of alloy and temper recommended by manufacturer and finisher for type of use and finish indicated.
 4. Include automatic drop baffle on fire-rated doors to guard against passage of smoke or flame.
 5. Exterior-Mounted Doors: Fabricate hood to act as weather protection and with a perimeter sealant-joint-bead profile for applying joint sealant.
- B. Removable Metal Soffit: Formed or extruded from same metal and with same finish as curtain if hood is mounted above ceiling unless otherwise indicated.

2.7 LOCKING DEVICES

- A. Slide Bolt: Fabricate with side-locking bolts to engage through slots in tracks for locking by padlock, located on both left and right jamb sides, operable from coil side.

- B. Locking Device Assembly: Fabricate with cylinder lock, spring-loaded dead bolt, operating handle, cam plate, and adjustable locking bars to engage through slots in tracks.
 - 1. Lock Cylinders: As specified in Section 087100 "Door Hardware".
 - 2. Keys: Two for each cylinder.
- C. Chain Lock Keeper: Suitable for padlock.
- D. Safety Interlock Switch: Equip power-operated doors with safety interlock switch to disengage power supply when door is locked.

2.8 CURTAIN ACCESSORIES

- A. Smoke Seals: Equip each fire-rated door with replaceable smoke-seal perimeter gaskets or brushes for smoke and draft control as required for door listing and labeling by a qualified testing agency.
- B. Weatherseals for Exterior Doors: Equip each exterior door with weather-stripping gaskets fitted to entire exterior perimeter of door for a weather-resistant installation unless otherwise indicated.
 - 1. At door head, use 1/8-inch- thick, replaceable, continuous-sheet baffle secured to inside of hood or field-installed on the header.
 - 2. At door jambs, use replaceable, adjustable, continuous, flexible, 1/8-inch- thick seals of flexible vinyl, rubber, or neoprene.
- C. Push/Pull Handles: Equip each push-up-operated or emergency-operated door with lifting handles on each side of door, finished to match door.
- D. Pull-Down Strap: Provide pull-down straps for doors more than 84 inches high.
- E. Pole Hooks: Provide pole hooks and poles for doors more than 84 inches high.
- F. Automatic-Closing Device: Equip each fire-rated door with an automatic-closing device or holder-release mechanism and governor unit complying with NFPA 80 and an easily tested and reset release mechanism. Testing for manually operated doors allows resetting by opening the door without retensioning the counterbalance mechanism. Automatic-closing device is to be designed for activation by the following:
 - 1. Replaceable fusible links with temperature rise and melting point of 165 deg F interconnected and mounted on both sides of door opening.
 - 2. Manufacturer's standard UL-labeled smoke detector and door-holder-release devices.
 - 3. Manufacturer's standard UL-labeled heat detector and door-holder-release devices.
 - 4. Building fire-detection, smoke-detection, and -alarm systems.

2.9 COUNTERBALANCE MECHANISM

- A. General: Counterbalance doors by means of manufacturer's standard mechanism with an adjustable-tension, steel helical torsion spring mounted around a steel shaft and contained in a spring barrel connected to top of curtain with barrel rings. Use grease-sealed bearings or self-lubricating graphite bearings for rotating members.
- B. Counterbalance Barrel: Fabricate spring barrel of manufacturer's standard hot-formed, structural-quality, seamless or welded carbon-steel pipe, of sufficient diameter and wall thickness to support rolled-up curtain without distortion of slats and to limit barrel deflection to not more than 0.03 in./ft. of span under full load.

- C. Counterbalance Spring: One or more oil-tempered, heat-treated steel helical torsion springs. Size springs to counterbalance weight of curtain, with uniform adjustment accessible from outside barrel. Secure ends of springs to barrel and shaft with cast-steel barrel plugs.
 - 1. Fire-Rated Doors: Equip with auxiliary counterbalance spring and prevent tension release from main counterbalance spring when automatic-closing device operates.
- D. Torsion Rod for Counterbalance Shaft: Fabricate of manufacturer's standard cold-rolled steel, sized to hold fixed spring ends and carry torsional load.
- E. Brackets: Manufacturer's standard mounting brackets of either cast iron or cold-rolled steel plate.

2.10 MANUAL DOOR OPERATORS

- A. General: Equip door with manual door operator by door manufacturer.
- B. Chain-Hoist Operator: Consisting of endless steel hand chain, chain-pocket wheel and guard, and gear-reduction unit with a maximum 25-lbf force for door operation. Provide alloy-steel hand chain with chain holder secured to operator guide.

2.11 ELECTRIC DOOR OPERATORS

- A. General: Electric door operator assembly of size and capacity recommended and provided by door manufacturer for door and operation-cycles requirement specified, with electric motor and factory-prewired motor controls, starter, gear-reduction unit, solenoid-operated brake, clutch, control stations, control devices, integral gearing for locking door, and accessories required for proper operation.
 - 1. Comply with NFPA 70.
 - 2. Control equipment complying with NEMA ICS 1, NEMA ICS 2, and NEMA ICS 6, with NFPA 70 Class 2 control circuit, maximum 24-V ac or dc.
- B. Usage Classification: Electric operator and components capable of operating for not less than number of cycles per hour indicated for each door.
- C. Door Operator Location(s): Operator location indicated for each door.
 - 1. Top-of-Hood Mounted: Operator is mounted to the right or left door head plate with the operator on top of the door-hood assembly and connected to the door drive shaft with drive chain and sprockets. Headroom is required for this type of mounting.
 - 2. Front-of-Hood Mounted: Operator is mounted to the right or left door head plate with the operator on coil side of the door-hood assembly and connected to the door drive shaft with drive chain and sprockets. Front clearance is required for this type of mounting.
 - 3. Wall Mounted: Operator is mounted to the inside front wall on the left or right side of door and connected to door drive shaft with drive chain and sprockets. Side room is required for this type of mounting. Wall-mounted operator can also be mounted above or below shaft; if above shaft, headroom is required.
 - 4. Bench Mounted: Operator is mounted to the right or left door head plate and connected to the door drive shaft with drive chain and sprockets. Side room is required for this type of mounting.
 - 5. Through-Wall Mounted: Operator is mounted on other side of wall from coil side of door.
- D. Motors: Reversible-type motor with controller (disconnect switch) for motor exposure indicated for each door assembly.
 - 1. Electrical Characteristics: Minimum as indicated for each door assembly. If not indicated, large enough to start, accelerate, and operate door in either direction from any position, at a speed not

-
- less than 8 in./sec. and not more than 12 in./sec., without exceeding nameplate ratings or service factor.
2. Operating Controls, Controllers, Disconnect Switches, Wiring Devices, and Wiring: Manufacturer's standard unless otherwise indicated.
 3. Coordinate wiring requirements and electrical characteristics of motors and other electrical devices with building electrical system and each location where installed.
- E. Limit Switches: Equip each motorized door with adjustable switches interlocked with motor controls and set to automatically stop door at fully opened and fully closed positions.
- F. Obstruction-Detection Devices: External entrapment protection consisting of indicated automatic safety sensor capable of protecting full width of door opening. For non-fire-rated doors, activation of device immediately stops and reverses downward door travel.
1. Photoelectric Sensor: Manufacturer's standard system designed to detect an obstruction in door opening without contact between door and obstruction.
 - a. Self-Monitoring Type: Designed to interface with door operator control circuit to detect damage to or disconnection of sensing device. When self-monitoring feature is activated, door closes only with sustained or constant pressure on close button.
 2. Electric Sensor Edge: Automatic safety sensor edge, located within astragal or weather stripping mounted to bottom bar. Contact with sensor activates device. Connect to control circuit using manufacturer's standard take-up reel or self-coiling cable.
 - a. Self-Monitoring Type: Four-wire-configured device designed to interface with door operator control circuit to detect damage to or disconnection of sensor edge.
- G. Control Station: Three-button control station in fixed location with momentary-contact push-button controls labeled "Open" and "Stop" and sustained- or constant-pressure push-button control labeled "Close."
1. Interior-Mounted Units: Full-guarded, surface-mounted, heavy-duty type, with general-purpose NEMA ICS 6, Type 1 enclosure.
 2. Exterior-Mounted Units: Full-guarded, standard-duty, surface-mounted, weatherproof type, NEMA ICS 6, Type 4 enclosure, key operated.
- H. Emergency Operation Disconnect Device: Equip operator with hand-operated disconnect mechanism for automatically engaging manual operator and releasing brake for emergency manual operation while disconnecting motor without affecting timing of limit switch. Mount mechanism so it is accessible from floor level. Include interlock device to automatically prevent motor from operating when emergency operator is engaged.
- I. Motor Removal: Design operator so motor may be removed without disturbing limit-switch adjustment and without affecting emergency manual operation.
- J. Audible and Visual Signals: Audible alarm and visual indicator lights in compliance with the accessibility standard.
- 2.12 GENERAL FINISH REQUIREMENTS
- A. Comply with NAAMM/NOMMA 500 for recommendations for applying and designating finishes.
 - B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.13 STEEL AND GALVANIZED-STEEL FINISHES

- A. Factory Prime Finish: Manufacturer's standard primer, compatible with field-applied finish. Comply with coating manufacturer's written instructions for cleaning, pretreatment, application, and minimum dry film thickness.
- B. Baked-Enamel or Powder-Coat Finish: Manufacturer's standard baked-on finish consisting of prime coat and thermosetting topcoat. Comply with coating manufacturer's written instructions for cleaning, pretreatment, application, and minimum dry film thickness.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates areas and conditions, with Installer present, for compliance with requirements for substrate construction and other conditions affecting performance of the Work.
- B. Examine locations of electrical connections.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

- A. Install overhead coiling doors and operating equipment complete with necessary hardware, anchors, inserts, hangers, and equipment supports; according to manufacturer's written instructions and as specified.
- B. Install overhead coiling doors, hoods, controls, and operators at the mounting locations indicated for each door.
- C. Accessibility: Install overhead coiling doors, switches, and controls along accessible routes in compliance with the accessibility standard.
- D. Power-Operated Doors: Install according to UL 325.

3.3 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections and to furnish reports to Architect.
- B. Perform the following tests and inspections :
 - 1. Test door release, closing, and alarm operations when activated by smoke detector or building's fire-alarm system. Test manual operation of closed door. Reset door-closing mechanism after successful test.
 - 2. Fire-Rated Door Inspections: Inspect each fire-rated door in accordance with NFPA 80, Section 5.2.
- C. Repair or remove and replace installations where inspections indicate that they do not comply with specified requirements.

- D. Reinspect repaired or replaced installations to determine if replaced or repaired door assembly installations comply with specified requirements.
- E. Prepare and submit separate inspection report for each fire-rated door assembly indicating compliance with each item listed in NFPA 80.

3.4 STARTUP SERVICE

- A. Engage a factory-authorized service representative to perform startup service.
 - 1. Complete installation and startup checks according to manufacturer's written instructions.
 - 2. After electrical circuitry has been energized, operate doors to confirm proper motor rotation and door performance.
 - 3. Test and adjust controls and safety devices. Replace damaged and malfunctioning controls and equipment.

3.5 ADJUSTING

- A. Adjust hardware and moving parts to function smoothly so that doors operate easily, free of warp, twist, or distortion.
 - 1. Adjust exterior doors and components to be weather resistant.
- B. Lubricate bearings and sliding parts as recommended by manufacturer.
- C. Adjust seals to provide tight fit around entire perimeter.

3.6 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain overhead coiling doors.

END OF SECTION 083323

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SECTION 084113 – ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes exterior and interior storefront framing.
 - 1. Systems include both mechanically-retained with gaskets on four sides and with gaskets on 2 sides and structural sealant on 2 sides.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for aluminum-framed systems.
- B. Shop Drawings: For aluminum-framed systems. Include plans, elevations, sections, details, and attachments to other work.
 - 1. Include details of provisions for system expansion and contraction and for drainage of moisture in the system to the exterior.
 - 2. Show sill pan/sill subframe/sill receptor.
 - 3. For entrance doors, include hardware schedule and indicate operating hardware types, functions, quantities, and locations. Refer to Section 087100 – Door Hardware.
- C. Samples for Verification: For each type of exposed finish required, in manufacturer's standard sizes.
 - 1. Sill pan/sill subframe/sill receptor.
- D. Fabrication Sample: Of each vertical-to-horizontal intersection of aluminum-framed systems, made from 12-inch lengths of full-size components and showing details of the following:
 - 1. Joinery, including concealed welds.
 - 2. Anchorage.
 - 3. Expansion provisions.
 - 4. Glazing.
 - 5. Flashing and drainage.
- E. Other Submittals:
 - 1. Entrance Door Hardware Schedule: Prepared by or under the supervision of supplier, detailing fabrication and assembly of entrance door hardware, as well as procedures and diagrams. Coordinate final entrance door hardware schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of entrance door hardware.
- F. Delegated-Design Submittal: For aluminum-framed systems indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
 - 1. Detail fabrication and assembly of aluminum-framed systems.
 - 2. Include design calculations.

1.3 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified Installer.

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- B. Energy Performance Certificates: For aluminum-framed entrances and storefronts, accessories, and components, from manufacturer.
 - 1. Basis for Certification: NFRC-certified energy performance values for each aluminum-framed entrance and storefront.
 - C. Quality-Control Program: Developed specifically for Project, including fabrication and installation, according to recommendations in ASTM C1401. Include periodic quality-control reports.
 - D. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for aluminum-framed systems, indicating compliance with performance requirements.
 - E. Preconstruction Test Reports: For structural sealant.
 - F. Sample Warranties: For special warranties.

1.4 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For aluminum-framed systems to include in maintenance manuals.
- B. Maintenance Data for Structural Sealant: For structural-sealant-glazed storefront to include in maintenance manuals. Include ASTM C1401 recommendations for post-installation-phase quality-control program.

1.5 QUALITY ASSURANCE

- A. Manufacturer's Qualifications: Provide entrances and storefront produced by a single manufacturer with not less than 10 years successful experience in the fabrication of assemblies of the type and quality required.
- B. Installer Qualifications: Entrances and storefront shall be installed by a firm that has not less than 5 years successful experience in the installation of systems similar to those required.
- C. Testing Agency Qualifications: Qualified according to ASTM E 699 for testing indicated.
- D. Engineering Responsibility: Prepare data for aluminum-framed systems, including Shop Drawings, based on testing and engineering analysis of manufacturer's standard units in systems similar to those indicated for this Project.
- E. Product Options: Information on Drawings and in Specifications establishes requirements for systems' aesthetic effects and performance characteristics. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction. Performance characteristics are indicated by criteria subject to verification by one or more methods including preconstruction testing, field testing, and in-service performance.
 - 1. Do not revise intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If revisions are proposed, submit comprehensive explanatory data to Architect for review.
- F. Structural-Sealant Glazing: Comply with ASTM C1401 for design and installation of storefront systems.

1.6 MOCKUPS

- A. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.
1. Build mockup of typical wall area as shown on Drawings.
 2. Field testing shall be performed on mockups according to requirements in "Field Quality Control" Article.
 3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 4. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of aluminum-framed systems that do not comply with requirements or that fail in materials or workmanship within specified warranty period.
1. Failures include the following:
 - a. Structural failures including, but not limited to, excessive deflection.
 - b. Noise or vibration created by wind and thermal and structural movements.
 - c. Deterioration of metals and other materials beyond normal weathering.
 - d. Water leakage through fixed glazing and framing areas.
 - e. Failure of operating components.
 2. Warranty Period: 2 years from date of Substantial Completion.
- B. Special Finish Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components on which finishes do not comply with requirements or that fail in materials or workmanship within specified warranty period. Warranty does not include normal weathering.
1. Warranty Period: 20 years from date of Substantial Completion.

1.8 MAINTENANCE

- A. Entrance Door Hardware:
1. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of entrance door hardware.

PART 2 - PRODUCTS

2.1 PERFORMANCE CRITERIA

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 – Quality Requirements, to design aluminum-framed entrances and storefronts.
- B. General Performance: Comply with performance requirements specified, as determined by testing of aluminum-framed entrances and storefronts representing those indicated for this Project without failure due to defective manufacture, fabrication, installation, or other defects in construction.

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1. Aluminum-framed entrances and storefronts shall withstand movements of supporting structure, including story drift, twist, column shortening, long-term creep, and deflection, from uniformly distributed and concentrated live loads.
 2. Failure also includes the following:
 - a. Thermal stresses transferring to building structure.
 - b. Glass breakage.
 - c. Noise or vibration created by wind and thermal and structural movements.
 - d. Loosening or weakening of fasteners, attachments, and other components.
 - e. Failure of operating units.
- C. Structural Loads:
1. Wind Loads: As indicated on Drawings.
 2. Other Design Loads: As indicated on Drawings.
- D. Deflection of Framing Members: At design wind pressure, as follows:
1. Deflection Normal to Wall Plane: Limited to edge of glass in a direction perpendicular to glass plane shall not exceed $L/175$ of the glass edge length for each individual glazing lite or an amount that restricts edge deflection of individual glazing lites to $3/4$ inch, whichever is less.
 2. Deflection Parallel to Glazing Plane: Limited to amount not exceeding that which reduces glazing bite to less than 75 percent of design dimension and that which reduces edge clearance between framing members and glazing or other fixed components directly below them to less than $1/8$ inch and clearance between members and operable units directly below them to less than $1/16$ inch.
- E. Structural: Test according to ASTM E330 as follows:
1. When tested at positive and negative wind-load design pressures, systems do not evidence deflection exceeding specified limits.
 2. When tested at 150 percent of positive and negative wind-load design pressures, systems, including anchorage, do not evidence material failures, structural distress, and permanent deformation of main framing members exceeding 0.2 percent of span.
 3. Test Durations: As required by design wind velocity, but not fewer than 10 seconds.
- F. Air Infiltration: Test per NFRC 400 or ASTM E283 for infiltration as follows:
1. Fixed Framing and Glass Area: Maximum air leakage of 0.06 cfm/sq. ft. at a static-air-pressure differential of 1.75 lbf/sq. ft..
 2. Entrance Doors:
 - a. Pair of Doors: Maximum air leakage 1.0 cfm/sq. ft. when tested at a static-air-pressure differential of 1.57 lbf/sq. ft.].
 - b. Single Doors: Maximum air leakage 0.5 cfm/sq. ft. when tested at a static-air-pressure differential of 1.57 lbf/sq. ft..
- G. Water Penetration under Static Pressure: Test per ASTM E331 as follows:
1. No evidence of water penetration through fixed glazing and framing areas when tested per a minimum static-air-pressure differential of 20 percent of positive wind-load design pressure, but not less than 10 pound-force per square foot.
- H. Energy Performance: Certify and label energy performance per NFRC as follows:
1. Thermal Transmittance (U-factor): The following components shall provide U-factors of not more than indicate as determined per NFRC 100.
 - a. Fixed Glazing and Framing Areas: 0.36 Btu/sq. ft. x h x deg F.

- b. Entrance Doors: 0.77 Btu/sq. ft. x h x deg F.
- 2. Solar Heat Gain Coefficient (SHGC): Fixed glazing and framing areas shall have a solar heat gain coefficient of no greater than 0.35 as determined per NFRC 200
- 3. Condensation Resistance: Fixed glazing and framing areas shall have an NFRC-certified condensation resistance rating of no less than 68 as determined per NFRC 500.
- I. Thermal Movements: Allow for thermal movements resulting from ambient and surface temperatures.
 - 1. Temperature Change (Range): 120 degrees F, ambient; 180 degrees F, material surfaces.
- J. Structural-Sealant Joints:
 - 1. Designed to carry gravity loads of glazing.
 - 2. Designed to produce tensile or shear stress of less than 20 psi.
- K. Structural Sealant: Capable of withstanding tensile and shear stresses imposed by aluminum-framed systems without failing adhesively or cohesively. When tested for preconstruction adhesion and compatibility, cohesive failure of sealant shall occur before adhesive failure.
 - 1. Adhesive failure occurs when sealant pulls away from substrate cleanly, leaving no sealant material behind.
 - 2. Cohesive failure occurs when sealant breaks or tears within itself but does not separate from each substrate because sealant-to-substrate bond strength exceeds sealant's internal strength.

2.2 MANUFACTURERS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide Basis-of-Design indicated or approved substitutions from one of the following:
 - 1. Kawneer North America (Basis-of-Design).
 - a. Product: Trifab VG 451T.
 - 2. EFCO Corporation.
 - 3. Oldcastle BuildingEnvelope.
 - 4. Tubelite Company, Inc.
 - 5. United States Aluminum.
 - 6. YKK AP America Inc.
- B. Source Limitations: Obtain components of aluminum-framed entrance and storefront system, including framing and accessories, from single manufacturer.
 - 1. Provide standard door hardware and electrified hardware as a single sourced package from same qualified supplier.

2.3 FRAMING

- A. Framing Members: Manufacturer's standard extruded-aluminum framing members of thickness required and reinforced as required to support imposed loads.
 - 1. Construction: Nonthermal and thermally broken.
 - 2. Glazing System: Retained mechanically with gaskets on four sides typically. Where indicated, provide glazing system that is retained mechanically with gaskets on 2 sides and structural sealant on 2 sides.
 - 3. Glazing Plane: Center.

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- B. Deflection Track: Manufacturer's standard thermally broken head deflection receptors sized for specified storefront framing system, finished to match framing.
1. Design deflection track for minimum deflection of 3/4 inch.
- C. Backer Plates: Manufacturer's standard, continuous backer plates for framing members, if not integral, where framing abuts adjacent construction.
- D. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims for aligning system components.
1. Roller Assemblies: Low-friction design.
- E. Thermal Break: Minimum 1/4 inch separation consisting of a 2-part chemically curing, high-density polyurethane, which is mechanically and adhesively joined to aluminum storefront sections.
1. Provide thermal break designed per AAMA TIR-A8 and tested per AAMA 505.
- F. Materials:
1. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.
 - a. Sheet and Plate: ASTM B209.
 - b. Extruded Bars, Rods, Profiles, and Tubes: ASTM B221.
 - c. Extruded Structural Pipe and Tubes: ASTM B429.
 - d. Structural Profiles: ASTM B308.
 2. Steel Reinforcement: Manufacturer's standard zinc-rich, corrosion-resistant primer complying with SSPC-PS Guide No. 12.00; applied immediately after surface preparation and pretreatment. Select surface preparation methods per recommendations in SSPC-SP COM, and prepare surfaces per applicable SSPC standard.
 - a. Structural Shapes, Plates, and Bars: ASTM A36.
 - b. Cold-Rolled Sheet and Strip: ASTM A1008.
 - c. Hot-Rolled Sheet and Strip: ASTM A1011.

2.4 ENTRANCE DOOR SYSTEMS

- A. Entrance Doors: Manufacturer's standard glazed entrance doors for manual-swing operation.
1. Basis-of-Design Product: Subject to compliance with requirements, provide 350 Entrance Doors by Kawneer Company Inc. or approved substitution by one of the specified aluminum-framed entrance and storefront manufacturers.
 2. Door Construction: 1-3/4 inch overall depth, with minimum 0.125 inch thick, extruded-aluminum tubular rail and stile members. Mechanically fasten corners with reinforcing brackets that are deeply penetrated and fillet welded or that incorporate concealed tie rods.
 - a. Thermal Construction: High-performance plastic connectors separate aluminum members exposed to the exterior from members exposed to the interior.
 3. Door Design: Wide stile; 5-inch nominal width.
 - a. Accessible Doors: Smooth surfaced for width of door in area within 10 inches above floor or ground plane.
 - b. Thermal Barriers: Two 1/4 inch separations consisting of a 2-part chemically curing, high-density polyurethane that is mechanically and adhesively joined to aluminum storefront sections.
 - 1) Provide thermal barriers for exterior doors only.

4. Glazing Stops and Gaskets: Square, snap-on, extruded-aluminum stops and preformed gaskets.
 - a. Provide nonremovable glazing stops on outside of door.

B. Entrance Door Hardware: As specified in Section 087100 – Door Hardware.

2.5 GLAZING

A. Glazing: As specified in Section 088100 – Glass Glazing.

B. Glazing Gaskets: Manufacturer's standard sealed-corner pressure-glazing system of black, resilient elastomeric glazing gaskets, setting blocks, and shims or spacers

C. Glazing Sealants: As recommended by manufacturer.

D. Structural Glazing Sealant: ASTM C1184, single-component neutral-curing silicone formulation that is compatible with system components with which it comes in contact, specifically formulated and tested for use as structural sealant and approved by a structural-sealant manufacturer for use in aluminum-framed systems indicated.

1. Color: Black.

E. Weatherseal Sealant: ASTM C920 for Type S, Grade NS, Class 25, Uses NT, G, A, and O; single-component neutral-curing formulation that is compatible with structural sealant and other system components with which it comes in contact; recommended by structural-sealant, weatherseal-sealant, and structural-sealant-glazed storefront manufacturers for this use.

1. Color: Matching structural sealant.

F. Bond-Breaker Tape: Manufacturer's standard TFE-fluorocarbon or polyethylene material to which sealants will not develop adhesion.

2.6 ACCESSORIES

A. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials.

1. Use self-locking devices where fasteners are subject to loosening or turning out from thermal and structural movements, wind loads, or vibration.
2. Reinforce members as required to receive fastener threads.
3. Use fasteners with countersunk Phillips screw heads fabricated from 300 series stainless steel.

B. Anchors: 3-way adjustable anchors with minimum adjustment of 1 inch that accommodate fabrication and installation tolerances in material and finish compatible with adjoining materials and recommended by manufacturer.

1. Concrete and Masonry Inserts: Hot-dip galvanized cast-iron, malleable-iron, or steel inserts complying with ASTM A123 or ASTM A153 requirements.

C. Concealed Flashing: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding flashing compatible with adjacent materials.

D. Bituminous Paint: Cold-applied, asphalt-mastic paint complying with SSPC-Paint 12 requirements except containing no asbestos; formulated for 30 mil thickness per coat.

2.7 FABRICATION

- A. Form or extrude aluminum shapes before finishing.
- B. Weld in concealed locations to greatest extent possible to minimize distortion or discoloration of finish. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.
- C. Framing Members, General: Fabricate components that, when assembled, have the following characteristics:
 - 1. Profiles that are sharp, straight, and free of defects or deformations.
 - 2. Accurately fitted joints with ends coped or mitered.
 - 3. Means to drain water passing joints, condensation within framing members, and moisture migrating within the system to exterior.
 - 4. Physical and thermal isolation of glazing from framing members.
 - 5. Accommodations for thermal and mechanical movements of glazing and framing to maintain required glazing edge clearances.
 - 6. Provisions for field replacement of glazing from interior for vision glass and exterior for spandrel glazing or metal panels.
 - 7. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.
- D. Mechanically Glazed Framing Members: Fabricate for flush glazing without projecting stops.
- E. Structural-Sealant-Glazed Framing Members: Include accommodations for using temporary support device to retain glazing in place while structural sealant cures.
- F. Storefront Framing: Fabricate components for assembly using head-and-sill-receptor system with shear blocks at intermediate horizontal members.
- G. Entrance Door Frames: Reinforce as required to support loads imposed by door operation and for installing entrance door hardware.
 - 1. At exterior doors, provide compression weather stripping at fixed stops.
 - 2. At interior doors, provide silencers at stops to prevent metal-to-metal contact. Install three silencers on strike jamb of single-door frames and two silencers on head of frames for pairs of doors.
 - 3. Sill Pan: Extruded aluminum, factory fabricated to provide sealed end dams, finished to match storefront; designed to direct water away from building when installed horizontally at sill. If manufacturer offers a similar sill pan as part of aluminum-framed entrance and storefront system, submit details and product data including finishes, for consideration and approved by Architect, PVC is not acceptable.
- H. Entrance Doors: Reinforce doors as required for installing entrance door hardware.
 - 1. At pairs of exterior doors, provide sliding-type weather stripping retained in adjustable strip and mortised into door edge.
 - 2. At exterior doors, provide weather sweeps applied to door bottoms.
- I. Entrance Door Hardware Installation: Factory install entrance door hardware to the greatest extent possible. Cut, drill, and tap for factory-installed entrance door hardware before applying finishes.
- J. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.

2.8 ALUMINUM FINISHES

- A. High-Performance Organic Finish: Two-coat fluoropolymer finish complying with AAMA 2605 and containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
 - 1. Color: As indicated on Drawings.
- B. Concealed Steel Items: Prime with iron oxide paint.
- C. Liquid Strippable Coating: Apply in shop to prefinished surfaces to protect finish during fabrication, shipping, and field handling.

2.9 SOURCE QUALITY CONTROL

- A. Structural-Sealant: Perform quality-control procedures complying with ASTM C1401 recommendations, including system material-qualification procedures, sealant testing, and assembly fabrication reviews and checks.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Prepare surfaces that will contact structural sealant per sealant manufacturer's written instructions to ensure compatibility and adhesion. Preparation includes cleaning and priming surfaces.

3.3 INSTALLATION

- A. General:
 - 1. Comply with manufacturer's written instructions.
 - 2. Do not install damaged components.
 - 3. Fit joints to produce hairline joints free of burrs and distortion.
 - 4. Rigidly secure nonmovement joints.
 - 5. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration.
 - 6. Seal joints watertight unless otherwise indicated.
- B. Metal Protection:
 - 1. Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer or applying sealant or tape, or by installing nonconductive spacers as recommended by manufacturer for this purpose.
 - 2. Where aluminum will contact concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.

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- C. Set continuous sill members and flashing in full sealant bed as specified in Section 079200 – Joint Sealants to produce weathertight installation.
 - D. Install components plumb and true in alignment with established lines and grades.
 - E. Install glazing as specified in Section 088100 – Glass Glazing.
 - F. Install weatherseal sealant per Section 079200 – Joint Sealants and per sealant manufacturer's written instructions to produce weatherproof joints. Install joint filler behind sealant as recommended by sealant manufacturer.
 - G. Structural-Sealant Glazing:
 - 1. Prepare surfaces that will contact structural sealant per sealant manufacturer's written instructions to ensure compatibility and adhesion. Preparation includes cleaning and priming surfaces.
 - 2. Install weatherseal sealant per Section 079200 – Joint Sealants and per sealant manufacturer's written instructions to produce weatherproof joints. Install joint filler behind sealant as recommended by sealant manufacturer.
 - H. Entrance Doors: Install doors to produce smooth operation and tight fit at contact points.
 - 1. Exterior Doors: Install to produce weathertight enclosure and tight fit at weather stripping.
 - 2. Field-Installed Entrance Door Hardware: Install surface-mounted entrance door hardware according to entrance door hardware manufacturers' written instructions using concealed fasteners to greatest extent possible.

3.4 ERECTION TOLERANCES

- A. Erection Tolerances: Install aluminum-framed entrances and storefronts to comply with the following maximum tolerances:
 - 1. Plumb: 1/8 inch in 10 feet; 1/4 inch in 40 feet.
 - 2. Level: 1/8 inch in 20 feet; 1/4 inch in 40 feet.
 - 3. Alignment:
 - a. Where surfaces abut in line or are separated by reveal or protruding element up to 1/2 inch wide, limit offset from true alignment to 1/16 inch.
 - b. Where surfaces are separated by reveal or protruding element from 1/2 to 1 inch wide, limit offset from true alignment to 1/8 inch.
 - c. Where surfaces are separated by reveal or protruding element of 1 inch wide or more, limit offset from true alignment to 1/4 inch.
 - 4. Location: Limit variation from plane to 1/8 inch in 12 feet; 1/2 inch over total length.

3.5 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections.
- B. Field Quality-Control Testing: Perform the following test on representative areas of aluminum-framed entrances and storefronts.
 - 1. Water-Spray Test: Before installation of interior finishes has begun, areas designated by Architect shall be tested per AAMA 501.2 and shall not evidence water penetration.

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- a. Perform tests a minimum area of 75 feet by 1 story of aluminum-framed systems designated by Architect.
 2. Air Infiltration: 1.5 times rate specified for laboratory testing in "Performance Requirements" Article, but not more than 0.50 cfm per square foot (2.25 L/s per sq. m), of fixed wall area when tested per ASTM E783 at a minimum static-air-pressure differential of 6.24 pound-force per square foot.
 - a. Perform a minimum of 2 tests in areas as directed by Architect.
 3. Water Penetration: Areas shall be tested according to ASTM E 1105 at a minimum uniform and cyclic static-air-pressure difference of 0.67 times the static-air-pressure difference specified for laboratory testing under "Performance Requirements" Article, but not less than 4.18 lbf/sq. ft., and shall not evidence water penetration.
- C. Structural-Sealant Adhesion: Test structural sealant per recommendations in ASTM C1401, Destructive Test Method A, "Hand Pull Tab (Destructive)," Appendix X2.
1. Test a minimum of four areas on each building facade.
 2. Repair installation areas damaged by testing.
- D. Repair or remove Work if test results and inspections indicate that it does not comply with specified requirements.
- E. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional Work with specified requirements.
1. Aluminum-framed assemblies will be considered defective if they do not pass tests and inspections.
- F. Prepare test and inspection reports.
- 3.6 ADJUSTING
- A. Adjust operating entrance door hardware to function smoothly as recommended by manufacturer.
1. For entrance doors accessible to people with disabilities, adjust closers to provide a 3-second closer sweep period for doors to move from a 70-degree open position to 3 inches from the latch, measured to the leading door edge.
- 3.7 MAINTENANCE SERVICE
- A. Entrance Door Hardware:
1. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of entrance door hardware.
 2. Initial Maintenance Service: Beginning at Substantial Completion, provide 6 months' full maintenance by skilled employees of entrance door hardware Installer. Include quarterly preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper entrance door hardware operation at rated speed and capacity. Use parts and supplies that are the same as those used in manufacture and installation of original equipment.
- B. Structural-Sealant-Glazed Systems:

1. Initial Maintenance Service: Beginning at Substantial Completion, provide [6] [12] months' full maintenance by skilled employees of structural-sealant-glazed system Installer. Include quarterly preventive maintenance, repair or replacement to ensure long-term performance and durability of structural-sealant-glazed system as required for proper entrance door hardware operation at rated speed and capacity. Provide parts and supplies same as those used in manufacture and installation of original system.

END OF SECTION 084113

SECTION 085113 – ALUMINUM WINDOWS**PART 1 - GENERAL****1.1 SUMMARY**

- A. Section includes aluminum windows for exterior locations.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, glazing and fabrication methods, dimensions of individual components and profiles, hardware, and finishes for aluminum windows.
- B. Shop Drawings: For aluminum windows.
 - 1. Include plans, elevations, sections, hardware, accessories, insect screens, operational clearances, and details of installation, including anchor, flashing, and sealant installation.
- C. Samples for Verification: For aluminum windows and components required, showing full range of color variations for finishes, and prepared on Samples of size indicated below.
 - 1. Exposed Finishes: 2 by 4 inches.
 - 2. Exposed Hardware: Full-size units.
- D. Product Schedule: For aluminum windows. Use same designations indicated on Drawings.

1.3 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For manufacturer and Installer.
- B. Product Test Reports: For each type of aluminum window, for tests performed by a qualified testing agency.
- C. Certification of ASHRAE 90.1 Fenestration Rating.
- D. Sample Warranties: For manufacturer's warranties.

1.4 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For finishes to include in maintenance manuals.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Manufacturer capable of fabricating aluminum windows that meet or exceed performance requirements indicated and of documenting this performance by inclusion in lists and by labels, test reports, and calculations.
- B. Installer Qualifications: Installer acceptable to aluminum window manufacturer for installation of units required for this Project.

- C. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
1. Build mockup of typical wall area as shown on Drawings or as directed by Architect.
 2. Approval of mockups does not constitute approval of deviations from Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.
- D. Fenestration Rating and Labeling: Comply with ASHRAE 90.1 for fenestration rating and labeling requirements.
1. In lieu of permanent nameplate or NFRC certified products, provide window manufacturer's certification, as determined by an independent laboratory acceptable to the Authority Having Jurisdiction, attesting to the following for each fenestration system scheduled for use on Project:
 - a. U-factor.
 - b. Solar heat gain coefficient (SHGC).
 - c. Air infiltration (Air leakage rate).
 2. Provide permanent nameplate; NFRC label; or window manufacturer's signed and dated certification of compliance with ASHRAE 90.1.
 3. Coordinate glazing and framing systems for overall system performance and labeling.

1.6 PROJECT CONDITIONS

- A. Field Measurements: Verify aluminum window openings by field measurements before fabrication and indicate measurements on Shop Drawings.
1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish opening dimensions and processed with fabricating aluminum windows without field measurements. Coordinate wall construction to ensure that actual opening dimensions correspond to established dimensions.

1.7 WARRANTY

- A. Manufacturer's Warranty: Manufacturer agrees to repair or replace aluminum windows that fail in materials or workmanship within specified warranty period.
1. Failures include the following:
 - a. Failure to meet performance requirements.
 - b. Structural failures including excessive deflection, water leakage, air infiltration, or condensation.
 - c. Deterioration of materials and metal finishes beyond normal weathering.
 - d. Failure of insulating glass.
 - e. Failure of operating components.
 2. Warranty Period: Minimum of two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations: Obtain aluminum windows and aluminum-framed entrances and storefronts from single source from single manufacturer.

2.2 WINDOW PERFORMANCE REQUIREMENTS

- A. Product Standard: Comply with AAMA/WDMA/CSA 101/I.S.2/A440 for definitions and minimum standards of performance, materials, components, accessories, and fabrication unless more stringent requirements are indicated.
1. Window Certification: AMMA certified with label attached to each window.
- B. Performance Class and Grade: AAMA/WDMA/CSA 101/I.S.2/A440 as follows:
1. Minimum Performance Class: AW.
 2. Minimum Performance Grade: PG70-FW.
- C. Structural Loads:
1. Wind Loads: As indicated on Drawings.
- D. Structural-Test Performance: Test per ASTM E330 as follows:
1. Uniform Load Deflection Test: When tested at positive and negative wind-load design pressures, assemblies do not evidence deflection of any unsupported span (L) of test unit in excess of $L/175$.
 2. Uniform Load Structural Test: When tested at 150 percent of positive and negative wind-load design pressures, systems, including anchorage, do not evidence material failures, structural distress, and permanent deformation of main framing members exceeding 0.2 percent of span.
 3. Test Durations: As required by design wind velocity but not fewer than 10 seconds.
- E. Air Infiltration: Test according to ASTM E283 for infiltration as follows:
1. Maximum air leakage of 0.1 cfm per square foot at an inward static-air-pressure differential of 6.24 pound-force per square foot.
- F. Water Penetration Performance Requirements:
1. Static Pressure according to ASTM E331: No uncontrolled water penetration when tested under static-air-pressure differential of not more than 10 pound-force per square foot, with water application rate of 20 percent of positive design pressure.
 2. Cyclical Pressure according to ASTM E547: No uncontrolled water penetration when tested under static pressure of not more than 10 pound-force per square foot, with water application rate of 20 percent of positive design pressure.
- G. Thermal Transmittance: NFRC 100 maximum whole-window U-factor of 0.20 Btu per square foot per hour per degrees F.
- H. Solar Heat-Gain Coefficient (SHGC): NFRC 200 maximum whole-window SHGC of 0.25.
- I. Condensation-Resistance Factor (CRF): Provide aluminum windows tested for thermal performance according to AAMA 1503, showing minimum CRF of 78 (Frame) and 79 (Glass).
- J. Thermal Movements: Provide aluminum windows, including anchorage, that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
1. Temperature Change (Range): 120 degrees F, ambient; 180 degrees F material surfaces.

- K. Sound Transmission Class (STC): Rated for not less than 29 STC when tested for laboratory sound transmission loss according to ASTM E90 and determined by ASTM E1425.
- L. Outside-Inside Transmission Class (OITC): Rated for not less than 23 OITC when tested for laboratory sound transmission loss according to ASTM E90 and determined by ASTM E1332.

2.3 ALUMINUM WINDOWS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide the Basis-of-Design indicated or a comparable product by one of the following:
 - 1. Kawneer North America (Basis-of-Design).
 - a. Product: AA5450 Series Windows.
 - 2. EFCO Corporation.
 - 3. Oldcastle BuildingEnvelope.
 - 4. YKK AP America Inc.
- B. Operating Types: Provide fixed type windows in sizes and locations indicated on Drawings:
- C. Frames: Aluminum extrusions complying with AAMA/WDMA/CSA 101/I.S.2/A440.
 - 1. Thermally Broken Construction: Fabricate frames and muntins with an integral, concealed, low-conductance thermal barrier located between exterior materials and window members exposed on interior side in a manner that eliminates direct metal-to-metal contact.
- D. Aluminum Materials: Alloy and temper recommended by manufacturer for type of use and finish indicated.
 - 1. Sheet and Plate: ASTM B209.
 - 2. Extruded Bars, Rods, Profiles, and Tubes: ASTM B221.
- E. Glass and Glazing Materials: Comply with requirements in Section 088000 – Glazing.
- F. Glazing System: Manufacturer's standard factory-glazing system that produces weathertight seal.
- G. Hardware, General: Provide manufacturer's standard hardware fabricated from aluminum, stainless steel, carbon steel complying with AAMA 907, or other corrosion-resistant material compatible with adjacent materials; designed to smoothly operate, tightly close, and securely lock windows, and sized to accommodate sash weight and dimensions.
 - 1. Exposed Hardware Color and Finish: As selected by Architect from manufacturer's full range.
- H. Thermal Break: Minimum 1/4 inch separation consisting of a 2-part chemically curing, high-density polyurethane, which is mechanically and adhesively joined to aluminum storefront sections.
 - 1. Provide thermal break designed per AAMA TIR-A8 and tested per AAMA 505.
- I. Weatherstripping: Provide full-perimeter weatherstripping for each operable sash unless otherwise indicated.
- J. Fasteners: Noncorrosive and compatible with window members, trim, hardware, anchors, and other components.
 - 1. Exposed Fasteners: Do not use exposed fasteners to the greatest extent possible. For application of hardware, use fasteners that match finish hardware being fastened.

2.4 INSTALLATION ACCESSORIES

- A. Sill Pan: Aluminum, factory fabricated to provide field-folded, sealed and riveted end dams, finished to match windows; designed to direct water away from building when installed horizontally at sill.
- B. Subsills: Thermally broken, extruded-aluminum subsills in configurations indicated on Drawings.
- C. Interior Trim: None.
- D. Receptor System: Window manufacturer's two-piece, snap-together, thermally-broken, extruded-aluminum receptor system that anchors windows in place.
 - 1. Provide receptors with manufacturer's weep holes designed to drain water to exterior unless indicated otherwise.

2.5 FABRICATION

- A. Fabricate aluminum windows in sizes indicated. Include a complete system for assembling components and anchoring windows.
- B. Glaze aluminum windows in the factory.
- C. Weatherstrip each operable sash to provide weathertight installation.
- D. Weep Holes: Provide weep holes and internal passages to conduct infiltrating water to exterior.
- E. Complete fabrication, assembly, finishing, hardware application, and other work in the factory to greatest extent possible. Disassemble components only as necessary for shipment and installation.

2.6 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM's "Metal Finishes Manual" for recommendations for applying and designating finishes.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.7 ALUMINUM FINISHES

- A. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.
- B. Clear Anodic Finish: AA-M12C22A41, Class I, 0.018 mm or thicker complying with AAMA 611.

PART 3 - EXECUTION**3.1 EXAMINATION**

- A. Examine openings, substrates, structural support, anchorage, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Verify rough opening dimensions, levelness of sill plate, and operational clearances.
- C. Examine wall flashings, vapor retarders, water and weather barriers, and other built-in components to ensure weathertight window installation.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Comply with manufacturer's written instructions for installing windows, hardware, accessories, and other components. For installation procedures and requirements not addressed in manufacturer's written instructions, comply with installation requirements in ASTM E 2112.
- B. Install windows level, plumb, square, true to line, without distortion or impeding thermal movement, anchored securely in place to structural support, and in proper relation to wall flashing and other adjacent construction to produce weathertight construction.
- C. Install windows and components to drain condensation, water penetrating joints, and moisture migrating within windows to the exterior.
- D. Set sill members in watertight sill flashing pan. Provide 3/4 inch by 1/8 inch angle on inside face of frame; attach to sill prior to installation of pan. To form pan, fold flashing ends and back up at least 1-1/2 inch but not to exceed 1/4 inch below top of sill member; seal corners of pan. Extend sloped pan to exterior face of building. Attach sill members to vertical leg of angle only if required by manufacturer.
 - 1. Do not penetrate bottom of flashing pan. Do not apply sealant between flashing pan and bottom of frame.
- E. Separate aluminum and other corrodible surfaces from sources of corrosion or electrolytic action at points of contact with other materials.

3.3 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
 - 1. Testing and inspecting agency will interpret tests and state in each report whether tested Work complies with or deviates from requirements.
- B. Tests and Inspections: Testing and inspecting of installed windows shall take place as follows:
 - 1. Testing Methodology: Perform testing of windows for air infiltration and water resistance per AAMA 502.
 - 2. Air-Infiltration Testing:
 - a. Test Pressure: That required to determine compliance with AAMA/WDMA/CSA 101/I.S.2/A440 performance class indicated.

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- b. Allowable Air-Leakage Rate: 1.5 times applicable AAMA/WDMA/CSA 101/I.S.2/A440 rate for product type and performance class rounded down to 1 decimal place.
 3. Water-Resistance Testing:
 - a. Test Pressure: Two-thirds times test pressure required to determine compliance with AAMA/WDMA/CSA 101/I.S.2/A440 performance grade indicated.
 - b. Allowable Water Infiltration: No water penetration.
 4. Testing Extent: Three mockup windows of each type as selected by Architect and a qualified independent testing and inspecting agency. Test windows after perimeter sealants have cured.
 5. Test Reports: Prepared according to AAMA 502.
- C. Windows will be considered defective if they do not pass tests and inspections. Remove and replace noncomplying windows and retest as specified above.
- D. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
- E. Prepare test and inspection reports.
- 3.4 ADJUSTING, CLEANING, AND PROTECTION
- A. Adjust operating sashes and hardware for a tight fit at contact points and weather stripping for smooth operation and weathertight closure.
 - B. Clean exposed surfaces immediately after installing windows. Avoid damaging protective coatings and finishes. Remove excess sealants, glazing materials, dirt, and other substances.
 1. Keep protective films and coverings in place until final cleaning.
 - C. Remove and replace glass that has been broken, chipped, cracked, abraded, or damaged during construction period.
 - D. Protect window surfaces from contact with contaminating substances resulting from construction operations. If contaminating substances do contact window surfaces, remove contaminants immediately according to manufacturer's written instructions.

END OF SECTION 085113

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SECTION 086200 - UNIT SKYLIGHTS**PART 1 - GENERAL****1.1 SUMMARY**

- A. Section Includes:
 - 1. Unit skylights mounted on integral curbs.

1.2 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of unit skylight.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for unit skylights.
- B. Shop Drawings: For unit skylight work.
 - 1. Include plans, elevations, sections, details, and connections to supporting structure and other adjoining work.
- C. Aluminum Finish Samples: For each type of exposed finish required, in a representative section of each unit skylight in manufacturer's standard size.
- D. Glazing Samples: For each color and finish of glazing indicated, 12 inches square and of same thickness indicated for the final Work.
- E. Product Schedule: For unit skylights.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified Installer and manufacturer.
- B. Product Test Reports: For each type and size of unit skylight, for tests performed within the last four years by a qualified testing agency. Test results based on testing of smaller unit skylights than specified will not be accepted.
- C. Field quality-control reports.
- D. Sample Warranty: For special warranty.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For unit skylights to include in maintenance manuals.

1.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A manufacturer capable of fabricating unit skylights that meet or exceed performance requirements indicated and of documenting this performance by inclusion in lists and by labels, test reports, and calculations.
- B. Installer Qualifications: An installer acceptable to unit skylight manufacturer for installation of units required for this Project.

1.7 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of unit skylights that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Uncontrolled water leakage.
 - b. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
 - c. Yellowing of acrylic glazing.
 - d. Breakage of polycarbonate glazing.
 - e. Deterioration of insulating-glass hermetic seal.
 - 2. Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 UNIT SKYLIGHTS

- A. General: Provide factory-assembled unit skylights that include glazing, extruded-aluminum glazing retainers, gaskets, and inner frames and that are capable of withstanding performance requirements indicated.
- B. Unit Shape and Size: As indicated.
- C. Polycarbonate-Insulating-Panel Glazing: Manufacturer's standard polycarbonate sheet with cellular cross section that provides isolated airspaces and that is coextruded with a UV-protective layer.
 - 1. Basis-of-Design: Subject to compliance with requirements, provide products by the Basis-of-Design manufacturer or a comparable product by one of the following:
 - a. Kingspan Light + Air (Basis-of-Design).
 - 1) Product: Quadwall.
 - b. Crystal Structures; Thermal Sky 400.
 - c. Super Sky Products, Inc.
 - d. Wasco; Lumira.

2.2 TRANSLUCENT-POLYCARBONATE PANELS

- A. Translucent, Multiwall Cellular Polycarbonate Panel Thermally Broken Assembly:
 - 1. Two independent, multiwall cellular cross-section, polycarbonate glazing panels with air-insulated spaces and coextruded UV protection
 - 2. Integrated into a panel assembly with concealed metal connectors consisting of a two-piece male/female battens with built-in silicone gaskets.

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3. Unitized panel assembly incorporated into a complete aluminum frame system without exposed mullions.
 4. Exterior panel replacement:
 - a. Independent of interior single panel,
 - b. Will not expose interior, compromise weather-tightness, or interfere with the normal building operations.
- B. Panel Assembly Thickness: Nominal Four inch, overall.
- C. UV Resistance: Coextruded on weather-exposed surfaces during glazing panel manufacture.
- D. Color: As selected by Architect from manufacturer's full range.
- E. Panel Performance:
1. Plastic Self-Ignition Temperature: 650 deg F or more according to ASTM D 1929.
 2. Smoke-Developed Index: 450 or less according to ASTM E 84, or 75 or less according to ASTM D 2843.
 3. Combustibility Classification: Class CC1 based on testing according to ASTM D 635.
 4. Flame Spread: 25 or less when tested according to ASTM E 84.
 5. Interior Finish Classification: Class A based on testing according to ASTM E 84.
 6. Visible Light Transmittance (VT) Loss: 6 percent maximum over 10 years, measured according to ASTM D 1003.
 7. Thermal Aging: When exposed to 300 deg F for 25 minutes, interior and exterior panels tested according to ASTM D 2244.
 8. Color Retention: 0.75 (Hunter) units ΔE maximum fade.
 9. Color Darkening: 0.3 (Hunter) units ΔL maximum.
 10. Cracking or crazing: None when exposed to 300 deg F for 25 minutes.
 11. Delamination: None when exposed to 300 deg F and 0 deg F for 25 minutes.
 12. Impact Resistance: No failure at an impact of 500 lbf when tested according to ASTM E 695.
 13. Concentrated Loading: No damage while applying a load of 600 lbf over 1 sq. ft. when tested according to 29 CFR 1910.23(e)(8); and no damage while applying a load of 400 lbf over 3 inches in diameter according to ASTM E 661.
 14. Haze Factor: Greater than 90 percent when tested according to ASTM D 1003.
- F. Energy Performance: Provide panel assemblies with performance properties specified, as indicated in manufacturer's published test data, based on procedures indicated below and certified and labeled according to NFRC.
1. Thermal Transmittance (U-Factor): Fixed panel and mill finish aluminum framing whole assemblies shall have U-factor of not more than 0.31 Btu/sq. ft. x h x deg F sloped application as determined according to NFRC 100.
 2. Solar-Heat-Gain Coefficient (SHGC): Panel assembly shall have an SHGC of no greater than 0.35 as determined according to NFRC 200.
 3. Visible Light Transmittance (VT): 0.35% or greater according to NFRC 202; or 0.52% or greater according to ASTM E 972, ASTM E 1084.
 4. Air Infiltration: Maximum air leakage through fixed glazing and skylight framing assemblies of 0.30 cfm/sq. ft. of fixed wall area as determined according to ASTM E 283 at a minimum static-air-pressure differential of 1.57 lbf/sq. ft.
- G. Thermal Break: Fabricate unit skylights with thermal barrier separating exterior and interior metal framing.

2.3 ALUMINUM FRAMING SYSTEMS

- A. Components: Manufacturer's standard extruded-aluminum members of thickness required and reinforced as required to support imposed loads.
 - 1. Construction: One piece, extruded aluminum.
- B. Aluminum: Alloy and temper recommended in writing by manufacturer for type of use and finish indicated.
 - 1. Sheet and Plate: ASTM B 209.
 - 2. Extruded Bars, Rods, Profiles, and Tubes: ASTM B 221.
 - 3. Extruded Structural Pipe and Tubes: ASTM B 429.
 - 4. Structural Profiles: ASTM B 308.
- C. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims for aligning skylight components.
- D. Fasteners and Accessories: Manufacturer's standard, corrosion-resistant, nonstaining, and nonbleeding fasteners and accessories; compatible with adjacent materials.
 - 1. At closures, retaining caps, or battens, use ASTM A 193, 300 series stainless-steel screws.
 - 2. Use self-locking devices where fasteners are subject to loosening or turning out from thermal and structural movements, wind loads, or vibration.
 - 3. At movement joints, use slip-joint linings, spacers, and sleeves of material and type recommended in writing by manufacturer.
- E. Concrete and Masonry Inserts: Hot-dip galvanized cast-iron, malleable-iron, or steel inserts complying with ASTM A 123 or ASTM A 153 requirements.
- F. Anchor Bolts: ASTM A 307, Grade A, galvanized steel.
- G. Concealed Flashing: Corrosion-resistant, nonstaining, nonbleeding flashing compatible with adjacent materials.
- H. Exposed Flashing and Closures: Aluminum sheet not less than 0.040 inch thick, finished to match framing.
- I. Framing Gaskets: Manufacturer's standard gasket system with low-friction surface treatment designed specifically for retaining structured-polycarbonate panels.
- J. Frame-System Sealants: As recommended in writing by manufacturer.
- K. Corrosion-Resistant Coating: Cold-applied asphalt mastic, compounded for 15-mil dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.

2.4 ACCESSORY MATERIALS

- A. Fasteners: Same metal as metal being fastened, nonmagnetic stainless steel, or other noncorrosive metal as recommended by manufacturer. Finish exposed fasteners to match material being fastened.
 - 1. Where removal of exterior exposed fasteners might allow access to building, provide nonremovable fastener heads.

- B. Bituminous Coating: Cold-applied asphalt mastic, compounded for 15-mil dry film thickness per coat.

2.5 FABRICATION

- A. Fabricate aluminum components that, when assembled, have the following characteristics:
 - 1. Profiles that are sharp, straight, and free of defects or deformations.
 - 2. Accurately fitted joints with ends coped or mitered.
 - 3. Internal guttering systems or other means to drain water passing through joints and moisture migrating within assembly to exterior.
- B. Fabricate aluminum sill closures with weep holes and for installation as continuous component.
- C. Reinforce aluminum components as required to receive fastener threads.

2.6 ALUMINUM FINISHES

- A. High-Performance Organic Finish: Two-coat fluoropolymer finish complying with AAMA 2604 and containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
 - 1. Color and Gloss: As selected by Architect from manufacturer's full range.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine openings, substrates, structural support, anchorage, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Coordinate installation of unit skylight with installation of substrates, vapor retarders, roof insulation, roofing membrane, and flashing as required to ensure that each element of the Work performs properly and that combined elements are waterproof and weathertight.
- B. Comply with recommendations in AAMA 1607 and with manufacturer's written instructions for installing unit skylights.
- C. Install unit skylights level, plumb, and true to line, without distortion.
- D. Anchor unit skylights securely to supporting substrates.
- E. Where aluminum surfaces of unit skylights will contact another metal or corrosive substrates, such as preservative-treated wood, apply bituminous coating on concealed metal surfaces or provide other approved permanent separation recommended in writing by unit skylight manufacturer.

3.3 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- B. After completion of installation and nominal curing of sealant and glazing compounds but before installation of interior finishes, test for water leaks according to AAMA 501.2.
- C. Perform test for total area of each unit skylight.
- D. Work will be considered defective if it does not pass tests and inspections.
- E. Additional testing and inspections, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
- F. Prepare test and inspection reports.

3.4 CLEANING

- A. Clean exposed unit skylight surfaces according to manufacturer's written instructions. Touch up damaged metal coatings and finishes.
- B. Remove excess sealants, glazing materials, dirt, and other substances.
- C. Remove and replace glazing that has been broken, chipped, cracked, abraded, or damaged during construction period.
- D. Protect unit skylight surfaces from contact with contaminating substances resulting from construction operations.

END OF SECTION 086200

SECTION 087100 – DOOR HARDWARE**PART 1 - GENERAL****1.1 SUMMARY****A. Section Includes:**

1. Mechanical door hardware for the following:
 - a. Swinging doors.
 - b. Sliding doors.
 - c. Folding doors.
 - d. Other doors to the extent indicated.
2. Cylinders for doors specified in other Sections.
3. Electrified door hardware.

1.2 ADMINISTRATIVE REQUIREMENTS**A. Coordination:**

1. Installation Templates: Distribute for doors, frames, and other Work specified to be factory prepared. Check Shop Drawings of other Work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.
2. Security: Coordinate installation of door hardware, keying, and access control with Owner's security consultant.
3. Electrical System Roughing-In: Coordinate layout and installation of electrified door hardware with connections to power supplies and building safety and security systems.

B. Pre-Submittal Hardware and Keying Conference: Conduct conference at Project site to comply with requirements in Section 013100 - Project Management and Coordination prior to preparing final submittals, including Owner, Architect, and supplier of hardware to determine the following:

1. Lock Function: Demonstrate function/type of each lockset scheduled and verify function at each door.
2. Electrical Operation: Verify function of openings requiring electrified hardware.
3. Keying Schedule: Provide keying schedule with keying designations conforming to Door and Hardware Institute document "Keying Systems and Nomenclature" prior to ordering permanent cores. Determine keying requirements for preparation of final keying schedule.
4. Submit letter of compliance, indicating when this meeting was held and who was in attendance, to Architect, Owner, and hardware supplier.

C. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Section 013100 - Project Management and Coordination. Review methods and procedures related to electrified door hardware including the following:

1. Attendees: Architect, Owner, Contractor, door hardware supplier, door and frame supplier, and installers of Work of this Section and of Work related to this Section.
2. Review materials, procedures and coordinating related Work.
3. Inspect and discuss electrical roughing-in and other preparatory Work, including Work performed by other trades.
4. Review sequence of operation for each type of electrified door hardware.
5. Review and finalize construction schedule and verify availability of materials, installer's personnel, equipment, and facilities needed to make progress and avoid delays.

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6. Review required testing, inspecting, and certifying procedures.
 7. Record minutes of meeting, indicating when it was held and who was in attendance, and submit to Owner, Architect, and hardware supplier.
- D. Keying Conference: Conduct conference at Project site to comply with requirements in Section 013100 - Project Management and Coordination.
1. Attendees: Owner, Contractor, and Architect, Installer's Architectural Hardware Consultant.
 2. Incorporate keying meeting decisions into final keying schedule after reviewing door hardware keying system including the following:
 - a. Function of building, flow of traffic, purpose of each area, degree of security required, and plans for future expansion.
 - b. Preliminary key system schematic diagram.
 - c. Requirements for key control system.
 - d. Requirements for access control.
 - e. Address for delivery of keys.
- E. Postinstallation Conference: After installation of hardware, conduct conference at Project site to comply with requirements in Section 013100 - Project Management and Coordination. Review methods and procedures related to electrified door hardware including the following:
1. Attendees: Architect, Owner, Contractor, Installer's Architectural Hardware Consultant (AHC), door hardware supplier, door and frame supplier, manufacturers representative of continuous hinges, locks, closers, and exit devices, and installers of Work of this Section and of Work related to this Section.
 2. Inspect hardware for proper installation and function.
 3. Schedule follow-up meeting with Architect, Owner, hardware supplier, and manufacturers' representatives to explain functions and use and maintenance of hardware installed.
 4. Record minutes of meetings, indicating when it was held and who was in attendance, and submit to Owner, Architect, and hardware supplier.
- 1.3 ACTION SUBMITTALS
- A. Product Data: For each type of product.
1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
- B. Shop Drawings: Details of electrified door hardware.
1. Wiring Diagrams: Power, signal, and control wiring. Verify voltage with electrical engineer. Include the following:
 - a. Schematic diagram of systems that interface with electrified door hardware.
 - b. Point-to-point wiring diagram indicating detailed interface between electrified door hardware, fire alarm, and security systems. Clarify between manufacturer-installed and field-installed wiring.
 - c. Riser diagram, including electrified components, gage of wire, and wire run.
 - d. Elevation of doors controlled by electrified door hardware.
 2. Detail interface between electrified door hardware and fire alarm, access control, security, and building control system.
 3. Operation Narrative: Describe operation of doors controlled by electrified door hardware.
- C. Samples for Verification: For each type of exposed product, in each finish specified.

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1. Sample Size: Full units or minimum 2-by-4-inch Samples for sheet and 4 inch long Samples for other products.
 - a. Full-size Samples will be returned to Contractor. Units that are acceptable and remain undamaged through submittal, review, and field comparison process may, after final check of operation, be incorporated into Work, within limitations of keying requirements.
 2. Tag Samples with full product description to coordinate Samples with door hardware schedule.
- D. Door Hardware Schedule: Prepared by or under the supervision of Installer's Architectural Hardware Consultant (AHC). Coordinate door hardware schedule with doors, frames, and related Work to ensure proper size, thickness, hand, function, and finish of door hardware.
1. Hardware schedules submitted without AHC's signature will be rejected without review.
 2. Submittal Sequence: Submit final door hardware schedule before or concurrent with submissions of Product Data, Shop Drawings, and Samples. Coordinate submission of door hardware schedule with scheduling requirements of other Work to facilitate fabrication of other Work that is critical in Project construction schedule.
 3. Format: Use same scheduling sequence, format, and door numbers indicated in Contract Documents.
 4. Content: Include the following information:
 - a. Identification number, location, hand, fire rating, and material of each door and frame.
 - b. Locations of each door hardware set, cross-referenced to Drawings on floor plans and to door and frame schedule.
 - c. Complete designations, including name and manufacturer, type, style, function, size, quantity, and finish of each door hardware item.
 - d. Description of each electrified door hardware function, including location, sequence of operation, and interface with other building control systems.
 - 1) Sequence of Operation: Include description of component functions that occur in the following situations: Authorized person wants to enter; authorized person wants to exit; unauthorized person wants to enter; unauthorized person wants to exit.
 - e. Fastenings and other pertinent information.
 - f. Explanation of abbreviations, symbols, and codes contained in schedule.
 - g. Mounting locations for door hardware.
 - h. Door and frame sizes and materials.
 - i. List of related door devices specified in other Sections for each door and frame.
- E. Keying Schedule: Prepared by or under the supervision of Installer's Architectural Hardware Consultant, detailing Owner's final keying instructions for locks. Include schematic keying diagram and index each key set to unique door designations that are coordinated with the Contract Documents.
- 1.4 INFORMATIONAL SUBMITTALS
- A. Qualification Data: For Installer and Architectural Hardware Consultant.
 - B. Product Certificates: For electrified door hardware.
 1. Certify that door hardware approved for use on types and sizes of labeled fire-rated doors complies with listed fire-rated door assemblies.
 - C. Product Test Reports: For compliance with accessibility requirements, for tests performed by manufacturer and witnessed by a qualified testing agency, for door hardware on doors located in accessible routes.

- D. Sample Warranty: For special warranty.

1.5 CLOSEOUT SUBMITTALS

- A. Operating and Maintenance Data: For each type of door hardware to include in maintenance manuals, including the following:
1. Maintenance instructions and warranty information for each item of hardware.
 2. Catalog pages for each product.
 3. Contact information for supplier of hardware and local representatives of each product manufacturer.
 4. Parts list for each product.
- B. Schedules: Final door hardware schedule, keying schedule, and wiring diagrams.

1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
- B. Maintenance Tools and Instructions: Furnish complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of door hardware.
- C. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
1. Door hardware.
 2. Electrical parts.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications: Supplier of products, with minimum of three years' experience in installation of commercial hardware similar to that required for this Project, is an employer of workers trained and approved by product manufacturers, and employs an Architectural Hardware Consultant (AHC) who is available during the course of the Work to consult Contractor, Architect, and Owner about door hardware and keying.
1. Successfully completed not less than five comparable scale projects.
 2. Warehousing Facilities: In Project's vicinity.
 3. Scheduling Responsibility: Preparation of door hardware and keying schedules.
 4. Engineering Responsibility: Preparation of data for electrified door hardware, including Shop Drawings, based on testing and engineering analysis of manufacturer's standard units in assemblies similar to those indicated for this Project.
- B. Installer Qualifications - Low Energy Power Operator: Certified by The American Association of Automatic Door Manufacturers (AAADM) or manufacturer's certified Power Operator Preferred Installer (POPI) for both installation and maintenance of operator units specified for Project. Install and maintain low energy operators per ANSI 156.19, ANSI 117.1, NFPA 101 and local applicable codes.
1. Minimum Experience: Not less than three years in installation and service of automatic door equipment of same manufacturer.
 2. Maintenance Proximity: Not more than one hour normal travel time from Installer's place of business and Project site.

- C. Hardware Supplier Qualifications: Industry-recognized commercial hardware supplier that maintains and operates an office and stocking warehouse in Project area for at least two years, which is not more than one-half day of travel from Project site, and can document experience with projects of similar type and scale.
1. Consulting services include overseeing scheduling, coordinating of hardware, establishing keying schedule, and being available during construction to consult with Contractor, Architect, and Owner about mechanical and electrical door hardware specified.
- D. Architectural Hardware Consultant Qualifications: A person who is experienced in providing consulting services for door hardware installations that are comparable in material, design, and extent to that indicated for this Project and who is currently certified by DHI as an Architectural Hardware Consultant (AHC) and an Electrified Hardware Consultant (EHC).

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Package hardware to prevent damage during transit and storage. Deliver products in original unopened packaging with legible manufacturer's identification.
1. Store hardware in a secured and dry environment to protect against loss, theft and damage.
- B. Deliver complete shipment of door hardware as detailed in Door Hardware Schedule and per approved Shop Drawings.
- C. Inventory door hardware on receipt and provide secure lock-up for door hardware delivered to Project site.
1. Compare delivered hardware to approved Hardware Schedule. Report shortage of products or damaged products to Architect and supplier within 24 hours of delivery. Shortages not reported are Contractor's responsibility and will not be an additional cost to Owner.
- D. Tag each item or package separately with identification coordinated with the final door hardware schedule, and include installation instructions, templates, and necessary fasteners with each item or package.
- E. Deliver keys to manufacturer of key control system for subsequent delivery to Owner.
- F. Deliver keys, permanent cores, and related accessories directly to Owner via registered mail or overnight package service.
- G. Electronic Access Control Hardware Requirements: Do not store electronic access control hardware, software or accessories at Project site without prior authorization and climate controlled facility. Failure to do so will void electronic warranties.

1.9 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of door hardware that fail in materials or workmanship within specified warranty period.
1. Failures include the following:
 - a. Structural failures including excessive deflection, cracking, or breakage.
 - b. Faulty operation of doors and door hardware.
 - c. Deterioration of metals, metal finishes, and other materials beyond normal weathering and use.

2. Warranty Period: Begins from date of Substantial Completion, unless otherwise indicated.
 - a. Mechanical Grade One Locksets: Seven years
 - b. Electrified locksets: Two years
 - c. Electromechanical and Electronic Products: Two years.
 - d. Exit Devices: Two years.
 - e. Panic Exit Hardware Trim: Five years.
 - f. Mechanical Door Closer Body: 10 years
 - g. Low-Energy Operators: Two years.
 3. Repair defects from faulty materials or workmanship developed during guarantee period, or replace with new materials, at no expense to Owner.
- B. Low Energy Power Operators: Provide extended warranty from defects in material or workmanship under normal use for a period of three years from date of Substantial Completion for units installed by a certified power operator Installer per manufacturer's written warranty certificate.

PART 2 - PRODUCTS

2.1 SCHEDULED DOOR HARDWARE

- A. Provide door hardware for each door as scheduled in Part 3 Door Hardware Schedule Article and on Drawings to comply with requirements in this Section.
1. Door Hardware Sets: Provide quantity, item, size, finish or color indicated, and named manufacturers' products. Where named manufacturers' products are not indicated, provide products complying with BHMA designations referenced.
 2. Sequence of Operation: Provide electrified door hardware function, sequence of operation, and interface with other building control systems indicated.
- B. Designations: Requirements for design, grade, function, finish, size, and other distinctive qualities of each type of door hardware are indicated in Part 3 Door Hardware Schedule Article. Products are identified by using door hardware designations, as follows:
1. Named Manufacturers' Products: Manufacturer and product designation are listed for each door hardware type required for purpose of establishing minimum requirements. Manufacturers' names are abbreviated in Part 3 Door Hardware Schedule Article.
 2. References to BHMA Designations: Where products are not specified by name, provide products complying with BHMA designations and requirements for description, quality, and function.
- C. Source Limitations: Obtain each type of door hardware from a single manufacturer unless indicated otherwise.
1. Provide electrified door hardware from same manufacturer as mechanical door hardware, unless otherwise indicated. Manufacturers that perform electrical modifications and that are listed by a testing and inspecting agency acceptable to authorities having jurisdiction are acceptable.

2.2 PERFORMANCE CRITERIA

- A. Fire-Rated Door Assemblies: Where fire-rated door assemblies are indicated, provide door hardware rated for use in assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at positive pressure per NFPA 252 or UL 10C, unless otherwise indicated.

1. This requirement takes precedence over other requirements for such hardware. Provide hardware that has been tested and listed by UL for type and size of door required, and complies with requirements of door and doorframe labels. Latching hardware, door closers, ball bearing hinges, and seals are required whether or not listed in Hardware schedule.
- B. Smoke- and Draft-Control Door Assemblies: Where smoke- and draft-control door assemblies are required, provide door hardware that meets requirements of assemblies tested per UL 1784 and installed per NFPA 105.
 1. Air Leakage Rate: Maximum air leakage of 0.3 cfm per square foot at the tested pressure differential of 0.3 inch wg of water.
- C. Electrified Door Hardware: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction.
- D. Means of Egress Doors: Latches do not require more than 15 pound-force to release latch. Locks do not require use of a key, tool, or special knowledge for operation.
- E. Accessibility Requirements: For door hardware on doors in an accessible route, comply with U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines and ICC/ANSI A117.1.
 1. Provide operating devices that do not require tight grasping, pinching, or twisting of wrist and that operate with a force of not more than 5 pound-force.
 2. Comply with the following maximum opening-force requirements:
 - a. Interior, Non-Fire-Rated Hinged Doors: 5 pound-force applied perpendicular to door.
 - b. Sliding or Folding Doors: 5 pound-force applied parallel to door at latch.
 - c. Fire Doors: Minimum opening force allowable by authorities having jurisdiction.
 3. Bevel raised thresholds with a slope of not more than 1:2. Provide thresholds not more than 1/2 inch high.
 4. Adjust door closer sweep periods so that, from an open position of 70 degrees, door will take at least 3 seconds to move to a point 3 inches from the latch, measured to leading edge of door.
- F. Electromechanical Hardware:
 1. Electrical products contained in this Specification represent a complete engineered system. If alternate electrical products are submitted, it is responsibility of supplier to bear cost of providing complete and working system including re-engineering of electrical diagrams and system layout, as well as power supplies, power transfers, and required electrical components. Coordinate with electrical engineer and electrician to ensure that line voltage and low voltage wiring is coordinated to provide a complete and working system.
 2. For each item of electrified hardware specified, provide standardized Molex plug connectors to accommodate up to 12 wires. Molex plug connectors shall plug directly into through-door wiring harnesses, frame wiring harnesses to power supplies.
 - a. If plug connectors are not available, coordinate installation and hook-up of hardware with a company that is licensed by Local Electricity Board.
 - b. Electrified Hinges: UL fire tested and listed for labeled doors up to and including Class "A".
 3. Where Electrified functions are specified, provide manufacturer's recommended power supply that is filtered and regulated; and listed and labeled for use with fire alarm systems, with power sufficient to operate electrified function specified.
 4. Electrical: Electrical boxes in walls, electrical service, conductors, and final connections are specified in Division 26:

2.3 HINGES

- A. Hinges: Provide template-produced hinges for hinges installed on hollow-metal doors and hollow-metal frames. BHMA A156.1. Listed under Category A in BHMA's "Certified Product Directory."
 - 1. Manufacturers: Subject to compliance with requirements, provide specified products by one of the following:
 - a. Bommer Industries, Inc.
 - b. Hager Companies.
 - c. IVES Hardware; an Allegion company.
 - d. McKinney Products Company; an ASSA ABLOY Group company.
 - e. Stanley Commercial Hardware; Div. of Stanley Security Solution Inc.
- B. Provide hinges with anti-friction bearings for doors scheduled to receive closers.
- C. Hinge Sizes: Provide hinges in widths sufficient to minimally clear trim to allow a door to swing fully open without striking door frame or adjacent wall.
 - 1. Height:
 - a. 1 pair per leaf for openings through 60 inches high.
 - b. 1 additional hinge per leaf for each additional 30 inches in height or fractions thereof.
 - 2. Width:
 - a. Doors up to and including 36 inches wide: 4-1/2 inch by 4-1/2 inch and 0.134 inch thick.
 - b. Doors over 36 inches up to and including 42 inches wide: 5 inch by 4-1/2 inch and 0.180 inch thick.
 - c. Doors over 42 inches up to and including 48 inches wide: 5 inch by 4-1/2 inch and 0.190 inch thick.
 - 3. 1 additional hinge for exterior doors.
- D. Applications:
 - 1. Exterior out swinging doors: Type 5 x NRP.
 - 2. Exterior in swinging doors and vestibule doors: Type 4.
 - 3. Interior doors with closers: Type 2 or 4.
 - 4. Interior doors over 36 inches in width: Type 4.
 - 5. Interior doors 36 inches or less without closer: Type 2.
 - 6. Exterior and reversed beveled interior lockable doors: Non-removable loose pin (NRP) hinges.
 - 7. Tips: Flat button type unless indicated otherwise in hardware groups.

<u>Type</u>	<u>Bommer</u>	<u>Hager</u>	<u>IVES</u>	<u>McKinney</u>
Type 2 (0.134 in.)	BB5000	BB1279		TA2714
Type 3 (0.134 in.)	BB5002	BB1191	5BB1	TA2314
Type 4 (0.180 in.)	BB5004	BB1168	5BB1	T4A3786
Type 5 (0.190 in.)	BB5006	BB1199	5BB1HW	T4A3386

2.4 CONTINUOUS HINGES

- A. Continuous Pin-and-Barrel Hinges: BHMA A156.26, Grade 1; minimum 0.120 inch thick, hinge leaves with minimum overall width of 4 inches; fabricated to full height of door and frame and to template screw locations; with components finished after milling and drilling are complete. Non-handed, edge mount unless otherwise specified. Geared type hinges are not acceptable.
 - 1. Material: Heavy-duty 0.075 inch stainless steel, unless otherwise scheduled.

- 2. Tip: Flat-button type at public areas and cross-corridors.
- 3. Knuckles: 2 inch long, including split nylon-bearing at each separation; quiet, smooth, self-lubricating operation.
 - a. Medical Bearing: "MB" Specially designed to provide clean and quiet operation and self lubricating with high resistance to wear.
- 4. Adjusting Screws: Adjustable to correct frame irregularities up to 3/8 inch.
- 5. Finish: US32D Satin, unless otherwise scheduled.

	<u>Hager</u>	<u>Markar</u>	<u>McKinney</u>	<u>Pemko</u>	<u>Stanley</u>
Concealed	790-900	FM-300	MCK-FM300	SPBMF	651

2.5 LOCKS

- A. Lock Functions: As indicated in door hardware schedule.
- B. Lock Throw: Comply with testing requirements for length of bolts required for labeled fire doors, and as follows:
 - 1. Mortise Locks: Minimum 3/4 inch latchbolt throw.
 - 2. Deadbolts: Minimum 1 inch bolt throw.
 - 3. Pairs of Doors: Minimum 3/4 inch latchbolt throw.
- C. Lock Backset: 2-3/4 inch, with deadlocking feature unless otherwise indicated.
- D. Lock Trim:
 - 1. Description: Lustra by Corbin Russwin – Basis of Design.
 - 2. Levers: Cast or wrought and free-wheeling.
 - 3. Escutcheons (Roses): Wrought.
 - 4. Operating Device: Lever with roses.
- E. Strikes: Provide manufacturer's standard strike for each lock bolt or latchbolt complying with requirements indicated for applicable lock or latch and with strike box and curved lip extended to protect frame; finished to match lock or latch.
 - 1. Curved Lip Strikes: For locks sized per Door and Hardware Institute.
 - 2. Extra-Long-Lip Strikes: For locks used on frames with applied wood casing trim.
 - 3. Aluminum-Frame Strike Box: Manufacturer's special strike box fabricated for aluminum framing.
 - 4. Rabbet Front and Strike: Provide on locksets for rabbeted meeting stiles.
- F. Mortise Locksets: BHMA A156.13; Operational Grade 1; stamped steel case with steel or brass parts; Series 1000.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Corbin Russwin, Inc.; an ASSA ABLOY Group company.
 - b. SARGENT Manufacturing Company; an ASSA ABLOY Group company.
 - c. Schlage Commercial Lock Division; an Allegion company.

	<u>Corbin-Russwin</u>	<u>Sargent</u>	<u>Schlage</u>
Lock	ML2000	8200	L-9000
Sectional Trim	LWA	LNJ	03A

- 2. Provide locks with reversible handing of lock without disassembly of lock.

3. Locate mortise locks so that centerline on lever matches centerline of levers of cylindrical locks.

2.6 MANUAL FLUSH BOLTS

- A. Manual Flush Bolts: BHMA A156.16; Grade 1; minimum 3/4 inch throw; designed for mortising into door edge.
 1. Manufacturers: Subject to compliance with requirements, provide specified products by one of the following:
 - a. Adams Rite Manufacturing Co.; an ASSA ABLOY Group company.
 - b. Burns Manufacturing Incorporated.
 - c. Door Controls International, Inc.
 - d. Hager Companies.
 - e. Hiawatha, Inc.
 - f. IVES Hardware; an Allegion company.
 - g. Rockwood Manufacturing Company; an ASSA ABLOY Group company.
 - h. Trimco.

	<u>DCI</u>	<u>Hager</u>	<u>Ives</u>	<u>Rockwood</u>	<u>Trimco</u>
Manual-Metal Door	780F	282D	FB458	555	3917
Manual- Wood Door	790F	283D	FB358	557	3913

- B. Manual Flush Bolts – Aluminum Entrances: BHMA A156.16; Grade 1; minimum 3/4 inch throw; designed for use with aluminum stile entrances and deadbolt lock. Provide flush bolt manufacturer's strikes, bolt guides, and related hardware.
 1. Manufacturers: Subject to compliance with requirements, provide specified products by the following:
 - a. Adams Rite Manufacturing Co.; an ASSA ABLOY Group company.
 2. Threshold Bolt: Part Number 4015.
 3. Header Bolt-1: Part Number 4016.
 4. Header Bolt-2: Part Number 4085 for pairs of doors only.

2.7 AUTOMATIC AND SELF-LATCHING FLUSH BOLTS

- A. Automatic and Self-Latching Flush Bolts: BHMA A156.16; Grade 1; minimum 3/4 inch throw; designed for mortising into door edge.
 1. Manufacturers: Subject to compliance with requirements, provide specified products by one of the following:
 - a. Door Controls International, Inc.
 - b. Hager Companies.
 - c. IVES Hardware; an Allegion company.
 - d. Rockwood Manufacturing Company; an ASSA ABLOY Group company.
 - e. Trimco.

	<u>DCI</u>	<u>Hager</u>	<u>Ives</u>	<u>Rockwood</u>	<u>Trimco</u>
Self-Latch- Metal Door	845	294D	FB61P	2845	3820
Dust Proof Strike	82	280X	DP2	570	3911

2.8 EXIT DEVICES AND AUXILIARY ITEMS

A. Exit Devices and Auxiliary Items: BHMA A156.3, Grade 1.

1. Manufacturers: Subject to compliance with requirements, provide specified products by one of the following:
 - a. Corbin Russwin, Inc.; an ASSA ABLOY Group company.
 - b. Precision Hardware, Inc.; Division of Stanley Security Solutions, Inc.
 - c. SARGENT Manufacturing Company; an ASSA ABLOY Group company.
 - d. Von Duprin; an Allegion company.
2. Provide exit devices UL listed for panic exit hardware based on testing per UL 305.
3. Fire-Rated Doors: Provide exit devices complying with NFPA 80 and UL listed as "Fire Exit Hardware" based on testing per UL 305 and NFPA 252.
4. Provide exit devices by single manufacturer.
5. Provide vandal resistant outside trim to discourage abuse when door is locked. Provide trim with lever design to match locks.
6. Provide device where noted with a photoluminescent coating which will produce visible EXIT signage in darkness or low lit areas similar to Yale "LUM".
7. Provide cylinder dogging on non-rated devices.
8. For doors with narrow stiles, or as listed in hardware sets, provide devices designed for maximum 2 inch wide stiles.
9. Provide devices with a heavy duty flush end cap.
10. Removable Mullions: Keyed.
11. Electrified Options: Where scheduled in hardware sets, provide electrified exit device options, including: electric latch retraction, exit alarm, and request-to-exit signaling. Unless otherwise indicated, provide electrified exit devices standard as fail secure.
 - a. Provide manufacturer's recommended power supply that is filtered and regulated; and listed and labeled for use with fire alarm systems, with power sufficient to operate electrified function specified.

	<u>Corbin-Russwin</u>	<u>Sargent</u>	<u>Von Duprin</u>
Narrow Stile	ED4000	AD8500	35A Series
Wide Stile	ED5000	80 Series	98 Series
Escutcheon/Pull	TH937	ET Trim	990NL

2.9 LOCK CYLINDERS

A. Lock Cylinders: Tumbler type, constructed from brass or bronze, stainless steel, or nickel silver.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following: Provide cylinders from the following to match Owner's existing key system.
 - a. Corbin-Russwin Architectural Hardware; an ASSA ABLOY Group company.
 - b. Medeco Security Locks, Inc.; an ASSA ABLOY Group company.
 - c. SARGENT Manufacturing Company; an ASSA ABLOY Group company.
 - d. Schlage Commercial Lock Division; an Allegion company.

B. Standard Lock Cylinders: BHMA A156.5; Grade 1; face finished to match lockset.

C. Construction Master Keys: Provide cylinders with feature that permits voiding of construction keys without cylinder removal. Provide 10 construction master keys.

2.10 KEYING

- A. Keying System: Factory registered, complying with guidelines in BHMA A156.28, Appendix A. Incorporate decisions made in keying conference.
1. Key cylinders per school district lock shop requirements.
 2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Corbin Russwin, Inc.; an ASSA ABLOY Group company.
 - b. Medeco Security Locks, Inc.; an ASSA ABLOY Group company.
 - c. SARGENT Manufacturing Company; an ASSA ABLOY Group company.
 - d. Schlage Commercial Lock Division; an Allegion company.
 - e. Yale Security Inc.; an ASSA ABLOY Group company.
- B. Keys: Nickel silver, factory-cut keys furnished with large bow.
1. Stamping: Permanently inscribe each key with a visual key control number and include the following notation:
 - a. Notation: "DO NOT DUPLICATE."
 2. Quantity: In addition to 1 extra key blank for each lock, provide the following:
 - a. Change Keys: 3 each per cylinder or keyed alike group.
 - b. Control Keys: 2 each.
 - c. Extra Key Blanks: 50 each.
 - d. Master Keys: 6 each per master key group.
 - e. Construction Control Keys: 2 each.
 - f. Construction Keys: 15 each.
 3. Ship permanent keys, cores, master keys, change keys, and additional key blanks, permanent control keys, and bitting list indicating bitting generated for this Project, directly to Owner, via registered mail. Shipment shall be complete, with keys enveloped in sets and tagged with key set numbers (with proper code numbers and factory file or folio number). Do not pack permanent keys and cores with locks. If permanent keys, cores, or both are sent anywhere other than previously stated, replace at no additional cost to Owner.
 - a. Forward Owner's Key System Registration Certificates, which shall accompany each procurement during construction period, to hardware supplier.

2.11 KEY CONTROL SYSTEM

- A. Key Control Cabinet: BHMA A156.5, Grade 1; metal cabinet with baked-enamel finish; containing key-holding hooks, labels, 2 sets of key tags with self-locking key holders, key-gathering envelopes, and temporary and permanent markers; with key capacity of 150 percent of number of locks.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. American Key Boxes and Cabinets.
 - b. GE Security, Inc.
 - c. HPC, Inc.
 - d. Lund Equipment Co., Inc.
 - e. MMF Industries.
 - f. Tri Palm International.

2. Multiple-Drawer Cabinet: Cabinet with drawers equipped with key-holding panels and key envelope storage, and progressive-type ball-bearing suspension slides. Include single cylinder lock to lock all drawers.
 3. Wall-Mounted Cabinet: Cabinet with hinged-panel door equipped with key-holding panels and pin-tumbler cylinder door lock.
 4. Portable Cabinet: Tray for mounting in file cabinet, equipped with key-holding panels, envelopes, and cross-index system.
- B. Key Lock Boxes: Recess- mounted unit. 1/4 inch plate steel housing, 1/2 inch thick steel door with interior gasket seal and stainless steel door hinge, designed for storage of 10 keys.
1. Products: Subject to compliance with requirements, provide one of the following:
 - a. ABLOY Security, Inc.; an ASSA ABLOY Group company (ABL).
 - b. Knox Company (KNX): 3200 Series KNOX-BOX.
 2. Exterior Dimensions:
 - a. Surface Mounted: 4 inch H by 5 inch W by 3 1/4 inch D.
 3. Lock: UL Listed. Double-action rotating tumblers and hardened steel pins accessed by biased cut key. 1/8 inch thick stainless steel dust cover.
 4. Finish: Manufacturer's standard finish.
- C. Cross-Index System: Single-index system for recording key information. Include 3 receipt forms for each key-holding hook. Set up by installer.
1. Manufacturers: Subject to compliance with requirements, provide Regent Wall Cabinet Series by Tri Palm International or comparable product from one of the following:
 - a. Lund Equipment Co., Inc.
 - b. MMF Industries.
 2. Material: 0.0478 inch thick cold-rolled steel with manufacturer's gray paint.
 3. Hinges: "No-sag", continuous piano-type.
 4. Door: Provide nickel-plated brass, pin tumbler lock and 2 keys.
 5. Size: Minimum 16-1/4 inch H by 12-1/8 inch W by 5 inch D.
 6. Key Capacity: Minimum of 50 keys per panel.

2.12 OPERATING TRIM

- A. Operating Trim: BHMA A156.6; stainless steel, unless otherwise indicated.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Burns Manufacturing Incorporated.
 - b. Forms + Surfaces.
 - c. Hager Companies.
 - d. Hiawatha, Inc.
 - e. IVES Hardware; an Allegion company.
 - f. Rockwood Manufacturing Company; an ASSA ABLOY Group company.
 - g. Trimco.

2.13 ACCESSORIES FOR PAIRS OF DOORS

- A. Coordinators: BHMA A156.3; consisting of active-leaf, hold-open lever and inactive-leaf release trigger; fabricated from steel with nylon-coated strike plates; with built-in, adjustable safety release; and with internal override.
 - 1. Manufacturers: Subject to compliance with requirements, provide specified products by one of the following:
 - a. Door Controls International, Inc.
 - b. Hager Companies.
 - c. IVES Hardware; an Allegion company.
 - d. Rockwood Manufacturing Company; an ASSA ABLOY Group company.
 - e. Trimco.

	<u>DCI</u>	<u>Hager</u>	<u>Ives</u>	<u>Rockwood</u>	<u>Trimco</u>
Bar Type Coordinator	600 Series	297D	COR7G	1600	3094

2.14 SURFACE CLOSERS

- A. Surface Closers: BHMA A156.4 Grade 1; cast iron body, rack-and-pinion hydraulic type with adjustable sweep and latch speeds controlled by key-operated valves and forged-steel main arm. Comply with manufacturer's written recommendations for size of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Provide non-handed, multi-sized closers, adjustable to meet field conditions and requirements for opening force.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Corbin Russwin, Inc.; an ASSA ABLOY Group company.
 - b. LCN Closers; an Allegion company.
 - c. Norton Door Controls; an ASSA ABLOY Group company.
 - d. SARGENT Manufacturing Company; an ASSA ABLOY Group company.

	<u>Corbin-Russwin</u>	<u>LCN</u>	<u>Norton</u>	<u>Sargent</u>
Heavy Duty.	DC6000	4040XP	7500	281

- 2. Fully adjustable type, with complete spring power adjustment, sizes 1 through 6.
- 3. Provide closers with swing, latch, and backcheck features.
- 4. Provide heavy-duty spring stop with hold open where scheduled.
- 5. Coordinate with door supplier to provide proper blocking for surface mounting. Use of through-bolts is not acceptable.
- 6. Where closers are indicated to be closer/stops, provide heavy-duty arms with means of positive stop. For closer/holders, provide heavy-duty units with additional built-in mechanical holder assembly. Manually select holder to off/on position.
- 7. Install closers using only manufacturer-furnished template machine screws for metal doors and manufacturer -furnished wood screws for wood doors.
 - a. Use of self-drilling or self-tapping fasteners is not allowed.
- 8. Accessories: Mounting brackets, drop plates, special shoes required by door and frames conditions.

2.15 LOW ENERGY DOOR OPERATORS

- A. General: Provide operators of size recommended by manufacturer for door size, weight, and movement; for condition of exposure; for long-term, maintenance-free operation under normal traffic load for type of occupancy indicated; and complying with UL 325. Coordinate operator mechanisms with door operation, hinges, and activation and safety devices.
1. Wind Load: Provide door operators on exterior doors that will open and close doors and maintain them in fully closed position when subjected to wind load of 30.
- B. Electromechanical Operating System: Self-contained unit powered by permanent-magnet dc motor; with closing speed controlled mechanically by gear train and dynamically by braking action of electric motor, connections for power and activation- and safety-device wiring, and manual operation including spring closing when power is off.
1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Besam Entrance Solutions; Subsidiary of ASSA ABLOY Entrance Systems: SW100.
 - b. DORMA Architectural Hardware: ED900 ED700 Series.
 - c. Horton Automatics: 6100 Series.
 - d. Hunter Automatics: Hunter Low Energy HA-8.
 - e. LCN Closers; an Allegion company: 9100 Series.
 - f. Nabco Entrances Inc.: Model GT350 GT500 Bottom Load or GT8350 GT8500 Side Load Swing Door System
 - g. Norton Door Controls; an ASSA ABLOY Group company: 5900 Series.
 - h. record-usa: Series 6100 Electromechanical Automatic Operator.
 - i. Stanley Access Technologies: Magic-Swing Series.
- C. Electrical Requirements: Coordinate power requirements for operation of operator with Division 26. Coordinate fire-alarm contracts as required.
- D. Standard: BHMA A156.19.
- E. Performance Criteria:
1. Opening Force if Power Fails: Not more than 15 pound-force required to release a latch if provided, not more than 30 pound-force required to manually set door in motion, and not more than 15 pound-force required to fully open door.
 2. Entrapment Protection: Not more than 15 pound-force required to prevent stopped door from closing or opening.
- F. Cover for Surface-Mounted Operators: Fabricated from 0.125 inch thick extruded or formed aluminum; manufacturer's standard width; with enclosed end caps, provision for maintenance access, and fasteners concealed when door is in closed position.
- G. Brackets and Reinforcements: Manufacturer's standard, fabricated from aluminum with nonstaining, nonferrous shims for aligning system components.
- H. Operation: Provide time delay for door to remain open before initiating closing cycle as required by BHMA A156.19. When not in automatic mode, door operator shall function as manual door closer, with or without electrical power.
- I. Features:
1. Adjustable opening and closing speed.
 2. Adjustable opening and closing force.

3. Adjustable backcheck.
4. Adjustable hold-open time from zero to 30 seconds.
5. Adjustable time delay.
6. Adjustable acceleration.
7. Obstruction recycle.
8. On-off/hold-open switch to control electric power to operator; key operated unless indicated otherwise.

J. Exposed Finish:

1. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
2. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
3. Apply organic and anodic finishes to formed metal after fabrication unless otherwise indicated.
4. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within range of approved Samples and are assembled or installed to minimize contrast.
5. Clear Anodic Finish: AAMA 611, AA-M12C22A41, Class I, 0.018 mm or thicker.

K. Fire-Rated Doors: Provide door operators for fire-rated door assemblies that comply with NFPA 80 for fire-rated door components and are listed and labeled by qualified testing agency.

1. Fire-Door Package: UL-listed latch mechanism, power-reset box, and caution signage for fire-rated doors. Latch mechanism shall allow door to swing free during automatic operation. When fire is detected, latch actuator shall cause exit hardware to latch when door closes. Provide latch actuators with fail-secure design.

L. Actuating Controls: Formed stainless steel plate, satin finish; with depressed marking; 2 required per opening. Handicapped symbol, filled blue.

1. Activation Switch Plate: ADA compliant, Type 304 stainless steel, 4-1/2 inch round cover plate, with brushed finish. Provide weather-resistant units at exterior applications.
 - a. Basis-of-Design Product: Subject to compliance with requirements, provide 4R Series Round Switch by Wikk Industries Inc. or approved substitution.
 - b. Engraved Pictorial: Engraved universal handicap symbol with "PUSH TO OPEN" lettering with blue infill.
 - c. Switch Mechanism: Single pole double throw (SPDT) snap-action switch, UL labeled for 15 amp, 120 VAC.
2. Surface Mounts: 7-1/4 inch round by 1-13/64 inch deep escutcheon plate fabricated from Type 304 stainless steel with brushed finish to match activation switch plate.
 - a. Basis-of-Design Product: Subject to compliance with requirements, provide WKS-4 by Wikk Industries Inc. or approved substitution.

2.16 MECHANICAL STOPS AND HOLDERS

A. Wall- and Floor-Mounted Stops: BHMA A156.16; polished cast brass, bronze, or aluminum base metal

1. Manufacturers: Where indicated in door and hardware schedules, provide specified products from one of the following:
 - a. Door Controls International, Inc.
 - b. Hager Companies.
 - c. IVES Hardware; an Allegion company.

- d. McKinney Products Company; an ASSA ABLOY Group company.
- e. Rockwood Manufacturing Company; an ASSA ABLOY Group company.
- f. Trimco.

B. Wall-Mounted Stops:

	<u>DCI</u>	<u>Hager</u>	<u>Ives</u>	<u>Rockwood</u>	<u>Trimco</u>
Convex	3210	232W	WS401CVX	406	1270CX
Concave	3211	236W	WS401CCV	409	1270CV
Extended	3260X	255W	WS11	518	1208
Wall Holder	3487X	326W	WS40	490	1254

C. Overhead Stops and Holders: BHMA A156.8.

- 1. Manufacturers: Subject to compliance with requirements, provide specified products by one of the following:
 - a. Glynn-Johnson; an Allegion company.
 - b. Rixson Specialty Door Controls; an ASSA ABLOY Group company.
 - c. SARGENT Manufacturing Company; an ASSA ABLOY Group company.

	<u>Glynn-Johnson</u>	<u>Rixson</u>	<u>Rockwood</u>	<u>Sargent</u>
Standard Duty Surface	GJ-450	10-Series	OH1100	1701

- 2. Provide overhead stop for doors that are capable of swinging more than 145 degrees before striking wall and where door strikes fixed object such as sink, cabinet, and similar obstructions.

D. Install surface-mounted stops and holders using only manufacturer supplied template machine screws for metal doors and manufacturer supplied wood screws for wood doors. Use of self-drilling or self-tapping fasteners is not allowed.

E. Coordinate with door supplier to provide proper blocking for surface mounting. Use of through-bolts is not acceptable.

2.17 ELECTROMAGNETIC STOPS AND HOLDERS

A. Electromagnetic Door Holders: BHMA A156.15, Grade 1; wall-mounted or floor-mounted electromagnetic units with strike plate attached to swinging door; coordinated with fire detectors and interface with fire alarm system for labeled fire-rated door assemblies.

- 1. Manufacturers: Subject to compliance with requirements, provide specified products by one of the following:
 - a. LCN Closers; an Allegion company.
 - b. Rixson Specialty Door Controls; an ASSA ABLOY Group company.
 - c. SARGENT Manufacturing Company; an ASSA ABLOY Group company.

	<u>LCN</u>	<u>Rixson</u>	<u>Sargent</u>
Flush-Mount	SEM7850	FM998	1561
Surface-Mount	SEM7830	FM996	1560

- 2. UL listed, triple voltage, field-selectable units. Provide extension pieces as required to meet wall conditions.

2.18 DOOR GASKETING

- A. Gaskets and sweeps for aluminum doors are specified in Section 084113 – Aluminum Entrances and Storefronts.
- B. Door Gasketing: BHMA A156.22; air leakage not to exceed 0.50 cfm per foot of crack length for gasketing other than for smoke control, as tested per ASTM E283; with resilient or flexible seal strips that are easily replaceable and readily available from stocks maintained by manufacturer.
 - 1. Products: Subject to compliance with requirements, provide products by one of the following:
 - a. Hager Companies.
 - b. KN Crowder Manufacturing.
 - c. National Guard Products.
 - d. Pemko Manufacturing Co.; an ASSA ABLOY Group company.
 - e. Reese Enterprises, Inc.
 - f. Zero International.
 - 2. Apply to head and jamb, forming seal between door and frame. Install header seal before mounting door closer arms and rim exit strikes.
 - a. Exterior Doors: Provide continuous gaskets. Install using non-corrosive fasteners.
 - b. Interior Doors: Provide smoke, light, or sound gasketing as scheduled.
 - c. Meeting Stile Astragals: Fasten to meeting stiles, forming seal when doors are closed.

Polypropene/Alum. HD

<u>Hager</u>	<u>KNCrowder</u>	<u>NGP</u>	<u>Pemko</u>	<u>Reese</u>	<u>Zero</u>
881S	W-20N	700NA	2891APK	755A	429A

- C. Smoke Gaskets: Concealed, adhesive backed, silicone gasketing, complying with UL 1784 for interior fire-rated openings.
 - 1. Products: Subject to compliance with requirements, provide products by one of the following:
 - a. Hager Companies.
 - b. KN Crowder Manufacturing.
 - c. National Guard Products.
 - d. Pemko Manufacturing Co.; an ASSA ABLOY Group company.
 - e. Reese Enterprises, Inc.
 - f. Zero International.
 - 2. Color: As selected by Architect from manufacturer's full color range.

<u>Hager</u>	<u>KNCrowder</u>	<u>NGP</u>	<u>Pemko</u>	<u>Reese</u>	<u>Zero</u>
726S	W-22	5050C	S88	638	188S

- D. Door Sweeps: Apply to bottom of door, forming seal with threshold when door is closed.

Brush-Type w/Rain Drip

<u>Hager</u>	<u>KNCrowder</u>	<u>NGP</u>	<u>Pemko</u>	<u>Reese</u>	<u>Zero</u>
NA	W-35-1	C627A	3452CNB	354C	8198AA

- E. Rain Drips:

<u>Hager</u>	<u>KNCrowder</u>	<u>NGP</u>	<u>Pemko</u>	<u>Reese</u>	<u>Zero</u>
810S	W-3	16A	346C	R201C	Series 148

2.19 THRESHOLDS

- A. Thresholds: BHMA A156.21; full saddle, fabricated to full width of opening indicated. Provide thresholds with slip-resistant surface similar to PemKote by Pemko.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. McKinney Products Company; an ASSA ABLOY Group company.
 - b. National Guard Products.
 - c. Pemko Manufacturing Co.; an ASSA ABLOY Group company.
 - d. Reese Enterprises, Inc.
 2. Provide flat saddles at fire rated doors where combustible material is indicated on both sides.
 3. Provide saddles that result in flush conditions with adjacent finish materials.

	<u>McKinney</u>	<u>National Guard</u>	<u>Pemko</u>	<u>Reese</u>
5 inch X 1/2 inch Saddle	MCK171	425	171	S205
5 inch X 1/2 inch Panic	MCK2005	896	2005	S483
5 inch X 1/4 inch	MCK271	513	271	S405
Carpet	MCK236	414	236	S565A
Heavy Duty	MCK1715	--	1715	--

2.20 METAL PROTECTIVE TRIM UNITS

- A. Metal Protective Trim Units: BHMA A156.6; fabricated from 0.050 inch thick stainless steel; with manufacturer's standard machine or self-tapping screw fasteners.
1. Manufacturers: Subject to compliance with requirements, provide specified products by one of the following:
 - a. Burns Manufacturing Incorporated.
 - b. Hager Companies.
 - c. Hiawatha, Inc.
 - d. IVES Hardware; an Allegion company.
 - e. Rockwood Manufacturing Company; an ASSA ABLOY Group company.
 - f. Trimco.

B. Push Plates: Beveled edges (B4E).

1. Size: 8 inch by 16 inch. Provide 4 inch by 16 inch where 8 inch by 16 inch is not applicable due to door conditions.

	<u>Burns</u>	<u>Hager</u>	<u>Hiawatha</u>	<u>Rockwood</u>	<u>Trimco</u>	<u>Ives</u>
8 inch x 16 inch 8"x16"	57	30S	200K	70F	1001-11	8200

C. Push Plate - Pull Combination: Beveled edges (B4E), with round pulls.

1. Size: 4 inch by 16 inch.
2. Pulls: 1 inch diameter, 10 inch screw centers.

<u>Burns</u>	<u>Hager</u>	<u>Hiawatha</u>	<u>Rockwood</u>	<u>Trimco</u>	<u>Ives</u>
5426C	34J	200F x 536B	111 x 70C	1018-3B	8303-10

D. Kick Plates: Beveled edges (B4E).

1. Widths: 2 inches less than door width.
2. Height: 12 inches or 1/2 inch less than height of bottom rail, whichever is less.

2.21 AUXILIARY DOOR HARDWARE

- A. Auxiliary Hardware: BHMA A156.16. Where indicated in hardware groups, provide the following products.
- B. Key Switches: Stainless steel single gang face plate with 12/24 V DC bi-color LED and an integral backing bracket that permits integration with any 1.125 inch or 1.25 inch mortise cylinder.
 1. Provide key switches for DPDT maintained action, in narrow stile designs.
 2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Folger Adam Electric Door Controls; an ASSA ABLOY Group company.
 - b. Schlage Commercial Lock Division; an Allegion company – Locknetics.
 - c. Security Door Controls.
 - d. Securitron Magnalock Corporation; an ASSA ABLOY Group company

2.22 FABRICATION

- A. Manufacturer's Nameplate: Do not provide products that have manufacturer's name or trade name displayed in a visible location except in conjunction with required fire-rated labels and as otherwise approved by Architect.
 1. Manufacturer's identification is permitted on rim of lock cylinders only.
- B. Base Metals: Produce door hardware units of base metal indicated, fabricated by forming method indicated, using manufacturer's standard metal alloy, composition, temper, and hardness. Furnish metals of a quality equal to or greater than that of specified door hardware units and BHMA A156.18.
- C. Fasteners: Provide door hardware manufactured to comply with published templates prepared for machine, wood, and sheet metal screws. Provide screws that comply with commercially recognized industry standards for application intended, except aluminum fasteners are not permitted. Provide Phillips flat-head screws with finished heads to match surface of door hardware, unless otherwise indicated.
 1. Concealed Fasteners: For door hardware units that are exposed when door is closed, except for units already specified with concealed fasteners. Do not use through bolts for installation where bolt head or nut on opposite face is exposed unless it is only means of securely attaching door hardware. Where through bolts are used on hollow door and frame construction, provide sleeves for each through bolt.
 2. Fire-Rated Applications:
 - a. Wood or Machine Screws: For the following:
 - 1) Hinges mortised to doors or frames; use threaded-to-head wood screws for wood doors and frames.
 - 2) Strike plates to frames.
 - 3) Closers to doors and frames.
 - b. Steel Through Bolts: For the following unless door blocking is provided:
 - 1) Surface hinges to doors.
 - 2) Closers to doors and frames.
 - 3) Surface-mounted exit devices.

3. Spacers or Sex Bolts: For through bolting of hollow-metal doors.
4. Fasteners for Wood Doors: Comply with requirements in DHI WDHS.2, "Recommended Fasteners for Wood Doors."
5. Gasketing Fasteners: Provide noncorrosive fasteners for exterior applications and elsewhere as indicated.

2.23 FINISHES

- A. Provide finishes complying with BHMA A156.18 as indicated in door hardware schedule.
- B. Protect mechanical finishes on exposed surfaces from damage by applying strippable, temporary protective covering before shipping.
- C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within 1/2 of range of approved Samples. Noticeable variations in same piece are not acceptable. Variations in appearance of other components are acceptable if they are within range of approved Samples and are assembled or installed to minimize contrast.

Exposed Metal Finishes:	BHMA 626 / US26D = Satin Chromium plated over nickel, over brass or bronze base metal. BHMA 652 / US26D = Satin Chromium plated over nickel, over steel base metal. BHMA 630 / US32D = Satin Stainless Steel, over stainless-steel base material.
Hinges-Exterior:	630 / US32D
Hinges-Interior:	652 / US26D
Continuous Gear Hinges:	AL – Clear anodized aluminum
Continuous Pin and Barrel:	630 / US32D
Locksets:	630 / US32D
Closers:	689 / AL Aluminum painted over any base material.
Exit Devices:	630 / US32D
Pushes, Pulls, Kick Plates:	630 / US32D
Armor Plates:	630 / US32D
Door Edge Guards:	630 / US32D
Overhead Stops and Holders:	630 / US32D
Door Stops:	630 / US32D
Thresholds:	AL – Mill finish aluminum
Door Gaskets:	AL – Mill finish aluminum
Sweep Strips:	AL – Mill finish aluminum
Automatic Door Bottoms:	
(Concealed)	AL – Mill finish aluminum
(Semi-Mortised)	SN – Satin nickel anodized aluminum
Rain Drips:	AL – Mill finish aluminum
Miscellaneous Items:	US26D

1. Hardware on aluminum doors shall match finish of doors and frames.

PART 3 - EXECUTION**3.1 EXAMINATION**

- A. Examine doors and frames, with Installer present, for compliance with requirements for installation tolerances, labeled fire door assembly construction, wall and floor construction, and other conditions affecting performance.
- B. Examine roughing-in for electrical power systems to verify actual locations of wiring connections before electrified door hardware installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 preparation

- A. Steel Doors and Frames: For surface applied door hardware, drill and tap doors and frames according to ANSI/SDI A250.6.
- B. Wood Doors: Comply with door and hardware manufacturers' written instructions.

3.3 iNSTALLATION

- A. Mounting Heights: Mount door hardware units at heights indicated as follows unless otherwise indicated or required to comply with governing regulations.
 - 1. Standard Steel Doors and Frames: ANSI/SDI A250.8.
 - 2. Custom Steel Doors and Frames: HMMA 831.
 - 3. Wood Doors: DHI's "Recommended Locations for Architectural Hardware for Wood Flush Doors."
- B. Install each door hardware item to comply with manufacturer's written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing Work. Do not install surface-mounted items until finishes have been completed on substrates involved.
 - 1. Set units level, plumb, and true to line and location. Adjust and reinforce attachment substrates as necessary for proper installation and operation.
 - 2. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors according to industry standards.
- C. Hinges: Install types and in quantities indicated in door hardware schedule but not fewer than the number recommended by manufacturer for application indicated or 1 hinge for every 30 inches of door height, whichever is more stringent, unless other equivalent means of support for door, such as spring hinges or pivots, are provided.
- D. Intermediate Offset Pivots: Where offset pivots are indicated, provide intermediate offset pivots in quantities indicated in door hardware schedule but not fewer than one intermediate offset pivot per door and one additional intermediate offset pivot for every 30 inches of door height greater than 90 inches.
- E. Lock Cylinders: Install construction cores to secure building and areas during construction period.
 - 1. Replace construction cores with permanent cores as indicated in keying schedule or as directed by Owner.
 - 2. Furnish permanent cores to Owner for installation.

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- F. Key Control System:
1. Key Control Cabinet: Tag keys and place them on markers and hooks in key control system cabinet, as determined by final keying schedule.
 2. Key Lock Boxes: Install where indicated or approved by Architect to provide controlled access for fire and medical emergency personnel.
 3. Key Control System Software: Set up multiple-index system based on final keying schedule.
- G. Boxed Power Supplies: Locate power supplies as indicated or, if not indicated, above accessible ceilings. Verify location with Architect.
1. Configuration: Provide one power supply for each door opening with electrified door hardware, with power sufficient to operate locks.
 - a. Verify voltage requirements with electrical engineer.
 2. Configuration: Provide least number of power supplies required to adequately serve doors with electrified door hardware.
- H. Thresholds: Set thresholds for exterior and acoustical doors in full bed of sealant complying with requirements specified in Section 079200 - Joint Sealants.
- I. Stops: Provide wall mounted stops for doors unless floor or other type stops are indicated in door hardware schedule. Do not mount floor stops where they will impede traffic. Coordinate blocking requirement with Section 061000.
1. Door Stops: Coordinate blocking requirement with Section 061000.
 - a. Position wall stops to catch lever handle or pull.
 - b. Wall Stop/ Holder: 78 inches up from finish concrete floor.
 2. Door Holders: 78 inches up from finish floor, backset same as for locks where applicable.
 3. Magnetic Wall Holders: 78 inches up from finish floor, with backset and projection as required to protect hardware from damage.
- J. Emergency Door Stop Release: 46 inches from bottom of frame to bottom of stop.
- K. Gasketing: Install prior to other surface hardware such as door closers, exit devices, and other similar items, to provide full perimeter seal without interruption. Do not notch gasketing to install oterh surface-applied hardware.
1. Perimeter Gasketing: Apply to head and jamb, forming seal between door and frame.
 2. Meeting Stile Gasketing: Fasten to meeting stiles, forming seal when doors are closed.
 3. Door Bottoms: Apply to bottom of door, forming seal with threshold when door is closed.
- L. Door Closers: Install closers using manufacturer-furnished template machine screws for metal doors and manufacturer-furnished wood screws for wood doors. Use of self-drilling or self-tapping fasteners is not allowed. Coordinate with door supplier to provide proper blocking for surface mounting. Use of through-bolts is not acceptable.
1. Corridor Doors: Mount on room side.
 2. Stairway Doors: Mount on room side.
 3. Lobby Doors: Mount on vestibule side.
 4. Exterior doors: Parallel rigid arm installation.
- M. Push Plates: Mount push plates at the following distances.
1. 1/2 inch: Distance from edge of door to edge of push plate on double acting doors and pairs of doors.

2. 1 inch: Distance from edge of door to edge of push plate on single acting doors.
3. 45 inches: Bottom of frame to center line of push plate.

N. Push Bars and Pulls:

1. 42 inches: Bottom of frame to center line of push bar.
2. 45 inches: Top bolt or screws (backset same as for locks).
3. Where pull-mounting interferes with outside cylinder function, off-set pull horizontally on door to allow for cylinder to function.

O. Kick Plates, Armor Plates, Diamond Plates: Bottom within 1/8 inch of door bottom; attach with Phillips head screws.

P. Door Guards: Apply on single acting doors to stop side of hinge edge of door and covering both edges on double acting doors. Place bottom 1/8 inch from bottom of door.

Q. Coat Hooks: 48 inches from finish floor on door centerline.

R. Low Energy Operator Wall Switches: Comply with the following for installing actuating control switches:

1. Mount between 30 inches and 36 inches above finished floor.
2. Locate at least 30 inches to 60 inches from pull arc of swing of door but never more than 12 feet.
3. Remain accessible from swing side when door is opened.
4. Do not locate where user would be in path of moving door.

3.4 FIELD QUALITY CONTROL

A. Independent Architectural Hardware Consultant: Owner will engage qualified independent Architectural Hardware Consultant to perform inspections and to prepare inspection reports.

1. Independent Architectural Hardware Consultant will inspect door hardware and state in each report whether installed Work complies with or deviates from requirements, including whether door hardware is properly installed and adjusted.

3.5 ADJUSTING

A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.

1. Door Closers: Adjust sweep period to comply with accessibility requirements and requirements of authorities having jurisdiction.
2. Spring Hinges: Adjust to achieve positive latching when door is allowed to close freely from an open position of 70 degrees and so that closing time complies with accessibility requirements of authorities having jurisdiction.
3. Electric Strikes: Adjust horizontal and vertical alignment of keeper to properly engage lock bolt.

B. Occupancy Adjustment: Approximately six months after date of Substantial Completion, schedule Installer's Architectural Hardware Consultant to examine and readjust each item of door hardware, including operating forces, as necessary to ensure function of doors, door hardware, and electrified door hardware.

3.6 CLEANING AND PROTECTION

- A. Clean adjacent surfaces soiled by door hardware installation.
- B. Clean operating items as necessary to restore proper function and finish.
- C. Provide final protection and maintain conditions that ensure that door hardware is without damage or deterioration at time of Substantial Completion.

3.7 MAINTENANCE SERVICE

- A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions for Owner's continued adjustment, maintenance, and removal and replacement of door hardware.
- B. Maintenance Service: Beginning at Substantial Completion, provide 12 months' full maintenance by skilled employees of door hardware Installer. Include quarterly preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper door and door hardware operation. Provide parts and supplies that are the same as those used in the manufacture and installation of original products.

3.8 DEMONSTRATION

- A. Engage factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain door hardware and door hardware finishes.

3.9 DOOR HARDWARE SCHEDULE, general

- A. Provide door hardware items in type, quality, and quantities as specified, appropriate for intended service unless additional hardware is required for complete and operable facility. These items may include special templates, wiring diagrams, shim kits for exit devices, filler bars and door closer arm mounting brackets for bar type coordinators, drop plates or other door closer accessory items, special fasteners required for attachment of hardware to doors, frames, or other substrates.
- B. Ensure completeness, proper function, and proper application of hardware for each door. Where hardware items are not definitely or correctly specified and are required for intended service, or if information is unclear or conflicting, direct such omission, error, or other discrepancy to Architect prior to Bid date. Architect will issue clarifications by addendum.
 - 1. Coordinate with other related Sections prior to ordering materials.
- C. Refer to door schedule for hardware sets required at each door opening. Ignore hardware sets not used on door schedule.

3.10 DOOR HARDWARE SCHEDULE, SETS

Hardware Sets

Set: 1.0

2	Continuous Hinge	FM100	628	MR
1	Keyed Removable Mullion	900BKM		RU
1	Exit Device	ED5200 K157ET	630	RU
1	Exit Device	ED5200 EO	630	RU
2	Cylinder	AS REQUIRED	626	RU
2	Flush Pull	BF97 x SIZE TO BE DETERMINED	US32D	RO
2	Surface Closer	DC6210 A11 x BRKTS REQ'D	689	RU
1	Threshold	171A		PE
1	Mullion Gasketing	5110BL		PE
1	Set Weatherstrip	BY DOOR MANUFACTURER		00

Set: 2.0

1	Continuous Hinge	FM100	628	MR
1	Elect Continuous Hinge	ETAP EL FM100	628	MR
1	Keyed Removable Mullion	900BKM		RU
1	Exit Device	ED5200 EO	630	RU
1	Exit Device	ED5200 K157ET M92 MELR	630	RU
2	Cylinder	AS REQUIRED	626	RU
2	Flush Pull	BF97 x SIZE TO BE DETERMINED	US32D	RO
2	Surface Closer	DC6210 A11 x BRKTS REQ'D	689	RU
1	Threshold	171A		PE
1	Mullion Gasketing	5110BL		PE
1	Set Weatherstrip	BY DOOR MANUFACTURER		00
1	ElectroLynx Harness	QC-C1500P (@ JAMB)		MK
1	ElectroLynx Harness	QC-C000P x LAR		MK
1	Card Reader	FURNISHED IN OTHER SECTION		OT
1	Power Supply	AQD AS REQUIRED		SU
1	Wiring Diagram	AS REQUIRED		OT

OPERATION: DOOR NORMALLY CLOSED AND LOCKED. PRESENTATION OF AUTHORIZED CREDENTIAL SIGNALS LATCH RETRACTION AND ALLOWS INGRESS. EGRESS BY EXIT DEVICE PUSH BAR AT ALL TIMES.

Set: 3.0

2	Continuous Hinge	FM100	628	MR
2	Elect Continuous Hinge	ETAP EL FM100	628	MR

1	Keyed Removable Mullion	900BKM		RU
1	Exit Device	ED5200 EO	630	RU
1	Exit Device	ED5200 K157ET M92 MELR	630	RU
2	Cylinder	AS REQUIRED	626	RU
2	Flush Pull	BF97 x SIZE TO BE DETERMINED	US32D	RO
1	Surface Closer	DC6210 A11 x BRKTS REQ'D	689	RU
1	Automatic Opener	6060/6070	689	NO
1	Threshold	171A		PE
1	Mullion Gasketing	5110BL		PE
1	Set Weatherstrip	BY DOOR MANUFACTURER		00
1	ElectroLynx Harness	QC-C1500P (@ JAMB)		MK
1	ElectroLynx Harness	QC-C000P x LAR		MK
1	Card Reader	FURNISHED IN OTHER SECTION		OT
2	Door Switch	506		NO
1	Power Supply	AQD AS REQUIRED		SU
1	Wiring Diagram	AS REQUIRED		OT

OPERATION: DOOR NORMALLY CLOSED AND LOCKED. PRESENTATION OF AUTHORIZED CREDENTIAL SIGNALS LATCH RETRACTION AND CYCLES AUTOMATIC OPERATOR ALLOWING INGRESS. EGRESS BY EXIT DEVICE PUSH BAR AT ALL TIMES.

Set: 4.0

	Hinge	T4A3386 x NRP	US32D	MK
1	Exit Device	ED5200 L957ET	630	RU
1	Cylinder	AS REQUIRED	626	RU
1	Surface Closer	DC6210 A4	689	RU
1	Kick Plate	K1050 8" 3BE CSK	US32D	RO
1	Threshold	2005AT		PE
1	Set Weatherstrip	303AS		PE
1	Rain Guard	346C		PE
1	Door Bottom Sweep	3452CNB		PE

Set: 5.0

	Hinge	T4A3386 x NRP	US32D	MK
1	Exit Device	ED5200 K157ET	630	RU
1	Cylinder	AS REQUIRED	626	RU
1	Flush Pull	BF97 x SIZE TO BE DETERMINED	US32D	RO
1	Surface Closer	DC6210 A4	689	RU

1 Kick Plate	K1050 8" 3BE CSK	US32D	RO
1 Threshold	2005AT		PE
1 Set Weatherstrip	303AS		PE
1 Rain Guard	346C		PE
1 Door Bottom Sweep	3452CNB		PE

Set: 6.0

Hinge	T4A3386 x NRP	US32D	MK
1 Keyed Removable Mullion	900BKM		RU
1 Exit Device	ED5200 L957ET	630	RU
1 Exit Device	ED5200 EO	630	RU
2 Cylinder	AS REQUIRED	626	RU
2 Surface Closer	DC6210 A4	689	RU
2 Kick Plate	K1050 8" 3BE CSK	US32D	RO
1 Threshold	2005AT		PE
1 Set Weatherstrip	303AS		PE
1 Rain Guard	346C		PE
1 Mullion Gasketing	5110BL		PE
2 Door Bottom Sweep	3452CNB		PE

Set: 7.0

Hinge	T4A3386 x NRP	US32D	MK
1 Keyed Removable Mullion	900BKM		RU
1 Exit Device	ED5200 K157ET	630	RU
1 Exit Device	ED5200 EO	630	RU
2 Cylinder	AS REQUIRED	626	RU
2 Flush Pull	BF97 x SIZE TO BE DETERMINED	US32D	RO
2 Surface Closer	DC6210 A4	689	RU
2 Kick Plate	K1050 8" 3BE CSK	US32D	RO
1 Threshold	2005AT		PE
1 Set Weatherstrip	303AS		PE
1 Rain Guard	346C		PE
1 Mullion Gasketing	5110BL		PE
2 Door Bottom Sweep	3452CNB		PE

Set: 8.0

Hinge	TA2314	US32D	MK
1 Apartment Lock	ML2067 LWA	630	RU
1 Door Closer	DC6200	689	RU
1 Kick Plate	K1050 8" 3BE CSK	US32D	RO
1 Threshold	171A		PE
1 Set Weatherstrip	303AS		PE
1 Rain Guard	346C		PE
1 Door Bottom	222APK		PE

Set: 9.0

Hinge	TA2314 x NRP	US32D	MK
1 Storeroom Lock	ML2057 LWA	630	RU
1 Surface Closer	DC6210 A4	689	RU
1 Kick Plate	K1050 8" 3BE CSK	US32D	RO
1 Threshold	2005AT		PE
1 Set Weatherstrip	303AS		PE
1 Rain Guard	346C		PE
1 Door Bottom Sweep	3452CNB		PE

Set: 10.0

Hinge	TA2314 x NRP	US32D	MK
1 Storeroom Security Lock	ML2059 LWA	630	RU
1 Surface Closer	DC6210 A4	689	RU
1 Kick Plate	K1050 8" 3BE CSK	US32D	RO
1 Threshold	2005AT		PE
1 Set Weatherstrip	303AS		PE
1 Rain Guard	346C		PE
1 Door Bottom Sweep	3452CNB		PE

Set: 11.0

Hinge	T4A3386	US32D	MK
1 Classroom Intruder Lock	ML2072 LWA	630	RU
1 Door Closer	DC6200	689	RU
1 Kick Plate	K1050 8" 3BE CSK	US32D	RO
1 Threshold	171A		PE
1 Set Weatherstrip	303AS		PE
1 Rain Guard	346C		PE
1 Door Bottom	222APK		PE

Set: 12.0

Hinge	T4A3386 x NRP	US32D	MK
1 Set Combo Flush Bolts	2845/2945	US26D	RO
1 Dust Proof Strike	570	US26D	RO
1 Storeroom Lock	ML2057 LWA	630	RU
2 Surface Closer	DC6210 A4	689	RU
2 Kick Plate	K1050 8" 3BE CSK	US32D	RO
1 Threshold	2005AT		PE
1 Set Weatherstrip	303AS		PE
1 Rain Guard	346C		PE
2 Door Bottom Sweep	3452CNB		PE
1 Set Astragal	18041CNB		PE

Set: 13.0

Hinge	T4A3386 x NRP	US32D	MK
1 Set Combo Flush Bolts	2845/2945	US26D	RO
1 Dust Proof Strike	570	US26D	RO
1 Storeroom Security Lock	ML2059 LWA	630	RU
2 Surface Closer	DC6210 A4	689	RU
2 Kick Plate	K1050 8" 3BE CSK	US32D	RO
1 Threshold	2005AT		PE
1 Set Weatherstrip	303AS		PE
1 Rain Guard	346C		PE
2 Door Bottom Sweep	3452CNB		PE
1 Set Astragal	18041CNB		PE

Set: 14.0

1	Continuous Hinge	FM100	628	MR
1	Storeroom Lock	ML2057 LWA	630	RU
1	Electric Strike	1006-LBM	630	HS
1	SMART Pac Bridge Rectifier	2005M3		HS
1	Surface Closer	DC6210 A11 x BRKTS REQ'D	689	RU
1	Door Seals	BY DOOR MANUFACTURER		00
1	Door Buzzer w/Camera	FURNISHED IN OTHER SECTION		OT
1	ElectroLynx Harness	QC-C1500P (@ JAMB)		MK
1	Card Reader	FURNISHED IN OTHER SECTION		OT
1	Power Supply	AQD AS REQUIRED		SU
1	Wiring Diagram	AS REQUIRED		OT

OPERATION: DOOR NORMALLY CLOSED AND LOCKED. PRESENTATION OF AUTHORIZED CREDENTIAL RELEASES ELECTRIC STRIKE ALLOWING INGRESS. EGRESS AT ALL TIMES BY INSIDE LEVER.

Set: 15.0

2	Continuous Hinge	FM100	628	MR
1	Keyed Removable Mullion	900BKM		RU
1	Exit Device	ED5200 K157ET	630	RU
1	Exit Device	ED5200 EO	630	RU
2	Cylinder	AS REQUIRED	626	RU
2	Flush Pull	BF97 x SIZE TO BE DETERMINED	US32D	RO
2	Surface Closer	DC6210 A2	689	RU
1	Mullion Gasketing	5110BL		PE
1	Door Seals	BY DOOR MANUFACTURER		00

Set: 16.0

2	Continuous Hinge	FM100	628	MR
1	Keyed Removable Mullion	900BKM		RU
1	Exit Device	ED5200 K157ET	630	RU
1	Exit Device	ED5200 EO	630	RU
2	Cylinder	AS REQUIRED	626	RU
2	Flush Pull	BF97 x SIZE TO BE DETERMINED	US32D	RO
2	Surface Closer	DC6210 A11 x BRKTS REQ'D	689	RU
1	Mullion Gasketing	5110BL		PE
1	Door Seals	BY DOOR MANUFACTURER		00

Set: 17.0

Hinge	TA2714	US26D	MK
1 Exit Device	ED5200 L957ET	630	RU
1 Cylinder	AS REQUIRED	626	RU
1 Door Closer	DC6210	689	RU
1 Kick Plate	K1050 8" 3BE CSK	US32D	RO
1 Door Stop	406/441CU	US26D	RO
1 Set Door Seals	S88D		PE
1 Auto Door Bottom	411ARL		PE

Set: 18.0

Hinge	TA2714	US26D	MK
1 Exit Device	ED5200 L957ET	630	RU
1 Cylinder	AS REQUIRED	626	RU
1 Surface Closer	DC6210 A4	689	RU
1 Kick Plate	K1050 8" 3BE CSK	US32D	RO
1 Set Door Seals/Silencers	S88D/608 AS REQUIRED		PE

Set: 19.0

Hinge	TA2714	US26D	MK
1 Exit Device	ED5200 K157ET	630	RU
1 Cylinder	AS REQUIRED	626	RU
1 Flush Pull	BF97 x SIZE TO BE DETERMINED	US32D	RO
1 Surface Closer	DC6210 A4	689	RU
1 Kick Plate	K1050 8" 3BE CSK	US32D	RO
1 Set Door Seals/Silencers	S88D/608 AS REQUIRED		PE

Set: 20.0

Hinge	TA2714	US26D	MK
1 Keyed Removable Mullion	900BKM		RU
1 Exit Device	ED5200 L957ET	630	RU
1 Exit Device	ED5200 EO	630	RU
2 Cylinder	AS REQUIRED	626	RU
2 Door Closer	DC6210	689	RU

2 Kick Plate	K1050 8" 3BE CSK	US32D	RO
2 Door Stop	406/441CU	US26D	RO
1 Mullion Gasketing	5110BL		PE
1 Set Door Seals	S88D		PE
2 Auto Door Bottom	411ARL		PE

Set: 21.0

Hinge	T4A3786	US26D	MK
1 Keyed Removable Mullion	900BKM		RU
1 Exit Device	ED5200 K157ET	630	RU
1 Exit Device	ED5200 EO	630	RU
2 Cylinder	AS REQUIRED	626	RU
2 Flush Pull	BF97 x SIZE TO BE DETERMINED	US32D	RO
2 Surface Closer	DC6210 A3	689	RU
2 Kick Plate	K1050 8" 3BE CSK	US32D	RO
2 Door Stop	406/441CU	US26D	RO
1 Mullion Gasketing	5110BL		PE
2 Set Door Seals/Silencers	S88D/608 AS REQUIRED		PE

Set: 22.0

Hinge	T4A3786	US26D	MK
1 Keyed Removable Mullion	900BKM		RU
1 Exit Device	ED5200 K157ET	630	RU
1 Exit Device	ED5200 EO	630	RU
2 Cylinder	AS REQUIRED	626	RU
2 Flush Pull	BF97 x SIZE TO BE DETERMINED	US32D	RO
2 Surface Closer	DC6210 A2	689	RU
2 Kick Plate	K1050 8" 3BE CSK	US32D	RO
2 Door Stop	406/441CU	US26D	RO
1 Mullion Gasketing	5110BL		PE
2 Set Door Seals/Silencers	S88D/608 AS REQUIRED		PE

Set: 23.0

Hinge	T4A3786	US26D	MK
1 Keyed Removable Mullion	900BKM		RU
1 Exit Device	ED5200 K157ET	630	RU

1 Exit Device	ED5200 EO	630	RU
2 Cylinder	AS REQUIRED	626	RU
2 Flush Pull	BF97 x SIZE TO BE DETERMINED	US32D	RO
2 Surface Closer	DC6210 A4	689	RU
2 Kick Plate	K1050 8" 3BE CSK	US32D	RO
1 Mullion Gasketing	5110BL		PE
2 Set Door Seals/Silencers	S88D/608 AS REQUIRED		PE

Set: 24.0

Hinge	T4A3786	US26D	MK
1 Keyed Removable Mullion	900BKM		RU
1 Exit Device	ED5200A L955ET	630	RU
1 Exit Device	ED5200A EO	630	RU
2 Cylinder	AS REQUIRED	626	RU
2 Surface Closer	DC6210 A3	689	RU
2 Kick Plate	K1050 8" 3BE CSK	US32D	RO
2 Electromagnetic Holder (Floor Mount)	980 SERIES	689	RF
1 Mullion Gasketing	5110BL		PE
1 Set Door Seals	S88D		PE
1 Hardware	SEE NOTE BELOW		OT

NOTE: ELECTROMAGNETIC HOLDERS TO BE TIED INTO FIRE ALARM SYSTEM.

NOTE: DOOR TO SWING 180 DEGREES WHERE INDICATED ON FLOOR PLANS.

Set: 25.0

Hinge	TA2714	US26D	MK
1 Passage Set	ML2010 LWA	630	RU
1 Door Stop	406/441CU	US26D	RO
1 Set Door Seals	S773D		PE
1 Auto Door Bottom	411ARL		PE

Set: 26.0

Hinge	TA2714	US26D	MK
1 Privacy Set	ML2060 LWA M34	630	RU
1 Door Stop	406/441CU	US26D	RO

1 Set Door Seals/Silencers	S88D/608 AS REQUIRED		PE
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Set: 27.0

Hinge	TA2714	US26D	MK
1 Privacy Set	ML2060 LWA M34	630	RU
1 Overhead Stop	10-X36	630	RF
1 Set Door Seals/Silencers	S88D/608 AS REQUIRED		PE

Set: 28.0

Hinge	TA2714	US26D	MK
1 Privacy Set	ML2060 LWA M34	630	RU
1 Door Closer	DC6200	689	RU
1 Kick Plate	K1050 8" 3BE CSK	US32D	RO
1 Door Stop	406/441CU	US26D	RO
1 Set Door Seals/Silencers	S88D/608 AS REQUIRED		PE

Set: 29.0

Hinge	TA2714	US26D	MK
1 Office Lock	ML2051 LWA	630	RU
1 Door Stop	406/441CU	US26D	RO
1 Set Door Seals/Silencers	S88D/608 AS REQUIRED		PE

Set: 30.0

Hinge	TA2714	US26D	MK
1 Office Lock	ML2051 LWA	630	RU
1 Door Stop	406/441CU	US26D	RO
1 Set Door Seals	S773D		PE
1 Auto Door Bottom	411ARL		PE

Set: 31.0

Hinge	TA2714	US26D	MK
1 Office Lock	ML2051 LWA	630	RU
1 Overhead Stop	10-X36	630	RF
1 Set Door Seals/Silencers	S88D/608 AS REQUIRED		PE

Set: 32.0

Hinge	TA2714	US26D	MK
1 Office Lock	ML2051 LWA	630	RU
1 Overhead Stop	10-X36	630	RF
1 Set Door Seals	S773D		PE
1 Auto Door Bottom	411ARL		PE

Set: 33.0

Hinge	TA2714	US26D	MK
1 Office Lock	ML2051 LWA	630	RU
1 Door Closer	DC6200	689	RU
1 Kick Plate	K1050 8" 3BE CSK	US32D	RO
1 Door Stop	406/441CU	US26D	RO
1 Set Door Seals/Silencers	S88D/608 AS REQUIRED		PE

Set: 34.0

Hinge	TA2714	US26D	MK
1 Classroom Lock	ML2055 LWA	630	RU
1 Door Stop	406/441CU	US26D	RO
1 Set Door Seals/Silencers	S88D/608 AS REQUIRED		PE

Set: 35.0

Hinge	T4A3786	US26D	MK
1 Classroom Lock	ML2055 LWA	630	RU
1 Overhead Stop	10-X36	630	RF
1 Set Door Seals/Silencers	S88D/608 AS REQUIRED		PE

Set: 36.0

Hinge	TA2714	US26D	MK
1 Classroom Lock	ML2055 LWA	630	RU
1 Overhead Stop	10-X36	630	RF
1 Set Door Seals/Silencers	S88D/608 AS REQUIRED		PE

Set: 37.0

Hinge	TA2714	US26D	MK
1 Classroom Lock	ML2055 LWA	630	RU
1 Overhead Stop	10-X36	630	RF
1 Set Door Seals	S773D		PE
1 Auto Door Bottom	411ARL		PE

Set: 38.0

Hinge	T4A3786	US26D	MK
1 Classroom Lock	ML2055 LWA	630	RU
1 Overhead Holder	10-X26	630	RF
1 Kick Plate	K1050 8" 3BE CSK	US32D	RO
1 Set Door Seals/Silencers	S88D/608 AS REQUIRED		PE

Set: 39.0

Hinge	TA2714	US26D	MK
1 Classroom Lock	ML2055 LWA	630	RU
1 Door Closer	DC6200	689	RU
1 Kick Plate	K1050 8" 3BE CSK	US32D	RO
1 Door Stop	406/441CU	US26D	RO
1 Set Door Seals/Silencers	S88D/608 AS REQUIRED		PE

Set: 40.0

Hinge	TA2714	US26D	MK
1 Classroom Lock	ML2055 LWA	630	RU
1 Overhead Stop	10-X36	630	RF
1 Door Closer	DC6200	689	RU
1 Kick Plate	K1050 8" 3BE CSK	US32D	RO
1 Set Door Seals/Silencers	S88D/608 AS REQUIRED		PE

Set: 41.0

Hinge	TA2714	US26D	MK
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1 Classroom Lock	ML2055 LWA	630	RU
1 Door Closer	DC6210	689	RU
1 Kick Plate	K1050 8" 3BE CSK	US32D	RO
1 Door Stop	406/441CU	US26D	RO
1 Set Door Seals/Silencers	S88D/608 AS REQUIRED		PE

Set: 42.0

Hinge	TA2714	US26D	MK
1 Classroom Lock	ML2055 LWA	630	RU
1 Surface Closer	DC6210 A2	689	RU
1 Kick Plate	K1050 8" 3BE CSK	US32D	RO
1 Set Door Seals/Silencers	S88D/608 AS REQUIRED		PE

Set: 43.0

Hinge	TA2714	US26D	MK
1 Classroom Lock	ML2055 LWA	630	RU
1 Surface Closer	DC6210 A5	689	RU
1 Kick Plate	K1050 8" 3BE CSK	US32D	RO
1 Set Door Seals/Silencers	S88D/608 AS REQUIRED		PE

Set: 44.0

Hinge	TA2714	US26D	MK
1 Classroom Lock	ML2055 LWA	630	RU
1 Surface Closer	DC6210 A4	689	RU
1 Kick Plate	K1050 8" 3BE CSK	US32D	RO
1 Set Door Seals/Silencers	S88D/608 AS REQUIRED		PE

Set: 45.0

Hinge	TA2714	US26D	MK
1 Apartment Lock	ML2067 LWA	630	RU
1 Door Closer	DC6200	689	RU
1 Kick Plate	K1050 8" 3BE CSK	US32D	RO
1 Door Stop	406/441CU	US26D	RO
1 Set Door Seals/Silencers	S88D/608 AS REQUIRED		PE

Set: 46.0

Hinge	TA2714	US26D	MK
1 Storeroom Lock	ML2057 LWA	630	RU
1 Overhead Stop	10-X36	630	RF
1 Set Door Seals/Silencers	S88D/608 AS REQUIRED		PE

Set: 47.0

Hinge	T4A3786	US26D	MK
1 Storeroom Lock	ML2057 LWA	630	RU
1 Overhead Stop	10-X36	630	RF
1 Set Door Seals/Silencers	S88D/608 AS REQUIRED		PE

Set: 48.0

Hinge	TA2314	US32D	MK
1 Storeroom Lock	ML2057 LWA	630	RU
1 Overhead Holder	10-X26	630	RF
1 Set Door Seals/Silencers	S88D/608 AS REQUIRED		PE

Set: 49.0

Hinge	TA2714	US26D	MK
1 Storeroom Lock	ML2057 LWA	630	RU
1 Door Closer	DC6200	689	RU
1 Kick Plate	K1050 8" 3BE CSK	US32D	RO
1 Door Stop	406/441CU	US26D	RO
1 Set Door Seals/Silencers	S88D/608 AS REQUIRED		PE

Set: 50.0

Hinge	T4A3786	US26D	MK
1 Storeroom Lock	ML2057 LWA	630	RU
1 Door Closer	DC6200	689	RU
1 Kick Plate	K1050 8" 3BE CSK	US32D	RO
1 Door Stop	406/441CU	US26D	RO
1 Set Door Seals/Silencers	S88D/608 AS REQUIRED		PE

Set: 51.0

Hinge	T4A3786	US26D	MK
1 Storeroom Lock	ML2057 LWA	630	RU
1 Overhead Stop	10-X36	630	RF
1 Door Closer	DC6200	689	RU
1 Kick Plate	K1050 8" 3BE CSK	US32D	RO
1 Set Door Seals/Silencers	S88D/608 AS REQUIRED		PE

Set: 52.0

Hinge	TA2714	US26D	MK
1 Storeroom Lock	ML2057 LWA	630	RU
1 Door Closer	DC6210	689	RU
1 Kick Plate	K1050 8" 3BE CSK	US32D	RO
1 Door Stop	406/441CU	US26D	RO
1 Set Door Seals/Silencers	S88D/608 AS REQUIRED		PE

Set: 53.0

Hinge	TA2714	US26D	MK
1 Storeroom Lock	ML2057 LWA	630	RU
1 Surface Closer	DC6210 A4	689	RU
1 Kick Plate	K1050 8" 3BE CSK	US32D	RO
1 Set Door Seals/Silencers	S88D/608 AS REQUIRED		PE

Set: 54.0

Hinge	TA2714	US26D	MK
1 Storeroom Lock	ML2057 LWA	630	RU
1 Door Stop	406/441CU	US26D	RO
1 Set Door Seals/Silencers	S88D/608 AS REQUIRED		PE

Set: 55.0

Hinge	TA2714	US26D	MK
1 Storeroom Lock	ML2057 LWA	630	RU
1 Overhead Stop	10-X36	630	RF

1 Set Door Seals/Silencers	S88D/608 AS REQUIRED		PE
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Set: 56.0

Hinge	TA2714	US26D	MK
1 Storeroom Lock	ML2057 LWA	630	RU
1 Door Closer	DC6200	689	RU
1 Kick Plate	K1050 8" 3BE CSK	US32D	RO
1 Door Stop	406/441CU	US26D	RO
1 Set Door Seals/Silencers	S88D/608 AS REQUIRED		PE

Set: 57.0

Hinge	TA2714	US26D	MK
1 Storeroom Lock	ML2057 LWA	630	RU
1 Overhead Stop	10-X36	630	RF
1 Door Closer	DC6200	689	RU
1 Kick Plate	K1050 8" 3BE CSK	US32D	RO
1 Door Stop	406/441CU	US26D	RO
1 Set Door Seals/Silencers	S88D/608 AS REQUIRED		PE

Set: 58.0

Hinge	TA2714	US26D	MK
1 Classroom Intruder Lock	ML2072 LWA	630	RU
1 Door Closer	DC6200	689	RU
1 Kick Plate	K1050 8" 3BE CSK	US32D	RO
1 Set Door Seals	S773D		PE
1 Auto Door Bottom	411ARL		PE

Set: 59.0

Hinge	TA2714	US26D	MK
1 Set Auto Flush Bolts	2842/2942	US26D	RO
1 Dust Proof Strike	570	US26D	RO
1 Classroom Lock	ML2055 LWA	630	RU
1 Coordinator	2600 x FILLER BAR x CLOSER MTG BRKTS AS REQ'D	Black	RO
2 Door Closer	DC6200	689	RU
2 Kick Plate	K1050 8" 3BE CSK	US32D	RO

2 Door Stop	406/441CU	US26D	RO
1 Set Door Seals/Silencers	S88D/608 AS REQUIRED		PE

Set: 60.0

Hinge	TA2714	US26D	MK
1 Set Combo Flush Bolts	2845/2945	US26D	RO
1 Dust Proof Strike	570	US26D	RO
1 Storeroom Lock	ML2057 LWA	630	RU
1 Coordinator	2600 x FILLER BAR x CLOSER MTG BRKTS AS REQ'D	Black	RO
2 Overhead Stop	10-X36	630	RF
2 Door Closer	DC6200	689	RU
2 Kick Plate	K1050 8" 3BE CSK	US32D	RO
2 Door Stop	406/441CU	US26D	RO
1 Set Door Seals/Silencers	S88D/608 AS REQUIRED		PE

Set: 61.0

Hinge	TA2714	US26D	MK
1 Push Plate	70F	US32D	RO
1 Pull Plate	111x70C	US32D	RO
1 Door Closer	DC6200	689	RU
1 Kick Plate	K1050 8" 3BE CSK	US32D	RO
1 Door Stop	406/441CU	US26D	RO
1 Set Door Seals/Silencers	S88D/608 AS REQUIRED		PE

Set: 62.0

1 Cylinder	AS REQUIRED	626	RU
1 Hardware	SEE NOTE BELOW		OT

NOTE: OVERHEAD DOOR - BALANCE OF HARDWARE FURNISHED IN OTHER SECTION BY DOOR MANUFACTURER.

END OF SECTION 087100

SECTION 088000 - GLAZING**PART 1 - GENERAL****1.1 SUMMARY**

- A. Section includes glass and glazing:

1.2 COORDINATION

- A. Coordinate glazing channel dimensions to provide necessary bite on glass and minimum edge and face clearances with reasonable tolerances.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Glass Samples: For each type of glass product other than clear monolithic vision glass; 12 inches square.
- C. Glazing Accessory Samples: For gaskets, and colored spacers, in 12 inch lengths.
- D. Glazing Schedule: List glass types and thicknesses for each size opening and location. Use same designations indicated on Drawings.
- E. Delegated-Design Submittal: For glass indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by qualified professional engineer responsible for their preparation.
- F. Special Submittal Requirements: Combine submittals of this Section with Sections listed below to ensure design intent of system/assembly is understood and can be reviewed together.
 - 1. Section 081113 – Hollow Metal Doors and Frames.
 - 2. Section 081416 – Flush Wood Doors.
 - 3. Section 084113 – Aluminum-Framed Entrances and Storefronts.
 - 4. Section 085113 – Aluminum Windows.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer, manufacturers of insulating-glass units with sputter-coated, low-E coatings, glass testing agency and sealant testing agency.
- B. Product Certificates: For glass and glazing products.
- C. Product Test Reports: For insulating glass and glazing gaskets, for tests performed by a qualified testing agency.
- D. Sample Warranties: For special warranties.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications for Insulating-Glass Units with Sputter-Coated, Low-E Coatings: A qualified insulating-glass manufacturer who is approved by coated-glass manufacturer.
- B. Installer Qualifications: A qualified installer who employs glass installers for this Project who are certified under the National Glass Association's Certified Glass Installer Program.
- C. Glass Testing Agency Qualifications: A qualified independent testing agency accredited according to the NFRC CAP 1 Certification Agency Program.

1.6 PRECONSTRUCTION TESTING

- A. Preconstruction Adhesion and Compatibility Testing: Test each glazing material type, tape sealant, gasket, glazing accessory, and glass-framing member for adhesion to and compatibility with elastomeric glazing sealants.
 - 1. Testing is not required if data are submitted based on previous testing of current sealant products and glazing materials matching those submitted.
 - 2. Use ASTM C1087 to determine whether priming and other specific joint-preparation techniques are required to obtain rapid, optimum adhesion of glazing sealants to glass, tape sealants, gaskets, and glazing channel substrates.
 - 3. Test no fewer than eight Samples of each type of material, including joint substrates, shims, sealant backings, secondary seals, and miscellaneous materials.
 - 4. Schedule sufficient time for testing and analyzing results to prevent delaying Work.
 - 5. For materials failing tests, submit sealant manufacturer's written instructions for corrective measures including use of specially formulated primers.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Protect glazing materials according to manufacturer's written instructions. Prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.
- B. Comply with insulating-glass manufacturer's written instructions for venting and sealing units to avoid hermetic seal ruptures due to altitude change.

1.8 FIELD CONDITIONS

- A. Environmental Limitations: Do not proceed with glazing when ambient and substrate temperature conditions are outside limits permitted by glazing material manufacturers and when glazing channel substrates are wet from rain, frost, condensation, or other causes.
 - 1. Do not install glazing sealants when ambient and substrate temperature conditions are outside limits permitted by sealant manufacturer or below 40 degrees F.

1.9 WARRANTY

- A. Manufacturer's Special Warranty on Laminated Glass: Manufacturer agrees to replace laminated-glass units that deteriorate within specified warranty period. Deterioration of laminated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning laminated glass contrary to manufacturer's written instructions. Defects include edge separation, delamination materially obstructing vision through glass, and blemishes exceeding those allowed by referenced laminated-glass standard.

1. Warranty Period: Five years from date of Substantial Completion.
- B. Manufacturer's Special Warranty for Insulating Glass: Manufacturer agrees to replace insulating-glass units that deteriorate within specified warranty period. Deterioration of insulating glass is defined as failure of hermetic seal under normal use that is not attributed to glass breakage or to maintaining and cleaning insulating glass contrary to manufacturer's written instructions. Evidence of failure is the obstruction of vision by dust, moisture, or film on interior surfaces of glass.
1. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Basis-of-Design Products: Subject to compliance with requirements, provide product indicated in glass schedules or comparable product by one of the following:
1. Guardian Industries (Basis-of-Design).
 2. Viracon, Inc.
 3. Vitro Architectural Glass.
- B. Source Limitations for Glass: Obtain from single source from single manufacturer for each glass type.
- C. Source Limitations for Glazing Accessories: Obtain from single source from single manufacturer for each product and installation method.

2.2 PERFORMANCE REQUIREMENTS

- A. General: Installed glazing systems shall withstand normal thermal movement and wind and impact loads (where applicable) without failure, including loss or glass breakage attributable to the following:
1. Defective manufacture, fabrication, or installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; or other defects in construction.
- B. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 – Quality Requirements, to design glazing.
- C. Structural Performance: Glazing shall withstand the following design loads within limits and under conditions indicated determined according to the IBC and ASTM E1300:
1. Design Wind Pressures: As indicated on Drawings.
- D. Safety Glazing: Where safety glazing is indicated, provide glazing that complies with 16 CFR 1201, Category II.
- E. Thermal and Optical Performance Properties: Provide glass with performance properties specified, as indicated in manufacturer's published test data, based on procedures indicated below:
1. For monolithic-glass lites, properties are based on units with lites 6.0 mm thick.
 2. For insulating-glass units, properties are based on units of thickness indicated for overall unit and for each lite.
 3. U-Factors: Center-of-glazing values, per NFRC 100 and based on LBL's WINDOW 5.2 computer program, expressed as Btu/sq. ft. x h x deg F.
 4. Solar Heat-Gain Coefficient and Visible Transmittance: Center-of-glazing values, according to NFRC 200 and based on LBL's WINDOW 5.2 computer program.

5. Visible Reflectance: Center-of-glazing values, according to NFRC 300.

2.3 GLASS PRODUCTS, GENERAL

- A. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below unless more stringent requirements are indicated. See these publications for glazing terms not otherwise defined in this Section or in referenced standards.
1. GANA Publications: Glazing Manual.
 2. GANA Publications: Laminated Glazing Reference Manual.
 3. IGMA Publication for Insulating Glass: SIGMA TM-3000, "North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial and Residential Use."
- B. Safety Glazing Labeling: Where safety glazing is indicated, permanently mark glazing with certification label of Safety Glazing Certification Council or another certification agency acceptable to authorities having jurisdiction. Label shall indicate manufacturer's name, type of glass, thickness, and safety glazing standard with which glass complies.
- C. Insulating-Glass Certification Program: Permanently marked either on spacers or on at least one component lite of units with appropriate certification label of IgCC.
- D. Thickness: Where glass thickness is indicated, it is a minimum. Provide glass that complies with performance requirements and is not less than the thickness indicated.
1. Minimum Glass Thickness for Exterior Lites: Not less than 6.0 mm.
 2. Thickness of Tinted Glass: Provide same thickness for each tint color indicated throughout Project.
- E. Strength: Where annealed float glass is indicated, provide annealed float glass, heat-strengthened float glass, or fully tempered float glass. Where heat-strengthened float glass is indicated, provide heat-strengthened float glass or fully tempered float glass. Where fully tempered float glass is indicated or required by applicable code, provide fully tempered float glass.

2.4 GLASS PRODUCTS

- A. Clear Annealed Float Glass: ASTM C 1036, Type I, Class 1 (clear), Quality-Q3.
- B. Fully Tempered Float Glass: ASTM C1048, Kind FT (fully tempered), Condition A (uncoated) unless otherwise indicated, Type I, Class 1 (clear) or Class 2 (tinted) as indicated, Quality-Q3.
1. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed unless otherwise indicated.
- C. Heat-Strengthened Float Glass: ASTM C 1048, Kind HS (heat strengthened), Type I, Condition A (uncoated) unless otherwise indicated, Type I, Class 1 (clear) or Class 2 (tinted) as indicated, Quality-Q3.
1. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed unless otherwise indicated.

2.5 LAMINATED GLASS

- A. Laminated Glass: ASTM C1172. Use materials that have a proven record of no tendency to bubble, discolor, or lose physical and mechanical properties after fabrication and installation.

1. Construction: Laminate glass with polyvinyl butyral interlayer to comply with interlayer manufacturer's written recommendations.
2. Interlayer Thickness: Provide thickness not less than that indicated and as needed to comply with requirements.
3. Interlayer Color: Clear unless otherwise indicated.

2.6 INSULATING GLASS

- A. Insulating-Glass Units: Factory-assembled units consisting of sealed lites of glass separated by a dehydrated interspace, qualified according to ASTM E 2190.
1. Sealing System: Dual seal, with polyisobutylene primary and silicone secondary or as recommended by manufacturer for application.
 2. Spacer Material: Aluminum with mill or anodized finish.

2.7 GLAZING GASKETS

- A. Dense Compression Gaskets: Molded or extruded gaskets of profile and hardness required to maintain watertight seal, made from EPDM complying with ASTM C864.

2.8 GLAZING SEALANTS

- A. General:
1. Compatibility: Provide glazing sealants that are compatible with one another and with other materials they will contact, including glass products, seals of insulating-glass units, and glazing channel substrates, under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.
 2. Suitability: Comply with sealant and glass manufacturers' written instructions for selecting glazing sealants suitable for applications indicated and for conditions existing at time of installation.
 3. Colors of Exposed Glazing Sealants: As selected by Architect from manufacturer's full range.
- B. Glazing Sealant: Neutral-curing silicone glazing sealant complying with ASTM C 920, Type S, Grade NS, Class 100/50, Use NT.
1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Dow Corning Corporation: 790.
 - b. Momentive Performance Materials: SCS2700 Silpruf LM.
 - c. Pecora Corporation: 890NST.
 - d. Sika Corporation: Sikasil WS-290.
 - e. Tremco Incorporated: Spectrem 1.

2.9 GLAZING TAPES

- A. Back-Bedding Mastic Glazing Tapes: Preformed, butyl-based, 100 percent solids elastomeric tape; nonstaining and nonmigrating in contact with nonporous surfaces; with or without spacer rod as recommended in writing by tape and glass manufacturers for application indicated; and complying with ASTM C1281 and AAMA 800 for products indicated below:
1. AAMA 807.3 tape, for glazing applications in which tape is not subject to continuous pressure.

- B. Expanded Cellular Glazing Tapes: Closed-cell, PVC foam tapes; factory coated with adhesive on both surfaces; and complying with AAMA 800 for the following types:
1. AAMA 810.1, Type 1, for glazing applications in which tape acts as the primary sealant.
 2. AAMA 810.1, Type 2, for glazing applications in which tape is used in combination with a full bead of liquid sealant.

2.10 MISCELLANEOUS GLAZING MATERIALS

- A. General: Provide products of material, size, and shape complying with referenced glazing standard, with requirements of manufacturers of glass and other glazing materials for application indicated, and with a proven record of compatibility with surfaces contacted in installation.
- B. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.
- C. Setting Blocks: Elastomeric material with a Shore, Type A durometer hardness of 85, plus or minus 5.
- D. Spacers: Elastomeric blocks or continuous extrusions of hardness required by glass manufacturer to maintain glass lites in place for installation indicated.
- E. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side walking).
- F. Cylindrical Glazing Sealant Backing: ASTM C 1330, Type O (open-cell material), of size and density to control glazing sealant depth and otherwise produce optimum glazing sealant performance.

2.11 FABRICATION OF GLAZING UNITS

- A. Fabricate glazing units in sizes required to fit openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing publications, to comply with system performance requirements.
1. Allow for thermal movements from ambient and surface temperature changes acting on glass framing members and glazing components.
 - a. Temperature Change: 120 degrees F, ambient; 180 degrees F, material surfaces.
- B. Clean-cut or flat-grind vertical edges of butt-glazed monolithic lites to produce square edges with slight chamfers at junctions of edges and faces.
- C. Grind smooth and polish exposed glass edges and corners.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine framing, glazing channels, and stops, with Installer present, for compliance with the following:
1. Manufacturing and installation tolerances, including those for size, squareness, and offsets at corners.
 2. Presence and functioning of weep systems.
 3. Minimum required face and edge clearances.
 4. Effective sealing between joints of glass-framing members.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings not firmly bonded to substrates.
- B. Examine glazing units to locate exterior and interior surfaces. Label or mark units as needed so that exterior and interior surfaces are readily identifiable. Do not use materials that leave visible marks in the completed Work.

3.3 GLAZING, GENERAL

- A. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.
- B. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass includes glass with edge damage or other imperfections that, when installed, could weaken glass, impair performance, or impair appearance.
- C. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction testing.
- D. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.
- E. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.
- F. Provide spacers for glass lites where length plus width is larger than 50 inches.
 - 1. Locate spacers directly opposite each other on both inside and outside faces of glass. Install correct size and spacing to preserve required face clearances, unless gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and to comply with system performance requirements.
 - 2. Provide 1/8 inch minimum bite of spacers on glass and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.
- G. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and according to requirements in referenced glazing publications.
- H. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.
- I. Set glass lites with proper orientation so that coatings face exterior or interior as specified.
- J. Where wedge-shaped gaskets are driven into one side of channel to pressurize sealant or gasket on opposite side, provide adequate anchorage so gasket cannot walk out when installation is subjected to movement.
- K. Square cut wedge-shaped gaskets at corners and install gaskets in a manner recommended by gasket manufacturer to prevent corners from pulling away; seal corner joints and butt joints with sealant recommended by gasket manufacturer.

3.4 TAPE GLAZING

- A. Position tapes on fixed stops so that, when compressed by glass, their exposed edges are flush with or protrude slightly above sightline of stops.
- B. Install tapes continuously, but not necessarily in one continuous length. Do not stretch tapes to make them fit opening.
- C. Cover vertical framing joints by applying tapes to heads and sills first, then to jambs. Cover horizontal framing joints by applying tapes to jambs, then to heads and sills.
- D. Place joints in tapes at corners of opening with adjoining lengths butted together, not lapped. Seal joints in tapes with compatible sealant approved by tape manufacturer.
- E. Do not remove release paper from tape until right before each glazing unit is installed.
- F. Apply heel bead of elastomeric sealant.
- G. Center glass lites in openings on setting blocks and press firmly against tape by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings.
- H. Apply cap bead of elastomeric sealant over exposed edge of tape.

3.5 GASKET GLAZING (DRY)

- A. Cut compression gaskets to lengths recommended by gasket manufacturer to fit openings exactly, with allowance for stretch during installation.
- B. Insert soft compression gasket between glass and frame or fixed stop so it is securely in place with joints miter cut and bonded together at corners.
- C. Installation with Drive-in Wedge Gaskets: Center glass lites in openings on setting blocks, and press firmly against soft compression gasket by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.
- D. Installation with Pressure-Glazing Stops: Center glass lites in openings on setting blocks, and press firmly against soft compression gasket. Install dense compression gaskets and pressure-glazing stops, applying pressure uniformly to compression gaskets. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.
- E. Install gaskets so they protrude past face of glazing stops.

3.6 LOCK-STRIP GASKET GLAZING

- A. Comply with ASTM C716 and gasket manufacturer's written instructions. Provide supplementary wet seal and weep system unless otherwise indicated.

3.7 SEALANT GLAZING (WET)

- A. Install continuous spacers, or spacers combined with cylindrical sealant backing, between glass lites and glazing stops to maintain glass face clearances and to prevent sealant from extruding into glass channel and blocking weep systems until sealants cure. Secure spacers or spacers and backings in place and in position to control depth of installed sealant relative to edge clearance for optimum sealant performance.
- B. Force sealants into glazing channels to eliminate voids and to ensure complete wetting or bond of sealant to glass and channel surfaces.
- C. Tool exposed surfaces of sealants to provide a substantial wash away from glass.

3.8 CLEANING AND PROTECTION

- A. Immediately after installation remove nonpermanent labels and clean surfaces.
- B. Protect glass from contact with contaminating substances resulting from construction operations. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for buildup of dirt, scum, alkaline deposits, or stains.
 - 1. If, despite such protection, contaminating substances do come into contact with glass, remove substances immediately as recommended in writing by glass manufacturer. Remove and replace glass that cannot be cleaned without damage to coatings.
- C. Remove and replace glass that is damaged during construction period.
- D. Wash glass on both exposed surfaces not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended in writing by glass manufacturer.

3.9 MONOLITHIC GLASS SCHEDULE

- A. Glass Type FG: Clear float glass.
 - 1. Minimum Thickness: 6 mm.
 - 2. Typical interior glass unless indicated otherwise.
- B. Glass Type TG: Clear fully tempered float glass.
 - 1. Minimum Thickness: 6 mm.

3.10 INSULATING GLASS SCHEDULE

- A. Glass Type IG: Clear, Low-E insulating glass.
 - 1. Basis-of-Design: Subject to compliance with requirements, provide SunGuard SuperNeutral SN 68 by Guardian Industries, Inc. or approved substitution by specified manufacturers.
 - 2. Overall Unit Thickness: 1 inch.
 - 3. Thickness of Each Glass Lite: 6.0 mm.
 - 4. Outdoor Lite: Fully tempered float glass.
 - 5. Interspace Content: Air.
 - 6. Indoor Lite: Fully teFloat glass.
 - 7. Low-E Coating: Sputtered on second surface.
 - 8. Transmittance:

- a. Ultra-Violet Transmittance: 30 percent.
 - b. Visible Light Transmittance: 68 percent.
 - c. Total Solar Energy: 33 percent.
9. Exterior Reflectance:
- a. Visible Light Reflectance - In: 12 percent.
 - b. Visible Light Reflectance - Out: 11 percent.
 - c. Solar Energy Reflectance: 33 percent.
10. NFRC U-Values:
- a. Winter Nighttime U-Factor: 0.29 Btu.
 - b. Summer Daytime U-Factor: 0.28 Btu.
11. Relative Heat Gain: 90.
12. Shading Coefficient: 0.43.
13. Solar Heat Gain Coefficient (SHGC): 0.38.
14. Light to Solar Gain (LSG): 1.80.
15. Provide safety glazing labeling.

B. Glass Type TIG: Clear, Low-E insulating glass.

1. Basis-of-Design: Subject to compliance with requirements, provide SunGuard SuperNeutral SN 68 by Guardian Industries, Inc. or approved substitution by specified manufacturers.
2. Overall Unit Thickness: 1 inch.
3. Thickness of Each Glass Lite: 6.0 mm.
4. Outdoor Lite: Fully tempered float glass.
5. Interspace Content: Dehydrated air.
6. Indoor Lite: Fully tempered float glass.
7. Low-E Coating: Sputtered on second surface.
8. Transmittance:
 - a. Ultra-Violet Transmittance: 30 percent.
 - b. Visible Light Transmittance: 68 percent.
 - c. Total Solar Energy: 33 percent.
9. Exterior Reflectance:
 - a. Visible Light Reflectance - In: 12 percent.
 - b. Visible Light Reflectance - Out: 11 percent.
 - c. Solar Energy Reflectance: 33 percent.
10. NFRC U-Values:
 - a. Winter Nighttime U-Factor: 0.29 Btu.
 - b. Summer Daytime U-Factor: 0.28 Btu.
11. Relative Heat Gain: 90.
12. Shading Coefficient: 0.43.
13. Solar Heat Gain Coefficient (SHGC): 0.38.
14. Light to Solar Gain (LSG): 1.80.
15. Provide safety glazing labeling.

3.11 INSULATING-LAMINATED-GLASS SCHEDULE

A. Glass Type IG-1: Low-E-coated, clear insulating laminated glass.

1. Basis-of-Design: Subject to compliance with requirements, provide SunGuard SuperNeutral SN 68 by Guardian Industries, Inc. with clear interlayer or approved substitution by specified manufacturers.
2. Overall Unit Thickness: 1.015 inch.
3. Minimum Thickness of Outdoor Lite: 3 mm.
4. Outdoor Lite: Clear, laminated glass with two plies of tempered float glass.
 - a. Minimum Thickness of Each Glass Ply: 3 mm.
 - b. Thickness of Interlayer Ply: 0.038 inch.
 - c. Number of Colored Interlayers: Two.
 - d. Interlayer Color: Vanceva Green 4667.
5. Interspace Content: Air.
6. Indoor Lite: Clear Low-E tempered float glass.
7. Indoor Lite Thickness: 6 mm.
8. Low-E Coating: Sputtered on second surface.
9. Transmittance:
 - a. Visible Light Transmittance: 2 percent.
 - b. Total Solar Energy: 6 percent.
10. Exterior Reflectance:
 - a. Visible Light Reflectance - In: 8 percent.
 - b. Visible Light Reflectance - Out: 4 percent.
 - c. Solar Energy Reflectance: 29 percent.
11. NFRC U-Values:
 - a. Winter Nighttime U-Factor: 0.29 Btu.
 - b. Summer Daytime U-Factor: 0.27 Btu.
12. Shading Coefficient: 0.17.
13. Solar Heat Gain Coefficient (SHGC): 0.15.
14. Light to Solar Gain (LSG): 0.11.
15. Provide safety glazing labeling.

END OF SECTION 088000

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DOCUMENT 088300 – MIRRORS**PART 1 - GENERAL****1.1 SUMMARY**

- A. Section includes the following types of silvered flat glass mirrors:
 - 1. Annealed monolithic glass mirrors.
 - 2. Film-backed glass mirrors qualifying as safety glazing.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: Include mirror elevations, edge details, mirror hardware, and attachment details.
- C. Samples: For each type of the following:
 - 1. Mirrors: 12 inches square, including edge treatment on two adjoining edges.
 - 2. Mirror Clips: Full size.
 - 3. Mirror Trim: 12 inches long.

1.3 INFORMATIONAL SUBMITTALS

- A. Sample Warranty: For special warranty.

1.4 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For mirrors to include in maintenance manuals.

1.5 PRECONSTRUCTION TESTING

- A. Preconstruction Mirror Mastic Compatibility Test: Submit mirror mastic products to mirror manufacturer for testing to determine compatibility of mastic with mirror backing.

1.6 WARRANTY

- A. Special Warranty: Manufacturer agrees to replace mirrors that deteriorate within specified warranty period. Deterioration of mirrors is defined as defects developed from normal use that are not attributed to mirror breakage or to maintaining and cleaning mirrors contrary to manufacturer's written instructions. Defects include discoloration, black spots, and clouding of the silver film.
 - 1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS**2.1 SILVERED FLAT GLASS MIRRORS**

- A. Mirrors, General: ASTM C 1503; manufactured using copper-free, low-lead mirror coating process.
- B. Annealed Monolithic Glass Mirrors: Mirror Select Quality, clear.
 - 1. Nominal Thickness: 6.0 mm.
- C. Safety Glazing Products: For film-backed mirrors, provide products that comply with 16 CFR 1201, Category II.

2.2 MISCELLANEOUS MATERIALS

- A. Setting Blocks: Elastomeric material with a Shore, Type A durometer hardness of 85, plus or minus 5.
- B. Edge Sealer: Coating approved by mirror manufacturer.
- C. Mirror Mastic: An adhesive setting compound, asbestos-free, produced specifically for setting mirrors, complying with LEED 2009 criteria and requirements for VOC content.
- D. Film Backing for Safety Mirrors: Film backing and pressure-sensitive adhesive; both compatible with mirror backing paint as certified by mirror manufacturer.

2.3 MIRROR HARDWARE

- A. Aluminum J-Channels: Aluminum extrusions with a return deep enough to produce a glazing channel to accommodate mirrors of thickness indicated and in lengths required to cover edges of mirrors in a single piece.
 - 1. Bottom Trim: J-channels formed with front leg and back leg not less than 3/8 and 7/8 inch in height, respectively, and a thickness of not less than 0.04 inch.
 - 2. Top Trim: J-channels formed with front leg and back leg not less than 5/8 and 1 inch in height, respectively, and a thickness of not less than 0.04 inch.
 - 3. Finish: Clear bright anodized.
- B. Fasteners: Fabricated of same basic metal and alloy as fastened metal and matching it in finished color and texture where fasteners are exposed.

2.4 FABRICATION

- A. Fabricate cutouts for notches and holes in mirrors without marring visible surfaces. Locate and size cutouts so they fit closely around penetrations in mirrors.
- B. Mirror Edge Treatment: Beveled polished. Seal edges of mirrors with edge sealer.

-
- C. Film-Backed Safety Mirrors: Apply film backing with adhesive coating over mirror backing paint, as recommended in writing by film-backing manufacturer.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Comply with mastic manufacturer's written installation instructions for preparation of substrates, including coating substrates with mastic manufacturer's special bond coating where applicable.

3.2 INSTALLATION

- A. General: Install mirrors to comply with mirror manufacturer's written instructions and with referenced GANA publications. Mount mirrors accurately in place in a manner that avoids distorting reflected images.
- B. Install mirrors with mastic and mirror hardware. Attach mirror hardware securely to mounting surfaces with mechanical fasteners installed with anchors or inserts as applicable. Install fasteners so heads do not impose point loads on backs of mirrors.
 - 1. Aluminum J-Channels: Provide setting blocks 1/8 inch thick by 4 inches long at quarter points. To prevent trapping water, provide, between setting blocks, two slotted weeps not less than 1/4 inch wide by 3/8 inch long at bottom channel.
 - 2. Install mastic as follows:
 - a. Apply barrier coat to mirror backing where approved in writing by manufacturers of mirrors and backing material.
 - b. Apply mastic to comply with mastic manufacturer's written instructions for coverage and to allow air circulation between back of mirrors and face of mounting surface.
 - c. After mastic is applied, align mirrors and press into place while maintaining a minimum airspace of 1/8 inch between back of mirrors and mounting surface.

3.3 CLEANING AND PROTECTION

- A. Protect mirrors from breakage and contaminating substances resulting from construction operations.
- B. Do not permit edges of mirrors to be exposed to standing water.
- C. Maintain environmental conditions that prevent mirrors from being exposed to moisture from condensation or other sources for continuous periods of time.
- D. Clean exposed surface of mirrors not more than four days before date scheduled for inspections that establish date of Substantial Completion. Clean mirrors as recommended in writing by mirror manufacturer.

END OF SECTION 088300

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SECTION 088700 - GLAZING SURFACE FILMS**PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes the decorative film overlays for interior applications:

1.3 ACTION SUBMITTALS

- A. Product Data: For each decorative-glass and glazing product indicated.
- B. Samples: For the following products, 12 inches square:
 - 1. Each pattern of film applied to clear glass.
- C. Product Schedule: For decorative glass films overlay. Use same designations indicated on Drawings.

1.4 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For each type of decorative film overlay to include in maintenance manuals.

1.5 QUALITY ASSURANCE

- A. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.
 - 1. Build mockups in the location and of the size indicated or, if not indicated, as directed by Architect.
 - 2. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Protect decorative glass film overlays materials according to manufacturer's written instructions.

1.7 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install decorative glass film overlays until spaces are enclosed and weathertight, wet work in spaces is complete and dry, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

-
- B. Field Measurements: Verify actual dimensions of glass lites by field measurements.

PART 2 - PRODUCTS

- A. Decorative Film Overlay. Use translucent, dimensionally stable, cast PVC film, 2-mil-minimum thickness, with pressure-sensitive, clear adhesive back for adhering to glass and releasable protective backing.
1. Products: Subject to compliance with requirements, provide privacy & security films indicated or comparable product by one of the following:
 - a. Avery Dennison, Graphics.
 - b. FDC Graphic Films, Inc..
 - c. 3M.
 2. Use: Suitable for interior applications.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Clean glass immediately before application of glazing film overlay.

3.2 APPLICATION

- A. Decorative Film Overlay: Apply squarely aligned to glass edges, uniformly smooth, and free from tears, air bubbles, wrinkles, and rough edges, in single sheet completely overlaying the back face of clean glass, according to manufacturer's written instructions, including surface preparation and application temperature limitations.

3.3 CLEANING AND PROTECTION

- A. Protect glass from contact with contaminating substances resulting from construction operations. If, despite such protection, contaminating substances do come into contact with glass film overlay, remove substances immediately as recommended in writing by glass film overlay manufacturer.

END OF SECTION 088113

SECTION 089119 - FIXED LOUVERS**PART 1 - GENERAL****1.1 SUMMARY**

- A. Section includes fixed, extruded-aluminum louvers.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. For louvers specified to bear AMCA seal, include printed catalog pages showing specified models with appropriate AMCA Certified Ratings Seals.
- B. Shop Drawings: For louvers and accessories. Include plans, elevations, sections, details, and attachments to other work. Show frame profiles and blade profiles, angles, and spacing.
- C. Samples: For each type of metal finish required.

1.3 INFORMATIONAL SUBMITTALS

- A. Product Test Reports: Based on tests performed according to AMCA 500-L.
- B. Windborne-debris-impact-resistance test reports.

PART 2 - PRODUCTS**2.1 PERFORMANCE REQUIREMENTS**

- A. Delegated Design: Design louvers, including comprehensive engineering analysis by a qualified professional engineer, using structural and seismic performance requirements and design criteria indicated.
- B. Structural Performance: Louvers shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated without permanent deformation of louver components, noise or metal fatigue caused by louver-blade rattle or flutter, or permanent damage to fasteners and anchors. Wind pressures shall be considered to act normal to the face of the building.
 - 1. Wind Loads: Determine loads based on a uniform pressure of 30 lbf/sq. ft., acting inward or outward.
- C. Windborne-Debris-Impact Resistance: Louvers shall pass basic-protection missile testing requirements in ASTM E 1996 when tested according to ASTM E 1886. Test specimens shall be no smaller in width and length than louvers indicated for use on Project.
 - 1. From grade to 30 feet above grade: Large Missile Impact.
 - 2. From 30 to 60 feet above grade: Small missile impact.

D. Seismic Performance: Louvers, including attachments to other construction, shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

1. Design earthquake spectral response acceleration, short period (Sds) for Project is as indicated on Drawings.
2. Component Importance Factor: 1.0.

2.2 FIXED, EXTRUDED-ALUMINUM LOUVERS

A. Horizontal, Nondrainable-Blade Louver:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Airolite Company, LLC (The).
 - b. American Warming and Ventilating.
 - c. Construction Specialties, Inc.
 - d. Greenheck Fan Corporation.
 - e. Industrial Louvers, Inc.
 - f. Nystrom, Inc.
 - g. Reliable Products, Inc.
 - h. Ruskin Company; Tomkins PLC.
2. Louver Depth: 2 inches.
3. Blade Profile: Plain blade without center baffle.
4. Frame and Blade Nominal Thickness: Not less than 0.060 inch for blades and frames.

2.3 LOUVER SCREENS

A. General: Provide screen at each exterior louver.

1. Screen Location for Fixed Louvers: Interior face.
2. Screening Type: Bird screening except where insect screening is indicated.

B. Secure screen frames to louver frames with stainless-steel machine screws machine screws with heads finished to match louver, spaced a maximum of 6 inches from each corner and at 12 inches on center.

C. Louver Screen Frames: Fabricate with mitered corners to louver sizes indicated.

1. Metal: Same kind and form of metal as indicated for louver to which screens are attached. Reinforce extruded-aluminum screen frames at corners with clips.
2. Finish: Same finish as louver frames to which louver screens are attached.
3. Type: Rewirable frames with a driven spline or insert.

D. Louver Screening for Aluminum Louvers:

1. Bird Screening: Aluminum, 1/2 inch square mesh, 0.063 inch wire.

2.4 BLANK-OFF PANELS

A. Uninsulated, Blank-Off Panels: Metal sheet attached to back of louver.

1. Aluminum sheet for aluminum louvers, not less than 0.050 inch nominal thickness.

2. Panel Finish: Same finish applied to louvers.
3. Attach blank-off panels with sheet metal screws.

2.5 MATERIALS

- A. Aluminum Extrusions: ASTM B 221, Alloy 6063-T5, T-52, or T6.
- B. Aluminum Sheet: ASTM B 209, Alloy 3003 or 5005 with temper as required for forming, or as otherwise recommended by metal producer for required finish.
- C. Fasteners: Use types and sizes to suit unit installation conditions.
 1. Use hex-head or Phillips pan-head screws for exposed fasteners unless otherwise indicated.
 2. For fastening aluminum, use aluminum or 300 series stainless-steel fasteners.
 3. For color-finished louvers, use fasteners with heads that match color of louvers.
- D. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.

2.6 FABRICATION

- A. Factory-assemble louvers to minimize field splicing and assembly. Disassemble units as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.
- B. Fabricate frames, including integral sills, to fit in openings of sizes indicated, with allowances made for fabrication and installation tolerances, adjoining material tolerances, and perimeter sealant joints.
- C. Include supports, anchorages, and accessories required for complete assembly.
- D. Join frame members to each other and to fixed louver blades with fillet welds concealed from view unless otherwise indicated or size of louver assembly makes bolted connections between frame members necessary.

2.7 ALUMINUM FINISHES

- A. High-Performance Organic Finish: Three-coat fluoropolymer finish complying with AAMA 2605 and containing not less than 70 percent PVDF resin by weight in both color coat and clear topcoat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
 1. Color and Gloss: As selected by Architect from manufacturer's full range.
- B. Liquid Strippable Coating: Apply in shop to prefinished surfaces to protect finish during fabrication, shipping, and field handling.
- C. Apply one coat of bituminous paint to concealed aluminum and steel surfaces in contact with cementitious or dissimilar materials.

PART 3 - EXECUTION**3.1 INSTALLATION**

- A. Locate and place louvers level, plumb, and at indicated alignment with adjacent work.
- B. Use concealed anchorages where possible. Provide brass or lead washers fitted to screws where required to protect metal surfaces and to make a weathertight connection.
- C. Form closely fitted joints with exposed connections accurately located and secured.
- D. Provide perimeter reveals and openings of uniform width for sealants and joint fillers, as indicated.
- E. Repair finishes damaged by cutting, welding, soldering, and grinding. Restore finishes so no evidence remains of corrective Work. Return items that cannot be refinished in field to factory, make required alterations, and refinish entire unit or provide new units.
- F. Protect unpainted galvanized and nonferrous-metal surfaces that are in contact with concrete, masonry, or dissimilar metals from corrosion and galvanic action by applying a heavy coating of bituminous paint or by separating surfaces with waterproof gaskets or nonmetallic flashing.
- G. Install concealed gaskets, flashings, joint fillers, and insulation as louver installation progresses, where weathertight louver joints are required. Comply with Section 079200 – Joint Sealants for sealants applied during louver installation.

3.2 ADJUSTING AND CLEANING

- A. Clean exposed louver surfaces that are not protected by temporary covering, to remove fingerprints and soil during construction period. Do not let soil accumulate during construction period.
- B. Before final inspection, clean exposed surfaces with water and a mild soap or detergent not harmful to finishes. Thoroughly rinse surfaces and dry.

3.3 ADJUSTING

- A. Restore louvers damaged during installation and construction so no evidence remains of corrective work. If results of restoration are unsuccessful, as determined by Architect, remove damaged units and replace with new units.

END OF SECTION 089119

SECTION 092216 - NON-STRUCTURAL METAL FRAMING**PART 1 - GENERAL****1.1 SUMMARY****A. Section Includes:**

1. Non-load-bearing steel framing systems for interior gypsum board assemblies.
2. Suspension systems for interior gypsum ceilings, soffits, and grid systems.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.

1.3 INFORMATIONAL SUBMITTALS

- A. Evaluation Reports: For embossed steel studs and runners and firestop tracks, from ICC-ES or other qualified testing agency acceptable to authorities having jurisdiction.

PART 2 - PRODUCTS**2.1 PERFORMANCE REQUIREMENTS**

- A. Fire-Test-Response Characteristics: For fire-resistance-rated assemblies that incorporate non-load-bearing steel framing, provide materials and construction identical to those tested in assembly indicated, according to ASTM E 119 by an independent testing agency.
- B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated, per ASTM E90 and classified per ASTM E413 by independent testing agency.

2.2 FRAMING SYSTEMS

- A. Framing Members, General: Comply with ASTM C 754 for conditions indicated.
1. Steel Sheet Components: Comply with ASTM C 645 requirements for metal unless otherwise indicated.
 2. Protective Coating: ASTM A653, G60, hot-dip galvanized unless otherwise indicated.
- B. Studs and Runners: ASTM C 645. Use either steel studs and runners or dimpled steel studs and runners.
1. Manufacturers: Subject to compliance with requirements, provide products from 1 of the following manufacturers:
 - a. Allsteel & Gypsum Products, Inc.
 - b. CEMCO; California Expanded Metals Co.
 - c. ClarkDietrich Building Systems, LLC.
 - d. Marino\WARE.

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- e. MRI Steel Framing, LLC.
 - f. Steel Construction Systems, LLC.
 - g. Steel Network, Inc. (The).
 - h. Telling Industries.
2. Steel Studs and Runners:
- a. Minimum Base-Metal Thickness: As required by performance requirements for horizontal deflection in depth as indicated on Drawings.
- C. Slip-Type Head Joints: Where indicated, provide following:
- 1. Deflection Track: Steel sheet top runner manufactured to prevent cracking of finishes applied to interior partition framing resulting from deflection of structure above; in thickness not less than indicated for studs and in width to accommodate depth of studs.
 - a. Products: Subject to compliance with requirements, provide one of the following:
 - 1) Blazeframe Industries: Bare Slotted Track (BST/BST 2).
 - 2) CEMCO: SLP-TRK Slotted Deflection Track.
 - 3) ClarkDietrich Building Systems: SLP-TRK Slotted Deflection Track.
 - 4) MBA Building Supplies: Slotted Deflecto Track.
 - 5) Metal-Lite.: The System.
 - 6) Steel Network Inc. (The): VertiTrack VT.
 - 7) Telling Industries: TRUE-ACTION Slotted Track.
- D. Firestop Tracks: Top runner manufactured to allow partition heads to expand and contract with movement of structure while maintaining continuity of fire-resistance-rated assembly indicated; in thickness not less than indicated for studs and in width to accommodate depth of studs.
- 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Blazeframe Industries: Intumescent Framing, Fire Stop System.
 - b. CEMCO: FAS Track.
 - c. ClarkDietrich Building Systems: MaxTrak UL Slotted Deflection Track.
 - d. Fire Trak Corp.: Fire Trak System attached to studs with Fire Trak Posi Klip.
 - e. Metal-Lite.: The System.
- E. Cold-Rolled Channel Bridging: Steel, 0.053 inch minimum base-metal thickness, with minimum 1/2 inch wide flanges.
- 1. Depth: 1-1/2 inches unless indicated otherwise on Drawings.
 - 2. Clip Angle: Not less than 1-1/2 by 1-1/2 inches, 0.068 inch thick, galvanized steel.
- F. Hat-Shaped, Rigid Furring Channels: ASTM C645.
- 1. Minimum Base-Metal Thickness: 0.018 inch.
 - 2. Depth: 7/8 inch unless indicated otherwise on Drawings.
- G. Resilient Furring Channels: 1/2 inch deep, steel sheet members designed to reduce sound transmission.
- 1. Configuration: Asymmetrical or hat shaped.

- H. Z-Shaped Furring: With slotted or nonslotted web, face flange of 1-1/4 inches, wall attachment flange of 7/8 inch, minimum uncoated-metal thickness of 0.018 inch, and depth required to fit insulation thickness indicated.

2.3 SUSPENSION SYSTEMS

- A. Tie Wire: ASTM A641, Class 1 zinc coating, soft temper, 0.062 inch diameter wire, or double strand of 0.048 inch diameter wire.
- B. Hanger Attachments to Concrete:
1. Anchors: Fabricated from corrosion-resistant materials with holes or loops for attaching wire hangers and capable of sustaining, without failure, a load equal to 5 times that imposed by construction as determined by testing according to ASTM E 488 by an independent testing agency.
 - a. Type: Cast-in-place anchor, designed for attachment to concrete forms.
 2. Powder-Actuated Fasteners: Suitable for application indicated, fabricated from corrosion-resistant materials with clips or other devices for attaching hangers of type indicated, and capable of sustaining, without failure, a load equal to 10 times that imposed by construction as determined by testing according to ASTM E 1190 by an independent testing agency.
- C. Wire Hangers: ASTM A641, Class 1 zinc coating, soft temper, 0.16 inch in diameter.
- D. Flat Hangers: Steel sheet, 1 by 3/16 inch by length indicated.
- E. Carrying Channels: Cold-rolled, commercial-steel sheet with base-metal thickness of 0.053 inch and minimum 1/2 inch wide flanges.
1. Depth: As indicated on Drawings.
- F. Furring Channels (Furring Members):
1. Cold-Rolled Channels: 0.053 inch uncoated-steel thickness, with minimum 1/2 inch wide flanges, 3/4 inch deep.
 2. Steel Studs and Runners: ASTM C 645.
 - a. Minimum Base-Metal Thickness: 0.033 inch.
 - b. Depth: As indicated on Drawings.
 3. Embossed Steel Studs and Runners: ASTM C 645.
 - a. Minimum Base-Metal Thickness: 0.025 inch.
 - b. Depth: As indicated on Drawings.
 4. Hat-Shaped, Rigid Furring Channels: ASTM C 645, 7/8 inch deep.
 - a. Minimum Base-Metal Thickness: 0.033 inch.
 5. Resilient Furring Channels: 1/2 inch deep members designed to reduce sound transmission.
 - a. Configuration: Asymmetrical or hat shaped.

- G. Grid Suspension System for Gypsum Board Ceilings: ASTM C 645, direct-hung system composed of main beams and cross-furring members that interlock.
1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Armstrong World Industries, Inc.; Drywall Grid Systems.
 - b. Chicago Metallic Corporation; Drywall Grid System.
 - c. USG Corporation; Drywall Suspension System.
 2. Main Beam: Minimum 0.0179 inch thick commercial grade steel, double-web construction, hot dipped galvanized per ASTM A653, 1-3/8 to 1-1/2 inch wide knurled face by 1-1/2 inches high by 144 inches long, with factory punched cross tee slots, hanger holes, and non-directional bayonet end tab couplings.
 3. Primary Cross Tees: Minimum 0.0179 inch thick commercial grade steel, double-web construction, hot dipped galvanized per ASTM A653, 1-1/2 inch wide knurled flange by 1-1/2 inches high.
 4. Secondary Framing Cross Tees: Minimum 0.0179 inch thick commercial grade steel, double-web construction, 15/16 inch wide flange by 1-1/2 inches high.
 5. Wall Track: Minimum 0.0179 inch thick commercial grade steel, double-web construction, 15/16 inch wide flange by minimum 1-1/2 inches high.
 6. Wall Moldings: Single web with knurled face.
 7. Accessories: Provide clips, compression posts, wire, fasteners, and other components for a complete system.

2.4 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that comply with referenced installation standards.
1. Fasteners for Metal Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.
- B. Isolation Strip at Exterior Walls: Provide one of the following:
1. Asphalt-Saturated Organic Felt: ASTM D226, Type I (No. 15 asphalt felt), nonperforated.
 2. Foam Gasket: Adhesive-backed, closed-cell vinyl foam strips that allow fastener penetration without foam displacement, 1/8 inch thick, in width to suit steel stud size.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames, cast-in anchors, and structural framing, for compliance with requirements and other conditions affecting performance of Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Suspended Assemblies: Coordinate installation of suspension systems with installation of overhead structure to ensure inserts and other provisions for anchorages to building structure

have been installed to receive hangers at spacing required to support Work and that hangers will develop their full strength.

1. Furnish concrete inserts and other devices indicated to other trades for installation in advance of time needed for coordination and construction.

B. Coordination with Sprayed Fire-Resistive Materials:

1. Before sprayed fire-resistive materials are applied, attach offset anchor plates or ceiling runners (tracks) to surfaces indicated to receive sprayed fire-resistive materials. Where offset anchor plates are required, provide continuous plates fastened to building structure not more than 24 inches on center.
2. After sprayed fire-resistive materials are applied, remove them only to extent necessary for installation of non-load-bearing steel framing. Do not reduce thickness of fire-resistive materials below that required for fire-resistance ratings indicated. Protect adjacent fire-resistive materials from damage.

3.3 INSTALLATION, GENERAL

A. Installation Standard: ASTM C754, except comply with framing sizes and spacing indicated.

1. Gypsum Board Assemblies: Also comply with requirements in ASTM C840 that apply to framing installation.

B. Install supplementary framing, and blocking to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction.

C. Install bracing at terminations in assemblies.

D. Do not bridge building control and expansion joints with non-load-bearing steel framing members. Frame both sides of joints independently.

3.4 INSTALLING FRAMED ASSEMBLIES

A. Where studs are installed directly against exterior masonry walls or dissimilar metals at exterior walls, install isolation strip between studs and exterior wall.

B. Install studs so flanges within framing system point in same direction.

1. Space studs as follows:
 - a. Single-Layer Application: 16 inches on center unless otherwise indicated.

C. Install tracks (runners) at floors and overhead supports. Extend framing full height to structural supports or substrates above suspended ceilings except where partitions are indicated to terminate at suspended ceilings. Continue framing around ducts penetrating partitions above ceiling.

1. Slip-Type Head Joints: Where framing extends to overhead structural supports, install to produce joints at tops of framing systems that prevent axial loading of finished assemblies.
2. Door Openings: Screw vertical studs at jambs to jamb anchor clips on door frames; install runner track section (for cripple studs) at head and secure to jamb studs.

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- a. Install two studs at each jamb unless otherwise indicated.
 - b. Install cripple studs at head adjacent to each jamb stud, with a minimum 1/2 inch clearance from jamb stud to allow for installation of control joint in finished assembly.
 - c. Extend jamb studs through suspended ceilings and attach to underside of overhead structure.
3. Other Framed Openings: Frame openings other than door openings same as required for door openings unless otherwise indicated. Install framing below sills of openings to match framing required above door heads.
 4. Fire-Resistance-Rated Partitions: Install framing to comply with fire-resistance-rated assembly indicated and support closures and to make partitions continuous from floor to underside of solid structure.
 - a. Firestop Track: Where indicated, install to maintain continuity of fire-resistance-rated assembly indicated.
 5. Sound-Rated Partitions: Install framing to comply with sound-rated assembly indicated.
 6. Curved Partitions:
 - a. Bend track to uniform curve and locate straight lengths tangent to arcs.
 - b. Begin and end each arc with a stud, and space intermediate studs equally along arcs. On straight lengths of no fewer than 2 studs at ends of arcs, place studs 6 inches on center.
- D. Z-Furring Members:
1. Erect insulation, specified in Section 072100 – Thermal Insulation, vertically and hold in place with Z-furring members spaced 24 inches on center.
 2. Except at exterior corners, securely attach narrow flanges of furring members to wall with concrete stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches on center.
 3. At exterior corners, attach wide flange of furring members to wall with short flange extending beyond corner; on adjacent wall surface, screw-attach short flange of furring channel to web of attached channel. At interior corners, space second member no more than 12 inches from corner and cut insulation to fit.
- E. Direct Furring:
1. Screw to framing.
 2. Attach to concrete or masonry with stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches on center.
- F. Installation Tolerance: Install each framing member so fastening surfaces vary not more than 1/8 inch from plane formed by faces of adjacent framing.
- 3.5 INSTALLING SUSPENSION SYSTEMS
- A. Install suspension system components according to spacings indicated on Drawings, but not greater than spacings required by referenced installation standards for assembly types.
1. Hangers: 48 inches on center.
 2. Carrying Channels (Main Runners): 48 inches on center.
 3. Furring Channels (Furring Members): 16 inches on center unless indicated otherwise.
- B. Isolate suspension systems from building structure where they abut or are penetrated by building structure to prevent transfer of loading imposed by structural movement.

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- C. Suspend hangers from building structure as follows:
1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structural or suspension system.
 - a. Splay hangers only where required to miss obstructions and offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
 2. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with locations of hangers required to support standard suspension system members, install supplemental suspension members and hangers in the form of trapezes or equivalent devices.
 - a. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced installation standards.
 3. Wire Hangers: Secure by looping and wire tying, either directly to structures or to inserts, eye screws, or other devices and fasteners that are secure and appropriate for substrate, and in a manner that will not cause hangers to deteriorate or otherwise fail.
 4. Flat Hangers: Secure to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices and fasteners that are secure and appropriate for structure and hanger, and in a manner that will not cause hangers to deteriorate or otherwise fail.
 5. Do not attach hangers to steel roof deck.
 6. Do not attach hangers to permanent metal forms. Furnish cast-in-place hanger inserts that extend through forms.
 7. Do not attach hangers to rolled-in hanger tabs of composite steel floor deck.
 8. Do not connect or suspend steel framing from ducts, pipes, or conduit.
- D. Fire-Resistance-Rated Assemblies: Wire tie furring channels to supports.
- E. Grid Suspension Systems: Attach perimeter wall track or angle where grid suspension systems meet vertical surfaces. Mechanically join main beam and cross-furring members to each other and butt-cut to fit into wall track.
- F. Installation Tolerances: Install suspension systems that are level to within 1/8 inch in 12 feet measured lengthwise on each member that will receive finishes and transversely between parallel members that will receive finishes.

END OF SECTION 092216

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SECTION 092400 - PORTLAND CEMENT PLASTERING**PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Exterior portland cement plasterwork (stucco) on metal lath and solid- plaster bases.
- B. Related Sections include the following:
 - 1. Division 07 Section "Joint Sealants" for sealants installed with exterior portland cement plaster (stucco).

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Show locations and installation of control and expansion joints including plans, elevations, sections, details of components, and attachments to other work.
- C. Samples for Initial Selection: For each type of factory-prepared finish coat indicated.
- D. Samples for Verification: For each type of factory-prepared, colored, textured finish coat indicated; 12 by 12 inches, and prepared on rigid backing.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Store materials inside under cover and keep them dry and protected against damage from weather, direct sunlight, surface contamination, corrosion, construction traffic, and other causes.

1.5 PROJECT CONDITIONS

- A. Comply with ASTM C 926 requirements.
- B. Exterior Plasterwork:
 - 1. Apply and cure plaster to prevent plaster drying out during curing period. Use procedures required by climatic conditions, including moist curing, providing coverings, and providing barriers to deflect sunlight and wind.
 - 2. Apply plaster when ambient temperature is greater than 40 deg F.
 - 3. Protect plaster coats from freezing for not less than 48 hours after set of plaster coat has occurred.

PART 2 - PRODUCTS**2.1 MANUFACTURERS**

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
1. Products: Subject to compliance with requirements, provide one of the products specified.
 2. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 METAL LATH

- A. Expanded-Metal Lath: ASTM C 847 with ASTM A 653/A 653M, G60, hot-dip galvanized zinc coating.
1. Manufacturers:
 - a. Alabama Metal Industries Corporation (AMICO).
 - b. California Expanded Metal Products Company (CEMCO).
 - c. Dale/Incor.
 - d. Marino/Ware; Division of Ware Industries, Inc.
 - e. Phillips Manufacturing Co.
 - f. Unimast, Inc.
 - g. Western Metal Lath & Steel Framing Systems.
 2. Diamond-Mesh Lath: Self-furring.
 - a. Weight: 3.4 lb/sq. yd..

2.3 ACCESSORIES

- A. General: Comply with ASTM C 1063 and coordinate depth of trim and accessories with thicknesses and number of plaster coats required.
- B. Provide factory-fabricated intersections.
- C. Zinc and Zinc-Coated (Galvanized) Accessories:
1. Manufacturers:
 - a. Alabama Metal Industries Corporation (AMICO).
 - b. California Expanded Metal Products Company (CEMCO).
 - c. Dale/Incor.
 - d. Dietrich Industries, Inc.
 - e. Phillips Manufacturing Co.
 - f. Unimast, Inc.
 - g. Western Metal Lath & Steel Framing Systems.
 2. Foundation Weep Screed: Fabricated from hot-dip galvanized steel sheet, ASTM A 653/A 653M, G60 zinc coating **or** zinc.
 3. Cornerite: Fabricated from metal lath with ASTM A 653/A 653M, G60, hot-dip galvanized zinc coating.

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4. External-Corner Reinforcement: Fabricated from metal lath with ASTM A 653/A 653M, G60, hot-dip galvanized zinc coating.
 5. Cornerbeads: Fabricated from zinc or zinc-coated (galvanized) steel.
 - a. Small nose cornerbead with expanded flanges; use unless otherwise indicated.
 - b. Small nose cornerbead with perforated flanges; use on curved corners.
 - c. Small nose cornerbead with expanded flanges reinforced by perforated stiffening rib; use on columns and for finishing masonry corners.
 - d. Bull nose cornerbead, radius 3/4 inch minimum, with expanded flanges; use at locations indicated on Drawings.
 6. Casing Beads: Fabricated from zinc or zinc-coated (galvanized) steel; square-edged style; with expanded flanges.
- D. Plastic Trim: Fabricated from high-impact PVC.
1. Manufacturers:
 - a. Alabama Metal Industries Corporation (AMICO).
 - b. Plastic Components, Inc.
 - c. Vinyl Corp.
 2. Cornerbeads: With perforated flanges.
 - a. Small nose cornerbead; use unless otherwise indicated.
 - b. Small nose cornerbead recommended by manufacturer for use where durable corner is required; use on columns and for finishing unit masonry corners.
 - c. Bull nose cornerbead, radius 3/4 inch minimum; use at locations indicated on Drawings.
 3. Casing Beads: With perforated flanges in depth required to suit plaster bases indicated and flange length required to suit applications indicated.
 - a. Square-edge style; use unless otherwise indicated.
 - b. Bull-nose style, radius 3/4 inch minimum; use at locations indicated on Drawings.
- 2.4 MISCELLANEOUS MATERIALS
- A. Water for Mixing: Potable and free of substances capable of affecting plaster set or of damaging plaster, lath, or accessories.
 - B. Fiber for Base Coat: Alkaline-resistant glass or polypropylene fibers, 1/2 inch long, free of contaminants, manufactured for use in portland cement plaster.
 - C. Bonding Compound: ASTM C 932.
 - D. Fasteners for Attaching Metal Lath to Substrates: Complying with ASTM C 1063.
- 2.5 PLASTER MATERIALS
- A. Portland Cement: ASTM C 150, Type I.
 1. Color for Finish Coats: Gray.
 2. Masonry Cement: Not Permitted.

- B. Lime: ASTM C 206, Type S; or ASTM C 207, Type S.
- C. Sand Aggregate: ASTM C 897.
 - 1. Color for Job-Mixed Finish Coats: White.

2.6 PLASTER MIXES

- A. General: Comply with ASTM C 926 for applications indicated.
 - 1. Fiber Content: Add fiber to base-coat mixes after ingredients have mixed for at least two minutes. Comply with fiber manufacturer's written instructions for fiber quantities in mixes, but do not exceed 1 lb of fiber/cu. ft. of cementitious materials. Reduce aggregate quantities accordingly to maintain workability.
- B. Base-Coat Mixes for Use over Metal Lath: Scratch and brown coats for three-coat plasterwork as follows:
 - 1. Portland Cement Mixes:
 - a. Scratch Coat: For cementitious material, mix 1 part portland cement and 3/4 to 1-1/2 parts lime. Use 2-1/2 to 4 parts aggregate per part of cementitious material (sum of separate volumes of each component material).
 - b. Brown Coat: For cementitious material, mix 1 part portland cement and 3/4 to 1-1/2 parts lime. Use 3 to 5 parts aggregate per part of cementitious material (sum of separate volumes of each component material).
 - 2. Portland and Masonry Cement Mixes:
 - a. Scratch Coat: For cementitious material, mix 1 part portland cement and 1 part masonry cement. Use 2-1/2 to 4 parts aggregate per part of cementitious material (sum of separate volumes of each component material).
 - b. Brown Coat: For cementitious material, mix 1 part portland cement and 1 part masonry cement. Use 3 to 5 parts aggregate per part of cementitious material (sum of separate volumes of each component material).
- C. Base-Coat Mixes for Use over Concrete Unit Masonry: Single base coats for two-coat plasterwork as follows:
 - 1. Portland Cement Mix: For cementitious material, mix 1 part portland cement and 3/4 to 1-1/2 parts lime. Use 2-1/2 to 4 parts aggregate per part of cementitious material (sum of separate volumes of each component material).
 - 2. Masonry Cement Mix: Use 1 part masonry cement and 2-1/2 to 4 parts aggregate.
 - 3. Plastic Cement Mix: Use 1 part plastic cement and 2-1/2 to 4 parts aggregate.
- D. Job-Mixed Finish-Coat Mixes:
 - 1. Portland Cement Mix: For cementitious materials, mix 1 part portland cement and 3/4 to 1-1/2 parts lime. Use 1-1/2 to 3 parts aggregate per part of cementitious material (sum of separate volumes of each component material).
 - 2. Masonry Cement Mix: 1 part masonry cement and 1-1/2 to 3 parts aggregate.
 - 3. Portland and Masonry Cement Mix: For cementitious materials, mix 1 part portland cement and 1 part masonry cement. Use 1-1/2 to 3 parts aggregate per part of cementitious material (sum of separate volumes of each component material).
 - 4. Plastic Cement Mix: 1 part plastic cement and 1-1/2 to 3 parts aggregate.

PART 3 - EXECUTION**3.1 EXAMINATION**

- A. Examine areas and substrates, with Installer present for compliance with requirements and other conditions affecting performance.
 - 1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Protect adjacent work from soiling, spattering, moisture deterioration, and other harmful effects caused by plastering.
- B. Prepare solid-plaster bases that are smooth or that do not have the suction capability required to bond with plaster according to ASTM C 926.

3.3 INSTALLING METAL LATH

- A. Expanded-Metal Lath: Install according to ASTM C 1063.
 - 1. On Solid Surfaces, Not Otherwise Furred: Install self-furring diamond-mesh lath.

3.4 INSTALLING ACCESSORIES

- A. Install according to ASTM C 1063 and at locations indicated on Drawings.
- B. Reinforcement for External Corners:
 - 1. Install lath-type external-corner reinforcement at exterior locations.

3.5 PLASTER APPLICATION

- A. General: Comply with ASTM C 926.
 - 1. Do not deviate more than plus or minus 1/4 inch in 10 feet from a true plane in finished plaster surfaces, as measured by a 10-foot straightedge placed on surface.
 - 2. Provide plaster surfaces that are ready to receive field-applied finishes indicated.
- B. Bonding Compound: Apply on unit masonry plaster bases.
- C. Plaster Finish Coats: Apply to provide finish to match Architect's sample.
- D. Acrylic-Based Finish Coatings: Apply coating system, including primers, finish coats, and sealing topcoats, according to manufacturer's written instructions.

3.6 CUTTING AND PATCHING

- A. Cut, patch, replace, and repair plaster as necessary to accommodate other work and to restore cracks, dents, and imperfections. Repair or replace work to eliminate blisters, buckles, crazing

and check cracking, dry outs, efflorescence, sweat outs, and similar defects and where bond to substrate has failed.

3.7 CLEANING AND PROTECTION

- A. Remove temporary protection and enclosure of other work. Promptly remove plaster from surfaces not indicated to be plastered. Repair surfaces stained, marred, or otherwise damaged during plastering.

END OF SECTION 092400

SECTION 092900 – GYPSUM BOARD**PART 1 - GENERAL****1.1 SUMMARY**

- A. Section Includes:
1. Interior gypsum board.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples for Verification: For the following products:
1. Trim Accessories: Full-size Sample in 12-inch-long length for each trim accessory indicated.

1.3 QUALITY ASSURANCE

- A. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing agency.
- B. Mockups: Build mockups of at least 100 sq. ft. in surface area to demonstrate aesthetic effects and to set quality standards for materials and execution.
1. Build mockups for the following:
 - a. Each level of gypsum board finish indicated for use in exposed locations.
 - b. Each texture finish indicated.
 2. Apply or install final decoration indicated, including painting and wallcoverings, on exposed surfaces for review of mockups.
 3. Simulate finished lighting conditions for review of mockups.
 4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.4 DELIVERY, STORAGE AND HANDLING

- A. Store materials inside under cover and keep them dry and protected against weather, condensation, direct sunlight, construction traffic, and other potential causes of damage. Stack panels flat and supported on risers on a flat platform to prevent sagging.

1.5 FIELD CONDITIONS

- A. Environmental Limitations: Comply with ASTM C 840 requirements or gypsum board manufacturer's written instructions, whichever are more stringent.
- B. Do not install paper-faced gypsum panels until installation areas are enclosed and conditioned.

- C. Do not install panels that are wet, moisture damaged, and mold damaged.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing agency.

2.2 GYPSUM BOARD, GENERAL

- A. Size: Provide maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.

2.3 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. American Gypsum.
 2. CertainTeed Corporation.
 3. Georgia-Pacific Gypsum LLC.
 4. National Gypsum Company.
 5. PABCO Gypsum.
 6. United States Gypsum Company.

2.4 INTERIOR GYPSUM BOARD

- A. Gypsum Board, Type X: ASTM C 1396/C 1396M.
1. Thickness: 5/8 inch.
 2. Long Edges: Tapered and featured (rounded or beveled) for prefilling.
- B. Mold-Resistant Gypsum Board: ASTM C 1396/C 1396M. With moisture- and mold-resistant core and paper surfaces.
1. Core: 5/8 inch, Type X.
 2. Long Edges: Tapered.
 3. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.

2.5 TRIM ACCESSORIES

- A. Interior Trim: ASTM C 1047.
1. Material: Galvanized or aluminum-coated steel sheet or rolled zinc.
 2. Shapes:
 - a. Cornerbead.
 - b. Bullnose bead.
 - c. L-Bead: L-shaped; exposed long flange receives joint compound.

- B. Expansion (Control) Joints: Galvanized or aluminum-coated steel sheet, rolled zinc, plastic, or paper-faced galvanized steel sheet control joint with 1/2 inch to 3/4 inch grounds for drywall finishes. Staple or screw grounds to panel face.
1. Where fire and sound control joints are indicated, provide fire rated seal behind control joint.
- C. Aluminum Trim: Extruded accessories of profiles and dimensions indicated.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Fry Reglet Corporation.
 - b. Gordon Interior Specialties Division, Gordon, Inc.
 - c. Pittcon Industries.
 2. Aluminum: Alloy and temper with not less than the strength and durability properties of ASTM B 221, Alloy 6063-T5.
 3. Finish: Corrosion-resistant primer compatible with joint compound and finish materials specified.

2.6 JOINT TREATMENT MATERIALS

- A. General: Comply with ASTM C 475/C 475M.
- B. Joint Tape: Interior Gypsum Board: Paper.
- C. Joint Compound for Interior Gypsum Board: For each coat, use formulation that is compatible with other compounds applied on previous or for successive coats.
1. Prefilling: At open joints, rounded or beveled panel edges, and damaged surface areas, use setting-type taping compound.
 2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use setting-type taping compound.
 - a. Use setting-type compound for installing paper-faced metal trim accessories.
 3. Fill Coat: For second coat, use setting-type, sandable topping compound.
 4. Finish Coat: For third coat, use drying-type, all-purpose compound.
 5. Skim Coat: For final coat of Level 5 finish, use setting-type, sandable topping compound or high-build interior coating product designed for application by airless sprayer and to be used instead of skim coat to produce Level 5 finish.

2.7 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written instructions.
- B. Steel Drill Screws: ASTM C 1002 unless otherwise indicated.
1. Use screws complying with ASTM C 954 for fastening panels to steel members from 0.033 to 0.112 inch thick.
- C. Thermal Insulation: As specified in Section 072100 – Thermal Insulation.

- D. Acoustical Joint Sealant: Specified in Section 079219 – Acoustical Joint Sealants.
- E. Provide other materials, not specifically described, but required for complete and proper installation, as selected by Contractor subject to approval of Architect.

2.8 SOUND ATTENUATION

- A. Sound Attenuation Blankets: ASTM C665, Type I (blankets without membrane facing) produced by combining thermosetting resins with mineral fibers manufactured from glass, slag wool, or rock wool.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. CertainTeed Corporation: CertaPro AcoustaTherm Batts.
 - b. Johns Manville: Sound Control Batts.
 - c. Knauf Insulation: QuietTherm Acoustical/Thermal Batt Insulation.
 - d. Owens Corning: Fiberglas Unfaced Sound Attenuation Blankets.
 - e. Roxul Inc.: AFB.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and substrates including welded hollow-metal frames and support framing, with Installer present, for compliance with requirements and other conditions affecting performance of the Work.
- B. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 APPLYING AND FINISHING PANELS, GENERAL

- A. Comply with ASTM C 840.
- B. Install ceiling panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.
- C. Install panels with face side out. Butt panels together for a light contact at edges and ends with not more than 1/16 inch of open space between panels. Do not force into place.
- D. Locate edge and end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Do not make joints other than control joints at corners of framed openings.
- E. Form control and expansion joints with space between edges of adjoining gypsum panels.
- F. Cover both faces of support framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases braced internally.

1. Unless concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. in area.
 2. Fit gypsum panels around ducts, pipes, and conduits.
 3. Where partitions intersect structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by structural members; allow 1/4- to 3/8-inch-wide joints to install sealant.
- G. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments. Provide 1/4- to 1/2-inch-wide spaces at these locations and trim edges with edge trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.
- H. Attachment to Steel Framing: Attach panels so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.

3.3 ACOUSTICALLY RATED PARTITIONS

- A. Provide materials as required by gypsum panel system manufacturers to achieve laboratory Sound Transmission Class (STC) ratings indicated.
- B. Install sound attenuation blankets before installing gypsum panels, unless blankets are readily installed after panels have been installed on 1 side.
- C. Do not install gypsum panel layers continuous between 2 adjacent rooms.
- D. STC-Rated Assemblies: Seal construction per requirements specified in Section 079219.

3.4 APPLYING INTERIOR GYPSUM BOARD

- A. Install interior gypsum board in the following locations:
 1. Wallboard Type: Vertical surfaces unless otherwise indicated.
 2. Type X: As indicated on Drawings.
 3. Moisture- and Mold-Resistant Type: At exterior walls, interior of unconditioned shafts, and at locations where wetting may occur during construction.
- B. Single-Layer Application:
 1. On ceilings, apply gypsum panels before wall/partition board application to greatest extent possible and at right angles to framing unless otherwise indicated.
 2. On partitions/walls, apply gypsum panels vertically (parallel to framing) unless otherwise indicated or required by fire-resistance-rated assembly, and minimize end joints.
 - a. Stagger abutting end joints not less than one framing member in alternate courses of panels.
 - b. At stairwells and other high walls, install panels horizontally unless otherwise indicated or required by fire-resistance-rated assembly.
 3. On Z-shaped furring members, apply gypsum panels vertically (parallel to framing) with no end joints. Locate edge joints over furring members.
 4. Fastening Methods: Apply gypsum panels to supports with steel drill screws.

3.5 INSTALLING TRIM ACCESSORIES

- A. For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.
- B. Control (Expansion) Joints: Install control joints per ASTM C840 and GA-216, and in specific locations approved by Architect for visual effect.
 - 1. Minimum Control Joint Spacing: 30 feet on center each way.
 - 2. Minimum Joint Spacing Between Panels: 1/4 inch.
- C. Interior Trim: Install in the following locations:
 - 1. Cornerbead: Use at outside corners unless otherwise indicated.
 - 2. Bullnose Bead: Use where indicated.
 - 3. L-Bead: Use where indicated.
- D. Aluminum Trim: Install in locations indicated on Drawings.

3.6 FINISHING GYPSUM BOARD

- A. General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.
- B. Prefill open joints, rounded or beveled edges, and damaged surface areas.
- C. Apply joint tape over gypsum board joints, except for trim products specifically indicated as not intended to receive tape.
- D. Gypsum Board Finish Levels: Finish panels to levels indicated below and according to ASTM C 840:
 - 1. Level 1: Use above suspended ceilings and within other concealed spaces where gypsum board assembly is fire rated, sound rated, sound or smoke controlled, or space serves as an air plenum.
 - 2. Level 3: Where indicated on Drawings.
 - 3. Level 4: Provide Level 4 finish at the following conditions:
 - a. Gypsum board indicated to be exposed to view except where indicated for other finish levels.
 - b. Gypsum board indicated for finish with flat finish coat.
 - c. Primer and its application to surfaces are specified in Section 099123 – Interior Painting.
 - 4. Level 5: Provide Level 5 finish at the following condition:
 - a. Gypsum board indicated for finish with semi-gloss or gloss finish coats.
 - b. Primer and its application to surfaces are specified in Section 099123 – Interior Painting.

3.7 PROTECTION

- A. Protect adjacent surfaces from drywall compound and promptly remove from floors and other non-drywall surfaces. Repair surfaces stained, marred, or otherwise damaged during drywall application.

- B. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.
- C. Remove and replace panels that are wet, moisture damaged, and mold damaged.
 - 1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
 - 2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION 092900

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SECTION 093013 - CERAMIC TILING**PART 1 - GENERAL****1.1 SUMMARY****A. Section Includes:**

1. Porcelain tile.
2. Stone thresholds.
3. Waterproof membrane for thinset applications.
4. Crack isolation membrane.
5. Metal edge strips.

B. Related Requirements:

1. Section 079200 "Joint Sealants" for sealing of expansion, contraction, control, and isolation joints in tile surfaces.
2. Section 092900 "Gypsum Board" for cementitious backer units.

1.2 DEFINITIONS**A. General:** Definitions in the ANSI A108 series of tile installation standards and in ANSI A137.1 apply to Work of this Section unless otherwise specified.**B. ANSI A108 Series:** ANSI A108.01, ANSI A108.02, ANSI A108.1A, ANSI A108.1B, ANSI A108.1C, ANSI A108.4, ANSI A108.5, ANSI A108.6, ANSI A108.8, ANSI A108.9, ANSI A108.10, ANSI A108.11, ANSI A108.12, ANSI A108.13, ANSI A108.14, ANSI A108.15, ANSI A108.16, and ANSI A108.17, which are contained in its "Specifications for Installation of Ceramic Tile."**C. Module Size:** Actual tile size plus joint width indicated.**D. Face Size:** Actual tile size, excluding spacer lugs.**1.3 PERFORMANCE REQUIREMENTS****A. Dynamic Coefficient of Friction:** For tile installed on walkway surfaces, provide products that meet the requirements of ANSI A 137.1-2012 testing method, the DCOF AcuTest.

1. Minimum Threshold: 0.42 for level interior spaces expected to be walked upon when wet.

1.4 ACTION SUBMITTALS**A. Product Data:** For each type of product.**B. Shop Drawings:** Show locations of each type of tile and tile pattern. Show widths, details, and locations of expansion, contraction, control, and isolation joints in tile substrates and finished tile surfaces.**C. Samples for Verification:**

1. Full-size units of each type and composition of tile and for each color and finish required. For ceramic mosaic tile in color blend patterns, provide full sheets of each color blend.

2. Assembled samples mounted on a rigid panel, with grouted joints, for each type and composition of tile and for each color and finish required. Make samples at least 12 inches square, but not fewer than four tiles. Use grout of type and in color or colors approved for completed Work.
3. Full-size units of each type of trim and accessory for each color and finish required.
4. Stone thresholds in 6-inch lengths.
5. Metal edge strips in 6-inch lengths.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Product Certificates: For each type of product.
- C. Product Test Reports: For tile-setting and -grouting products and certified porcelain tile.

1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match and are from same production runs as products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 1. Tile and Trim Units: Furnish quantity of full-size units equal to 5 percent of amount installed for each type, composition, color, pattern, and size indicated.
 2. Grout: Furnish quantity of grout equal to 5 percent of amount installed for each type, composition, and color indicated.

1.7 QUALITY ASSURANCE

- A. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution, including grouted joints, composition, pattern and custom blending of tile for each type, color, and finish required. Mockups shall be minimum 36 inches square or in sizes as directed by Architect.
 1. Build mockup of each type of floor tile installation.
 2. Build mockup of each type of wall tile installation.
 3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver and store packaged materials in original containers with seals unbroken and labels intact until time of use. Comply with requirements in ANSI A137.1 for labeling tile packages.
- B. Store tile and cementitious materials on elevated platforms, under cover, and in a dry location.
- C. Store aggregates where grading and other required characteristics can be maintained and contamination can be avoided.
- D. Store liquid materials in unopened containers and protected from freezing.

1.9 FIELD CONDITIONS

- A. Environmental Limitations: Do not install tile until construction in spaces is complete and ambient temperature and humidity conditions are maintained at the levels indicated in referenced standards and manufacturer's written instructions.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations for Tile: Obtain tile of each type from single source or producer.
1. Obtain tile of each type and color or finish from same production run and of consistent quality in appearance and physical properties for each contiguous area.
- B. Source Limitations for Setting and Grouting Materials: Obtain ingredients of a uniform quality for each mortar, adhesive, and grout component from single manufacturer and each aggregate from single source or producer.
1. Obtain setting and grouting materials, except for unmodified Portland cement and aggregate, from single manufacturer.
 2. Obtain waterproof membrane and crack isolation membrane, except for sheet products, from manufacturer of setting and grouting materials.
- C. Source Limitations for Other Products: Obtain each of the following products specified in this Section from a single manufacturer:
1. Stone thresholds.
 2. Waterproof membrane.
 3. Crack isolation membrane.
 4. Metal edge strips.

2.2 PRODUCTS, GENERAL

- A. ANSI Ceramic Tile Standard: Provide tile that complies with ANSI A137.1 for types, compositions, and other characteristics indicated.
1. Provide tile complying with Standard grade requirements unless otherwise indicated.
- B. ANSI Standards for Tile Installation Materials: Provide materials complying with ANSI A108.02, ANSI standards referenced in other Part 2 articles, ANSI standards referenced by TCNA installation methods specified in tile installation schedules, and other requirements specified.
- C. Factory Blending: For tile exhibiting color variations within ranges, blend tile in factory and package so tile units taken from one package show same range in colors as those taken from other packages and match approved Samples.

2.3 TILE PRODUCTS

- A. Tile Products for Walls, Floors and Trim Units (Base): Subject to compliance with requirements, provide Basis-of-Design products indicated on Room Finish Legend or a comparable product by one of the following:
1. Crossville.

2. Daltile.
3. Or approved equal.

2.4 THRESHOLDS

- A. General: Fabricate to sizes and profiles indicated or required to provide transition between adjacent floor finishes.
 1. Bevel edges at 1:2 slope, with lower edge of bevel aligned with or up to 1/16 inch above adjacent floor surface. Finish bevel to match top surface of threshold. Limit height of threshold to 1/2 inch or less above adjacent floor surface.
- B. Marble Thresholds: ASTM C 503/C 503M, with a minimum abrasion resistance of 12 according to ASTM C 1353 or ASTM C 241/C 241M and with honed finish.
 1. Description: Match Architect's sample.

2.5 TILE BACKING PANELS

- A. Tile Backing Panels: As specified in Section 092900 "Gypsum Board."

2.6 WATERPROOF MEMBRANE

- A. General: Manufacturer's standard product that complies with ANSI A118.10 and is recommended by the manufacturer for the application indicated. Include reinforcement and accessories recommended by manufacturer.
- B. Polyethylene Sheet: Polyethylene faced on both sides with fleece webbing; 0.008-inch nominal thickness.
 1. Products: Subject to compliance with requirements, provide the following:
 - a. Schluter Systems L.P.; KERDI.

2.7 WATERPROOFING AND CRACK ISOLATION MEMBRANES

- A. General: Manufacturer's standard product that complies with ANSI A118.10/ANSI A118.12 and is recommended by the manufacturer for the application indicated. Include reinforcement and accessories recommended by manufacturer.
- B. Fabric-Reinforced, Fluid-Applied Membrane: System consisting of liquid-latex rubber or elastomeric polymer and continuous fabric reinforcement.
 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Boiardi Products; a QEP company; Elastiment 344 Reinforced Waterproofing and Anti-Fracture/Crack Suppression Membrane.
 - b. Custom Building Products; 9240 Waterproofing and Anti-Fracture Membrane.
 - c. Laticrete International, Inc.; Laticrete 9235 Waterproof Membrane.
 - d. MAPEI Corporation; Mapelastic HPG with MAPEI Fiberglass Mesh.
 - e. TEC: H.B. Fuller Construction Products Inc.; HydraFlex Waterproof-Crack Isolation Membrane with TEC Waterproofing Mesh.
 - f. Southern Grouts & Mortars, Inc.; Southcrete 1100 Crack Suppression.
 - g. Summitville Tiles, Inc.; S-9000.

2.8 CRACK ISOLATION MEMBRANE

- A. General: Manufacturer's standard product that complies with ANSI A118.12 for high performance and is recommended by the manufacturer for the application indicated. Include reinforcement and accessories recommended by manufacturer.
- B. Corrugated Polyethylene/Uncoupling Membrane: Corrugated polyethylene with dovetail-shaped corrugations and with anchoring webbing on the underside; 3/16-inch nominal thickness.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. ARDEX Americas; ARDEX IU 740 Flexbone.
 - b. Schluter Systems L.P.; DITRA.

2.9 SETTING MATERIALS

- A. Modified Dry-Set Mortar (Thinset): ANSI A118.4.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. ARDEX Americas; X77.
 - b. Custom Building Products; Porcelain Tile.
 - c. Laticrete International, Inc.; 254 Platinum.
 - d. TEC: H.B. Fuller Construction Products Inc.; Full Flex.
 - 2. Provide prepackaged, dry-mortar mix containing dry, redispersible, vinyl acetate or acrylic additive to which only water must be added at Project site.
 - 3. Provide prepackaged, dry-mortar mix combined with acrylic resin or styrene-butadiene-rubber liquid-latex additive at Project site.
 - 4. For wall applications, provide mortar that complies with requirements for nonsagging mortar in addition to the other requirements in ANSI A118.4.
- B. Water-Cleanable, Tile-Setting Epoxy: ANSI A118.3.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Custom Building Products; CEG Lite.
 - b. Laticrete International Inc.; SpectraLock Pro Premium.
 - c. MAPEI Corporation; Kerapoxy.
 - d. TEC: H.B. Fuller Construction Products Inc. ; Accucolor EFX.
 - 2. Provide product capable of withstanding continuous and intermittent exposure to temperatures of up to 140 and 212 deg F, respectively, and certified by manufacturer for intended use.

2.10 GROUT MATERIALS

- A. Water-Cleanable Epoxy Grout: ANSI A118.3, with a VOC content of 65 g/L or less.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Bostik, Inc.; EzPoxy.
 - b. Custom Building Products; CEG Lite.
 - c. Laticrete International, Inc.; Spectralock Pro Premium.
 - d. MAPEI Corporation; Kerapoxy.
 - e. Summitville Tiles, Inc.
 - f. TEC: H.B. Fuller Construction Products Inc.; Accucolor EFX.

2. Provide product capable of withstanding continuous and intermittent exposure to temperatures of up to 140 and 212 deg F, respectively, and certified by manufacturer for intended use.
- B. Water-Cleanable Epoxy Grout (for quarry tile in kitchen): ANSI A118.3 and ANSI A118.5, with a VOC content of 65 g/L or less.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Bostik, Inc.
 - b. Custom Building Products.
 - c. Laticrete International, Inc.; Spectralock 2000 IG (Basis-of-Design).
 - d. MAPEI Corporation.
 - e. Summitville Tiles, Inc.
 - f. TEC: H.B. Fuller Construction Products Inc.
 2. Provide product capable of withstanding continuous and intermittent exposure to temperatures of up to 140 and 212 deg F, respectively, and certified by manufacturer for intended use.

2.11 MISCELLANEOUS MATERIALS

- A. Trowelable Underlayments and Patching Compounds: Latex-modified, portland cement-based formulation provided or approved by manufacturer of tile-setting materials for installations indicated.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. ARDEX Americas; ARDEX TL 1000 Self-Leveling Underlayment.
 - b. Laticrete International, Inc.
 - c. MAPEI Corporation.
 - d. TEC: H.B. Fuller Construction Products, Inc.; Fast Set Deep Patch Leveler.
- B. Vapor-Retarder Membrane: Polyethylene sheeting, ASTM D 4397, 4.0 mils thick.
- C. Metal Edge Strips: Angle or L-shaped, height to match tile and setting-bed thickness, metallic or combination of metal and PVC or neoprene base, designed specifically for flooring applications; stainless-steel, ASTM A 666, 300 Series exposed-edge material.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Blanke Corporation.
 - b. Ceramic Tool Company, Inc.
 - c. Schluter Systems L.P.
- D. Tile Cleaner: A neutral cleaner capable of removing soil and residue without harming tile and grout surfaces, specifically approved for materials and installations indicated by tile and grout manufacturers.
- E. Floor Sealer: Manufacturer's standard product for sealing grout joints and that does not change color or appearance of grout.
1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Custom Building Products; Grout and Tile Sealer.
 - b. Laticrete International, Inc.; Bulletproof Sealer.
 - c. MAPEI Corporation; UltraCare Grout Sealer.
 - d. Summitville Tile, Inc.; SL-15 Invisible Seal.

2.12 MIXING MORTARS AND GROUT

- A. Mix mortars and grouts to comply with referenced standards and mortar and grout manufacturers' written instructions.
- B. Add materials, water, and additives in accurate proportions.
- C. Obtain and use type of mixing equipment, mixer speeds, mixing containers, mixing time, and other procedures to produce mortars and grouts of uniform quality with optimum performance characteristics for installations indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions where tile will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
 - 1. Verify that substrates for setting tile are firm; dry; clean; free of coatings that are incompatible with tile-setting materials, including curing compounds and other substances that contain soap, wax, oil, or silicone; and comply with flatness tolerances required by ANSI A108.01 for installations indicated.
 - 2. Verify that concrete substrates for tile floors installed with thinset mortar comply with surface finish requirements in ANSI A108.01 for installations indicated.
 - a. Verify that surfaces that received a steel trowel finish have been mechanically scarified.
 - b. Verify that protrusions, bumps, and ridges have been removed by sanding or grinding.
 - 3. Verify that installation of grounds, anchors, recessed frames, electrical and mechanical units of work, and similar items located in or behind tile has been completed.
 - 4. Verify that joints and cracks in tile substrates are coordinated with tile joint locations; if not coordinated, adjust joint locations in consultation with Architect.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Fill cracks, holes, and depressions in concrete substrates for tile floors installed with thinset mortar with trowelable leveling and patching compound specifically recommended by tile-setting material manufacturer.
- B. Where indicated, prepare substrates to receive waterproofing by applying a reinforced mortar bed that complies with ANSI A108.1A and is sloped 1/8 inch per foot toward drains
- C. Blending: For tile exhibiting color variations, verify that tile has been factory blended and packaged so tile units taken from one package show same range of colors as those taken from other packages and match approved Samples. If not factory blended, either return to manufacturer or blend tiles at Project site before installing.

3.3 TILE BACKING PANEL INSTALLATION

- A. As indicated in Section 092900 "Gypsum Board."

3.4 CERAMIC TILE INSTALLATION

- A. Comply with TCNA's "Handbook for Ceramic, Glass, and Stone Tile Installation" for TCNA installation methods specified in tile installation schedules. Comply with parts of the ANSI A108 series "Specifications for Installation of Ceramic Tile" that are referenced in TCNA installation methods, specified in tile installation schedules, and apply to types of setting and grouting materials used.
1. For the following installations, follow procedures in the ANSI A108 series of tile installation standards for providing 95 percent mortar coverage:
 - a. Tile floors in wet areas.
 - b. Tile floors in laundries.
 - c. Tile floors consisting of tiles 8 by 8 inches or larger.
 - d. Tile floors consisting of rib-backed tiles.
- B. Extend tile work into recesses and under or behind equipment and fixtures to form complete covering without interruptions unless otherwise indicated. Terminate work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.
- C. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish, or built-in items for straight aligned joints. Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so plates, collars, or covers overlap tile.
- D. Provide manufacturer's standard trim shapes where necessary to eliminate exposed tile edges.
- E. Where accent tile differs in thickness from field tile, vary setting-bed thickness so that tiles are flush.
- F. Jointing Pattern: Lay tile in grid pattern unless otherwise indicated. Lay out tile work and center tile fields in both directions in each space or on each wall area. Lay out tile work to minimize the use of pieces that are less than half of a tile. Provide uniform joint widths unless otherwise indicated.
1. For tile mounted in sheets, make joints between tile sheets same width as joints within tile sheets so joints between sheets are not apparent in finished work.
 2. Where adjoining tiles on floor, base, walls, or trim are specified or indicated to be same size, align joints.
 3. Where tiles are specified or indicated to be whole integer multiples of adjoining tiles on floor, base, walls, or trim, align joints unless otherwise indicated.
- G. Joint Widths: Unless otherwise indicated, install tile with the joint width the narrowest joint recommended in writing by tile manufacturer:
- H. Expansion Joints: Provide expansion joints and other sealant-filled joints, including control, contraction, and isolation joints, where indicated on approved Shop Drawings. Form full depth joints during installation of setting materials, mortar beds, and tile. Do not saw-cut joints after installing tiles. Provide expansion joints as follows:
1. Where joints occur in concrete substrates, locate joints in tile surfaces directly above them and of equal or greater widths.
 2. Where tilework abuts restraining surfaces such as perimeter walls, curbs, columns, and ceilings.
 3. Where there is a change in substrate material.
 4. Interior Tilework: 20 to 25 feet in each direction.
 5. Above ground concrete substrates: 8 to 12 feet in each direction.
 6. Interior tilework exposed to direct sunlight: 8 to 12 feet in each direction.
 7. Interior tilework exposed to moisture: 8 to 12 feet in each direction.

- I. Stone Thresholds: Install stone thresholds in same type of setting bed as adjacent floor unless otherwise indicated.
 - 1. Do not extend waterproofing or crack isolation membrane under thresholds set in standard dry-set mortar. Fill joints between such thresholds and adjoining tile set on waterproofing or crack isolation membrane with elastomeric sealant.
- J. Metal Edge Strips: Install at locations indicated on Drawings.
- K. Floor Sealer: Apply floor sealer to cementitious grout joints in tile floors according to floor-sealer manufacturer's written instructions. As soon as floor sealer has penetrated grout joints, remove excess sealer and sealer from tile faces by wiping with soft cloth.

3.5 WATERPROOFING INSTALLATION

- A. Install waterproofing to comply with ANSI A108.13 and manufacturer's written instructions to produce waterproof membrane of uniform thickness that is bonded securely to substrate.
- B. Allow waterproofing to cure and verify by testing that it is watertight before installing tile or setting materials over it.

3.6 CRACK ISOLATION MEMBRANE INSTALLATION

- A. Install crack isolation membrane to comply with ANSI A108.17 and manufacturer's written instructions to produce membrane of uniform thickness that is bonded securely to substrate.
- B. Allow crack isolation membrane to cure before installing tile or setting materials over it.

3.7 ADJUSTING AND CLEANING

- A. Remove and replace tile that is damaged or that does not match adjoining tile. Provide new matching units, installed as specified and in a manner to eliminate evidence of replacement.
- B. Cleaning: On completion of placement and grouting, clean all ceramic tile surfaces so they are free of foreign matter.
 - 1. Remove grout residue from tile as soon as possible.
 - 2. Clean grout smears and haze from tile according to tile and grout manufacturer's written instructions but no sooner than 10 days after installation. Use only cleaners recommended by tile and grout manufacturers and only after determining that cleaners are safe to use by testing on samples of tile and other surfaces to be cleaned. Protect metal surfaces and plumbing fixtures from effects of cleaning. Flush surfaces with clean water before and after cleaning.

3.8 PROTECTION

- A. Protect installed tile work with kraft paper or other heavy covering during construction period to prevent staining, damage, and wear. If recommended by tile manufacturer, apply coat of neutral protective cleaner to completed tile walls and floors.
- B. Prohibit foot and wheel traffic from tiled floors for at least seven days after grouting is completed.
- C. Before final inspection, remove protective coverings and rinse neutral protective cleaner from tile surfaces.

END OF SECTION 093013

SECTION 095113 - ACOUSTICAL PANEL CEILINGS**PART 1 - GENERAL****1.1 SUMMARY**

- A. Section Includes:
1. Acoustical panels and exposed suspension systems for ceilings.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples: For each exposed product and for each color and texture specified, 6 inches in size.
- C. Samples for Verification: For each component indicated and for each exposed finish required, prepared on Samples of size indicated below.
1. Acoustical Panel: Set of three 24 inch square Samples of each type, color, pattern, and texture.
 2. Exposed Suspension-System Members, Moldings, and Trim: Set of 12 inch long Samples of each type, finish, and color.

1.3 INFORMATIONAL SUBMITTALS

- A. Product Test Reports: For each acoustical panel ceiling, for tests performed by manufacturer and witnessed by qualified testing agency.
- B. Evaluation Reports: For each acoustical panel ceiling suspension system from ICC-ES.

1.4 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For finishes to include in maintenance manuals.

1.5 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
1. Acoustical Ceiling Panels: Full-size panels equal to 2 percent of quantity installed.
 2. Suspension-System Components: Quantity of each exposed component equal to 2 percent of quantity installed.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver acoustical panels, suspension-system components, and accessories to Project site in original, unopened packages and store in fully enclosed, conditioned space where they will be protected against damage from moisture, humidity, temperature extremes, direct sunlight, surface contamination, and other causes.
- B. Before installing acoustical panels, permit to reach room temperature and stabilized moisture content.

- C. Handle acoustical panels carefully to avoid chipping edges or damaging units in any way.

PART 2 - PRODUCTS

2.1 PERFORMANCE criteria

- A. Surface-Burning Characteristics: Comply with ASTM E84; testing by qualified testing agency. Identify products with appropriate markings of applicable testing agency.
1. Flame-Spread Index: Comply with ASTM E1264 for Class A materials.
 2. Smoke-Developed Index: 50 or less.

2.2 ACOUSTICAL PANELS, GENERAL

- A. Source Limitations:
1. Acoustical Ceiling Panel: Obtain each type from single source from single manufacturer.
 2. Suspension System: Obtain each type from single source from single manufacturer.
- B. Acoustical Panel Standard: Provide manufacturer's standard panels of configuration indicated that comply with ASTM E1264 classifications as designated by types, patterns, acoustical ratings, and light reflectances unless otherwise indicated.
1. Mounting Method for Measuring NRC: Type E-400; plenum mounting in which face of test specimen is 15-3/4 inches away from test surface per ASTM E795.

2.3 ACOUSTICAL PANELS

- A. Acoustical Ceiling Panel Products: Subject to compliance with requirements, provide products indicated on Room Finish Legend on Drawings, or a comparable product by one of the following:
1. Armstrong World Industries, Inc. (Basis-of-Design)
 2. AVL Systems, Inc.
 3. Certainteed Corp.
 4. USG Corp.
 5. Rockfon LLC

2.4 METAL SUSPENSION SYSTEMS, GENERAL

- A. Metal Suspension System Standard: Provide manufacturer's standard direct-hung metal suspension systems of types, structural classifications, and finishes indicated that comply with applicable requirements in ASTM C635.
- B. Finishes and Colors, General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes. Provide manufacturer's standard factory-applied finish for type of system indicated.
- C. Metal Edge Moldings and Trim: Type and profile indicated or, if not indicated, manufacturer's standard moldings for edges and penetrations formed from sheet metal of same material, finish, and color as that used for exposed flanges of suspension system runners.
- D. Attachment Devices: Size for 5 times design load indicated in ASTM C635, Table 1, "Direct Hung," unless otherwise indicated.

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- E. Wire Hangers, Braces, and Ties: Provide wires as follows:
1. Zinc-Coated, Carbon-Steel Wire: ASTM A641, Class 1 zinc coating, soft temper.
 2. Size: Select wire diameter so its stress at 3 times hanger design load (ASTM C635, Table 1, "Direct Hung") will be less than yield stress of wire, but provide not less than 0.108 inch diameter wire.
- F. Hold-Down Clips: Manufacturer's standard hold-down clips spaced 24 inches on center on cross tees.
- G. Impact Clips: Manufacturer's standard impact-clip system designed to absorb impact forces against acoustical panels.
- H. Provide other materials, not specifically described but required for complete and proper installation, subject to approval of Architect.

2.5 METAL SUSPENSION SYSTEM

- A. Wide-Face, Capped, Double-Web, Steel Suspension System: Main and cross runners roll formed from cold-rolled steel sheet, prepainted, electrolytically zinc coated, or hot-dip galvanized per ASTM A653, not less than G30 coating designation, with prefinished 15/16 inch wide metal caps on flanges.
1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Armstrong World Industries, Inc.: Prelude ML 15/16" Exposed Tee.
 - b. CertainTeed Corp.: 15/16" Classic Stab.
 - c. Chicago Metallic Corporation: 200 Snap-Grid.
 - d. USG Interiors, Inc.: Donn DX Acoustical Suspension System.

2.6 METAL EDGE MOLDINGS AND TRIM

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Armstrong World Industries, Inc.
 2. CertainTeed Corp.
 3. Chicago Metallic Corporation.
 4. Fry Reglet Corporation.
 5. Gordon, Inc.
 6. USG Interiors, Inc.: Subsidiary of USG Corporation.
- B. Roll-Formed, Sheet-Metal Edge Moldings and Trim: Type and profile indicated or, if not indicated, manufacturer's standard moldings for edges and penetrations; formed from sheet metal of same material, finish, and color as that used for exposed flanges of suspension system runners.
1. Provide manufacturer's standard edge moldings that fit acoustical panel edge details and suspension systems indicated and that match width and configuration of exposed runners, unless otherwise indicated.
 2. For circular penetrations of ceiling, provide edge moldings fabricated to diameter required to fit penetration exactly.

2.7 SUSPENDED DECORATIVE CHANNELS

- A. Decorative Trim System: Extruded aluminum sections, alloy 6063, formed to match profiles indicated on Drawings, pre-assembled with built-in splice plates that connect to straight sections.

1. Basis-of-Design Product: Subject to compliance with requirements, provide Axiom Classic Trim by Armstrong World Industries, Inc. or approved substitution from one of the following:
 - a. CertainTeed Corp.
 - b. Chicago Metallic Corporation.
 - c. Fry Reglet Corporation.
 - d. Gordon Interior Specialties Division, Gordon, Inc.
 - e. USG Interiors, Inc.
 2. Finish: Decorative trim manufacturer's factory-applied baked polyester paint system.
 3. Color: As indicated on Room Finish Legend or as selected by Architect from manufacturer's full color range.
- B. Accessories: Provide decorative channel manufacturer's hanging clips, splices and set screws, T-Bar connector clips, perimeter trim hold-down clips, drywall trim, and other materials necessary for a complete installation.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Above-Ceiling Observation: Before installing acoustical ceilings, Architect will conduct an above-ceiling observation and report deficiencies in Work observed. Do not proceed with installation of acoustical ceiling support framing until deficiencies have been corrected.
- B. Notify Architect seven days in advance of date and time when Project, or part of Project, will be ready for above-ceiling observation.
- C. Measure each ceiling area and establish layout of acoustical panels to balance border widths at opposite edges of each ceiling. Do not use less than 1/2 width panels at borders. Comply with layout shown on reflected ceiling plans.

3.2 INSTALLATION

- A. General: Install acoustical panel ceilings to comply with ASTM C636 requirements indicated, per manufacturer's written instructions and CISCA's "Ceiling Systems Handbook."
- B. Suspend ceiling hangers from building's structural members and as follows:
 1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structure or of ceiling suspension system.
 2. Splay hangers only where required to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
 3. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with location of hangers at spacings required to support standard suspension-system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices.
 4. Secure wire hangers to ceiling-suspension members and to supports above with minimum of 3 tight turns. Connect hangers directly either to structures or to inserts, eye screws, or other devices that are secure and appropriate for substrate and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.
 5. When steel framing does not permit installation of hanger wires at spacing required, install carrying channels or other supplemental support for attachment of hanger wires.
 6. Do not attach hangers to steel deck tabs.

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7. Do not attach hangers to steel roof deck. Attach hangers to structural members.
 8. Space hangers not more than 48 inches on center along each member supported directly from hangers unless otherwise indicated; provide hangers not more than 8 inches from ends of each member.
 9. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards and publications.
- C. Secure bracing wires to ceiling suspension members and to supports with minimum of 4 tight turns. Suspend bracing from building's structural members as required for hangers, without attaching to permanent metal forms, steel deck, or steel deck tabs. Fasten bracing wires into concrete with cast-in-place or postinstalled anchors.
- D. Install edge moldings and trim of type indicated at perimeter of acoustical ceiling area and where necessary to conceal edges of acoustical panels.
1. Screw attach moldings to substrate at intervals not more than 16 inches on center and not more than 3 inches from ends, leveling with ceiling suspension system to tolerance of 1/8 inch in 12 feet. Miter corners accurately and connect securely.
- E. Install suspension-system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.
- F. Install acoustical panels with undamaged edges and fit accurately into suspension-system runners and edge moldings. Scribe and cut panels at borders and penetrations to provide neat, precise fit as indicated on reflected ceiling plans.
- 3.3 ADJUSTING AND CLEANING
- A. Adjust sags or twists that develop in ceiling systems and replace materials which are damaged or faulty.
- B. Clean exposed surfaces of acoustical panel ceilings, including trim, edge moldings, and suspension-system members. Comply with manufacturer's written instructions for cleaning and touchup of minor finish damage. Remove and replace ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION 095113

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SECTION 096463 – WOOD STAGE FLOORING**PART 1 - GENERAL****1.1 SUMMARY**

- A. Section includes wood stage-floor assemblies.

1.2 SYSTEMS DESCRIPTION

- A. Provide monolithically rigid, slightly sprung, wood stage floor suited for multi-use performances.
- B. The system consists of two layers of subflooring installed over sleepers on resilient pads with finish surface of tempered hardboard at performance area and hardwood strip flooring at forestage.

1.3 ACTION SUBMITTALS

- A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for wood stage-floor assemblies.
- B. Shop Drawings: Show installation details including location and layout of each type of floor assembly and accessory. Include the following:
 - 1. Expansion provisions and trim details.
- C. Samples for Verification: For each type of stage-floor assembly and accessory required; approximately 12 inches long and of same thickness and material indicated for the Work. For hardwood strip flooring, provide sample approximately 12 inches long, showing the full range of normal color and texture variations expected and stained and finished as proposed for this Project.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Maintenance Data: For wood stage-floor assemblies and finish systems to include in maintenance manuals. Include the following:
 - 1. Overview of floor construction, including its inherent features.
 - 2. Recommended practices and accessories (“improved stage screws”) for fastening and anchoring scenic and production elements to the floor and repair of the floor after removal of screws.
 - 3. Recommendations for routine cleaning and maintenance.
 - 4. Recommendations for appropriate paints for re-application.
 - 5. Instructions for the removal and replacement of the top hardboard layer when it becomes too damaged by production wear and tear to be repaired.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who has completed wood stage-floor assembly installations similar in material, design, and extent to that indicated for this Project and whose work has resulted in installations with a record of successful in-service performance.

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1. Installer responsibilities include installation and field finishing of stage-floor assembly components and accessories.
 - B. Maple Flooring: Comply with applicable MFMA grading rules for species, grade, and cut.
 1. Certification: Provide flooring that carries MFMA mark on each bundle or piece.
- 1.6 DELIVERY, STORAGE, AND HANDLING
- A. Deliver assembly materials in unopened cartons or bundles.
 - B. Protect wood from exposure to moisture. Do not deliver wood components until after concrete, masonry, plaster, ceramic tile, and similar wet work is complete and dry.
 - C. Store wood components in a dry, warm, well-ventilated, weathertight location and in a horizontal position. Do not store in contact with masonry.
- 1.7 PROJECT CONDITIONS
- A. Conditioning period begins not less than seven days before stage-floor assembly installation, is continuous through installation, and continues not less than seven days after stage-floor installation.
 1. Environmental Conditioning: Maintain an ambient temperature between 65 and 75 deg F and relative humidity planned for building occupants, but not less than 35 percent or more than 50 percent, in spaces to receive stage-floor assemblies during the conditioning period.
 2. Wood Conditioning: Move wood components into spaces where they will be installed, no later than beginning of the conditioning period.
 - a. Do not install stage-floor assemblies until wood components adjust to relative humidity of, and are at same temperature as, spaces where they are to be installed.
 - b. Open sealed packages to allow wood components to acclimatize immediately on moving wood components into spaces in which they will be installed.
 - B. After conditioning period, maintain relative humidity and ambient temperature planned for building occupants.
 - C. Install stage-floor assemblies after other finishing operations, including painting, except for painting of stage floor itself, have been completed.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Resilient Pads: Subject to compliance with requirements, provide products by one of the following or approved substitute:
 1. Kenetics.
 2. Mason Industries.
- B. Tempered High Density Fiberboard:
 1. Subject to compliance with requirements, provide the following or approved substitute:
 2. Masonite "Duron" tempered floor underlayment.

2.2 WOOD PANEL PRODUCTS, GENERAL

- A. Plywood: Either DOC PS 1 or DOC PS 2, unless otherwise indicated.
- B. Oriented Strand Board: DOC PS 2.
- C. Tempered High Density Fiberboard: ANSI A208.2, Grade HD.
- D. Factory mark panels to indicate compliance with applicable standard.

2.3 WOOD-PRESERVATIVE-TREATED LUMBER

- A. Preservative Treatment by Pressure Process: AWWA U1, except that lumber that is not in contact with the ground and is continuously protected from liquid water may be treated according to AWWA C31 with inorganic boron (SBX).
 - 1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.
- B. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Do not use material that is warped or does not comply with requirements for untreated material.
- C. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review.
- D. Application: Treat wood sleepers and similar concealed members in contact with masonry or concrete.

2.4 WOOD FLOORING

- A. Solid-Wood, Strip Flooring: Kiln dried to 6 to 9 percent maximum moisture content, tongue and groove and end matched, and with backs channeled (kerfed) for stress relief.
 - 1. Species and Grade: MFMA-RL First Grade hard maple.
 - 2. Cut: Plain sawn.
 - 3. Thickness: 25/32 inch.
 - 4. Face Width: 2-1/4 inches.
 - 5. Lengths: Random-length strips complying with applicable grading rules.
 - 6. Backs: Channeled (kerfed) for stress relief.
- B. Urethane Finish System: Complete water-based system of compatible components, complying with VOC limitations, that is recommended by finish manufacturer for application indicated.
 - 1. Floor Sealer: Pliable, penetrating type.
 - a. BonaKemi USA Inc.; Bonaseal or approved substitute.
 - 2. Finish Coats: Formulated for multicoat application on wood flooring.
 - a. BonaKemi USA Inc.; Bonatech Traffic Commercial Finish, Satin, or approved substitute.
- C. Wood Filler: Compatible with finish system components and recommended by filler and finish manufacturers for use indicated. If required to match approved Samples, provide pigmented filler.

2.5 SUBFLOOR SYSTEM

- A. Oriented-Strand-Board Subflooring: Exposure 1 single-floor panels or sheathing.
 - 1. Span Rating: Not less than 16 o.c.
 - 2. Nominal Thickness: Not less than 23/32 inch.
- B. Plywood Underlayment: APA rated, A-C, exterior glue, tongue and groove, 23/32 inch thick.
- C. Wood Sleepers: Standard grade; 48 inches long; kiln-dried Eastern hemlock, fir, pine, or spruce.
 - 1. Preservative Treatment: Clear, penetrating, water-repellent wood preservative that protects against mold, mildew, staining, and decay fungi; complying with MFMA's written recommendations and applied by immersion.
 - 2. Size: Nominal 2 by 4 inches.
- D. Resilient Pads:
 - 1. Type: Ribbed or waffled.
 - 2. Hardness: 50 durometer.
 - 3. Material: Neoprene.
 - 4. Thickness: 1/2 inch.

2.6 ACCESSORIES

- A. Trowelable Leveling and Patching Compound: Latex-modified, hydraulic-cement-based formulation approved by stage-floor manufacturer.
- B. Vapor Retarder: ASTM D 4397, polyethylene sheet not less than 6 mils thick.
- C. Fasteners: Cement-coated steel staples, 1-1/2 inches long.
- D. Adhesives for Field Gluing Panels to Framing: Formulation complying with APA AFG-01 that is approved for use with type of construction panel indicated by manufacturers of both adhesives and panels.
- E. Unfaced, Glass-Fiber Blanket Insulation: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively; passing ASTM E 136 for combustion characteristics.
- F. Sealant: complying with Section 079200 – Joint Sealants.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas and conditions, with Installer present, for compliance with requirements for maximum moisture content, installation tolerances, and other conditions affecting performance of stage-floor assemblies.
 - 1. Proceed with installation only after unsatisfactory conditions have been corrected.
- B. Concrete Slabs: Verify that concrete slabs comply with requirements specified in Division 03 Section "Cast-In-Place Concrete."

1. Moisture Testing:
 - a. Perform anhydrous calcium chloride test per ASTM F 1869, as follows:
 - 1) Perform tests so that each test area does not exceed 200 sq. ft. and perform not less than 2 tests in each installation area and with test areas evenly spaced in installation areas.
 - 2) Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. in 24 hours.
 - b. Perform tests recommended by manufacturer. Proceed with installation only after substrates pass testing.

3.2 PREPARATION

- A. Grind high spots and fill low spots on concrete substrates to produce a maximum 1/8-inch deviation in any direction when checked with a 10-foot straight edge.
 1. Use trowelable leveling and patching compounds, according to manufacturer's written instructions, to fill cracks, holes, and depressions in substrates.
- B. Remove coatings including curing compounds and other substances on substrates that are incompatible with installation adhesives and that contain soap, wax, oil, or silicone; use mechanical methods recommended by manufacturer. Do not use solvents.
- C. Broom and vacuum clean substrates to be covered immediately before product installation. After cleaning, examine substrates for moisture, alkaline salts, carbonation, or dust. Proceed with installation only after unsatisfactory conditions have been corrected.

3.3 INSTALLATION

- A. Comply with flooring manufacturer's written installation instructions, but not less than applicable recommendations in NWFA's "Installation Guidelines: Wood Flooring."
- B. Pattern: Lay flooring parallel with long dimension of space to be floored, unless otherwise indicated.
- C. Expansion Spaces: Provide as indicated, but not less than that required by manufacturer's written instructions and MFMA's written recommendations at walls and other obstructions, and at interruptions and terminations of flooring.
 1. Cover expansion spaces with base molding, trim, and saddles, as indicated on Drawings.
- D. Vapor Retarder: Install with joints lapped a minimum of 6 inches and sealed. Turn up a minimum of 3 inches at perimeter.
- E. Resilient Pads: Glue pads to underside of sleepers at 16 inches on center. Support cut ends of sleepers with resilient pads.
- F. Sleepers:
 1. Install perpendicular to direction of flooring, staggering end joints a minimum of 24 inches.
 2. Space 16 inches o.c.
 3. Do not provide attachment methods such as screws, nails, anchors or other fasteners. Sleepers shall be free floating.
 4. Provide framing around all floorboxes, conduit, fittings and at perimeter of stage area. Provide gaps in framing for thermal and moisture expansion.

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- G. Acoustical Insulation: Fill spaces between sleepers with two-inch layer of unfaced insulation without gaps or bunching.
- H. Subfloor installation, first layer:
1. Provide a bead of sealant at top of sleepers.
 2. Install OSB as first layer of subfloor with staggered joints and tongues fully inserted into grooves
 3. Fasten panels with staples at 12 centers along sleepers, staggered 6 inches from adjacent rows.
- I. Subfloor installation, middle layer:
1. Trowel construction adhesive over OSB.
 2. Install plywood panels at right angles to OSB with joints staggered from joints in subfloor below and from adjacent panels and tongues fully inserted into grooves
 3. At forestage, provide 1/4-inch HDF in lieu of plywood.
 4. Fasten panels with staples at 12 centers along sleepers, staggered 6 inches from adjacent rows and from staples in subfloor below.
- J. Finish Floor, Stage:
1. Clean, dry and level subfloor.
 2. Install HDF panels with screen (rough) side down.
 3. Install panels with staggered joints, with rows starting with one piece centered at the front edge of the stage floor.
 4. Provide 1/8-inch gap at each panel joint.
 5. Staple panels at center and at perimeter at 12 inches on center and 1/2-inch from edge.
 6. Staple panels at interruptions or penetrating items at 6-inches on center, with a minimum of two staples per side.
 7. Set staples flush with floor with no protruding edges
- K. Finish Floor, Forestage: Blind nail through OSB into sleepers.
- L. Installation Tolerances: 1/8 inch in 10 feet of variance from level.
- M. Cover wood flooring before finishing.
- 3.4 SANDING AND FINISHING
- A. Painting: Refer to Division 09 Section "Interior Painting" for requirements for painting of stage flooring.
- B. For finishing of forestage flooring, comply with applicable recommendations in NWFA's "Installation Guidelines: Wood Flooring."
- C. Allow installed flooring to acclimate to ambient conditions for at least 10 days before sanding.
- D. Fill and repair wood flooring seams and defects.
- E. Apply one coat of floor sealer in accordance with manufacturer's written recommendations.
- F. Mix Traffic finish and hardener in accordance with manufacturer's written recommendations.
- G. Apply three coats of floor-finish materials in accordance with manufacturer's written recommendations.
1. Lightly sand or abrade between coat as recommended by manufacturer and vacuum and clean with tack cloth.

2. For water-based finishes, use finishing methods recommended by finish manufacturer to minimize grain raise.

3.5 PROTECTION

- A. Protect stage floors during remainder of construction period to allow finish to cure and to ensure that flooring and finish are without damage or deterioration at time of Substantial Completion.
 1. Do not cover stage floors after finishing until finish reaches full cure, and not before seven days after applying last finish coat.
 2. Do not move heavy and sharp objects directly over stage floors. Protect fully cured floor finishes and surfaces with plywood or hardboard panels to prevent damage from storing or moving objects over sports floors.

END OF SECTION 096463

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SECTION 096466 – WOOD ATHLETIC FLOORING**PART 1 - GENERAL****1.1 SUMMARY**

- A. Section includes wood athletic flooring.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for wood athletic flooring.
- B. Shop Drawings: For each type of floor assembly, include the following:
1. Plans, sections, and attachment details.
 2. Details of concrete-slab depressions.
 3. Locations of different grades of wood flooring.
 4. Expansion provisions and trim details.
 5. Layout, colors, widths, and dimensions of game lines and markers.
 6. Locations of floor inserts for athletic equipment installed through flooring assembly.
- C. Samples for Verification: For each type of wood athletic flooring and accessory required; approximately 12 inches long and of same thickness and material indicated for the Work.
1. Include Sample sets showing the full range of normal color and texture variations expected in wood flooring.
 2. Include Sample sets showing finishes and game-line and marker paints applied to wood flooring.

1.3 INFORMATIONAL SUBMITTALS

- A. Product Test Reports: For each wood athletic flooring system, for tests performed by a qualified testing agency.

1.4 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For wood athletic flooring and finish systems to include in maintenance manuals.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: A firm or individual that has been approved by MFMA as an accredited Installer according to the MFMA Accreditation Program.
1. Installer responsibilities include installation and field finishing of wood athletic flooring components and accessories, and application of game lines and markers.
- B. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for installation.
1. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.

2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver floor assembly materials in unopened cartons or bundles.
- B. Protect wood from exposure to moisture. Do not deliver wood components until after concrete, masonry, plaster, ceramic tile, and similar wet-work is complete and dry.
- C. Store wood components in a dry, warm, well-ventilated, weathertight location and in a horizontal position.

1.7 FIELD CONDITIONS

- A. Conditioning period begins not less than seven days before wood athletic flooring installation, is continuous through installation, and continues not less than seven days after installation.
 1. Environmental Conditioning: Maintain ambient temperature between 65 and 75 deg F and relative humidity planned for building occupants, but not less than 35 percent or more than 50 percent, in spaces to receive wood athletic flooring during the conditioning period.
 2. Wood Conditioning: Move wood components into spaces where they will be installed, no later than beginning of the conditioning period.
 - a. Do not install wood athletic flooring until wood components adjust to relative humidity of, and are at same temperature as, spaces where they are to be installed.
 - b. Open sealed packages to allow wood components to acclimatize immediately on moving wood components into spaces in which they will be installed.
- B. After conditioning period, maintain relative humidity and ambient temperature planned for building occupants.
- C. Install wood athletic flooring after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Basis-of-Design Product (SF-1): Subject to compliance with requirements, provide the Basis-of-Design product or a comparable product by one of the following:
 1. Connor Sports (Basis-of-Design).
 - a. Product: Duracushion II.
 2. Aacer Sports Flooring.
 3. Action Floor Systems LLC.
 4. Horner Flooring Company, Inc.
 5. Robbins Sports Surfaces.

2.2 SYSTEM DESCRIPTION

- A. System Type: Floating.

2.3 FLOORING MATERIALS

- A. Maple Flooring: Comply with MFMA grading rules for species, grade, and cut.
 - 1. Certification: Provide flooring that carries MFMA mark on each bundle or piece.
- B. Random-Length Strip Flooring: Northern Hard Maple (*Acer saccharum*), kiln dried, random length, tongue and groove, and end matched.
 - 1. Grade: MFMA-RL Second and Better.
 - a. Exception: For areas under stacked portion of telescoping bleachers that are normally concealed from view, provide Third and Better Grade.
 - 2. Cut: Flat.
 - 3. Thickness: 25/32 inch.
 - 4. Face Width: 2-1/4 inches.

2.4 SUBFLOOR MATERIALS

- A. Wood Sleepers: Standard grade; kiln-dried Eastern hemlock, fir, pine, or spruce, nominal 2 inches by 3 inches by 48 inches long.
- B. Plywood Underlayment: APA rated, C-D plugged, exterior glue, tongue and groove, 15/32 inch thick.
- C. Resilient Pads: With air voids for resiliency and installed at manufacturer's standard spacing for product designation indicated above.
 - 1. Type: Manufacturer's standard shape.
 - 2. Material: PVC or neoprene.
 - 3. Thickness: Nominal 3/8 inch by 2-1/4 inches by 3 inches.

2.5 FINISHES

- A. Floor-Finish System: System of compatible components recommended in writing by flooring manufacturer, and MFMA approved.
 - 1. Floor-Sealer Formulation: Pliable, penetrating type. MFMA Group 1, Sealers.
 - 2. Finish-Coat Formulation: Formulated for gloss finish indicated and multicoat application.
 - a. Type: MFMA Group 3, Gymnasium-Type Surface Finishes.
 - 3. Game-Line and Marker Paint: Industrial enamel compatible with finish coats and recommended in writing by manufacturers of finish coats, and paint for this use.

2.6 ACCESSORIES

- A. Vapor Retarder: ASTM D 4397, polyethylene sheet not less than 6 mils thick.
- B. Resilient Wall Base: Molded, vented, rubber or vinyl cove base with premolded outside corners.
 - 1. Size: Nominal 3 inches by 4 inches by 48 inches.
 - 2. Color: As selected by Architect.
- C. Fasteners: Type and size recommended by manufacturer, but not less than those recommended by MFMA for application indicated.

- D. Trowelable Leveling and Patching Compound: Latex-modified, hydraulic-cement-based formulation approved by wood athletic flooring manufacturer.
- E. Adhesives: Manufacturer's standard for application indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for maximum moisture content, installation tolerances, and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.
- C. Concrete Slabs: Verify that concrete substrates are dry and moisture-vapor emissions are within acceptable levels according to manufacturer's written instructions.
 - 1. Moisture Testing: Perform tests so that each test area does not exceed 1,000 sq. ft., and perform no fewer than three tests in each installation area and with test areas evenly spaced in installation areas.
 - a. Relative Humidity Test: Using in situ probes, ASTM F 2170. Proceed with installation only after substrates have a maximum 50 percent relative humidity level measurement.
 - b. Perform additional moisture tests recommended by manufacturer. Proceed with installation only after substrates pass testing.

3.2 PREPARATION

- A. Concrete Slabs:
 - 1. Grind high spots and fill low spots on concrete substrates to produce a maximum 1/8 inch deviation in any direction when checked with a 10 foot straight edge.
 - 2. Use trowelable leveling and patching compounds, according to manufacturer's written instructions, to fill cracks, holes, and depressions in substrates.
- B. Broom and vacuum clean substrates to be covered immediately before product installation. After cleaning, examine substrates for moisture, alkaline salts, carbonation, or dust. Proceed with installation only after unsatisfactory conditions have been corrected.

3.3 INSTALLATION

- A. Comply with wood athletic flooring manufacturer's written instructions, but not less than written recommendations of MFMA applicable to flooring type indicated.
- B. Pattern: Lay flooring parallel with long dimension of space to be floored unless otherwise indicated.
- C. Expansion Spaces: Provide as indicated, but not less than that required by manufacturer's written instructions and MFMA's written recommendations at walls and other obstructions, and at interruptions and terminations of flooring.
 - 1. Cover expansion spaces with base molding, trim, and saddles, as indicated on Drawings.

- D. Vapor Retarder: Cover entire slab area beneath wood flooring. Install with joints lapped a minimum of 6 inches and sealed.
- E. Sleepers:
 - 1. Space at 9 inches o.c. or as recommended by manufacturer for system components indicated. Allow 1/4 inch space between sleeper ends, and offset joints 12 inches in adjacent rows. Provide 1-1/2 inch to 2 inch expansion voids at perimeter and at vertical obstructions.
 - 2. Install solid blocking at doorways, under bleachers in the stacked position, and below portable goals.
 - 3. Anchor predrilled sleepers through resilient pads.
- F. Strip Flooring: Mechanically fasten perpendicular to supports.
- G. Parquet Flooring: Adhere to substrates according to manufacturer's written instructions.
- H. Installation Tolerances: 1/8 inch in 10 feet of variance from level.

3.4 SANDING AND FINISHING

- A. Allow installed flooring to acclimate to ambient conditions before sanding.
- B. Follow applicable recommendations in MFMA's "Industry Recommendations for Sanding, Sealing, Court Lining, Finishing, and Resurfacing of Maple Gym Floors."
- C. Machine sand with coarse, medium, and fine grades of sandpaper to achieve a level, smooth, uniform surface without ridges or cups. Remove sanding dust by tack or vacuum.
- D. Finish: Apply seal and finish coats of finish system according to finish manufacturer's written instructions. Provide no fewer than four coats total and no fewer than two finish coats.
 - 1. Water-Based Finishes: Use finishing methods recommended by finish manufacturer to reduce grain raise and sidebonding effect.
 - 2. Game-Line and Marker Paint: Apply game-line and marker paint between final seal coat and first finish coat according to paint manufacturer's written instructions.
 - a. Mask flooring at game lines and markers, and apply paint to produce lines and markers with sharp edges.
 - b. Where game lines cross, break minor game line at intersection; do not overlap lines.
 - c. Apply game lines and markers in widths and colors according to requirements indicated on Drawings.
 - d. Apply finish coats after game-line and marker paint is fully cured.

3.5 PROTECTION

- A. Protect wood athletic flooring during remainder of construction period to allow finish to cure and to ensure that flooring and finish are without damage or deterioration at time of Substantial Completion.
 - 1. Do not cover flooring after finishing until finish reaches full cure and not before seven days after applying last finish coat.
 - 2. Do not move heavy and sharp objects directly over flooring. Protect fully cured floor finishes and surfaces with plywood or hardboard panels to prevent damage from storing or moving objects over flooring.

END OF SECTION 096466

SECTION 096513 - RESILIENT BASE AND ACCESSORIES**PART 1 - GENERAL****1.1 SUMMARY**

- A. Section Includes:
1. Resilient base.
 2. Resilient molding accessories.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples for Verification: For each type of product indicated and for each color, texture, and pattern required in manufacturer's standard-size Samples, but not less than 12 inches long.
- C. Product Schedule: For resilient base and accessory products. Use same designations indicated on Drawings.

1.3 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
1. Furnish not less than 10 linear feet for every 500 linear feet or fraction thereof, of each type, color, pattern, and size of resilient product installed.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Store resilient products and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F or more than 90 deg F.

1.5 FIELD CONDITIONS

- A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F or more than 95 deg F, in spaces to receive resilient products during the following time periods:
1. 48 hours before installation, during installation, and 48 hours after installation.
- B. After installation and until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F or more than 95 deg F.
- C. Install resilient products after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS**2.1 THERMOSET-RUBBER BASE**

- A. Manufacturers: Subject to compliance with requirements, provide products indicated on Finish Legend on Drawings or comparable products by one of the following:
1. Mannington Commercial (Basis-of-Design).
 2. Johnsonite; a Tarkett North America company.
 3. Roppe Corporation, USA.
- B. Product Standard: ASTM F 1861, Type TS (rubber, vulcanized thermoset), Group I (solid, homogeneous).
1. Style and Location:
 - a. Style A, Straight: Provide in areas with carpet.
 - b. Style B, Cove: Provide in areas with resilient or other hard surface flooring unless indicated otherwise.
- C. Thickness: 0.125 inch.
- D. Height: 4 inches.
- E. Lengths: Coils in manufacturer's standard length.
- F. Outside Corners: Job formed or preformed.
- G. Inside Corners: Job formed or preformed.
- H. Colors: As indicated on Room Finish Legend on Drawings.

2.2 RUBBER MOLDING ACCESSORY

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Armstrong World Industries, Inc.
 2. Johnsonite; a Tarkett North America company.
 3. Roppe Corporation, USA.
- B. Description: Rubber reducer strip for resilient flooring transition strips.
- C. Profile and Dimensions: As indicated.
- D. Locations: Provide rubber molding accessories in areas indicated.
- E. Colors and Patterns: As indicated on Room Finish Legend on Drawings.

2.3 INSTALLATION MATERIALS

- A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic-cement-based formulation provided or approved by resilient-product manufacturer for applications indicated.

- B. Adhesives: Water-resistant type recommended by resilient-product manufacturer for resilient products and substrate conditions indicated.
- C. Metal Edge Strips: Extruded aluminum with mill finish of width shown, of height required to protect exposed edges of flooring, and in maximum available lengths to minimize running joints.
- D. Floor Polish: Provide protective, liquid floor-polish products recommended by resilient stair-tread manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
 - 1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of resilient products.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.
 - 1. Installation of resilient products indicates acceptance of surfaces and conditions.

3.2 PREPARATION

- A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of resilient products.
- B. Concrete Substrates for Resilient Stair Accessories: Prepare horizontal surfaces according to ASTM F 710.
 - 1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
 - 2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.
 - 3. Alkalinity and Adhesion Testing: Perform tests recommended by manufacturer. Proceed with installation only after substrate alkalinity falls within range on pH scale recommended by manufacturer in writing, but not less than 5 or more than 9 pH.
 - 4. Moisture Testing: Proceed with installation only after substrates pass testing per manufacturer's written recommendations, but not less stringent than the following:
 - a. Perform relative humidity test using in situ probes, ASTM F2170. Proceed with installation only after substrates have maximum 75 percent relative humidity level measurement.
- C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.
- D. Do not install resilient products until they are the same temperature as the space where they are to be installed.
 - 1. At least 48 hours in advance of installation, move resilient products and installation materials into spaces where they will be installed.
- E. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient products.

3.3 RESILIENT BASE INSTALLATION

- A. Comply with manufacturer's written instructions for installing resilient base.
- B. Apply resilient base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.
- C. Install resilient base in lengths as long as practical without gaps at seams and with tops of adjacent pieces aligned.
- D. Tightly adhere resilient base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.
- E. Do not stretch resilient base during installation.
- F. On masonry surfaces or other similar irregular substrates, fill voids along top edge of resilient base with manufacturer's recommended adhesive filler material.
- G. Preformed Corners: Install preformed corners before installing straight pieces.
- H. Job-Formed Corners:
 - 1. Outside Corners: Use straight pieces of maximum lengths possible and form with returns not less than 3 inches in length.
Form without producing discoloration (whitening) at bends.
 - 2. Inside Corners: Use straight pieces of maximum lengths possible and form with returns not less than 3 inches in length.
Miter corners to minimize open joints.

3.4 RESILIENT ACCESSORY INSTALLATION

- A. Comply with manufacturer's written instructions for installing resilient accessories.
- B. Resilient Molding Accessories: Butt to adjacent materials and tightly adhere to substrates throughout length of each piece. Install reducer strips at edges of floor covering that would otherwise be exposed.

3.5 CLEANING AND PROTECTION

- A. Comply with manufacturer's written instructions for cleaning and protecting resilient products.
- B. Perform the following operations immediately after completing resilient-product installation:
 - 1. Remove adhesive and other blemishes from exposed surfaces.
 - 2. Sweep and vacuum horizontal surfaces thoroughly.
 - 3. Damp-mop horizontal surfaces to remove marks and soil.
- C. Protect resilient products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.
- D. Floor Polish: Remove soil, visible adhesive, and surface blemishes from resilient stair treads before applying liquid floor polish.
 - 1. Apply one coat(s).

- E. Cover resilient products subject to wear and foot traffic until Substantial Completion.

END OF SECTION 096513

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SECTION 096516 – RESILIENT SHEET FLOORING**PART 1 - GENERAL****1.1 SUMMARY**

- A. Section includes vinyl sheet flooring.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For each type of flooring. Include flooring layouts, locations of seams, edges, columns, doorways, enclosing partitions, built-in furniture, cabinets, and cutouts.
 - 1. Show details of special patterns.
- C. Samples for Verification: In manufacturer's standard size, but not less than 6-by-6-inch sections of each different color and pattern of resilient sheet flooring required.
- D. Welded-Seam Samples: For seamless-installation technique indicated and for each resilient sheet flooring product, color, and pattern required; with seam running lengthwise and in center of 6-by-6-inch Sample applied to a rigid backing and prepared by Installer for this Project.
- E. Product Schedule: For resilient sheet flooring. Use same designations indicated on Drawings.

1.3 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.

1.4 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For each type of resilient sheet flooring to include in maintenance manuals.

1.5 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Resilient Sheet Flooring: Furnish not less than 10 linear feet for every 500 linear feet or fraction thereof, in roll form and in full roll width for each type, color, and pattern of flooring installed.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified installer who employs workers for this Project who are competent in techniques required by manufacturer for resilient sheet flooring installation and seaming method indicated.
 - 1. Engage an installer who employs workers for this Project who are trained or certified by resilient sheet flooring manufacturer for installation techniques required.

- B. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
1. Build mockups for resilient sheet flooring including accessories.
 2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Store resilient sheet flooring and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F or more than 90 deg F. Store rolls upright.

1.8 FIELD CONDITIONS

- A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F or more than 85 deg F, in spaces to receive resilient sheet flooring during the following time periods:
1. 48 hours before installation.
 2. During installation.
 3. 48 hours after installation.
- B. After installation and until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F or more than 95 deg F.
- C. Close spaces to traffic during resilient sheet flooring installation.
- D. Close spaces to traffic for 48 hours after resilient sheet flooring installation.
- E. Install resilient sheet flooring after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Test-Response Characteristics: For resilient sheet flooring, as determined by testing identical products according to ASTM E 648 or NFPA 253 by a qualified testing agency.
1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.

2.2 UNBACKED VINYL SHEET FLOORING (RSF-1)

- A. Basis-of-Design Product: Subject to compliance with requirements, provide vinyl sheet flooring by Oscoda Plastics, Inc. as indicated on Room Finish Legend on Drawings.
1. Oscoda Plastics, Inc.; Protect-All Commercial Flooring.
 - a. Product: Protect-All Rapid-Weld Commercial Flooring.
- B. Color: As indicated on Room Finish Legend on Drawings.

- C. Product Standard: ASTM F 1913.
- D. Thickness: 1/4 inch.
- E. Wearing Surface: Smooth.
- F. Finish: Matte.
- G. Sheet Size: 5 by 8 feet.
- H. Seamless-Installation Method: Chemically bonded.
 - 1. Acceptable Product: Subject to compliance with requirements, provide the following or approved substitution.
 - a. Oscoda Plastics, Inc.: Protect-All Rapid Weld.
 - 2. Color: To match sheet flooring.

2.3 UNBACKED VINYL SHEET FLOORING (STF-1)

- A. Basis-of-Design Product: Subject to compliance with requirements, provide the Basis-of-Design indicated or a comparable product by one of the following:
 - 1. American Harlequin Corp. (Basis-of-Design).
 - a. Product: Harlequin Standfast.
 - 2. Dance and Stage Pro.
 - 3. Rosco Dance Floors.
- B. Thickness: 0.100 inch.
- C. Wearing Surface: Smooth.
- D. Sheet Width: 59 inches.
- E. Seamless-Installation Method: Manufacturer's recommended adhesive.
- F. Colors and Patterns: As indicated on Finish Legend on Drawings.

2.4 INSTALLATION MATERIALS

- A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic-cement-based formulation provided or approved by resilient sheet flooring manufacturer for applications indicated.
- B. Adhesives: Water-resistant type recommended by flooring and adhesive manufacturers to suit resilient sheet flooring and substrate conditions indicated.
- C. Seamless-Installation Accessories:
 - 1. Chemical-Bonding Compound: Manufacturer's product for chemically bonding seams.
- D. Integral-Flash-Cove-Base Accessories:

1. Cove Strip: 1 inch radius provided or approved by resilient sheet flooring manufacturer.
 2. Cap Strip: Square metal cap provided or approved by resilient sheet flooring manufacturer.
 3. Corners: Metal inside and outside corners and end stops provided or approved by resilient sheet flooring manufacturer.
- E. Floor Polish: Provide protective, liquid floor-polish products recommended by resilient sheet flooring manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of resilient sheet flooring.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Prepare substrates according to resilient sheet flooring manufacturer's written instructions to ensure adhesion of resilient sheet flooring.
- B. Concrete Substrates: Prepare according to ASTM F 710.
1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
 2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by resilient sheet flooring manufacturer. Do not use solvents.
 3. Alkalinity and Adhesion Testing: Perform tests recommended by resilient sheet flooring manufacturer. Proceed with installation only after substrate alkalinity falls within range on pH scale recommended by manufacturer in writing, but not less than 8 or more than 10 pH.
 4. Moisture Testing: Proceed with installation only after substrates pass testing according to resilient sheet flooring manufacturer's written recommendations, but not less stringent than the following:
 - a. Perform anhydrous calcium chloride test according to ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. in 24 hours.
 - b. Perform relative humidity test using in situ probes according to ASTM F 2170. Proceed with installation only after substrates have a maximum 75 percent relative humidity level.
- C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.
- D. Do not install resilient sheet flooring until it is the same temperature as the space where it is to be installed.
1. At least 48 hours in advance of installation, move flooring and installation materials into spaces where they will be installed.

- E. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient sheet flooring.

3.3 RESILIENT SHEET FLOORING INSTALLATION

- A. Comply with manufacturer's written instructions for installing resilient sheet flooring.
- B. Unroll resilient sheet flooring and allow it to stabilize before cutting and fitting.
- C. Lay out resilient sheet flooring as follows:
 - 1. Maintain uniformity of flooring direction.
 - 2. Minimize number of seams; place seams in inconspicuous and low-traffic areas, at least 6 inches away from parallel joints in flooring substrates.
 - 3. Match edges of flooring for color shading at seams.
 - 4. Avoid cross seams.
- D. Scribe and cut resilient sheet flooring to butt neatly and tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, and door frames.
- E. Extend resilient sheet flooring into toe spaces, door reveals, closets, and similar openings.
- F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on resilient sheet flooring as marked on substrates. Use chalk or other nonpermanent marking device.
- G. Install resilient sheet flooring on covers for telephone and electrical ducts and similar items in installation areas. Maintain overall continuity of color and pattern between pieces of flooring installed on covers and adjoining flooring. Tightly adhere flooring edges to substrates that abut covers and to cover perimeters.
- H. Adhere resilient sheet flooring to substrates using a full spread of adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.
- I. Seamless Installation:
 - 1. Chemically Bonded Seams: Bond seams with chemical-bonding compound to permanently fuse sections into a seamless flooring. Prepare seams and apply compound to produce tightly fitted seams without gaps, overlays, or excess bonding compound on flooring surfaces.
- J. Integral-Flash-Cove Base: Cove resilient sheet flooring 4 inches up vertical surfaces. Support flooring at horizontal and vertical junction with cove strip. Butt at top against cap strip.
 - 1. Install metal corners at inside and outside corners.

3.4 CLEANING AND PROTECTION

- A. Comply with manufacturer's written instructions for cleaning and protecting resilient sheet flooring.
- B. Perform the following operations immediately after completing resilient sheet flooring installation:
 - 1. Remove adhesive and other blemishes from surfaces.
 - 2. Sweep and vacuum surfaces thoroughly.
 - 3. Damp-mop surfaces to remove marks and soil.

- C. Protect resilient sheet flooring from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.
- D. Cover resilient sheet flooring until Substantial Completion.

END OF SECTION 096516

SECTION 096519 – RESILIENT TILE FLOORING**PART 1 - GENERAL****1.1 SUMMARY**

- A. Section includes solid vinyl floor tile.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For each type of floor tile. Include floor tile layouts, edges, columns, doorways, enclosing partitions, built-in furniture, cabinets, and cutouts.
 - 1. Show details of special patterns.
- C. Samples for Verification: Full-size units of each color and pattern of floor tile required.
 - 1. For heat-welding bead, manufacturer's standard-size Samples, but not less than 9 inches long, of each color required.
- D. Welded-Seam Samples: For seamless-installation technique indicated and for each flooring product, color, and pattern required; with seam running lengthwise and in center of 6-by-9-inch Sample applied to a rigid backing and prepared by Installer for this Project.
- E. Product Schedule: For floor tile. Use same designations indicated on Drawings.

1.3 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.

1.4 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For each type of floor tile to include in maintenance manuals.

1.5 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Floor Tile: Furnish one box for every 50 boxes or fraction thereof, of each type, color, and pattern of floor tile installed.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified installer who employs workers for this Project who are competent in techniques required by manufacturer for floor tile installation and seaming method indicated.
 - 1. Engage an installer who employs workers for this Project who are trained or certified by floor tile manufacturer for installation techniques required.

- B. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
1. Build mockups for floor tile including resilient base and accessories.
 - a. Size: Minimum 100 sq. ft. for each type, color, and pattern in locations directed by Architect.
 2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Store floor tile and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F or more than 90 deg F. Store floor tiles on flat surfaces.

1.8 FIELD CONDITIONS

- A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F or more than 95 deg F, in spaces to receive floor tile during the following time periods:
1. 48 hours before installation.
 2. During installation.
 3. 48 hours after installation.
- B. After installation and until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F or more than 95 deg F.
- C. Close spaces to traffic during floor tile installation.
- D. Close spaces to traffic for 48 hours after floor tile installation.
- E. Install floor tile after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.1 SOLID VINYL FLOOR TILE (LVT-1, LVT-2, LVT-3, LVT-4)

- A. Basis-of-Design Products: Subject to compliance with requirements, provide the Basis-of-Design indicated or comparable products by one of the following:
1. Interface, Inc. (Basis-of-Design).
 - a. Products: As indicated on Room Finish Legend on Drawings.
 2. Armstrong Flooring.
 3. Mannington Commercial.
 4. Mohawk Group.
- B. Tile Standard: ASTM F 1700.
1. Class: Class III, printed film vinyl tile.
 2. Type: A, Smooth Surface.

- C. Thickness: 4.5 mm.
- D. Size: As indicated on Finishes Legend on Drawings.
- E. Seamless-Installation Method: Heat welded.
- F. Colors and Patterns: As indicated on Finishes Legend on Drawings.

PART 3 - EXECUTION

3.1 INSTALLATION MATERIALS

- A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic-cement-based formulation provided or approved by floor tile manufacturer for applications indicated.
- B. Adhesives: Water-resistant type recommended by floor tile and adhesive manufacturers to suit floor tile and substrate conditions indicated.
- C. Seamless-Installation Accessories:
 - 1. Heat-Welding Bead: Manufacturer's solid-strand product for heat welding seams.
 - a. Color: Match floor tile.
- D. Floor Polish: Provide protective, liquid floor-polish products recommended by floor tile manufacturer.

3.2 EXAMINATION

- A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
 - 1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of floor tile.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.3 PREPARATION

- A. Prepare substrates according to floor tile manufacturer's written instructions to ensure adhesion of resilient products.
- B. Concrete Substrates: Prepare according to ASTM F 710.
 - 1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
 - 2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by floor tile manufacturer. Do not use solvents.
 - 3. Alkalinity and Adhesion Testing: Perform tests recommended by floor tile manufacturer. Proceed with installation only after substrate alkalinity falls within range on pH scale recommended by manufacturer in writing, but not less than 7 or more than 9 pH.
 - 4. Moisture Testing: Proceed with installation only after substrates pass testing according to floor tile manufacturer's written recommendations, but not less stringent than the following:

- a. Perform anhydrous calcium chloride test according to ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 8 lb of water/1000 sq. ft. in 24 hours.
 - b. Perform relative humidity test using in situ probes according to ASTM F 2170. Proceed with installation only after substrates have a maximum 85 percent relative humidity level.
- C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.
- D. Do not install floor tiles until they are the same temperature as the space where they are to be installed.
1. At least 48 hours in advance of installation, move resilient floor tile and installation materials into spaces where they will be installed.
- E. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient floor tile.

3.4 FLOOR TILE INSTALLATION

- A. Comply with manufacturer's written instructions for installing floor tile.
- B. Lay out floor tiles from center marks established with principal walls, discounting minor offsets, so tiles at opposite edges of room are of equal width. Adjust as necessary to avoid using cut widths that equal less than one-half tile at perimeter.
1. Lay tiles in pattern indicated.
- C. Match floor tiles for color and pattern by selecting tiles from cartons in the same sequence as manufactured and packaged, if so numbered. Discard broken, cracked, chipped, or deformed tiles.
1. Lay tiles in pattern of colors and sizes indicated.
- D. Scribe, cut, and fit floor tiles to butt neatly and tightly to vertical surfaces and permanent fixtures including built-in furniture, cabinets, pipes, outlets, and door frames.
- E. Extend floor tiles into toe spaces, door reveals, closets, and similar openings. Extend floor tiles to center of door openings.
- F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on floor tiles as marked on substrates. Use chalk or other nonpermanent marking device.
- G. Install floor tiles on covers for telephone and electrical ducts, building expansion-joint covers, and similar items in finished floor areas. Maintain overall continuity of color and pattern between pieces of tile installed on covers and adjoining tiles. Tightly adhere tile edges to substrates that abut covers and to cover perimeters.
- H. Adhere floor tiles to flooring substrates using a full spread of adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.
- I. Seamless Installation:
1. Heat-Welded Seams: Comply with ASTM F 1516. Rout joints and heat weld with welding bead to permanently fuse sections into a seamless flooring. Prepare, weld, and finish seams to produce surfaces flush with adjoining flooring surfaces.

3.5 CLEANING AND PROTECTION

- A. Comply with manufacturer's written instructions for cleaning and protecting floor tile.
- B. Perform the following operations immediately after completing floor tile installation:
 - 1. Remove adhesive and other blemishes from exposed surfaces.
 - 2. Sweep and vacuum surfaces thoroughly.
 - 3. Damp-mop surfaces to remove marks and soil.
- C. Protect floor tile from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.
- D. Cover floor tile until Substantial Completion.

END OF SECTION 096519

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SECTION 096566 - RESILIENT ATHLETIC FLOORING**PART 1 - GENERAL****1.1 SUMMARY****A. Section Includes:**

1. Rubber sheet flooring.

B. Related Requirements:

1. Section 096513 "Resilient Base and Accessories" for wall base and accessories installed with resilient athletic flooring.

1.2 COORDINATION

- A. Coordinate layout and installation of flooring with floor inserts for gymnasium equipment.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.

- B. Shop Drawings: Show installation details and locations of the following:

1. Border tiles.
2. Floor patterns.
3. Layout, colors, widths, and dimensions of game lines and markers.
4. Locations of floor inserts for athletic equipment installed through flooring.

- C. Samples for Verification: For each type, color, and pattern of flooring specified, 6-inch- square in size and of same thickness and material indicated for the Work.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For sheet vinyl flooring Installer.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For resilient athletic flooring to include in maintenance manuals.

1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Floor Tile: Furnish no fewer than 1 box for each 50 boxes or fraction thereof, of each type, color, pattern, and size of floor tile installed.

1.7 QUALITY ASSURANCE

- A. Sheet Vinyl Flooring Installer Qualifications: An experienced installer who has completed sheet vinyl flooring installations using seaming methods indicated for this Project and similar in material, design, and extent to that indicated for this Project; who is acceptable to manufacturer; and whose work has resulted in installations with a record of successful in-service performance.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials in original packages and containers, with seals unbroken, bearing manufacturer's labels indicating brand name and directions for storing.
- B. Store materials to prevent deterioration.
 - 1. Store tiles on flat surfaces.
 - 2. Store rolls upright.

1.9 FIELD CONDITIONS

- A. Adhesively Applied Products:
 - 1. Maintain temperatures during installation within range recommended in writing by manufacturer, but not less than 70 deg F or more than 95 deg F, in spaces to receive flooring 48 hours before installation, during installation, and 48 hours after installation unless longer period is recommended in writing by manufacturer.
 - 2. After postinstallation period, maintain temperatures within range recommended in writing by manufacturer, but not less than 55 deg F or more than 95 deg F.
 - 3. Close spaces to traffic during flooring installation.
 - 4. Close spaces to traffic for 48 hours after flooring installation unless manufacturer recommends longer period in writing.
- B. Install flooring after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.1 RUBBER SHEET FLOORING (SF-2)

- A. Basis-of-Design Product: Subject to compliance with requirements, provide the Basis-of-Design indicated or a comparable product by one of the following:
 - 1. Regupol USA (Basis-of-Design).
 - a. Product: Aktivpro Roll.
 - 2. Action Floor Systems.
 - 3. Connor Sports Flooring.
 - 4. Ecore International.
 - 5. Mats, Inc.
 - 6. Mondo USA.
 - 7. Robbins Inc.
 - 8. Surface America.
 - 9. Tarkett Sports Indoors.
- B. Description: Rubber athletic flooring provided as rolled goods for adhered installation.

- C. Material: Recycled-rubber compound.
- D. Traffic-Surface Texture: Smooth.
- E. Roll Size: Not less than 48 inches wide by longest length that is practical to minimize splicing during installation.
- F. Thickness: 1-inch.
- G. Color and Pattern: As indicated on Room Finish Legend.
- H. Border: Interlocking, beveled-edge tiles, of same material as sheet flooring; with bevels that transition from thickness of sheet flooring to surface below it; with straight outside edges; for use where flooring corners and edges do not abut vertical surfaces.

2.2 ACCESSORIES

- A. Trowelable Leveling and Patching Compound: Latex-modified, hydraulic-cement-based formulation approved by flooring manufacturer.
- B. Adhesives: Water-resistant type recommended in writing by manufacturer for substrate and conditions indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, with Installer present, for compliance with requirements for installation tolerances, moisture content, and other conditions affecting performance of the Work.
 - 1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of resilient products.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of flooring.
- B. Concrete Substrates: Prepare according to ASTM F710.
 - 1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
 - 2. Alkalinity Testing: Perform pH testing according to ASTM F710. Proceed with installation only if pH readings are not less than 7.0 and not greater than 8.5.
 - 3. Moisture Testing: Perform tests so that each test area does not exceed 1000 sq. ft., and perform no fewer than three tests in each installation area and with test areas evenly spaced in installation areas.
 - a. Anhydrous Calcium Chloride Test: ASTM F1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. in 24 hours.

- b. Relative Humidity Test: Using in-situ probes, ASTM F2170. Proceed with installation only after substrates have a maximum 75 percent relative humidity level measurement.
- C. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended in writing by manufacturer. Do not use solvents.
- D. Use trowelable leveling and patching compound to fill cracks, holes, and depressions in substrates.
- E. Move flooring and installation materials into spaces where they will be installed at least 48 hours in advance of installation unless manufacturer recommends a longer period in writing.
 - 1. Do not install flooring until it is the same temperature as space where it is to be installed.
- F. Sweep and vacuum clean substrates to be covered by flooring immediately before installation. After cleaning, examine substrates for moisture, alkaline salts, carbonation, and dust. Proceed with installation only after unsatisfactory conditions have been corrected.

3.3 FLOORING INSTALLATION, GENERAL

- A. Comply with manufacturer's written installation instructions.
- B. Scribe, cut, and fit flooring to butt neatly and tightly to vertical surfaces, equipment anchors, floor outlets, and other interruptions of floor surface.
- C. Extend flooring into toe spaces, door reveals, closets, and similar openings unless otherwise indicated.
- D. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating subfloor markings on flooring. Use nonpermanent, nonstaining marking device.

3.4 SHEET FLOORING INSTALLATION

- A. Unroll sheet flooring and allow it to stabilize before cutting and fitting.
- B. Lay out sheet flooring as follows:
 - 1. Maintain uniformity of flooring direction.
 - 2. Minimize number of seams; place seams in inconspicuous and low-traffic areas, at least 6 inches away from parallel joints in flooring substrates.
 - 3. Match edges of flooring for color shading at seams.
 - 4. Locate seams according to approved Shop Drawings.
- C. Adhere products to substrates using a full spread of adhesive applied to substrate to comply with adhesive and flooring manufacturers' written instructions, including those for trowel notching, adhesive mixing, and adhesive open and working times.
 - 1. Provide completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.

3.5 CLEANING AND PROTECTION

- A. Perform the following operations immediately after completing flooring installation:
 - 1. Remove adhesive and other blemishes from flooring surfaces.

2. Sweep and vacuum flooring thoroughly.
 3. Damp-mop flooring to remove marks and soil after time period recommended in writing by manufacturer.
- B. Protect flooring from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period. Use protection methods recommended in writing by manufacturer.
1. Do not move heavy and sharp objects directly over flooring. Protect flooring with plywood or hardboard panels to prevent damage from storing or moving objects over flooring.

END OF SECTION 096566

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SECTION 096623 - RESINOUS MATRIX TERRAZZO FLOORING**PART 1 - GENERAL****1.1 SUMMARY**

- A. Section Includes:
1. Thin-set, epoxy-resin terrazzo flooring and base.
 2. Precast epoxy-resin terrazzo base.

1.2 ADMINISTRATIVE REQUIREMENTS

- A. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Section 013100 – Project Management and Coordination.
1. Review methods and procedures related to terrazzo including, but not limited to, the following:
 - a. Inspect and discuss condition of substrate and other preparatory work performed by other trades.
 - b. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
 - c. Review special terrazzo designs and patterns.
 - d. Review dust-control procedures.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: Include terrazzo installation requirements. Include plans, elevations, sections, component details, and attachments to other work. Show layout of the following:
1. Divider strips.
 2. Control-joint strips.
 3. Accessory strips.
 4. Abrasive strips.
 5. Precast terrazzo jointing and edge configurations.
 6. Terrazzo patterns.
- C. Samples for Verification: For each type, material, color, and pattern of terrazzo and accessory required showing the full range of color, texture, and pattern variations expected. Label each terrazzo sample to identify manufacturer's matrix color and aggregate types, sizes, and proportions. Prepare Samples of same thickness and from same material to be used for the Work, in size indicated below:
1. Terrazzo: 6 inch square Samples.
 2. Precast Terrazzo: 6 inch square Samples.
 3. Accessories: 6 inch long Samples of each exposed strip item required.
 4. Provide chip mix for each sample.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer and other key personnel who will be utilized on this Project, including project manager, field supervisor, head mechanic for placing, and lead grinder.

1. Submit letter from NTMA indicating Installer's current member status.
2. Submit documentation of Installer's installations indicated in Quality Assurance Article, including the following:
 - a. Project name and location.
 - b. Names and contact information for project architects, owners, and contractors.
 - c. Square footage of terrazzo installed.
 - d. Lineal footage of precast base and cast-in-place base.

- B. Material Certificates: For each type of terrazzo material or product, from manufacturer.
- C. Installer Certificates: Signed by manufacturers certifying that installers comply with requirements.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For terrazzo to include in maintenance manuals.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: Engage an Installer who complies with the following requirements:
1. Contractor member of NTMA.
 - a. Submit proof of Installer's current NTMA membership.
 2. Is certified in writing by terrazzo manufacturer as qualified to install manufacturer's products.
 3. Has a minimum of five years' experience with installations of a minimum of three resinous epoxy terrazzo flooring installations similar in scope to that of this Project.
- B. Source Limitations: Obtain primary terrazzo materials from single source from single manufacturer. Provide secondary materials including patching and fill material, joint sealant, and repair materials of type and from source recommended by manufacturer of primary materials.
- C. Source Limitations for Aggregates: Obtain each color, grade, type, and variety of granular materials from single source with resources to provide materials of consistent quality in appearance and physical properties.
- D. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
1. Build mockups for terrazzo including accessories.
 - a. Size: Minimum 100 square feet of typical poured-in-place flooring condition for each color and pattern in locations directed by Architect.
 - b. Include base.
 2. Approval of mockups does not constitute approval of deviations from Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to Project site in supplier's original wrappings and containers, labeled with source's or manufacturer's name, material or product brand name, and lot number if any.
- B. Store materials in their original, undamaged packages and containers, inside a well-ventilated area protected from weather, moisture, soiling, extreme temperatures, and humidity.

1.8 FIELD CONDITIONS

- A. Environmental Limitations: Comply with manufacturer's written instructions for substrate temperature, ambient temperature, moisture, ventilation, and other conditions affecting terrazzo installation.
- B. Field Measurements: Verify actual dimensions of construction contiguous with precast terrazzo by field measurements before fabrication.
- C. Provide permanent lighting or, if permanent lighting is not in place, simulate permanent lighting conditions during terrazzo installation.
- D. Close spaces to traffic during terrazzo application and for not less than 24 hours after application unless manufacturer recommends a longer period.
- E. Control and collect water and dust produced by grinding operations. Protect adjacent construction from detrimental effects of grinding operations.

1.9 WARRANTY

- A. Labor and Material Warranty: Manufacturer and Installer agree to repair, restore, or replace resinous epoxy terrazzo Work that fails in materials or workmanship within specified warranty period.
 - 1. Failures include loss of bond and damage due to normal wear and tear.
 - 2. Exclusions: Reflective cracks from the substrate, and damage due to bubbling or loss of adhesion due to moisture penetration through substrate, Acts of God, or other elements beyond the scope of protection of this system.
 - 3. Warranty Claims: Owner will notify manufacturer and Installer in writing within 30 days of first appearance of problems covered under this warranty. Owner will provide access to area during normal working hours for manufacturer and Installer. Owner is responsible for property protection.
 - 4. Warranty Work: Limited to direct repair of epoxy terrazzo flooring system.
 - 5. Warranty Period: One year from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE CRITERIA

- A. NTMA Standards: Comply with NTMA's "Terrazzo Specifications and Design Guide" and with written recommendations for terrazzo type indicated unless more stringent requirements are specified.

2.2 EPOXY-RESIN TERRAZZO (TZF-1, TZF-2, TZF-3, TZF-4)

- A. Epoxy-Resin Terrazzo: Comply with NTMA's "Terrazzo Specifications and Design Guide" and manufacturer's written instructions for matrix and aggregate proportions and mixing.
 - 1. Basis-of-Design System: Subject to compliance with requirements, provide resinous matrix terrazzo flooring system as indicated on Finishes Legend or comparable system by one of the following:
 - a. Terrazzo & Marble Supply Companies; Terroxy Resin Systems (Basis-of-Design).
 - b. Crossfield Products Corp.: Dex-O-Tex..
 - c. Dur-A-Flex, Inc.; a Sherwin-Williams compan
 - d. Key Resin Company.

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- e. Master Terrazzo Technologies LLC.
 2. Thickness: 3/8 inch nominal unless indicated otherwise.
 3. Custom Mix Color and Pattern: As indicated on Finish Legend.
 - B. Flexible Reinforcing Membrane: Manufacturer's resinous membrane for substrate-crack preparation and reflective-crack reduction.
 1. Reinforcement: Fiberglass scrim.
 - C. Moisture Vapor Control: Water-based epoxy resin surfacing system, moisture vapor tolerant and alkaline resistant, broadcast with silica aggregate (or mixed into resin if smooth finish is required).
 - D. Primer: Manufacturer's product recommended for substrate and use indicated.
 - E. Epoxy-Resin Matrix: Manufacturer's product recommended for substrate and use indicated and in color required for mix indicated.
 1. Physical Properties without Aggregates:
 - a. Hardness: 60 to 85 per ASTM D2240, Shore D.
 - b. Minimum Tensile Strength: 3,000 psi per ASTM D638 for a 2 inch specimen made using a "C" die per ASTM D412.
 - c. Minimum Compressive Strength: 10,000 psi per ASTM D695, Specimen B cylinder.
 2. Physical Properties with Aggregates: For resin blended with Georgia white marble, ground, grouted, and cured per requirements in NTMA's "Terrazzo Specifications and Design Guide"; comply with the following:
 - a. Flammability: Self-extinguishing, maximum extent of burning 1/4 inch per ASTM D635.
 - b. Thermal Coefficient of Linear Expansion: 0.0025 inch/inch per degrees F for temperature range of minus 12 to plus 140 degrees F per ASTM D696.
 - F. Aggregates: Marble complying with NTMA gradation standards for mix indicated
 1. Abrasion and Impact Resistance: Loss of 40 percent or less when tested according to ASTM C131 (LA Abrasion).
 2. Provide aggregates that contain no deleterious or foreign matter.
 - G. Finishing Grout: Resin based.
- 2.3 PRECAST EPOXY-RESIN TERRAZZO
- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. Terrazzo & Marble Supply Companies (Basis-of-Design).
 2. Key Resin Company.
 3. Master Terrazzo Technologies.
 4. Precast Terrazzo Enterprises, Inc.
 5. Tectura Designs; a Wausau Tile Inc. brand.
 - B. Precast Terrazzo Base: Reinforced, cast portland cement terrazzo units. Comply with NTMA's written recommendations for fabricating precast terrazzo base units in sizes and profiles indicated.
 1. Thickness: Minimum 1/2 inch.
 2. Length: Maximum lengths possible, but not less than 36 inches.
 3. Type: Straight, with chamfered edges, unless indicated otherwise.
 4. Top Edge: Radius 1/8 inch edge with polished top surface.

5. Metal Toe Strip: Zinc.
6. Outside Corner Units: With finished returned edges at outside corner.
7. Color, Pattern, and Finish: Match adjacent poured-in-place terrazzo flooring unless indicated otherwise.

2.4 STRIP MATERIALS

- A. Thin-Set Divider Strips: L-type or T-type angle, ¼" Deep.
 1. Material: white-zinc alloy.
 2. Top width: ¼"
- B. Control-Joint Strips: Separate, double L-type angles, positioned back-to-back, that match material and color of divider strips and in depth required for topping thickness indicated.
- C. Accessory Strips: Match divider-strip width, material, and color unless otherwise indicated. Use the following types of accessory strips as required to provide a complete installation:
 1. Base-bead strips for exposed top edge of terrazzo base.
 2. Edge-bead strips for exposed edges of terrazzo.

2.5 MISCELLANEOUS ACCESSORIES

- A. Strip Adhesive: Epoxy-resin adhesive recommended by adhesive manufacturer for this use.
- B. Anchoring Devices:
 1. Strips: Provide mechanical anchoring devices or adhesives for strip materials as recommended by manufacturer and required for secure attachment to substrate.
 2. Precast Terrazzo: Provide mechanical anchoring devices as recommended by fabricator for proper anchorage and support of units for conditions of installation and support.
- C. Patching and Fill Material: Terrazzo manufacturer's resinous product approved and recommended by manufacturer for application indicated.
- D. Joint Compound: Terrazzo manufacturer's resinous product approved and recommended by manufacturer for application indicated.
- E. Resinous Matrix Terrazzo Cleaner: Chemically neutral cleaner with pH factor between 7 and 10 that is biodegradable, phosphate free, and recommended by sealer manufacturer for use on terrazzo type indicated.
- F. Sealer: Slip- and stain-resistant, penetrating-type sealer that is chemically neutral; does not affect terrazzo color or physical properties; is recommended by sealer manufacturer; and complies with NTMA's "Terrazzo Specifications and Design Guide" for terrazzo type indicated.
 1. Basis-of-Design Product: Subject to compliance with requirements, provide the following:
 - a. Terroxy Penetrating Sealer by Terrazzo & Marble Supply Companies or approved substitution.
 2. Surface Friction: Not less than 0.6 per ASTM D2047.
 3. Acid-Base Properties: With pH factor between 7 and 10.

PART 3 - EXECUTION**3.1 EXAMINATION**

- A. Examine substrates and areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions, including levelness tolerances, have been corrected.

3.2 PREPARATION

- A. Clean substrates of substances, including oil, grease, and curing compounds, that might impair terrazzo bond. Provide clean, dry, and neutral substrate for terrazzo application.
- B. Concrete Slabs:
 - 1. Provide sound concrete surfaces free of laitance, glaze, efflorescence, curing compounds, form-release agents, dust, dirt, grease, oil, and other contaminants incompatible with terrazzo.
 - a. Shot-blast surfaces with an apparatus that abrades the concrete surface, contains the dispensed shot within the apparatus, and recirculates the shot by vacuum pickup.
 - b. Repair damaged and deteriorated concrete according to terrazzo manufacturer's written recommendations.
 - c. Use patching and fill material to fill holes and depressions in substrates according to terrazzo manufacturer's written instructions.
- C. Verify that concrete substrates are dry and moisture-vapor emissions are within acceptable levels according to manufacturer's written instructions.
 - 1. Moisture Testing: Perform tests indicated below.
 - a. In-Situ Probe Test: Perform relative-humidity test using in-situ probes per ASTM F 2170. Proceed with installation only after substrates have a maximum 75 percent relative-humidity-level measurement.
 - b. Test Method: Test for moisture content by method recommended in writing by terrazzo manufacturer. Proceed with installation only after substrates pass testing.
- D. Protect other Work from water and dust generated by grinding operations. Control water and dust to comply with environmental protection regulations.
 - 1. Erect and maintain temporary enclosures and other suitable methods to limit water damage and dust migration and to ensure adequate ambient temperatures and ventilation conditions during installation.
- E. Moisture Vapor Control Installation: On properly prepared concrete substrates, install moisture vapor control product per manufacturer's instructions. Allow proper curing time prior to installing resinous epoxy terrazzo flooring system.

3.3 EPOXY-RESIN TERRAZZO INSTALLATION

- A. Comply with NTMA's written recommendations for terrazzo and accessory installation.
- B. Place, rough grind, grout, cure grout, fine grind, and finish terrazzo according to manufacturer's written instructions and NTMA's "Terrazzo Specifications and Design Guide."

-
- C. Installation Tolerance: Limit variation in terrazzo surface from level to 1/4 inch in 10 feet; noncumulative.
- D. Ensure that matrix components and fluids from grinding operations do not stain terrazzo by reacting with divider and control-joint strips.
- E. Delay fine grinding until heavy trade work is complete and construction traffic through area is restricted.
- F. Primer: Apply to terrazzo substrates according to manufacturer's written instructions.
- G. Strip Materials:
1. Divider and Control-Joint Strips:
 - a. Locate divider strips in locations indicated.
 - b. Install control-joint strips back-to-back directly above concrete-slab control joints and in locations indicated.
 - c. Install control-joint strips with 1/4 inch gap between strips, and install sealant in gap.
 - d. Install strips in adhesive setting bed without voids below strips, or mechanically anchor strips as required to attach strips to substrate, as recommended by strip manufacturer.
 2. Accessory Strips: Install as required to provide a complete installation.
 3. Abrasive Strips: Install with surface of abrasive strip positioned 1/16 inch higher than terrazzo surface.
- H. FINISHING:
1. Rough Grinding: Grind with 24 or finer grit stones or with comparable diamond plates. Follow initial grind with 80 or finer grit stones.
 2. Cleaning: Clean floor with water and rinse thoroughly. Remove excess rinse water by wet vacuum.
 3. Grouting: Machine or hand-apply epoxy grout to fill voids.
 4. Fine Grinding: Grind with 400 or finer grit stones until grout is removed from surface. Repeat rough grinding, grout coat, and fine grinding if large voids exist after initial fine grinding. Produce surface with a minimum of 70 percent aggregate exposure.

3.4 PRECAST TERRAZZO INSTALLATION

- A. Install precast terrazzo units using method recommended by NTMA and manufacturer unless otherwise indicated.
1. Do not install units that are chipped, cracked, discolored, or not properly finished.
- B. Installation Tolerance: Limit variation in terrazzo base alignment from level to 1/8 inch in 10 feet; noncumulative.
- C. Seal joints between units with joint compound matching precast terrazzo matrix.

3.5 REPAIR

- A. Where resinous epoxy terrazzo flooring indicates a lack of bond with substrate, cut out and remove damaged flooring in areas defined by divider and control strips.
- B. Once damaged flooring is completely removed, thoroughly clean existing substrate and prepare for terrazzo flooring replacement in manner recommended by NTMA.

3.6 CLEANING AND PROTECTION

A. Cleaning:

1. Remove grinding dust from installation and adjacent areas.
2. Wash surfaces with cleaner per NTMA's written recommendations and manufacturer's written instructions; rinse surfaces with water and allow them to dry thoroughly.

B. Sealing: Apply minimum two coats of recommended sealer.

1. Seal surfaces per NTMA's written recommendations.
2. Apply sealer per sealer manufacturer's written instructions.

C. Protection: Provide final protection and maintain conditions, in a manner acceptable to Installer, that ensure that terrazzo is without damage or deterioration at time of Substantial Completion.

END OF SECTION 096623

SECTION 096723 - RESINOUS FLOORING**PART 1 - GENERAL****1.1 SUMMARY****A. Section Includes:**

1. Resinous flooring.
2. Integral cove base accessories.

B. Related Sections:

1. Section 096623 "Resinous Matrix Terrazzo Flooring" for thinset, epoxy-matrix terrazzo.

1.2 PREINSTALLATION MEETINGS**A. Preinstallation Conference: Conduct conference at Project site.**

1. Review manufacturer's written instructions for substrate preparation and environmental conditions affecting resinous flooring installation.
2. Review details of integral cove bases.
3. Review manufacturer's written instructions for installing resinous flooring systems.
4. Review protection measures for adjacent construction and installed flooring, floor drainage requirements, curbs, base details, and so forth.

1.3 ACTION SUBMITTALS**A. Product Data: For each type of product.**

1. Include manufacturer's technical data, installation instructions, and recommendations for each resinous flooring component required.

B. Samples for Verification: For each resinous flooring system required and for each color and texture specified, 6 inches square, applied to a rigid backing by Installer for this Project.**1.4 INFORMATIONAL SUBMITTALS****A. Qualification Data: For Installer.****B. Material Certificates: For each resinous flooring component.****C. Material Test Reports: For each resinous flooring system, by a qualified testing agency.****1.5 CLOSEOUT SUBMITTALS****A. Maintenance Data: For resinous flooring to include in maintenance manuals.****1.6 QUALITY ASSURANCE****A. Installer Qualifications: An authorized representative who is trained and approved by manufacturer.**

1. Engage an installer who is certified in writing by resinous flooring manufacturer as qualified to apply resinous flooring systems indicated.
- B. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.
1. Apply full-thickness mockups on 96-inch- square floor area selected by Architect.
 - a. Include 96-inch length of integral cove base with inside and outside corner.
 2. Simulate finished lighting conditions for Architect's review of mockups.
 3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.
- 1.7 DELIVERY, STORAGE, AND HANDLING
- A. Deliver materials in original packages and containers, with seals unbroken, bearing manufacturer's labels indicating brand name and directions for storage and mixing with other components.
- 1.8 FIELD CONDITIONS
- A. Environmental Limitations: Comply with resinous flooring manufacturer's written instructions for substrate temperature, ambient temperature, moisture, ventilation, and other conditions affecting resinous flooring installation.
- B. Lighting: Provide permanent lighting or, if permanent lighting is not in place, simulate permanent lighting conditions during resinous flooring installation.
- C. Close spaces to traffic during resinous flooring installation and for 24 hours after installation unless manufacturer recommends a longer period.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Flammability: Self-extinguishing in accordance with ASTM D635.

2.2 RESINOUS FLOORING (RF-1)

- A. Resinous Flooring System: Abrasion-, impact-, and chemical-resistant, aggregate-filled, resin-based monolithic floor surfacing designed to produce a seamless floor and integral cove base.
1. Basis-of-Design: Subject to compliance with requirements, provide the Basis-of-Design indicated or a comparable product by one of the following:
 - a. Stonhard, Inc. (Basis-of-Design).
 - b. Dex-O-Tex.
 - c. Sherwin-Williams High Performance Flooring.
- B. Source Limitations: Obtain primary resinous flooring materials, including primers, resins, hardening agents, grouting coats, and topcoats, from single source from single manufacturer. Obtain secondary

materials, including patching and fill material, joint sealant, and repair materials, of type and from manufacturer recommended in writing by manufacturer of primary materials.

C. System Characteristics:

1. Color and Pattern: As indicated on Finishes Legend on Drawings.
2. Wearing Surface: Orange-peel texture.
3. Overall System Thickness: 1/8 inch.

D. System Physical Properties: Provide resinous flooring system with the following minimum physical property requirements when tested in accordance with test methods indicated:

1. Tensile Strength: 1,600 psi minimum in accordance with ASTM C307.
2. Flexural Modulus of Elasticity: 1.0×10^6 psi minimum in accordance with ASTM C580.
3. Water Absorption: 0.1 percent maximum in accordance with ASTM C413.
4. Abrasion Resistance: 0.6 gm maximum weight loss in accordance with ASTM D4060.
5. Hardness: 85 to 90, Shore D in accordance with ASTM D2240.

E. Primer: Type recommended in writing by resinous flooring manufacturer for substrate and resinous flooring system indicated.

1. Products:
 - a. Stonhard Standard Primer (Basis-of-Design).
2. Formulation Description: 100 percent solids.

F. Waterproofing Membrane: Type recommended in writing by resinous flooring manufacturer for substrate and resinous flooring system indicated.

G. Patching and Fill Material: Resinous product of or approved by resinous flooring manufacturer and recommended in writing by manufacturer for installation indicated.

H. Undercoat:

1. Products:
 - a. Stonhard; Stonshield Undercoat (Basis-of-Design).
2. Resin: Epoxy.
3. Formulation Description: 100 percent solids.
4. Type: Clear.
5. Installation Method: Self-leveling slurry with broadcast aggregates.
6. Number of Coats: One.
7. Thickness of Coats: 1/16 inch.
8. Aggregates: Colored quartz (ceramic-coated silica).

I. Topcoats: Sealing or finish coats.

1. Products:
 - a. Stonhard; Stonshield SLT (Basis-of-Design).
2. Resin: Epoxy.
3. Formulation Description: 100 percent solids.
4. Type: Clear.
5. Number of Coats: One.
6. Thickness of Coats: 1/16 inch.
7. Finish: Matte.

PART 3 - EXECUTION**3.1 EXAMINATION**

- A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
 - 1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of resinous flooring systems.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Prepare and clean substrates in accordance with resinous flooring manufacturer's written instructions for substrate indicated to ensure adhesion.
- B. Concrete Substrates: Provide sound concrete surfaces free of laitance, glaze, efflorescence, curing compounds, form-release agents, dust, dirt, grease, oil, and other contaminants incompatible with resinous flooring.
 - 1. Roughen concrete substrates as follows:
 - a. Shot-blast surfaces with an apparatus that abrades the concrete surface, contains the dispensed shot within the apparatus, and recirculates the shot by vacuum pickup.
 - b. Comply with requirements in SSPC-SP 13/NACE No. 6, with a Concrete Surface Profile of 3 or greater in accordance with ICRI Technical Guideline No. 310.2R, unless manufacturer's written instructions are more stringent.
 - 2. Repair damaged and deteriorated concrete in accordance with resinous flooring manufacturer's written instructions.
 - 3. Moisture Testing: Perform tests so that each test area does not exceed 1000 sq. ft., and perform no fewer than three tests in each installation area and with test areas evenly spaced in installation areas.
 - a. Anhydrous Calcium Chloride Test: ASTM F1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. in 24 hours.
 - b. Relative Humidity Test: Using in-situ probes, ASTM F2170. Proceed with installation only after substrates have a maximum 80 percent relative humidity level measurement.
- C. Patching and Filling: Use patching and fill material to fill holes and depressions in substrates in accordance with manufacturer's written instructions.
 - 1. Control Joint Treatment: Treat control joints and other nonmoving substrate cracks to prevent cracks from reflecting through resinous flooring in accordance with manufacturer's written instructions.
- D. Resinous Materials: Mix components and prepare materials in accordance with resinous flooring manufacturer's written instructions.

3.3 INSTALLATION

- A. Apply components of resinous flooring system in accordance with manufacturer's written instructions to produce a uniform, monolithic wearing surface of thickness specified.
1. Coordinate installation of components to provide optimum adhesion of resinous flooring system to substrate, and optimum intercoat adhesion.
 2. Cure resinous flooring components in accordance with manufacturer's written instructions. Prevent contamination during installation and curing processes.
- B. Primer: Apply primer over prepared substrate at spreading rate recommended in writing by manufacturer.
- C. Field-Formed Integral Cove Base: Apply cove base mix to wall surfaces before applying flooring coats. Apply in accordance with manufacturer's written instructions and details, including those for taping, mixing, priming, troweling, sanding, and topcoating of cove base. Round internal and external corners.
1. Integral Cove Base: 6 inches high.
- D. Self-Leveling Body Coats: Apply self-leveling slurry body coats in thickness specified for flooring system.
1. Aggregates: Broadcast aggregates at rate recommended in writing by manufacturer. After resin is cured, remove excess aggregates to provide surface texture indicated.
- E. Troweled or Screeded Body Coats: Apply troweled or screeded body coats in thickness specified for flooring system. Hand or power trowel and grout to fill voids. When body coats are cured, remove trowel marks and roughness using method recommended in writing by manufacturer.
- F. Grout Coat: Apply grout coat to fill voids in surface of final body coat.
- G. Topcoats: Apply topcoats in number indicated for flooring system specified, at spreading rates recommended in writing by manufacturer, and to produce wearing surface specified.

3.4 FIELD QUALITY CONTROL

- A. Material Sampling: Owner may, at any time and any number of times during resinous flooring installation, require material samples for testing for compliance with requirements.
1. Owner will engage an independent testing agency to take samples of materials being used. Material samples will be taken, identified, sealed, and certified in presence of Contractor.
 2. Testing agency will test samples for compliance with requirements, using applicable referenced testing procedures or, if not referenced, using testing procedures listed in manufacturer's product data.
 3. If test results show applied materials do not comply with specified requirements, pay for testing, remove noncomplying materials, prepare surfaces coated with unacceptable materials, and reinstall flooring materials to comply with requirements.

3.5 PROTECTION

- A. Protect resinous flooring from damage and wear during the remainder of construction period. Use protective methods and materials, including temporary covering, recommended in writing by resinous flooring manufacturer.

END OF SECTION 096723

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SECTION 096813 – TILE CARPETING**PART 1 - GENERAL****1.1 SUMMARY**

- A. Section includes modular carpet tile.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
1. Include manufacturer's written data on physical characteristics, durability, and fade resistance.
 2. Include installation recommendations for each type of substrate.
- B. Shop Drawings: For carpet tile installation, plans showing the following:
1. Columns, doorways, enclosing walls or partitions, built-in cabinets, and locations where cutouts are required in carpet tiles.
 2. Carpet tile type, color, and dye lot.
 3. Type of subfloor.
 4. Type of installation.
 5. Pattern of installation.
 6. Pattern type, location, and direction.
 7. Pile direction.
 8. Type, color, and location of insets and borders.
 9. Type, color, and location of edge, transition, and other accessory strips.
 10. Transition details to other flooring materials.
- C. Samples: For each of the following products and for each color and texture required. Label each Sample with manufacturer's name, material description, color, pattern, and designation indicated on Drawings and in schedules.
1. Carpet Tile: Full-size Sample.
 2. Exposed Edge, Transition, and Other Accessory Stripping: 12 inch long Samples.
- D. Product Schedule: For carpet tile. Use same designations indicated on Drawings.

1.3 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Product Test Reports: For carpet tile, for tests performed by a qualified testing agency.
- C. Sample Warranty: For special warranty.

1.4 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For carpet tiles to include in maintenance manuals. Include the following:
1. Methods for maintaining carpet tile, including cleaning and stain-removal products and procedures and manufacturer's recommended maintenance schedule.
 2. Precautions for cleaning materials and methods that could be detrimental to carpet tile.

1.5 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Carpet Tile: Full-size units equal to a minimum of one percent of amount installed for each carpet type indicated, but not less than 10 square yards or predetermined quantity as requested by owner.

1.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in carpet tile manufacturing with a minimum of ten continuous years of documented experience.
- B. Installer Qualifications: An experienced installer with a minimum of five years documented experience in the installation of carpet tiles that is certified or accredited by carpet manufacturer and by the International Certified Floorcovering Installers Association.
 - 1. Installer shall have documented experience with a formal lift system when applicable to the job.
- C. Mock-Ups: Build mock-ups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.
 - 1. Build mock-ups at locations and in sizes shown on Drawings.
 - 2. Subject to compliance with requirements, approved mock-ups may become part of completed Work if undisturbed at time of Substantial Completion.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Comply with CRI's "CRI Carpet Installation Standard."

1.8 FIELD CONDITIONS

- A. Comply with CRI's "CRI Carpet Installation Standard" for temperature, humidity, and ventilation limitations.
- B. Environmental Limitations: Do not deliver or install carpet tiles until spaces are enclosed and weathertight, wet Work in spaces is complete and dry, and ambient temperature and humidity conditions are maintained at occupancy levels during remainder of construction period.
- C. Do not install carpet tiles over concrete slabs until slabs have cured and are sufficiently dry to bond with adhesive and concrete slabs have pH range recommended by carpet tile manufacturer.

1.9 WARRANTY

- A. Special Warranty for Carpet Tiles: Manufacturer agrees to repair or replace components of carpet tile installation that fail in materials or workmanship within specified warranty period.
 - 1. Warranty does not include deterioration or failure of carpet tile due to unusual traffic, failure of substrate, vandalism, or abuse.
 - 2. Failures include the following:
 - a. Surface wear.
 - b. Edge ravel.
 - c. Delamination.

- d. Tuft bind.
 - e. Moisture resistance.
3. Warranty Period: Lifetime from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 CARPET TILE (CPT-1, CPT-2, CPT-3, CPT-4)

- A. Basis of Design Products: Subject to compliance requirements, provide the Basis-of-Design products indicated or approved equal products by one of the following:
 1. Shaw Contract (Basis-of-Design).
 - a. Products: As indicated on Room Finish Legend on Drawings.
 2. Tandus Centiva, a Tarkett Company.
 3. Milliken & Company.
- B. Performance Characteristics:
 1. CRI Indoor Air Quality Testing Program:
 - a. VOC: Not to exceed 0.5 milligrams per square meter per hour.
 - b. Styrene: Not to exceed 0.4 milligrams per square meter per hour
 - c. 4-PC (phenylcyclohexene): Not to exceed 0.1 milligrams per square meter per hr
 - d. Formaldehyde: Not to exceed 0.5 milligrams per square meter per hr.
 2. Appearance Retention Rating: Heavy traffic, 3.0 to Severe traffic, 3.5 minimum according to ASTM D-5252 Hexapod Tumble Test.
 3. Critical Radiant Flux Classification: Not less than 0.45 W/square cm.
 4. Dry Breaking Strength: Not less than 100 pound-force per ASTM D2646.
 5. Methenamine Pill Test: Pass per ASTM D 2859 or CPSC FF-1-70.
 6. Dimensional Tolerance: Within 1/32 inch of specified size dimensions, as determined by physical measurement.
 7. Dimensional Stability: 0.2 percent or less per ISO 2551 (Aachen Test).
 8. Noise Reduction Coefficient (NRC): 0.20 minimum per ASTM C423.
 9. Colorfastness to Crocking: Not less than 4, wet and dry, per AATCC 165.
 10. Colorfastness to Light: Not less than 4 after 80 AFU (AATCC fading units) per AATCC 16, Option E.
 11. Electrostatic Propensity: Less than 3.5 kV per AATCC 134.

2.2 INSTALLATION ACCESSORIES

- A. Trowelable Leveling and Patching Compounds: Latex-modified, hydraulic-cement-based formulation or Portland cement based floor-patching compound provided or recommended by carpet tile manufacturer.
- B. Adhesives: Water-resistant, mildew-resistant, nonstaining, pressure-sensitive type to suit products and subfloor conditions indicated, that comply with flammability requirements for installed carpet tile, and is recommended by carpet tile manufacturer.
 1. Adhesives shall have a VOC content of 50 g/L or less.
- C. Metal Edge/Transition Strips: Extruded aluminum with mill finish of profile and width shown, of height required to protect exposed edge of carpet, and of maximum lengths to minimize running joints.

PART 3 - EXECUTION**3.1 EXAMINATION**

- A. Concrete Slabs: Verify that finishes comply with requirements specified in Section 033000 – Cast-in-Place Concrete and that surfaces are free of cracks, ridges, depressions, scale, and foreign deposits.
 - 1. Moisture Testing: Perform tests so that each test area does not exceed 200 square feet, and perform no fewer than 3 tests in each installation area and with test areas evenly spaced in installation areas.
 - a. Relative Humidity Test: Using in situ probes, ASTM F2170. Proceed with installation only after substrates have a maximum 75 percent relative humidity level measurement.
 - b. Perform additional moisture tests recommended in writing by adhesive and carpet tile manufacturers. Proceed with installation only after substrates pass testing.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. General: Comply with CRI's "CRI Carpet Installation Standards" and with carpet manufacturer's written installation instructions for preparing substrates indicated to receive carpet tile.
- B. Use trowelable leveling and patching compounds, per manufacturer's written instructions, to fill cracks, holes, depressions, and protrusions in substrates. Fill or level cracks, holes and depressions 1/8 inch wide or wider and protrusions more than 1/32 inch unless more stringent requirements are required by manufacturer's written instructions.
- C. Concrete Substrates: Remove coatings, including curing compounds, and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, without using solvents. Use mechanical methods recommended in writing by adhesive and carpet tile manufacturers.
- D. Broom and vacuum clean substrates to be covered immediately before installing carpet tile.

3.3 INSTALLATION

- A. General: Comply with CRI's "CRI Carpet Installation Standard," Section 18, "Modular Carpet" and with carpet tile manufacturer's written installation instructions.
- B. Installation Method: As recommended in writing by carpet tile manufacturer.
- C. Install pattern parallel to walls and borders unless indicated otherwise.
- D. Maintain dye lot integrity. Do not mix dye lots in same area.
- E. Cut and fit carpet tile to butt tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, edgings, thresholds, and nosings. Bind or seal cut edges as recommended by carpet tile manufacturer.
- F. Extend carpet tile into toe spaces, door reveals, closets, open-bottomed obstructions, removable flanges, alcoves, and similar openings.

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- G. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on finish flooring as marked on subfloor. Use nonpermanent, nonstaining marking device.

3.4 CLEANING AND PROTECTION

- A. Perform the following operations immediately after installing carpet tile:
1. Remove excess adhesive, seam sealer, and other surface blemishes using cleaner recommended by carpet tile manufacturer.
 2. Remove yarns that protrude from carpet tile surface.
 3. Vacuum carpet tile using commercial machine with face-beater element.
- B. Protect installed carpet tile to comply with CRI's "CRI Carpet Installation Standard," Section 20, "Protecting Indoor Installations."
- C. Protect carpet tile against damage from construction operations and placement of equipment and fixtures during the remainder of construction period. Use protection methods indicated or recommended in writing by carpet tile manufacturer.

END OF SECTION 096813

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SECTION 098433 - SOUND-ABSORBING WALL UNITS**PART 1 - GENERAL****1.1 SUMMARY**

- A. Section includes shop-fabricated, acoustical panel units tested for acoustical performance, including:
1. Sound-absorbing wall panels.
 2. Sound-absorbing metal wall panels.

1.2 DEFINITIONS

- A. NRC: Noise Reduction Coefficient.
- B. SAA: Sound Absorption Average.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of panel edge, core material, and mounting indicated.
- B. Shop Drawings: For sound-absorbing wall units. Include mounting devices and details; details at panel head, base, joints, and corners; and details at ceiling, floor base, and wall intersections. Indicate panel edge and core materials.
1. Include elevations showing panel sizes and direction of fabric weave and pattern matching.
- C. Samples for Verification: For the following products, prepared on Samples of size indicated:
1. Fabric: Full-width by approximately 36-inch long Sample, but not smaller than required to show complete pattern repeat, from dye lot to be used for the Work, and with specified treatments applied. Mark top and face of fabric.
 2. Metal Wall Panels: 6-inch-square Sample(s) of each type, finish, color, pattern, and texture. Show pan edge profile.
 3. Panel Edge: 12-inch long Sample(s) showing each edge profile, corner, and finish.
 4. Core Material: 12-inch square Sample at corner.
 5. Sound-Absorbing Blanket: 12-inch square Sample.
 6. Mounting Devices: Full-size Samples.
 7. Assembled Panels: Approximately 36 by 36 inches, including joints and mounting methods.

1.4 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Elevations and other details, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:
1. Electrical outlets, switches, and thermostats.
 2. Items penetrating or covered by sound-absorbing wall units including the following:

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- a. Lighting fixtures.
 - b. Air outlets and inlets.
 - c. Speakers.
 - d. Alarms.
 - e. Sprinklers.
 - f. Access panels.
3. Show operation of hinged and sliding components covered by or adjacent to sound-absorbing wall units.
- B. Product Certificates: For each type of sound-absorbing wall unit, from manufacturer.
- C. Sample Warranties: For manufacturers' special warranties.
- 1.5 CLOSEOUT SUBMITTALS
- A. Maintenance Data: For each type of unit to include in maintenance manuals. Include fabric manufacturer's written cleaning and stain-removal instructions.
- 1.6 QUALITY ASSURANCE
- A. Source Limitations: Obtain sound-absorbing wall units from single source from single manufacturer.
- B. Fire-Test-Response Characteristics: Provide sound-absorbing wall units meeting the following as determined by testing identical products by UL or another testing and inspecting agency acceptable to authorities having jurisdiction:
- 1. Surface-Burning Characteristics: As determined by testing per ASTM E 84.
 - a. Flame-Spread Index: 25 or less.
 - b. Smoke-Developed Index: 450 or less.
- 1.7 DELIVERY, STORAGE, AND HANDLING
- A. Comply with fabric and sound-absorbing wall unit manufacturers' written instructions for minimum and maximum temperature and humidity requirements for shipment, storage, and handling.
- B. Deliver materials and units in unopened bundles and store in a temperature-controlled dry place with adequate air circulation.
- 1.8 FIELD CONDITIONS
- A. Environmental Limitations: Do not install units until spaces are enclosed and weathertight, wet-work in spaces is complete and dry, Work at and above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.
- B. Lighting: Do not install units until a permanent level of lighting is provided on surfaces to receive the units.

- C. Air-Quality Limitations: Protect units from exposure to airborne odors, such as tobacco smoke, and install units under conditions free from odor contamination of ambient air.
- D. Field Measurements: Verify unit locations and actual dimensions of openings and penetrations by field measurements before fabrication, and indicate them on Shop Drawings.

1.9 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace units and components that fail in materials or workmanship within specified warranty period.
 - 1. Failures include the following:
 - a. Acoustical performance.
 - b. Fabric sagging, distorting, or releasing from panel edge.
 - c. Warping of core.
 - 2. Warranty Period: Two years from date of Substantial Completions.

PART 2 - PRODUCTS

2.1 PERFORMANCE CRITERIA

- A. Fire-Test-Response Characteristics: Units shall comply with "Surface-Burning Characteristics" or "Fire Growth Contribution" Subparagraph below, or both, as determined by testing identical products by UL or another testing and inspecting agency acceptable to authorities having jurisdiction:
 - 1. Surface-Burning Characteristics: Comply with ASTM E 84 or UL 723; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - a. Flame-Spread Index: 25 or less.
 - b. Smoke-Developed Index: 450 or less.
 - 2. Fire Growth Contribution: Comply with acceptance criteria of local code and authorities having jurisdiction when tested according to NFPA 286.

2.2 SOUND-ABSORBING WALL UNITS

- A. Sound-Absorbing Wall Panel: Manufacturer's standard panel construction consisting of facing material stretched over front face of edge-framed core and bonded or attached to edges and back of frame.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Accutrack Systems.
 - b. Armstrong World Industries, Inc.
 - c. AVL Systems, Inc.
 - d. Conwed Designscape; an Owens Corning company.
 - e. Decoustics Limited; a Saint Gobain company.
 - f. Wenger Corporation.

2. Panel Shape: As indicated on Drawings.
3. Mounting: Back mounted with manufacturer's standard metal clips or bar hangers, secured to substrate.
4. Core: Glass-fiber board.
 - a. Core-Face Layer: Manufacturer's standard tackable, impact-resistant, high-density board.
5. Edge Profile: Square.
6. Corner Detail: Square.
7. Facing Material: As indicated on Room Finish Legend on Drawings.
8. Acoustical Performance: Sound absorption NRC of not less than 0.080 for Type A mounting per ASTM E 795.
9. Nominal Overall Panel Thickness: As indicated on Drawings.
10. Panel Width and Height: As indicated on Drawings.

2.3 SOUND-ABSORBING METAL WALL PANELS

- A. Basis-of-Design: Subject to compliance with requirements, provide Pattern "C" Panel ALPRO Systems by ALPRO Acoustical Systems, a division of Gordon, Inc. or approved substitution by one of the following:
 1. American Decorative Ceilings (ADC).
 2. Armstrong World Industries, Inc.
 3. Custom Architectural Designs, Inc.
 4. Chicago Metallic Corporation.
 5. Hunter Douglas Architectural Products, Inc.
 6. United States Gypsum Company.
- B. Classification: Units complying with ASTM E 1264 for Type VII, perforated aluminum facing (pan) with mineral- or glass-fiber-base backing.
 1. Pattern: Corrugated with Pattern C (perforated, small holes) regularly spaced, with uniform perforations of dimension, holes per square foot or inch, and percent open area as specified by product designation.
 - a. Perforation Pattern: 1/8 inch diameter holes on 21/64 inch staggered centers, approximately 13 percent open area.
- C. Sheet Metal Characteristics: For metal components exposed to view in the completed Work, provide materials with smooth, flat surfaces without blemishes. Do not use materials with exposed pitting, seam marks, roller marks, roughness, stains, or discolorations.
 1. Aluminum Sheet: Rolled aluminum sheet, complying with ASTM B 209; alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated.
- D. Sound-Absorbent Pads: Provide width and length to completely fill concealed surface of pan, with surface-burning characteristics for flame-spread index of 25 or less and smoke-developed index of 50 or less, as determined by testing according to ASTM E 84, and to comply with the following requirements:

1. Unwrapped, Glass-Fiber Insulation: Black coated, unfaced, complying with ASTM C 553, Type I, Type II, or Type III; not less than 1-lb/cu. ft. density; treated to be nondusting; 1 inch thick.

E. Adhesive: Manufacturer's standard nonflammable adhesive for sound-absorbent pads.

2.4 FABRICATION

A. Standard Construction: Use manufacturer's standard construction unless otherwise indicated; with facing material applied to face, edges, and back border of dimensionally stable core; and with rigid edges to reinforce panel perimeter against warpage and damage.

B. Edge Hardening: For glass-fiber board cores, chemically harden core edges and areas of core where mounting devices are attached.

C. Core-Face Layer: Evenly stretched over core face and edges and securely attached to core; free from puckers, ripples, wrinkles, or sags.

D. Facing Material: Apply fabric facing fully covering visible surfaces of unit; with material stretched straight, on the grain, tight, square, and free from puckers, ripples, wrinkles, sags, blisters, seams, adhesive, or other visible distortions or foreign matter.

1. Square Corners: Tailor corners.

2. Radius and Other Nonsquare Corners: Attach facing material so there are no seams or gathering of material.

3. Fabrics with Directional or Repeating Patterns or Directional Weave: Mark fabric top and attach fabric in same direction so pattern or weave matches in adjacent units.

E. Dimensional Tolerances of Finished Units: Plus or minus 1/16 inch for the following:

1. Thickness.

2. Edge straightness.

3. Overall length and width.

4. Squareness from corner to corner.

5. Chords, radii, and diameters.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine fabricated units, substrates, areas, and conditions, for compliance with requirements, installation tolerances, and other conditions affecting performance of sound-absorbing wall units.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install sound-absorbing wall units in locations indicated with vertical surfaces and edges plumb, top edges level and in alignment with other units, faces flush, and scribed to fit adjoining work accurately at borders and at penetrations.

- B. Comply with sound-absorbing wall unit manufacturer's written instructions for installation of units using type of mounting devices indicated. Mount units securely to supporting substrate.

3.3 CLEANING

- A. Clean panels on completion of installation to remove dust and other foreign materials according to manufacturer's written instructions.

END OF SECTION 098433

SECTION 098436 - SOUND-DIFFUSING CEILING UNITS**PART 1 - GENERAL****1.1 SUMMARY**

- A. Section includes shop-fabricated, acoustical panel units tested for acoustical performance, including the following:
 - 1. Sound-diffusing ceiling panels.

1.2 DEFINITIONS

- A. NRC: Noise Reduction Coefficient.
- B. SAA: Sound Absorption Average.

1.3 ADMINISTRATIVE REQUIREMENTS

- A. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Section 013100 – Project Management and Coordination.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include panel edge, core material, and mounting indicated.
- B. Shop Drawings: For unit assembly and installation.
 - 1. Include reflected ceiling plans, elevations, sections, and mounting devices and details.
 - 2. Include details at joints and corners; and details at ceiling intersections and intersections with walls. Indicate panel edge profile and core materials.
 - 3. Include direction of fabric weave and pattern matching.
- C. Samples for Initial Selection: For each type of fabric facing.
 - 1. Include Samples of hardware and accessories involving color or finish selection.
- D. Samples for Verification: For the following products:
 - 1. Fabric: Full-width by approximately 36-inch long Sample, but not smaller than required to show complete pattern repeat, from dye lot to be used for the Work, and with specified treatments applied. Mark top and face of fabric.
 - 2. Panel Edge: 12-inch long Sample(s) showing each edge profile, corner, and finish.
 - 3. Core Material: 12-inch square Sample at corner.
 - 4. Mounting Devices: Full-size Samples.
 - 5. Assembled Panels: Approximately 36 by 36 inches, including joints and mounting methods.

1.5 INFORMATIONAL SUBMITTALS

- A. Product Certificates: For each type of unit.

- B. Sample Warranty: For manufacturer's special warranty.

1.6 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For each type of unit to include in maintenance manuals. Include fabric manufacturer's written cleaning and stain-removal instructions.

1.7 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Fabric: For each fabric, color, and pattern installed, furnish length equal to 10 percent of amount installed, but no fewer than 10 sq. yd., full width of bolt.
 - 2. Mounting Devices: Full-size units equal to 5 percent of amount installed, but no fewer than five Insert number devices.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Comply with fabric and sound-absorbing ceiling unit manufacturers' written instructions for minimum and maximum temperature and humidity requirements for shipment, storage, and handling.
- B. Deliver materials and units in unopened bundles and store in a temperature-controlled dry place with adequate air circulation.

1.9 FIELD CONDITIONS

- A. Environmental Limitations: Do not install units until spaces are enclosed and weathertight, wet-work in spaces is complete and dry, Work at and above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.
- B. Lighting: Do not install units until a permanent level of lighting is provided on surfaces to receive the units.
- C. Air-Quality Limitations: Protect units from exposure to airborne odors, such as tobacco smoke, and install units under conditions free from odor contamination of ambient air.
- D. Field Measurements: Verify unit locations and actual dimensions of openings and penetrations by field measurements before fabrication, and indicate them on Shop Drawings.

1.10 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace units and components that fail in materials or workmanship within specified warranty period.
 - 1. Failures include the following:
 - a. Acoustical performance.
 - b. Fabric sagging, distorting, or releasing from panel edge.
 - c. Warping of core.
 - 2. Warranty Period: Two years from date of Substantial Completion.

PART 2 - PRODUCTS**2.1 MANUFACTURERS**

- A. Source Limitations: Obtain ceiling units specified in this Section and wall units specified in Section 098433 – Sound-Absorbing Wall Units from single source from single manufacturer.

2.2 PERFORMANCE CRITERIA

- A. Fire-Test-Response Characteristics: Units shall comply with "Surface-Burning Characteristics" or "Fire Growth Contribution" Subparagraph below, or both, as determined by testing identical products by UL or another testing and inspecting agency acceptable to authorities having jurisdiction:
1. Surface-Burning Characteristics: Comply with ASTM E 84 or UL 723; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - a. Flame-Spread Index: 25 or less.
 - b. Smoke-Developed Index: 450 or less.
 2. Fire Growth Contribution: Comply with acceptance criteria of local code and authorities having jurisdiction when tested according to NFPA 286.

2.3 SOUND-DIFFUSING CEILING UNITS

- A. Sound-Diffusing Ceiling Panel: Manufacturer's standard panel construction consisting of facing material laminated to front face, edges, and back edge border of core.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Accutrack Systems.
 - b. Armstrong World Industries, Inc.
 - c. AVL Systems, Inc.
 - d. Conwed Designscape; an Owens Corning company.
 - e. Decoustics Limited; a Saint Gobain company.
 - f. Wenger Corporation. (Basis of Design)
 2. Panel Shape: As indicated on Drawings.
 3. Mounting: Back mounted with manufacturer's standard metal clips or bar hangers, secured to substrate.
 4. Core: Glass-fiber board.
 - a. Core-Face Layer: Manufacturer's standard tackable, impact-resistant, high-density board.
 5. Edge Profile: Square.
 6. Corner Detail: Square.
 7. Facing Material: As indicated on Room Finish Legend on Drawings.
 8. Acoustical Performance: Sound absorption NRC of not less than 0.080 for Type A mounting per ASTM E 795.
 9. Nominal Overall Panel Thickness: As indicated on Drawings.
 10. Panel Width and Height: As indicated on Drawings.

2.4 FABRICATION

- A. Standard Construction: Use manufacturer's standard construction unless otherwise indicated, with facing material applied to face, edges, and back border of dimensionally stable core and with rigid edges to reinforce panel perimeter against warpage and damage.
- B. Measure each area and establish layout of panels and joints of sizes indicated on Drawings within a given area.
- C. Edge Hardening: For glass-fiber board cores, chemically harden core edges and areas of core where mounting devices are attached.
- D. Facing Material: Apply fabric facing fully covering visible surfaces of unit; with material stretched straight, on the grain, tight, square, and free from puckers, ripples, wrinkles, sags, blisters, seams, adhesive, or other visible distortions or foreign matter.
 - 1. Square Corners: Tailor corners.
 - 2. Radius and Other Nonsquare Corners: Attach facing material so there are no seams or gathering of material.
 - 3. Fabrics with Directional or Repeating Patterns or Directional Weave: Mark fabric top and attach fabric in same direction so pattern or weave matches adjacent units.
- E. Dimensional Tolerances of Finished Units: Plus or minus 1/16 inch for the following:
 - 1. Thickness.
 - 2. Edge straightness.
 - 3. Overall length and width.
 - 4. Squareness from corner to corner.
 - 5. Chords, radii, and diameters.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install units in locations indicated. Unless otherwise indicated, install units with edges in alignment with walls and other units, faces flush, and scribed to fit adjoining work accurately at borders and at penetrations.
- B. Comply with manufacturer's written instructions for installation of units using type of mounting devices indicated. Mount units securely to supporting substrate.
- C. Align fabric pattern and grain as indicated on Drawings.

3.2 INSTALLATION TOLERANCES

- A. Variation from Alignment with Surfaces: Plus or minus 1/16 inch in 48 inches, noncumulative.
- B. Variation from Level or Slope: Plus or minus 1/16 inch.
- C. Variation of Joint Width: Not more than 1/16 inch wide from hairline in 48 inches, noncumulative.

3.3 CLEANING

- A. Clip loose threads; remove pills and extraneous materials.
- B. Clean panels on completion of installation to remove dust and other foreign materials according to manufacturer's written instructions.

END OF SECTION 098436

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SECTION 099123 – INTERIOR PAINTING**PART 1 - GENERAL****1.1 SUMMARY**

- A. Section includes surface preparation and the application of paint systems on interior substrates.
1. Concrete.
 2. Concrete masonry units (CMUs).
 3. Steel.
 4. Gypsum board.

1.2 DEFINITIONS

- A. Paint gloss is defined as sheen rating of applied paint, per ASTM D523:
1. MPI Gloss Level 1 (Matte or Flat): Not more than 5 units at 60 degrees and 10 units at 85 degrees.
 2. MPI Gloss Level 3 (Eggshell): 10 to 25 units at 60 degrees and 10 to 35 units at 85 degrees.
 3. MPI Gloss Level 4 (Satin): 20 to 35 units at 60 degrees and not less than 35 units at 85 degrees.
 4. MPI Gloss Level 5 (Semi-Gloss): 35 to 70 units at 60 degrees.
 5. MPI Gloss Level 6 (Gloss): 70 to 85 units at 60 degrees.
 6. MPI Gloss Level 7 (High-Gloss): More than 85 units at 60 degrees.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product. Include preparation requirements and application instructions.
1. Include printout of current "MPI Approved Products List" for each product category specified, with proposed product highlighted.
- B. Samples for Verification: For each type of paint system and in each color and gloss of topcoat.
1. Submit Samples on rigid backing, 8 inches square.
 2. Step coats on Samples to show each coat required for system.
 3. Label each coat of each Sample.
 4. Label each Sample for location and application area.
- C. Product List: Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules. Include color designations.

1.4 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials, from same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
1. Paint: 5 percent, but not less than 1 gallon of each material and color applied.

1.5 QUALITY ASSURANCE

- A. Mockups: Apply mockups of each paint system indicated and each color and finish selected to verify preliminary selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
 - 1. Architect will select one surface to represent surfaces and conditions for application of each paint system specified in Part 3.
 - a. Vertical and Horizontal Surfaces: Provide samples of at least 100 square feet.
 - b. Other Items: Architect will designate items or areas required.
 - 2. Final approval of color selections will be based on mockups.
 - a. If preliminary color selections are not approved, apply additional mockups of additional colors selected by Architect at no added cost to Owner.
 - 3. Approval of mockups does not constitute approval of deviations from Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 - 4. Subject to compliance with requirements, approved mockups may become part of completed Work if undisturbed at time of Substantial Completion.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 degrees F.
 - 1. Maintain containers in clean condition, free of foreign materials and residue.
 - 2. Remove rags and waste from storage areas daily.

1.7 FIELD CONDITIONS

- A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 degrees F.
- B. Do not apply paints when relative humidity exceeds 85 percent; at temperatures less than 5 degrees F above dew point; or to damp or wet surfaces.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Products: Subject to compliance with requirements, provide one of the products listed in Interior Painting Schedule for coating category indicated.

2.2 PAINT, GENERAL

- A. MPI Standards: Provide products that comply with MPI standards indicated and that are listed in its "MPI Approved Products List."

- B. Material Compatibility:
1. Provide materials for use within each paint system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
 2. For each coat in a paint system, provide products recommended in writing by topcoat manufacturers for use in paint system and on substrate indicated.
 3. If a manufacturer provides more than one product within an MPI category, provide the highest quality product within that category.
- C. Material Quality: Paint material containers not displaying paint manufacturer's product identification will not be accepted.
- D. Colors: As selected by Architect from manufacturer's full range or as indicated in color schedule.

2.3 BLOCK FILLERS

- A. Block Filler, Latex, Interior/Exterior: MPI #4.
1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Benjamin Moore: Coronado, Super Kote 5000 Latex Production Block Filler Flat, 958.
 - b. Benjamin Moore: Super Spec, Int/Ext High-Build Block Filler, 206/K206.
 - c. PPG Architectural: Dulux X-Pert (CA), Int/Ext Acrylic Latex Block Filler, 36250.
 - d. PPG Architectural: Glidden Professional (US), Concrete Coatings Block Filler Interior/Exterior Primer, 3010.
 - e. PPG Architectural: PPG Paints, Interior/Exterior Masonry HiFill Latex Block Filler, 15-Jun.
 - f. Sherwin-Williams: PrepRite, Int/Ext Block Filler, B25W00025/B25WQ8025.
 - g. Sherwin-Williams: Protective & Marine, Heavy Duty Block Filler, B42W00046.

2.4 METAL PRIMERS

- A. Primer, Rust-Inhibitive, Water Based: MPI #107
1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Benjamin Moore: Super Spec HP, Acrylic Metal Primer, P04/KP04.
 - b. PPG Architectural: High Performance Coatings, Pitt-Tech Plus Int/Ext DTM Industrial Primer, 90-908/909/912.
 - c. Sherwin-Williams: Pro Industrial, Pro-Cryl Universal Primer, B66W310.

2.5 PRIMERS/SEALERS

- A. Primer Sealer, Interior, Institutional Low Odor/VOC: MPI #149
1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Benjamin Moore: Eco Spec WB, Interior Latex Primer, N372.
 - b. Benjamin Moore: Natura, Waterborne Interior Primer, 511.
 - c. Benjamin Moore: Ultra Spec 500, Waterborne Interior Primer, N534.
 - d. PPG Architectural: Glidden Professional, Lifemaster No VOC Interior Primer, 9116.
 - e. PPG Architectural: PPG, Speedhide Zero Interior Zero VOC Latex Sealer, 6-4900XI.

- f. Sherwin-Williams: Harmony, Interior Latex Primer, B11W00500.
- g. Sherwin-Williams: Multi-Purpose Multi-Purpose Latex Primer/Sealer, B51W00450.
- h. Sherwin-Williams: ProMar 200 Zero, Interior Latex Primer, B28W02600.

B. Primer Sealer, Latex, Interior: MPI #50

- 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Benjamin Moore: Eco Spec WB, Interior Latex Primer, N372/F372.
 - b. Benjamin Moore: Ultra Spec 500, Waterborne Interior Primer Sealer, N534/K534.
 - c. Rust-Oleum: Zinsser, Bulls Eye Zero, 249019/20/21.
 - d. Sherwin-Williams: Harmony, Interior Latex Primer, B11W00500.

2.6 WATER-BASED PAINTS

A. Latex, Interior, Flat, (MPI Gloss Level 1): MPI #53.

- 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Benjamin Moore: Eco Spec WB, Interior Latex Flat Finish, N373/F373.
 - b. Benjamin Moore: Eco Spec WB Silver, Interior Flat Finish, 473/K473.
 - c. PPG Architectural: PPG Paints, Speedhide Zero Interior Zero VOC Latex Flat, 6-4110XI.
 - d. Sherwin-Williams: Harmony, Interior Acrylic Latex Flat, B05W01051.
 - e. Sherwin-Williams: Solo, Solo Interior/Exterior 100% Acrylic Flat, A74W00051.

B. Latex, Interior, (MPI Gloss Level 3): MPI #52.

- 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Benjamin Moore: Eco Spec WB, Interior Latex Eggshell Finish, N374/F374.
 - b. Benjamin Moore: Super Hide, Zero VOC Interior Eggshell, 357/K357.
 - c. Benjamin Moore: Ultra Spec 500, Waterborne Interior Eggshell, N538/K538.
 - d. PPG Architectural: PPG Paints, Speedhide Interior Satin Acrylic Latex, 6-3511.
 - e. PPG Architectural: PPG Paints, Speedhide Zero Interior Zero VOC Latex Satin, 6-4410XI.
 - f. PPG Architectural: PPG Pittsburgh Paints, Wonder Pure zero VOC Interior Satin, DRP34XX.
 - g. Sherwin-Williams: ProMar 200 Zero VOC, Interior Latex Eg-Shel, B20W02651.
 - h. Sherwin-Williams: ProMar 400, Int. Latex Low Lustre, B24W00551.

C. Latex, Interior, Semi-Gloss, (MPI Gloss Level 5), MPI #54.

- 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Benjamin Moore: Eco Spec WB, Interior Latex Semi-Gloss Finish, N376/F376.
 - b. PPG Architectural: Glidden Professional, Ultra-Hide 150 Interior Latex Semi-Gloss, 1416.
 - c. PPG Architectural: Glidden Professional, Ultra-Hide 440 Interior Latex Semi-Gloss Paint, GP4-5110.
 - d. PPG Architectural: Glidden Professional, Ultra-Hide 250 Interior Semi-Gloss Paint, 1406N. PPG Architectural: PPG Paints, Speedhide Interior Enamel Latex Semi-Gloss, 6-500.
 - e. PPG Architectural: PPG Paints, Speedhide Pro-EV Interior Enamel Latex Semi-Gloss, 12-510.
 - f. PPG Architectural: PPG Paints, SPEEDHIDE zero Interior Zero VOC Latex Semi-Gloss, 6-4510XI.
 - g. Sherwin-Williams: ProMar 200, Interior Latex Gloss, B21W02251.
 - h. Sherwin-Williams: ProMar 400, Interior Latex Gloss, B21W04451.

- D. Latex, Interior, Institutional Low Odor/VOC, Semi-Gloss (MPI Gloss Level 5): MPI #147
1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Benjamin Moore: Aura, Waterborne Interior Semi-Gloss Finish, 528/K528.
 - b. Benjamin Moore: Regal Select, Premium Interior Semi-Gloss Finish, 551/K551.
 - c. Benjamin Moore: Ultra Spec 500, Waterborne Interior Gloss, N540/K540.
 - d. PPG Architectural: Glidden Professional (US), Diamond 450 No VOC Interior Semi-Gloss Paint, 7400N.
 - e. PPG Architectural: Glidden Professional (US), Lifemaster No VOC Interior Acrylic Semi-Gloss, 9200.
 - f. PPG Architectural: PPG Paints, Speedhide Zero Interior Zero VOC Latex Semi-Gloss, 6-4510XI.
 - g. PPG Architectural: PPG Pittsburgh Paints, Wonder-Pure No VOC Interior semigloss, DRP33XX.
 - h. Sherwin-Williams: Emerald, Interior Acrylic Latex Semi Gloss, K38W00351.
 - i. Sherwin-Williams: Pro Industrial, Acrylic Semi-Gloss Coating, B66W00651.
- E. Light Industrial Coating, Interior, Water Based, Semi-Gloss (MPI Gloss Level 5): MPI #153.
1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Benjamin Moore: Spec HP, D.T.M. Acrylic Semi-Gloss, HP29/FP29.
 - b. PPG Architectural: Devco Coatings, DEVFLEX 4216 High Performance WB Acrylic SG Enamel, 4216L.
 - c. PPG Architectural: High Performance Coatings, Pitt-Tech Plus Int/Ext Semi-Gloss DTM Industrial Enamel, 90-1210.
 - d. Sherwin-Williams: Pro Industrial, Acrylic Semi-Gloss Coating, B66W00651.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
- B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
 1. Masonry (CMU): 12 percent.
 2. Gypsum Board: 12 percent.
- C. Gypsum Board Substrates: Verify that finishing compound is sanded smooth.
- D. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.
- E. Proceed with coating application only after unsatisfactory conditions have been corrected.
 1. Application of coating indicates acceptance of surfaces and conditions.

3.2 PREPARATION

- A. Comply with manufacturer's written instructions and recommendations in "MPI Manual" applicable to substrates indicated.

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- B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.
 - 1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.
 - 2. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
 - C. Clean substrates of substances that could impair bond of paints, including dust, dirt, oil, grease, and incompatible paints and encapsulants.
 - D. Concrete Substrates: Remove release agents, curing compounds, efflorescence, and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces to be painted exceeds that permitted in manufacturer's written instructions.
 - E. Masonry Substrates: Remove efflorescence and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces or mortar joints exceed that permitted in manufacturer's written instructions.
 - F. Steel Substrates: Remove rust, loose mill scale, and shop primer, if any. Clean using methods recommended in writing by paint manufacturer.
 - G. Shop-Primed Steel Substrates: Clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material as used for shop priming to comply with SSPC-PA 1 for touching up shop-primed surfaces.

3.3 APPLICATION

- A. Apply paints according to manufacturer's written instructions and to recommendations in "MPI Manual."
 - 1. Use applicators and techniques suited for paint and substrate indicated.
 - 2. Paint surfaces behind movable equipment and furniture same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
 - 3. Paint front and backsides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.
- B. Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Tint undercoats to match color of topcoat, but provide sufficient difference in shade of undercoats to distinguish each separate coat.
- C. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.
- D. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.
- E. Apply primers and finish coats in accordance with manufacturer's recommended dry-film thickness, square foot per gallon, and mil thickness per coat. Do not add solvent or thinner to paint and coating products.

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- F. Painting Mechanical and Electrical Work: Paint same color as the adjoining substrate items exposed in equipment rooms and occupied spaces including, but not limited to, the following:
1. Mechanical Work:
 - a. Uninsulated metal piping.
 - b. Uninsulated plastic piping.
 - c. Pipe hangers and supports.
 - d. Tanks that do not have factory-applied final finishes.
 - e. Visible portions of internal surfaces of metal ducts, without liner, behind air inlets and outlets.
 - f. Duct, equipment, and pipe insulation having cotton or canvas insulation covering or other paintable jacket material.
 - g. Mechanical equipment that is indicated to have a factory-primed finish for field painting.
 2. Paint the following work where exposed in occupied spaces:
 - a. Panelboards.
 - b. Electrical equipment that is indicated to have a factory-primed finish for field painting.
- G. Fire-Rated Assemblies:
1. By stenciling, permanently identify corridor partitions. Above decorative ceiling line and in concealed spaces, on both sides of wall, apply a minimum one-inch red line interrupted at maximum 12-foot spacing with the working "X HOUR FIRE AND SMOKE BARRIER – PROTECT ALL OPENINGS" in 4-inch high letters with "X" designating appropriate hourly rating.

3.4 CLEANING AND PROTECTION

- A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.
- B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.
- C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.
- D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.5 INTERIOR PAINTING SCHEDULE

- A. CMU Substrates:
 1. Institutional Low-Odor/VOC Latex System:
 - a. Block Filler: Block filler, latex, interior/exterior, MPI #4.
 - b. Intermediate Coat: Latex, interior, institutional low odor/VOC, matching topcoat.
 - c. Topcoat: Latex, interior, institutional low odor/VOC, semi-gloss (MPI Gloss Level 5), MPI #147.

B. Steel Substrates:**1. Water-Based Light Industrial Coating System:**

- a. Locations: Hollow metal doors and frames, pipe and tube railings.
- b. Prime Coat: Primer, rust-inhibitive, water based, MPI #107.
- c. Intermediate Coat: Light industrial coating, interior, water based, matching topcoat.
- d. Topcoat: Light industrial coating, interior, water based, semi-gloss (MPI Gloss Level 5), MPI #153.

C. Gypsum Board Substrates:**1. Institutional Low-Odor/VOC Latex System:**

- a. Prime Coat: Primer sealer, interior, institutional low odor/VOC, MPI #149.
- b. Intermediate Coat: Latex, interior, institutional low odor/VOC, matching topcoat.
- c. Topcoat: Latex, interior, institutional low odor/VOC, semi-gloss (MPI Gloss Level 5), MPI #147.

2. Latex over Latex Sealer System:**3. Locations: Toilet and Restrooms, where mildew resistance is required, and where indicated.**

- a. Prime Coat: Primer sealer, latex, interior, MPI #50.
- b. Intermediate Coat: Latex, interior, matching topcoat.
- c. Topcoat: Latex, interior, (MPI Gloss Level 3), MPI #52.
- d. Topcoat: Latex, interior, semi-gloss, (MPI Gloss Level 5), MPI #54.

3.6 COLOR SCHEDULE

- A. Colors are indicated on Room Finish Legend on Drawings.

END OF SECTION 099123

SECTION 099600 – HIGH-PERFORMANCE COATINGS**PART 1 - GENERAL****1.1 SUMMARY**

- A. Section includes surface preparation and the application of high-performance coating systems.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product. Include preparation requirements and application instructions.
1. Include printout of current "MPI Approved Products List" for each product category specified, with the proposed product highlighted.
- B. Samples for Verification: For each type of coating system and each color and gloss of topcoat indicated.
1. Submit Samples on rigid backing, 8 inches square.
 2. Apply coats on Samples in steps to show each coat required for system.
 3. Label each coat of each Sample.
 4. Label each Sample for location and application area.
- C. Product List: Cross-reference to coating system and locations of application areas. Use same designations indicated on Drawings and in schedules. Include color designations.

1.3 INFORMATIONAL SUBMITTALS

- A. Steel Primer Certification: Written confirmation from fabricators of structural steel and miscellaneous metals certifying that surface preparation procedures for fabricated steel items comply with Specifications and that applied primers are compatible with specified finish coat materials.

1.4 QUALITY ASSURANCE

- A. Mockups: Apply mockups of each coating system indicated to verify preliminary selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
1. Architect will select one surface to represent surfaces and conditions for application of each coating system.
 - a. Wall and Ceiling Surfaces: Provide samples of at least 100 square feet.
 - b. Other Items: Architect will designate items or areas required.
 2. Final approval of color selections will be based on mockups.
 - a. If preliminary color selections are not approved, apply additional mockups of additional colors selected by Architect at no added cost to Owner.

3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 degrees F.
 1. Maintain containers in clean condition, free of foreign materials and residue.

1.6 FIELD CONDITIONS

- A. Apply coatings only when temperature of surfaces to be coated and surrounding air temperatures are between 50 and 95 degrees F.
- B. Do not apply coatings when relative humidity exceeds 85 percent; at temperatures less than 5 degrees F above the dew point; or to damp or wet surfaces.
- C. Do not apply exterior coatings in snow, rain, fog, or mist.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. Behr Process Corporation.
 2. Benjamin Moore & Co.
 3. Diamond Vogel Paints.
 4. PPG Architectural Finishes, Inc.
 5. Pratt & Lambert.
 6. Sherwin-Williams Company (The).
 7. Tnemec Company, Inc.
- B. Products: Subject to compliance with requirements, provide one of the products listed in High-Performance Coatings Schedule for coating category indicated.

2.2 HIGH-PERFORMANCE COATINGS, GENERAL

- A. MPI Standards: Provide products that comply with MPI standards indicated and are listed in "MPI Approved Products List."
- B. Material Compatibility:

1. Provide materials for use within each coating system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
2. For each coat in a coating system, provide products recommended in writing by manufacturers of topcoat for use in coating system and on substrate indicated.
3. Provide products of same manufacturer for each coat in a coating system.
4. If a manufacturer provides more than one product within an MPI category, provide the highest quality product within that category.

C. Colors: Selected by Architect from manufacturer's full range as indicated in Finish Schedules.

2.3 BLOCK FILLERS

A. Block Filler, Latex, Interior/Exterior: MPI #4.

1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Behr Paint: Behr Pro, Block Filler, PR50.
 - b. Benjamin Moore: Coronado, Super Kote 5000 Latex Production Block Filler Flat, 958.
 - c. Benjamin Moore: Super Spec, Int/Ext High-Build Block Filler, 206/K206.
 - d. Diamond Vogel: Fil-Kote, 100% Acrylic Block Filler, BF-1504
 - e. PPG Architectural: Glidden Professional (US), Concrete Coatings Block Filler Interior/Exterior Primer, 3010.
 - f. PPG Architectural: PPG Paints, Interior/Exterior Masonry HiFill Latex Block Filler, 6-15.
 - g. Rust-Oleum: Zinsser, Watertite Flexible Primer & Finish, 5063/5061.
 - h. Sherwin-Williams: PrepRite, Int/Ext Block Filler, B25W00025/B25WQ8025.
 - i. Sherwin-Williams: Protective & Marine, Heavy Duty Block Filler, B42W00046.
 - j. Valspar: Valspar, Professional Interior/Exterior Block Filler, 589.

B. Block Filler, Epoxy: MPI #116.

1. Products: Subject to compliance with requirements, provide one of the following:
 - a. AkzoNobel: Devoe Coatings, Bar-Rust 236 Multi-Purpose Epoxy Coating, 236.
 - b. AkzoNobel: Devoe High Performance Coatings, Devran 224V, 224V.
 - c. PPG Architectural: Amercoat, Amerlock 400 BF, AK400B-x.

2.4 METAL PRIMERS

A. Primer, Zinc-Rich, Inorganic, Water Based: Shop-applied primer with minimum 2.5 to 3.5 DFT. MPI #19.

1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Carboline Company: Carboline, Carbozinc 11 VOC.
 - b. PPG Architectural: Amercoat, Ameron Dimetcote 9HS, D9HS.
 - c. Sherwin-Williams: Protective & Marine, Zinc Clad XI, B69V11.

B. Primer, Zinc-Rich, Epoxy: MPI #20.

1. Products: Subject to compliance with requirements, provide one of the following:
 - a. AkzoNobel: Devoe Coatings, CATHACOAT 313 Organic Zinc Rich Primer, 313.
 - b. PPG Architectural: High Performance Coatings, Epoxy Zinc Rich Primer, 97-670.
 - c. Sherwin-Williams: Protective & Marine, Zinc Clad IV, B69A8/B69V8.

2.5 EPOXY COATINGS

A. Epoxy, Gloss: MPI #77.

1. Products: Subject to compliance with requirements, provide one of the following:
 - a. PPG Architectural, PPG, Aquapon 35 Polyamide Epoxy Gloss, 95-1/95-98.
 - b. Sherwin-Williams, Protective & Marine, Tile-Clad HS Epoxy, B62WZ111/B60VZ70.

2.6 POLYURETHANE COATINGS

A. Polyurethane, Two-Component, Pigmented, Gloss (MPI Gloss Level 6): MPI #72.

1. AkzoNobel: Devoe Coatings, Devthane 379 Aliphatic Urethane Gloss Enamel, 379UVA.
2. Benjamin Moore: Corotech, Aliphatic Acrylic Urethane Gloss, V500.
3. PPG Architectural: High Performance Coatings, Pitthane Ultra Gloss Urethane Enamel, 95-812/819.
4. Rust-Oleum: 9800 System, DTM Urethane Mastic, 9892419.
5. Sherwin-Williams: Protective & Marine, Acrolon 218 HS, B65W00651/B65V00600.
6. Tnemec Company Inc.: Tnemec, Series 740 UVX, F740.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify suitability of substrates, including surface conditions and compatibility, with existing finishes and primers.
- B. Proceed with coating application only after unsatisfactory conditions have been corrected.
 1. Application of coating indicates acceptance of surfaces and conditions.

3.2 PREPARATION

- A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates and coating systems indicated.
- B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.
 1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.
- C. Clean substrates of substances that could impair bond of coatings, including dust, dirt, oil, grease, and incompatible paints and encapsulants.
 1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce coating systems indicated.
- D. Steel Substrates: Remove rust, loose mill scale, and shop primer if any. Clean using methods recommended in writing by paint manufacturer but not less than the following:

1. SSPC-SP 6/NACE No. 3.

- E. Shop-Primed Steel Substrates: Clean field welds, bolted connections, and areas where shop paint is abraded. Paint exposed areas with the same material as used for shop priming to comply with SSPC-PA 1 for touching up shop-primed surfaces.
- F. Galvanized-Metal Substrates: Remove grease and oil residue from galvanized sheet metal by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied coatings.

3.3 APPLICATION

- A. Apply high-performance coatings according to manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual."
1. Use applicators and techniques suited for coating and substrate indicated.
 2. Coat surfaces behind movable equipment and furniture same as similar exposed surfaces. Before final installation, coat surfaces behind permanently fixed equipment or furniture with prime coat only.
 3. Coat backsides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.
 4. Do not apply coatings over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
- B. Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of the same material are to be applied. Tint undercoats to match color of finish coat, but provide sufficient difference in shade of undercoats to distinguish each separate coat.
- C. If undercoats or other conditions show through final coat, apply additional coats until cured film has a uniform coating finish, color, and appearance.
- D. Apply coatings to produce surface films without cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections. Produce sharp glass lines and color breaks.

3.4 FIELD QUALITY CONTROL

- A. Dry Film Thickness Testing: Owner may engage the services of a qualified testing and inspecting agency to inspect and test coatings for dry film thickness.
1. Contractor shall touch up and restore coated surfaces damaged by testing.
 2. If test results show that dry film thickness of applied coating does not comply with coating manufacturer's written recommendations, Contractor shall pay for testing and apply additional coats as needed to provide dry film thickness that complies with coating manufacturer's written recommendations.

3.5 CLEANING AND PROTECTION

- A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.
- B. After completing coating application, clean spattered surfaces. Remove spattered coatings by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.

- C. Protect work of other trades against damage from coating operation. Correct damage to work of other trades by cleaning, repairing, replacing, and recoating, as approved by Architect, and leave in an undamaged condition.
- D. At completion of construction activities of other trades, touch up and restore damaged or defaced coated surfaces.

3.6 HIGH-PERFORMANCE COATING SCHEDULE

A. CMU Substrates:

1. Exterior Epoxy System:

- a. Block Filler: Block filler, epoxy, MPI #116.
- b. Intermediate Coat: Epoxy, matching topcoat.
- c. Topcoat: Epoxy, gloss, MPI #77.

2. Interior Epoxy System:

- a. Block Filler: Block filler, latex, interior/exterior, MPI #4.
- b. Intermediate Coat: Epoxy, gloss, MPI #77.
- c. Topcoat: Epoxy, gloss, MPI #77.

B. Steel Substrates:

1. Exterior Locations: Exposed structural steel components including stairs and ladders; hollow metal doors and frames, bollards, and other ferrous metals.

a. Pigmented Polyurethane over Epoxy Zinc-Rich Primer System:

- 1) Prime Coat: Primer, zinc-rich, epoxy, MPI #20.
- 2) Intermediate Coat: Epoxy, gloss, MPI #77.
- 3) First Topcoat: Polyurethane, 2-component, pigmented, gloss (MPI Gloss Level 6), MPI #72.

2. Interior Locations: Exposed structural steel components including stairs and ladders; hollow metal doors and frames, bollards, and other ferrous metals.

a. Pigmented Polyurethane over Inorganic Zinc-Rich Primer System:

- 1) Prime Coat: Primer, zinc-rich, inorganic, MPI #19.
- 2) Intermediate Coat: Epoxy, gloss, MPI #77.
- 3) Topcoat: Polyurethane, 2-component, pigmented, gloss (MPI Gloss Level 6), MPI #72.

3.7 COLOR SCHEDULE

- A. Colors are indicated on Room Finish Legend on Drawings.

END OF SECTION 099600

SECTION 101100 - VISUAL DISPLAY UNITS**PART 1 - GENERAL****1.1 SUMMARY****A. Section Includes:**

1. Glass markerboards.
2. Tackboard Surfaces

1.2 DEFINITIONS

- A. Tackboard: Framed or unframed, tackable, visual display board assembly.
- B. Visual Display Board Assembly: Visual display surface that is factory fabricated into composite panel form, either with or without a perimeter frame; includes chalkboards, markerboards, and tackboards.
- C. Visual Display Surface: Surfaces that are used to convey information visually, including surfaces of chalkboards, markerboards, tackboards, and surfacing materials that are not fabricated into composite panel form but are applied directly to walls.

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 1. Include construction details, material descriptions, dimensions of individual components and profiles, finishes, and accessories for visual display units.
- B. Shop Drawings: For visual display units.
 1. Include plans, elevations, sections, details, and attachment to other work.
 2. Show locations of panel joints.
 3. Include sections of typical trim members.
- C. Samples for Verification: For each type of visual display unit indicated.
 1. Visual Display Panel: Not less than 8-1/2 by 11 inches, with facing, core, and backing indicated for final Work. Include one panel for each type, color, and texture required.
 2. Trim: 6-inch- long sections of each trim profile.
 3. Display Rail: 6-inch- long section of each type.
 4. Modular Support System: 6-inch- long sections.
 5. Accessories: Full-size Sample of each type of accessory.
- D. Product Schedule: For visual display units. Use same designations indicated on Drawings.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Product Test Reports: For each visual display unit, for tests performed by a qualified testing agency , for surface-burning characteristics of fabrics.
- C. Sample Warranties: For manufacturer's special warranties.

1.6 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For visual display units to include in maintenance manuals.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.
- B. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for fabrication and installation.
 - 1. Build mockup of typical visual display unit as shown on Drawings. Include accessories.
 - 2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 - 3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver factory-fabricated visual display units completely assembled in one piece. If dimensions exceed maximum manufactured unit size, or if unit size is impracticable to ship in one piece, provide two or more pieces with joints in locations indicated on approved Shop Drawings.

1.9 FIELD CONDITIONS

- A. Environmental Limitations: Do not deliver or install visual display units until spaces are enclosed and weathertight, wet-work in spaces is complete and dry, work above ceilings is complete, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

1.10 WARRANTY

- A. Special Warranty for Porcelain-Enamel Face Sheets: Manufacturer agrees to repair or replace porcelain-enamel face sheets that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Surfaces lose original writing and erasing qualities.
 - b. Surfaces exhibit crazing, cracking, or flaking.
 - 2. Warranty Period: Life of the building.

PART 2 - PRODUCTS**2.1 PERFORMANCE REQUIREMENTS**

- A. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
1. Flame-Spread Index: 25 or less.
 2. Smoke-Developed Index: 450 or less.

2.2 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide Basis-of-Design products indicated on Room Finish Legend on Drawings products by one of the following:
1. Aarco Products.
 2. Best-Rite Manufacturing.
 3. Claridge Products and Equipment, Inc. (Basis-of-Design)
 4. Egan Visual.
 5. Forbo (Basis-of-Design).
 6. Ghent Manufacturing, Inc.

2.3 GLASS MARKERBOARDS (MB-1, MB-2)

- A. Glass Markerboards: Fabricated of 6-mm tempered glass with steel backing for use with magnets.
1. Edge Treatment: Smooth polished edge with eased corners.
 2. Frame: Aluminum trim in profile indicated.
 3. Surface: Glossy.
 4. Color: White.
- B. Mounting: Concealed, Z-shaped and angle brackets.
- C. Marker Tray: Aluminum, attached with stainless steel clips.
- D. Size: As indicated on Drawings.

2.4 DISPLAY RAILS

- A. Aluminum Display Rail: Manufacturer's standard, extruded-aluminum display rail with linoleum tackable insert, designed to hold accessories.
- B. Tackable Insert Color: As selected by Architect from full range of industry colors.
- C. Size: As indicated on Drawings.
- D. End Stops: Aluminum.

2.5 TACKBOARD PANELS

- A. Tackboard Panels (TBD-1):
1. Facing: 1/8-inch- thick, cork bulletin board.

2. Core: Manufacturer's standard.
3. Factory-Applied Trim: Manufacturer's standard.

2.6 MATERIALS

- A. Adhesives: Water-resistant type recommended by flooring and adhesive manufacturers to suit products and substrate conditions indicated.
- B. Pinable Linoleum Sheet, ASTM F2034. Clear Tempered Glass: ASTM C 1048, Kind FT, Condition A, Type I, Class 1, Quality Q3, with exposed edges seamed before tempering.
- C. Extruded Aluminum: ASTM B 221, Alloy 6063.

2.7 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM/NOMMA 500 for recommendations for applying and designating finishes.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Appearance of Finished Work: Noticeable variations in same piece are unacceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.8 ALUMINUM FINISHES

- A. Clear Anodic Finish: AAMA 611, AA-M12C22A31, Class II, 0.010 mm or thicker.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for installation tolerances, surface conditions of wall, and other conditions affecting performance of the Work.
- B. Examine roughing-in for electrical power systems to verify actual locations of connections before installation of motorized, sliding visual display units.
- C. Examine walls and partitions for proper preparation and backing for visual display units.
- D. Examine walls and partitions for suitable framing depth where sliding visual display units will be installed.
- E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Comply with manufacturer's written instructions for surface preparation.

- B. Clean substrates of substances, such as dirt, mold, and mildew, that could impair the performance of and affect the smooth, finished surfaces of visual display boards.
- C. Prepare surfaces to achieve a smooth, dry, clean surface free of flaking, unsound coatings, cracks, defects, projections, depressions, and substances that will impair bond between visual display units and wall surfaces.
- D. Prime wall surfaces indicated to receive visual display units and as recommended in writing by primer/sealer manufacturer and visual display unit manufacturer.
- E. Prepare recesses for sliding visual display units as required by type and size of unit.

3.3 INSTALLATION

- A. General: Install visual display surfaces in locations and at mounting heights indicated on Drawings, or if not indicated, at heights indicated below. Keep perimeter lines straight, level, and plumb. Provide grounds, clips, backing materials, adhesives, brackets, anchors, trim, and accessories necessary for complete installation.
- B. Field-Assembled Visual Display Board Assemblies: Coordinate field-assembled units with grounds, trim, and accessories indicated. Join parts with a neat, precision fit.
 - 1. Make joints only where total length exceeds maximum manufactured length. Fabricate with minimum number of joints, as indicated on approved Shop Drawings.
 - 2. Where size of visual display board assemblies or other conditions require support in addition to normal trim, provide structural supports or modify trim as indicated or as selected by Architect from manufacturer's standard structural support accessories to suit conditions indicated.
- C. Factory-Fabricated Visual Display Board Assemblies: Attach concealed clips, hangers, and grounds to wall surfaces and to visual display board assemblies with fasteners at not more than 16 inches o.c. Secure tops and bottoms of boards to walls.
- D. Visual Display Board Assembly Mounting Heights: Install visual display units at mounting heights indicated on Drawings.
- E. Display Rails: Install rails at mounting heights indicated on Drawings, or if not indicated, at height indicated below. Attach to wall surface with fasteners at not more than 16 inches o.c.
- F. Modular Support System: Install adjustable standards at mounting heights indicated on Drawings, or if not indicated, at height indicated below. Install standards at 48 inches o.c., vertically aligned and plumb, and attached to wall with fasteners at 12 inches o.c.

3.4 CLEANING AND PROTECTION

- A. Clean visual display units in accordance with manufacturer's written instructions. Attach one removable cleaning instructions label to visual display unit in each room.
- B. Touch up factory-applied finishes to restore damaged or soiled areas.
- C. Cover and protect visual display units after installation and cleaning.

END OF SECTION 101100

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SECTION 101419 – DIMENSIONAL LETTER SIGNAGE**PART 1 - GENERAL****1.1 SUMMARY**

- A. Section includes fabricated channel dimensional characters.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For dimensional letter signs.
 - 1. Include fabrication and installation details and attachments to other work.
 - 2. Show sign mounting heights, locations of supplementary supports to be provided by others, and accessories.
 - 3. Show message list, typestyles, graphic elements, and layout for each sign at least half size.
- C. Samples for Verification: For each type of sign assembly showing all components and with the required finish(es), in manufacturer's standard size unless otherwise indicated and as follows:
 - 1. Dimensional Characters: Half-size Sample of dimensional character.
 - 2. Exposed Accessories: Half-size Sample of each accessory type.
- D. Sign Schedule: Use same designations specified or indicated on Drawings or in a sign schedule.

1.3 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer and manufacturer.

1.4 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For signs to include in maintenance manuals.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

1.6 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of signs that fail in materials or workmanship within specified warranty period.
 - 1. Failures include the following:
 - a. Deterioration of finishes beyond normal weathering.
 - b. Separation or delamination of sheet materials and components.

2. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Thermal Movements: For exterior fabricated channel dimensional characters, allow for thermal movements from ambient and surface temperature changes.
 1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

2.2 DIMENSIONAL CHARACTERS

- A. Fabricated Channel Characters: Metal face and side returns, formed free from warp and distortion; with uniform faces, sharp corners, and precisely formed lines and profiles; internally braced for stability and for securing fasteners; and as follows.
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. A. R. K. Ramos.
 - b. ACE Sign Systems, Inc.
 - c. Apco Graphics, Inc.
 - d. ASI Sign Systems, Inc.
 - e. Gemini Incorporated.
 - f. Matthews International Corporation.
 - g. Mohawk Sign Systems.
 - h. Nelson-Harkins Industries.
 - i. Poblocki Sign Company.
 - j. Seton Identification Products.
 - k. Steel Art Company.
 2. Character Material: Sheet or plate aluminum.
 3. Material Thickness: Manufacturer's standard for size and design of character.
 4. Character Height: As indicated.
 5. Character Depth: As indicated.
 6. Finishes:
 - a. Integral Aluminum Finish: As selected by Architect from full range of industry colors and finishes.
 7. Mounting: Concealed, stainless-steel back bar or bracket assembly.
 8. Typeface: As indicated on Drawings.

2.3 DIMENSIONAL CHARACTER MATERIALS

- A. Aluminum Castings: ASTM B 26, alloy and temper recommended by sign manufacturer for casting process used and for type of use and finish indicated.
- B. Aluminum Sheet and Plate: ASTM B 209, alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated.

- C. Aluminum Extrusions: ASTM B 221, alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated.
- D. Paints and Coatings for Sheet Materials: Inks, dyes, and paints that are recommended by manufacturer for optimum adherence to surface and are UV and water resistant for colors and exposure indicated.

2.4 ACCESSORIES

- A. Fasteners and Anchors: Manufacturer's standard as required for secure anchorage of signage, noncorrosive and compatible with each material joined, and complying with the following:
 - 1. Use concealed fasteners and anchors unless indicated to be exposed.
 - 2. For exterior exposure, furnish nonferrous-metal or stainless-steel devices unless otherwise indicated.
 - 3. Exposed Metal-Fastener Components, General:
 - a. Fabricated from same basic metal and finish of fastened metal unless otherwise indicated.
 - b. Fastener Heads: For nonstructural connections, use flathead or oval countersunk screws and bolts with tamper-resistant slots unless otherwise indicated.
 - 4. Sign Mounting Fasteners:
 - a. Concealed Studs: Concealed (blind), threaded studs welded or brazed to back of sign material, screwed into back of sign assembly, or screwed into tapped lugs cast integrally into back of cast sign material, unless otherwise indicated.
- B. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.

2.5 FABRICATION

- A. General: Provide manufacturer's standard sign assemblies according to requirements indicated.
 - 1. Preassemble signs and assemblies in the shop to greatest extent possible. Disassemble signs and assemblies only as necessary for shipping and handling limitations. Clearly mark units for reassembly and installation; apply markings in locations concealed from view after final assembly.
 - 2. Mill joints to a tight, hairline fit. Form assemblies and joints exposed to weather to resist water penetration and retention.
 - 3. Comply with AWS for recommended practices in welding and brazing. Provide welds and brazes behind finished surfaces without distorting or discoloring exposed side. Clean exposed welded and brazed connections of flux, and dress exposed and contact surfaces.
 - 4. Conceal connections if possible; otherwise, locate connections where they are inconspicuous.
 - 5. Internally brace signs for stability and for securing fasteners.
 - 6. Provide rebates, lugs, and brackets necessary to assemble components and to attach to existing work. Drill and tap for required fasteners. Use concealed fasteners where possible; use exposed fasteners that match sign finish.
 - 7. Castings: Fabricate castings free of warp, cracks, blowholes, pits, scale, sand holes, and other defects that impair appearance or strength. Grind, wire brush, sandblast, and buff castings to remove seams, gate marks, casting flash, and other casting marks before finishing.

2.6 GENERAL FINISH REQUIREMENTS

- A. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.
- C. Directional Finishes: Run grain with long dimension of each piece and perpendicular to long dimension of finished trim or border surface unless otherwise indicated.
- D. Organic, Anodic, and Chemically Produced Finishes: Apply to formed metal after fabrication but before applying contrasting polished finishes on raised features unless otherwise indicated.

2.7 ALUMINUM FINISHES

- A. Clear Anodic Finish: AAMA 611, Class I, 0.018 mm or thicker.
- B. Baked-Enamel or Powder-Coat Finish: AAMA 2603 except with a minimum dry film thickness of 1.5 mils. Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of signage work.
- B. Verify that sign-support surfaces are within tolerances to accommodate signs without gaps or irregularities between backs of signs and support surfaces unless otherwise indicated.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General: Install signs using mounting methods indicated and according to manufacturer's written instructions.
 - 1. Install signs level, plumb, true to line, and at locations and heights indicated, with sign surfaces free of distortion and other defects in appearance.
 - 2. Before installation, verify that sign surfaces are clean and free of materials or debris that would impair installation.
 - 3. Corrosion Protection: Coat concealed surfaces of exterior aluminum in contact with grout, concrete, masonry, wood, or dissimilar metals, with a heavy coat of bituminous paint.
- B. Mounting Methods:

1. Concealed Studs: Using a template, drill holes in substrate aligning with studs on back of sign. Remove loose debris from hole and substrate surface.
 - a. Masonry Substrates: Fill holes with adhesive. Leave recess space in hole for displaced adhesive. Place sign in position and push until flush to surface, embedding studs in holes. Temporarily support sign in position until adhesive fully sets.
 - b. Thin or Hollow Surfaces: Place sign in position and flush to surface, install washers and nuts on studs projecting through opposite side of surface, and tighten.
2. Back Bar and Brackets: Remove loose debris from substrate surface and install backbar or bracket supports in position so that signage is correctly located and aligned.

3.3 ADJUSTING AND CLEANING

- A. Remove and replace damaged or deformed characters and signs that do not comply with specified requirements. Replace characters with damaged or deteriorated finishes or components that cannot be successfully repaired by finish touchup or similar minor repair procedures.
- B. Remove temporary protective coverings and strippable films as signs are installed.
- C. On completion of installation, clean exposed surfaces of signs according to manufacturer's written instructions, and touch up minor nicks and abrasions in finish. Maintain signs in a clean condition during construction and protect from damage until acceptance by Owner.

END OF SECTION 101419

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SECTION 101423 – PANEL SIGNAGE**PART 1 - GENERAL****1.1 SUMMARY**

- A. Section includes panel signs.

1.2 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:

1. Furnish templates for placement of sign-anchorage devices embedded in permanent construction by other installers.
2. Furnish templates for placement of electrical service embedded in permanent construction by other installers.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.

- B. Shop Drawings: For panel signs.

1. Include fabrication and installation details and attachments to other Work.
2. Show sign mounting heights, locations of supplementary supports to be provided by others, and accessories.
3. Show message list, typestyles, graphic elements, including raised characters and Braille, and layout for each sign at least half size.

- C. Samples for Verification: For each type of sign assembly showing all components and with the required finish(es), in manufacturer's standard size unless otherwise indicated and as follows:

1. Panel Signs: Not less than 12 inches square, including corner.
2. Room-Identification Signs: Full-size Sample.
3. Field-Applied, Vinyl-Character Signs: Full-size Sample of characters on glass.
4. Variable Component Materials: 8 inch Sample of each base material, character (letter, number, and graphic element) in each exposed color and finish not included in Samples above.
5. Exposed Accessories: Full-size Sample of each accessory type.

- D. Sign Schedule: Use same designations specified or indicated on Drawings or in a sign schedule.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.

- B. Sample Warranty: For special warranty.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For signs to include in maintenance manuals.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: Sign manufacturer or entity that employs installers and supervisors who are trained and approved by manufacturer.

1.7 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of signs that fail in materials or workmanship within specified warranty period.
1. Failures include the following:
 - a. Deterioration of finishes beyond normal weathering.
 - b. Deterioration of embedded graphic image.
 - c. Separation or delamination of sheet materials and components.
 2. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Accessibility Standard: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines for Buildings and Facilities and ICC A117.1 for signs.

2.2 SIGNS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. 2/90 Sign Systems.
 2. Ace Sign Systems, Inc.
 3. Advance Corporation; Braille-Tac Division.
 4. Allen Markings.
 5. APCO Graphics, Inc.
 6. ASE, Inc.
 7. ASI Sign Systems, Inc.
 8. Avalis Wayfinding Solutions, Inc.
 9. Best Sign Systems Inc.
 10. Fossil Industries, Inc.
 11. Graphic Specialties, Inc.
 12. InPro Corporation (IPC).
 13. Mohawk Sign Systems.
 14. Nelson-Harkins Industries.
 15. Poblocki Sign Company, LLC.
 16. Seton Identification Products.
 17. Vomar Products, Inc.
- B. Panel Sign: Sign with smooth, uniform surfaces; with message and characters having uniform faces, sharp corners, and precisely formed lines and profiles; and as follows:

1. Engraved Plastic-Laminate Sign: Plastic-laminate face laminated to contrasting phenolic core to produce composite sheet.
 - a. Composite-Sheet Thickness: 0.25 inch.
 - b. Engraved Graphics: Characters engraved through plastic-laminate face sheet to expose contrasting phenolic core.
 - c. Plastic-Laminate Color and Pattern: As selected by Architect from manufacturer's full range.
 - d. Core Color: Manufacturer's standard dark color.
2. Sign-Panel Perimeter: Finish edges smooth.
 - a. Edge Condition: Beveled.
 - b. Corner Condition in Elevation: Rounded to 1/2 inch radius.
3. Mounting: Surface mounted to wall with concealed studs and tamper-proof fasteners.
4. Text and Typeface: Accessible raised characters and Braille in typeface as selected by Architect from manufacturer's full range and variable content as scheduled.
5. Flatness Tolerance: Sign panel shall remain flat or uniformly curved under installed conditions as indicated and within a tolerance of plus or minus 1/16 inch measured diagonally from corner to corner.

2.3 PANEL-SIGN MATERIALS

- A. Acrylic Sheet: ASTM D4802, category as standard with manufacturer for each sign, Type UVF (UV filtering).
- B. Fiberglass Sheet: Multiple laminations of glass-fiber-reinforced polyester resin with UV-light stable, colorfast, nonfading, weather- and stain-resistant, colored polyester gel coat, and with manufacturer's standard finish.
- C. Plastic-Laminate Sheet: NEMA LD 3, general-purpose HGS grade, 0.048 inch nominal thickness.

2.4 ACCESSORIES

- A. Fasteners and Anchors: Manufacturer's standard as required for secure anchorage of signage, noncorrosive and compatible with each material joined, and complying with the following:
 1. Use concealed fasteners and anchors unless indicated to be exposed.
 2. Concealed (blind), threaded studs welded or brazed to back of sign material or screwed into back of sign assembly, unless otherwise indicated.
 3. Fastener Heads: For nonstructural connections, use screws and bolts with tamper-resistant slots unless indicated otherwise.

2.5 FABRICATION

- A. General: Provide manufacturer's standard sign assemblies per requirements indicated.
 1. Preassemble signs and assemblies in the shop to greatest extent possible. Disassemble signs and assemblies only as necessary for shipping and handling limitations. Clearly mark units for reassembly and installation; apply markings in locations concealed from view after final assembly.

2. Comply with AWS for recommended practices in welding and brazing. Provide welds and brazes behind finished surfaces without distorting or discoloring exposed side. Clean exposed welded and brazed connections of flux, and dress exposed and contact surfaces.
 3. Provide rebates, lugs, and brackets necessary to assemble components and to attach to existing work. Drill and tap for required fasteners. Use concealed fasteners where possible; use exposed fasteners that match sign finish.
- B. Surface-Engraved Graphics: Machine engrave characters and other graphic devices into panel surface indicated to produce precisely formed copy, incised to uniform depth.
1. Engraved Metal: Fill engraved graphics with manufacturer's standard baked enamel.
 2. Engraved Opaque Acrylic Sheet: Fill engraved graphics with manufacturer's standard enamel.
 3. Face-Engraved Clear Acrylic Sheet: Fill engraved copy with manufacturer's standard enamel. Apply manufacturer's standard opaque background color coating to back face of acrylic sheet.
 4. Engraved Plastic Laminate: Engrave through exposed face ply of plastic-laminate sheet to expose contrasting core ply.
- C. Subsurface-Engraved Graphics: Reverse engrave back face of clear face-sheet material. Fill resulting copy with manufacturer's standard enamel. Apply opaque manufacturer's standard background color coating over enamel-filled copy.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of signage Work.
- B. Verify that sign-support surfaces are within tolerances to accommodate signs without gaps or irregularities between backs of signs and support surfaces unless otherwise indicated.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General: Install signs using mounting methods indicated and per manufacturer's written instructions.
 1. Install signs level, plumb, true to line, and at locations and heights indicated, with sign surfaces free of distortion and other defects in appearance.
 2. Install signs so they do not protrude or obstruct per the accessibility standard.
 3. Before installation, verify that sign surfaces are clean and free of materials or debris that would impair installation.
 4. Corrosion Protection: Coat concealed surfaces of exterior aluminum in contact with grout, concrete, masonry, wood, or dissimilar metals, with a heavy coat of bituminous paint.
- B. Room-Identification Signs and Other Accessible Signage: Install in locations on walls as indicated and per accessibility standard.
- C. Mounting Methods:

1. Concealed Studs: Using a template, drill holes in substrate aligning with studs on back of sign. Remove loose debris from hole and substrate surface.
 - a. Masonry Substrates: Fill holes with adhesive. Leave recess space in hole for displaced adhesive. Place sign in position and push until flush to surface, embedding studs in holes. Temporarily support sign in position until adhesive fully sets.
 - b. Thin or Hollow Surfaces: Place sign in position and flush to surface, install washers and nuts on studs projecting through opposite side of surface, and tighten.

3.3 ADJUSTING AND CLEANING

- A. Remove and replace damaged or deformed signs and signs that do not comply with specified requirements. Replace signs with damaged or deteriorated finishes or components that cannot be successfully repaired by finish touchup or similar minor repair procedures.
- B. Remove temporary protective coverings and strippable films as signs are installed.
- C. On completion of installation, clean exposed surfaces of signs per manufacturer's written instructions, and touch up minor nicks and abrasions in finish. Maintain signs in a clean condition during construction and protect from damage until acceptance by Owner.

END OF SECTION 101423

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SECTION 101453 – TRAFFIC SIGNAGE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Traffic signs.

1.3 REGULATORY REQUIREMENTS

- A. Regulatory Performance: Provide traffic signs in accordance with requirements of current editions of the following government agency publications:
 - 1. "Manual on Uniform Traffic Control Devices" (MUTCD) published by the Federal Highway Administration (FHWA), U.S. Department of Transportation.
 - 2. "Standard Highway Signs" published by the Federal Highway Administration (FHWA), U.S. Department of Transportation.
 - 3. "Standard Specifications for Roads and Structures" published by North Carolina Department of Transportation (NCDOT Standard Specifications).

1.4 SUBMITTALS

- A. Product Data: For each type of sign indicated, showing compliance with regulatory requirements.
- B. Sign Schedule: Use same designations indicated on Drawings.

1.5 QUALITY ASSURANCE

- A. Fabricator Qualifications: Shop that employs skilled workers who custom-fabricate products similar to those required for this Project and whose products have a record of successful in-service performance.
- B. Source Limitations for Signs: Obtain each sign type indicated from one source from a single manufacturer.
- C. Authorities Having Jurisdiction: Conform to requirements of all authorities having jurisdiction.
 - 1. Where conflicts exist between the requirements of the Contract Documents and those of authorities having jurisdiction, the higher quality or more restrictive requirement shall apply.

1.6 PROJECT CONDITIONS

- A. Weather Limitations: Proceed with installation only when weather conditions permit installation of signs to be performed according to manufacturers' written instructions and warranty requirements.
- B. Field Measurements: Indicate measurements on Shop Drawings.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Aluminum Sheet and Plate: ASTM B 209, alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated, and with at least the strength and durability properties of Alloy 6061-T6, 5052-H38 or 3004-H38 in accordance with Sections 901 and 1092 of the NCDOT Standard Specifications.
- B. Galvanized Steel Materials:
 - 1. All steel materials shall be galvanized in accordance with the requirements of ASTM A123, F2329, or B696, Class 55 as applicable.
 - 2. Steel Bars and Shapes, Carbon Rolled from "T" Rails: ASTM A 499, Grade 60 and conforming to chemical requirements of ASTM A 1.
 - 3. Bolts for Steel Framing: ASTM A 307 or ASTM A 325 as necessary for design loads and connection details.
 - 4. For steel exposed to view on completion, provide materials having flat, smooth surfaces without blemishes. Do not use materials whose surfaces exhibit pitting, seam marks, roller marks, rolled trade names, or roughness.
- C. Retroreflective Sheeting: ASTM D 4956, "Standard Specifications for Retroreflective Sheeting for Traffic Control" (latest edition) and NCDOT Standard Specifications Sections 901 and 1092.
 - 1. Reflectorize all signs unless otherwise indicated.
 - 2. Obtain only sheeting products that are listed on the current edition of NCDOT Approved Products List.
- D. Minimum coefficient of retroreflection for each grade of sign (A,B or C) shall be as indicated in NCDOT Standard Specifications Section 1092.
 - 1. Retroreflection grade for each sign type shall be in accordance with the requirements of the Manual on Uniform Traffic Control Devices" (MUTCD) published by the Federal Highway Administration (FHWA), U.S. Department of Transportation.

2.2 TRAFFIC SIGNS

- A. Sign Panels: Provide smooth sign panel surfaces constructed to remain flat under installed conditions within a tolerance of plus or minus 1/16 inch measured diagonally from corner to corner.

-
- B. Sign Panel Materials: In accordance with NCDOT "Standard Specifications for Roads and Structures", Section 901 and 1092 as applicable.
1. Aluminum Sheet: thickness for sign panels, based on panel dimensions, shall be as indicated in Section 901 of the NCDOT Standard Specifications.
 - a. Panel Finish: Reflective sheeting.
 - b. Shape, Dimensions and Color: In accordance with FHWA "Standard Highway Signs".
- C. Posts: Fabricate posts to lengths required for mounting method indicated.
1. Direct-Burial Method: Provide posts 36 inches longer than height of sign to permit direct embedment in poured concrete foundations.
- D. U-Section Steel Posts: In accordance with NCDOT "Standard Specifications for Roads and Structures", Section 903.
1. Post Weight: Provide posts of one of the following weights as appropriate for applications:
 - a. 2 lbs/lin.ft.
 - b. 3 lbs/lin.ft.
 2. Post Fabrication: Punch standard 3/8-inch diameter holes in post prior to applying galvanized finish. Place holes as follows:
 - a. 2-lb. Posts: Minimum 58 holes, one inch o.c., beginning one inch from top of post.
 - b. 3-lb Posts: Holes one inch o.c., starting one inch from top and extending to within 6 feet from the bottom, and 2 inches o.c. for the remainder of post length.
 3. Finish: Hot-dip galvanize post assemblies after fabrication to comply with ASTM A 123/A 123M.
- E. Breakaway Square Tubing Post: In accordance with NCDOT "Standard Specifications for Roads and Structures", Section 903. Provide tubing capable of telescoping when consecutive size tubes are used one inside the other, with free movement and without excess side movement, as approved by FHWA.
1. Post Gage: Provide posts of one of the following gages as appropriate for applications:
 - a. 12 gage (0.105 inch) thick.
 - b. 14 gage (0.083 inch) thick.
 2. Post Fabrication: Punch standard 7/16-inch diameter holes in post prior to applying galvanized finish. Place holes one inch o.c. along centerline of each of the 4 sides, beginning one inch from tube end, with vertical spacing accuracy of 1/8-inch in 20 feet of tube length.
 3. Finish: Hot-dip galvanize post assemblies after fabrication to comply with ASTM A 123/A 123M.

2.3 ACCESSORIES

- A. Anchors: Provide hot-dip galvanized anchors.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Excavation: Excavate for sign to elevations and dimensions indicated. Reconstruct subgrade that is not firm, undisturbed, or compacted soil, or that is damaged by freezing temperatures, frost, rain, accumulated water, or construction activities by excavating a further 12 inches, backfilling with satisfactory soil, and compacting to original subgrade elevation.
 - 1. Excavate hole depths approximately 39 inches below finished grade.
- B. Locate signs where indicated, using mounting methods of types described and complying with manufacturer's written instructions.
 - 1. Install signs level, plumb, and at heights indicated, with sign surfaces free of distortion and other defects in appearance.
 - 2. Install at heights and lateral offsets from the roadway that conform to guidelines established in Part 2 of the MUTCD published by the FHWA and in accordance with requirements of NCDOT "Standard Specifications for Roads and Structures", Section 904

3.3 CLEANING AND PROTECTION

- A. After installation, clean soiled sign surfaces according to manufacturer's written instructions. Protect signs from damage until acceptance by Owner.

END OF SECTION 101453

SECTION 102113.19 - PLASTIC TOILET COMPARTMENTS**PART 1 - GENERAL****1.1 SUMMARY****A. Section Includes:**

1. Solid-plastic toilet compartments configured as toilet enclosures and urinal screens.

B. Related Requirements:

1. Section 055000 "Metal Fabrications" for supports that attach floor-and-ceiling-anchored compartments to overhead structural system.
2. Section 061000 "Rough Carpentry" for blocking and overhead support of floor-and-ceiling-anchored compartments.
3. Section 102800 "Toilet and Bath Accessories" for toilet tissue dispensers, grab bars, and similar accessories mounted on toilet compartments.

1.2 ACTION SUBMITTALS**A. Product Data:** For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for toilet compartments.

B. Shop Drawings: For toilet compartments.

1. Include plans, elevations, sections, details, and attachment details.
2. Show locations of cutouts for compartment-mounted toilet accessories.
3. Show locations of centerlines of toilet fixtures.
4. Show locations of floor drains.
5. Show ceiling grid, ceiling-mounted items, and overhead support or bracing locations.

C. Samples for Verification: For the following products, in manufacturer's standard sizes unless otherwise indicated:

1. Each type of material, color, and finish required for toilet compartments, prepared on 6-inch-square Samples of same thickness and material indicated for Work.
2. Each type of hardware and accessory.

D. Product Schedule: For toilet compartments, prepared by or under the supervision of supplier, detailing location and selected colors for toilet compartment material.**1.3 INFORMATIONAL SUBMITTALS****A. Product Certificates:** For each type of toilet compartment.**1.4 CLOSEOUT SUBMITTALS****A. Maintenance Data:** For toilet compartments to include in maintenance manuals.

1.5 PROJECT CONDITIONS

- A. Field Measurements: Verify actual locations of toilet fixtures, walls, columns, ceilings, and other construction contiguous with toilet compartments by field measurements before fabrication.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire Performance: Tested in accordance with, and pass the acceptance criteria of, NFPA 286.
- B. Regulatory Requirements: Comply with applicable provisions in the U.S. Department of Justice 2010 ADA Standards for Accessible Design and ICC A117.1 for toilet compartments designated as accessible.

2.2 SOLID-PLASTIC TOILET COMPARTMENTS (TPT1)

- A. Manufacturers: Subject to compliance with requirements, provide toilet compartments by Scranton Products or comparable products by one of the following:
1. Scranton Products (Basis-of-Design).
 - a. Product: Hiny-Hiders.
 2. Accurate Partitions Corp.; ASI Group.
 3. Global Partitions; ASI Group.
 4. General Partitions Mfg. Corp.
 5. Hadrian.
 6. Metpar
- B. Toilet-Enclosure Style: Floor anchored; overhead braced.
- C. Urinal-Screen Style: Wall hung.
- D. Door, Panel, Screen, and Pilaster Construction: Solid, high-density polyethylene (HDPE) panel material, not less than 1 inch thick, seamless, with eased edges, and with homogenous color and pattern throughout thickness of material.
1. Integral Hinges: Configure doors and pilasters to receive integral hinges.
 2. Heat-Sink Strip: Manufacturer's standard continuous, extruded-aluminum or stainless-steel strip fastened to exposed bottom edges of solid-plastic components to hinder malicious combustion.
 3. Color and Pattern: As indicated on Interior Finish Legend on Drawings.
- E. Pilaster Shoes and Sleeves (Caps): Manufacturer's standard design; stainless steel.
- F. Brackets (Fittings):
1. Stirrup Type: Ear or U-brackets, stainless steel.
- G. Overhead Bracing: As recommended by manufacturer and fabricated from solid polymer.

2.3 HARDWARE AND ACCESSORIES

- A. Hardware and Accessories: Manufacturer's heavy-duty operating hardware and accessories.

1. Material: Stainless steel.
 2. Hinges: Manufacturer's standard continuous, cam type that swings to a closed or partially open position, allowing emergency access by lifting door.
 3. Latch and Keeper: Manufacturer's standard recessed latch unit designed for emergency access and with combination rubber-faced door strike and keeper. Provide units that comply with regulatory requirements for accessibility at compartments designated as accessible.
 4. Coat Hook: Manufacturer's standard combination hook and rubber-tipped bumper, sized to prevent in-swinging door from hitting compartment-mounted accessories.
 5. Door Bumper: Manufacturer's standard rubber-tipped bumper at out-swinging doors.
 6. Door Pull: Manufacturer's standard unit at out-swinging doors that complies with regulatory requirements for accessibility. Provide units on both sides of doors at compartments designated as accessible.
- B. Overhead Bracing: Manufacturer's standard continuous, extruded-aluminum head rail with antigrip profile and in manufacturer's standard finish.
- C. Anchorages and Fasteners: Manufacturer's standard exposed fasteners of stainless steel, finished to match the items they are securing, with theft-resistant-type heads. Provide sex-type bolts for through-bolt applications. For concealed anchors, use stainless-steel, hot-dip galvanized-steel, or other rust-resistant, protective-coated steel compatible with related materials.

2.4 MATERIALS

- A. Stainless-Steel Sheet: ASTM A 666, Type 304, stretcher-leveled standard of flatness.
- B. Stainless-Steel Castings: ASTM A 743/A 743M.

2.5 FABRICATION

- A. Fabrication, General: Fabricate toilet compartment components to sizes indicated. Coordinate requirements and provide cutouts for through-partition toilet accessories where required for attachment of toilet accessories.
- B. Overhead-Braced Units: Provide manufacturer's standard corrosion-resistant supports, leveling mechanism, and anchors at pilasters to suit floor conditions. Provide shoes at pilasters to conceal supports and leveling mechanism.
- C. Floor-Anchored Units: Provide manufacturer's standard corrosion-resistant anchoring assemblies with leveling adjustment nuts at pilasters for structural connection to floor. Provide shoes at pilasters to conceal anchorage.
- D. Urinal-Screen Posts: Provide manufacturer's standard corrosion-resistant anchoring assemblies with leveling adjustment nuts at tops and bottoms of posts. Provide shoes and sleeves (caps) at posts to conceal anchorage.
- E. Door Size and Swings: Unless otherwise indicated, provide 24-inch- wide, in-swinging doors for standard toilet compartments and 36-inch- wide, out-swinging doors with a minimum 32-inch- wide, clear opening for compartments designated as accessible.

PART 3 - EXECUTION**3.1 EXAMINATION**

- A. Examine areas and conditions, with Installer present, for compliance with requirements for fastening, support, alignment, operating clearances, and other conditions affecting performance of the Work.
 - 1. Confirm location and adequacy of blocking and supports required for installation.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General: Comply with manufacturer's written installation instructions. Install units rigid, straight, level, and plumb. Secure units in position with manufacturer's recommended anchoring devices.
 - 1. Maximum Clearances:
 - a. Pilasters and Panels: 1/2 inch.
 - b. Panels and Walls: 1 inch.
 - 2. Stirrup Brackets: Secure panels to walls and to pilasters with no fewer than three brackets attached at midpoint and near top and bottom of panel.
 - a. Locate wall brackets so holes for wall anchors occur in masonry or tile joints.
 - b. Align brackets at pilasters with brackets at walls.
- B. Overhead-Braced Units: Secure pilasters to floor and level, plumb, and tighten. Set pilasters with anchors penetrating not less than 1-3/4 inches into structural floor unless otherwise indicated in manufacturer's written instructions. Secure continuous head rail to each pilaster with no fewer than two fasteners. Hang doors to align tops of doors with tops of panels, and adjust so tops of doors are parallel with overhead brace when doors are in closed position.
- C. Floor-Anchored Units: Set pilasters with anchors penetrating not less than 2 inches into structural floor unless otherwise indicated in manufacturer's written instructions. Level, plumb, and tighten pilasters. Hang doors and adjust so tops of doors are level with tops of pilasters when doors are in closed position.
- D. Urinal Screens: Attach with anchoring devices to suit supporting structure. Set units level and plumb, rigid, and secured to resist lateral impact.

3.3 ADJUSTING

- A. Hardware Adjustment: Adjust and lubricate hardware according to hardware manufacturer's written instructions for proper operation. Set hinges on in-swinging doors to hold doors open approximately 30 degrees from closed position when unlatched. Set hinges on out-swinging doors to return doors to fully closed position.

END OF SECTION 102113.19

SECTION 102123 - CUBICLE CURTAINS AND TRACK**PART 1 - GENERAL****1.1 SUMMARY**

- A. Section Includes:
1. Curtain tracks and carriers.
 2. Curtains.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: Show layout of cubicles, sizes of curtains, number of carriers, anchorage details, and accessories.
- C. Samples: For each type of curtain.

1.3 CLOSEOUT SUBMITTALS

- A. Operation and maintenance data.

PART 2 - PRODUCTS**2.1 PERFORMANCE REQUIREMENTS**

- A. Curtains: Provide curtain fabrics with the following characteristics:
1. Launderable to a temperature of not less than 160 deg F.
 2. Flame resistant and identical to those that have passed NFPA 701 when tested by a testing and inspecting agency acceptable to authorities having jurisdiction.

2.2 CURTAIN AND SUPPORT-SYSTEM MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. A.R. Nelson.
 2. C/S Construction Specialties, Inc.
 3. Imperial Fastener Company.
 4. InPro Corp. (Basis-of-Design).

2.3 CURTAIN SUPPORT SYSTEMS

- A. Extruded-Aluminum Curtain Track: Not less than 1-1/4 inches wide by 3/4 inch high; with manufacturer's standard wall thickness.
1. Finish: Baked enamel, acrylic, or epoxy.
- B. Curtain Track Accessories: Fabricate from same material and with same finish as track.

- C. Curtain Carriers: Two nylon rollers and nylon axle with chrome-plated steel or aluminum hook.

2.4 CURTAINS

- A. Basis-of-Design: Subject to compliance with requirements, provide cubicle curtain fabric named on Room Finish Legend on Drawings or a comparable product by one of the following:
1. A.R. Nelson.
 2. Designtex.
 3. Imperial Fastener Company.
 4. Maharam (Basis-of-Design).
- B. Cubicle Curtain Fabric: Curtain manufacturer's standard, 100 percent polyester, inherently and permanently flame resistant, stain resistant, and antimicrobial.
1. Color: As indicated on Interior Finish Legend on Drawings.
- C. Curtain Grommets: Nickel-plated brass; spaced not more than 6 inches o.c.; machined into top hem.
- D. Mesh Top: Not less than 22-inch- high mesh top of No. 50 nylon mesh.
- E. Fabricate curtains as follows:
1. Width: Equal to track length from which curtain is hung plus 10 percent added fullness, but not less than 12 inches added fullness.
 2. Length: Equal to floor-to-ceiling height, minus depth of track and carrier at top, and minus clearance above the finished floor:
 - a. Cubicle Curtains: 93 inches.
- F. Vertical Seams: Not less than 1/2 inch wide, double turned and double stitched.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. General: Install tracks level and plumb, according to manufacturer's written instructions.
- B. Up to 20 feet in length, provide track fabricated from single continuous length.
1. Curtain Track Mounting: As indicated on Drawings.
- C. Surface-Track Mounting: Fasten tracks to ceilings at intervals recommended by manufacturer. Fasten tracks to structure at each splice and tangent point of each corner. Center fasteners in track to ensure unencumbered carrier operation.
- D. Suspended-Track Mounting: Install track with manufacturer's standard tubular aluminum suspended supports at intervals and with fasteners recommended by manufacturer. Fasten supports to structure. Provide supports at each splice and tangent point of each corner. Secure ends of track to wall with flanged fittings or brackets.
- E. Track Accessories: Install splices, end caps, connectors, end stops, coupling and joining sleeves, and other accessories as required for a secure and operational installation.

- F. Curtain Carriers: Provide curtain carriers adequate for 6-inch spacing along full length of curtain plus an additional carrier.
- G. Curtains: Hang curtains on each curtain track. Secure with curtain tieback.
- H.
- I. END OF SECTION 102123

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SECTION 102600 - WALL AND DOOR PROTECTION**PART 1 - GENERAL****1.1 SUMMARY****A. Section Includes:**

1. Corner guards.

1.2 ACTION SUBMITTALS**A. Product Data:** For each type of product.

1. Include construction details, material descriptions, impact strength, dimensions of individual components and profiles, and finishes.

B. Shop Drawings: For each type of wall and door protection showing locations and extent.

1. Include plans, elevations, sections, and attachment details.

C. Samples for Verification: For each type of exposed finish on the following products, prepared on Samples of size indicated below:

1. Corner Guards: 12 inches long..

1.3 INFORMATIONAL SUBMITTALS**A. Product Certificates:** For each type of handrail.**B. Material Certificates:** For each type of exposed plastic material.**C. Sample Warranty:** For special warranty.**1.4 MAINTENANCE MATERIAL SUBMITTALS****A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.**

1. Corner-Guard Covers: Full-size plastic covers of maximum length equal to 2 percent of each type, color, and texture of cover installed, but no fewer than two, 48-inch- long units.
2. Mounting and Accessory Components: Amounts proportional to the quantities of extra materials. Package mounting and accessory components with each extra material.

1.5 DELIVERY, STORAGE, AND HANDLING**A. Store wall and door protection in original undamaged packages and containers inside well-ventilated area protected from weather, moisture, soiling, extreme temperatures, and humidity.**

1. Maintain room temperature within storage area at not less than 70 deg F during the period plastic materials are stored.
2. Keep plastic materials out of direct sunlight.

3. Store plastic wall- and door-protection components for a minimum of 72 hours, or until plastic material attains a minimum room temperature of 70 deg F.
 - a. Store corner-guard covers in a vertical position.

1.6 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of wall- and door-protection units that fail in materials or workmanship within specified warranty period.
 1. Failures include, but are not limited to, the following:
 - a. Structural failures including detachment of components from each other or from the substrates, delamination, and permanent deformation beyond normal use.
 - b. Deterioration of metals, metal finishes, plastics, and other materials beyond normal use.
 2. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Surface Burning Characteristics: Comply with ASTM E84 or UL 723; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 1. Flame-Spread Index: 25 or less.
 2. Smoke-Developed Index: 450 or less.

2.2 CORNER GUARDS

- A. Surface-Mounted, Metal Corner Guards: Fabricated as one piece from formed or extruded metal with formed edges; with 90- or 135-degree turn to match wall condition.
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Inpro Corporation (Basis-of-Design).
 - b. Balco; a CSW Industrials Company.
 - c. Construction Specialties, Inc.
 - d. Pawling Corporation.
 2. Material: Stainless-steel sheet, Type 304.
 - a. Thickness: Minimum 0.0625 inch .
 - b. Finish: Directional satin, No. 4.
 3. Wing Size: Nominal 2-1/2 by 2-1/2 inches .
 4. Corner Radius: 1/8 inch .
 5. Mounting: Flat-head, countersunk screws through factory-drilled mounting holes .

2.3 MATERIALS

- A. Plastic Materials: Chemical- and stain-resistant, high-impact-resistant plastic with integral color throughout; extruded and sheet material as required, thickness as indicated.

- B. Fasteners: Aluminum, nonmagnetic stainless-steel, or other noncorrosive metal screws, bolts, and other fasteners compatible with items being fastened. Use security-type fasteners where exposed to view.
- C. Adhesive: As recommended by protection product manufacturer.

2.4 FABRICATION

- A. Fabricate wall and door protection according to requirements indicated for design, performance, dimensions, and member sizes, including thicknesses of components.
- B. Factory Assembly: Assemble components in factory to greatest extent possible to minimize field assembly. Disassemble only as necessary for shipping and handling.
- C. Quality: Fabricate components with uniformly tight seams and joints and with exposed edges rolled. Provide surfaces free of wrinkles, chips, dents, uneven coloration, and other imperfections. Fabricate members and fittings to produce flush, smooth, and rigid hairline joints.

2.5 FINISHES

- A. Protect finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and wall areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Examine walls to which wall and door protection will be attached for blocking, grounds, and other solid backing that have been installed in the locations required for secure attachment of support fasteners.
 - 1. For wall and door protection attached with adhesive, verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Complete finishing operations, including painting, before installing wall and door protection.
- B. Before installation, clean substrate to remove dust, debris, and loose particles.

3.3 INSTALLATION

- A. Installation Quality: Install wall and door protection according to manufacturer's written instructions, level, plumb, and true to line without distortions. Do not use materials with chips, cracks, voids, stains, or other defects that might be visible in the finished Work.

3.4 CLEANING

- A. Immediately after completion of installation, clean plastic covers and accessories using a standard ammonia-based household cleaning agent.
- B. Remove excess adhesive using methods and materials recommended in writing by manufacturer.

END OF SECTION 102600

SECTION 102800 – TOILET AND BATH ACCESSORIES**PART 1 - GENERAL****1.1 SUMMARY**

- A. Section Includes:
1. Public-use washroom accessories.
 2. Private-use bathroom accessories.
 3. Shower and bath accessories.
 4. Warm-air dryers.
 5. Childcare accessories.
 6. Underlavatory guards.
 7. Custodial accessories.

1.2 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
1. Coordinate accessory locations with other Work to prevent interference with clearances required for access by people with disabilities, and for proper installation, adjustment, operation, cleaning, and servicing of accessories.
 2. Deliver inserts and anchoring devices set into concrete or masonry as required to prevent delaying Work.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
 2. Include anchoring and mounting requirements, including requirements for cutouts in other work and substrate preparation.
 3. Include electrical characteristics.
- B. Product Schedule: Indicating types, quantities, sizes, and installation locations by room of each accessory required.
1. Identify locations using room designations indicated.
 2. Identify accessories using designations indicated.

1.4 INFORMATIONAL SUBMITTALS

- A. Sample Warranty: For manufacturer's special warranty.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For accessories to include in maintenance manuals.

1.6 WARRANTY

- A. Special Mirror Warranty: Manufacturer agrees to repair or replace mirrors that fail in materials or workmanship within specified warranty period.
1. Failures include visible silver spoilage defects.
 2. Warranty Period: 15 years from date of Substantial Completion.

PART 2 - PRODUCTS**2.1 OWNER-FURNISHED MATERIALS**

- A. Owner-Furnished Materials: Where indicated on Drawings, the following items will be furnished by Owner for installation by Contractor:
1. Soap Dispenser (SD).
 2. Toilet Tissue Dispenser (TT).
 3. Paper towel dispensers (PTR).

2.2 PERFORMANCE CRITERIA

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.3 PUBLIC-USE WASHROOM ACCESSORIES

- A. Frameless, Stainless Steel Mirrors (MR2): Surface-mounted mirror fabricated from 18-8, Type 304 stainless steel, 0.035 inch thick, with No. 8 bright finish and 1/4 inch deep edge returns. Mirror surface is factory-bonded to 1/4 inch thick tempered Masonite backing. Provide units with four countersunk holes for flush fit of mounting screws.
1. Products: Subject to compliance with requirements, provide one of the following:
 - a. American Specialties, Inc.: No. 8026.
 - b. Bobrick Washroom Equipment, Inc.: No. B-1556 Series.
 - c. Bradley Corporation: Bradex Model No. 748.
 2. Mirror sizes: As indicated on Drawings.
 3. Mounting Hardware: Four countersunk sheet metal screws included with unit.
- B. Sanitary-Napkin Disposal Unit (SDU-2): Partition-mounted napkin/tampon disposal unit with formed face, fabricated from stainless steel sheet with satin finish on exposed surfaces, fully welded, with seamless corners and burr-free edges. Serves two adjacent compartments. Provide manufacturer's single-sided unit on side wall of odd-numbered end compartments where applicable.
1. Basis-of-Design Product: Subject to compliance with requirements, provide Diplomat Series Model 4A11 by Bradley Corporation or comparable product by one of the following:
 - a. AJW Architectural Products.
 - b. American Specialties, Inc.
 - c. Bobrick Washroom Equipment, Inc.
 2. Material and Finish: Type 304 stainless steel, 0.030 inch thick body and 0.036 inch thick door, with satin finish exposed surfaces.
 3. Overall Dimensions: 12-5/16 inch wide by 14-13/16 inch high by inch deep.
 4. Capacity: 1.5 gallons.

5. Door: Push flap type with concealed hinges, hinged drop-down service door, and keyed tumbler lock with universal keying.
 6. Receptacle: Removable.
- C. Electric Hand Dryer (EHD): Surface mounted electric hand dryer, sensor activated with timed power cut-off switch.
1. Basis of Design Product: Subject to compliance with requirements, provide Model 2902-2874 by Bradley Corporation or comparable product by of the following:
 - a. Bobrick Washroom Equipment, Inc.
 - b. American Specialties, Inc.
 2. Operation Time: 15 seconds.
 3. Cover Material and Finish: Stainless steel, No. 4 finish (satin).
 4. Electrical Requirements: 115V, 13 A, 1500 W,

2.4 PRIVATE-USE BATHROOM ACCESSORIES

- A. Robe Hook (RH): Surface-mounted, two-piece stainless steel. Capable of withstanding 300 pound downward pull when properly installed. Provide with 0.120 inch, case hardened concealed wall plate and related fasteners.
1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Double Prong Unit:
 - 1) American Specialties, Inc.: No. 7345-S.
 - 2) Bobrick Washroom Equipment, Inc.: No. B- 6727.
 - 3) Bradley Corporation: Bradex Model No. 9124.
 - b. Finish: Satin.
- B. Coat Hook with Bumper (CH): Solid cast aluminum, surface mounted coat hook with rubber bumper. Provide complete with stainless steel mounting screws designed for specific substrate (include plugs or expansion shields where required).
1. Products: Subject to compliance with requirements, provide B-212 by Bobrick Washroom Equipment Inc. or approved substitution by one of the following:
 - a. American Specialties, Inc.
 - b. Bradley Corporation.
 2. Size: 3-3/4 inch total projection with 2 inch coat hook.
- C. Sanitary-Napkin Disposal Unit (SDU-1): Surface-mounted napkin/tampon disposal unit, with formed face. Formed from stainless steel sheet with satin finish on exposed surfaces, fully welded, with seamless corners and burr-free edges: cabinet and waste container
1. 1. Basis-of-Design Product: Subject to compliance with requirements, provide Diplomat Series Model 4A10 by Bradley Corporation or comparable product by one of the following:
 2. a. AJW Architectural Products.
 3. b. American Specialties, Inc.
 4. c. Bobrick Washroom Equipment, Inc.
 5. 2. Material and Finish: Type 304 stainless steel, 0.030 inch thick body and 0.036 inch thick door, with satin finish exposed surfaces.
 6. 3. Overall Dimensions: 8 inch wide by 10 inch high by 3-7/8 inch deep.
 7. 4. Capacity: 1.5 gallons.
 8. 5. Cover: Self-closing, disposal-opening, hinged cover.

9. 6. Receptacle: Removable.

D. Angled Mirror with Frame (MR1): 1/4 inch float glass, electro-copper plated mirror guaranteed for 15 years against silver spoilage. Type 304 stainless steel angle frame, with satin finish, 0.031 inch, approximately 3/4 by 3/4 inch with corners mitered, welded, and ground smooth. 0.033 inch galvanized steel back, concealed mounting devices. Include extruded polystyrene wedge between mirror and steel back.

1. Products: Subject to compliance with requirements, provide one of the following:
 - a. American Specialties, Inc.: No. 0600T Series.
 - b. Bobrick Washroom Equipment, Inc.: No. B-290 Series.
 - c. Bradley Corporation: Bradex Model No. 780 Series.
2. Mirror Sizes: As indicated on Drawings.

2.5 GRAB BARS

A. Grab Bars (GB):

1. Products: Subject to compliance with requirements, provide one of the following:
 - a. American Specialties, Inc.: Model No. 3800 Series.
 - b. Bobrick Washroom Equipment, Inc.: No. B-6806 Series.
 - c. Bradley Corporation: No. 812 Series.
2. Grab Bar Materials: 18-8, Type 304, 0.047 inch thick stainless steel tubing with satin finish. Ends of grab bar pass through flanges and are heliarc welded to flanges to form one structural unit.
 - a. Outside diameter 1-1/2 inches.
3. Concealed Mounting Flanges: 18-8, Type 304, 1/8 inch thick, stainless steel plate.
 - a. End Flanges: 2 inches by 3-1/8 inches, with two holes for attachment to wall.
 - b. Intermediate Flanges: 2-5/8 inches by 3-1/8 inches by 3-1/8 inches diameter.
4. Snap Flange Covers: 18-8 S, type-304, 0.0314 inch thick stainless steel, satin finish. 3-1/4 inch diameter by 1/2 inch deep; snap over mounting flange to conceal mounting screws.
5. Length:
 - a. GB18: 18 inch vertical.
 - b. GB36: 36 inch horizontal.
 - c. GB42: 42 inch horizontal.
 - d. GBL: L-shaped in lengths indicated on Drawings.
6. Where grab bars are mounted on dissimilar adjacent surfaces that do not meet on an equal plane, modify end post lengths as required to mount grab bars plumb and true.
7. Provide special non-slip finish on grab bars where indicated.

2.6 SHOWER AND BATH ACCESSORIES

A. Shower Curtain Rod and Hooks (SCR): Exposed mounting, 304 stainless steel, 0.050 inch, 1-1/4 inch diameter curtain rod; 304 stainless steel, 0.038 inch 1-piece die formed mounting flanges, satin finish exposed surfaces.

1. Products: Subject to compliance with requirements, provide one of the following:
 - a. American Specialties, Inc.: No. 1224 Series with No. 1200-SHU hooks.
 - b. Bobrick Washroom Equipment, Inc.: No. B-207 Series with No. 204 Series hooks.
 - c. Bradley Corporation: No. 9539 Series with No. 9536 hooks.

2. Provide stainless steel shower curtain hooks as specified above.
- B. Shower Curtain (SCR): Vinyl Shower Curtain, minimum 0.008 inch thick, opaque, white, matte vinyl with hemmed edges, integral antibacterial agent, and corrosion corrosion-resistant grommets at minimum 6 inches on center through top hem.
1. Products: Subject to compliance with requirements, provide the following or approved substitution.
 - a. Bobrick Washroom Equipment, Inc.: No. 204-2.
 2. Size: Minimum 6 inches wider than opening by 72 inches high.
 3. Color: As selected by Architect from manufacturer's full range.
- C. Shower Seat (FSS): Folding molded plastic shower seat in "L" shape configuration approximately 32 inches long by 12-1/2 inches and 22-1/2 inches deep with 304 stainless steel tube frame, wall bracket, and piano hinge.
1. Products: Subject to compliance with requirements, provide one of the following:
 - a. American Specialties, Inc.: No. 8206.
 - b. Bobrick Washroom Equipment, Inc.: No. B-5181.
 - c. Bradley Corporation: No. 956 for left hand configuration and No. 9561 for right hand configuration.
- D. Electric Hand Dryer (EHD): Surface mounted electric hand dryer, sensor activated with timed power cut-off switch.
1. Basis of Design Product: Subject to compliance with requirements, provide Model 2902-2874 by Bradley Corporation or comparable product by of the following:
 - a. Bobrick Washroom Equipment, Inc.
 - b. American Specialties, Inc.
 2. Operation Time: 15 seconds.
 3. Cover Material and Finish: Stainless steel, No. 4 finish (satin).
 4. Electrical Requirements: 115V, 13 A, 1500 W,

2.7 CHILDCARE ACCESSORIES

- A. Diaper Changing Station (DCS): Horizontal baby changing unit that opens by folding down from stored position. Provide units with child-protection strap and built-in liner dispenser.
1. Products: Subject to compliance with requirements, provide one of the following:
 - a. AJW Architectural Products: U944 Series Horizontal Baby Changing Station.
 - b. American Specialties, Inc.: No. 9012 Baby Changing Station.
 - c. Koala Kare Products, a division of Bobrick Washroom Equipment, Inc.: Model KB200.
 2. Weight Limit: Engineered to support a minimum of 250 pound static load when opened.
 3. Mounting: Surface mounted, with unit projecting not more than 4 inches from wall when closed.
 4. Operation: By pneumatic shock-absorbing mechanism.
 5. Material and Finish: HDPE in manufacturer's standard color.
 6. Size: Nominal 35 inches by 20 inches by 4 inches deep in closed position, 20 inches wide when opened.

2.8 UNDERLAVATORY GUARDS

- A. Underlavatory Guard (UG): Insulating pipe covering for supply and drain piping assemblies that prevent direct contact with piping and allow service access without removing coverings.
1. Products: Subject to compliance with requirements, provide one of the following:
 - a. American Graby Inc.: HC500R Trap Wrap Standard.
 - b. Plumberex Specialty Products, Inc.: Pro-Extreme.
 - c. IPS Corporation: Truebro Lav Guard 2E-Z Series.
 2. Material and Finish: Antimicrobial, molded-plastic.
 3. Minimum wall thickness: 1/8 inch.
 4. Color: White.

2.9 CUSTODIAL ACCESSORIES

- A. Utility Shelf (MOP): Surface-mounted combination unit with shelf, hooks, and mop/broom holders.
1. Products: Subject to compliance with requirements, provide one of the following:
 - a. American Specialties, Inc.: Model No. 1308 Series.
 - b. Bobrick Washroom Equipment Inc.: B-239x34.
 - c. Bradley Corporation: Bradex Model 9930 Series.
 2. Material: 18-8, Type 304 stainless steel, with satin finish.
 - a. Backplate: Minimum 0.032 inch thick, with factory-formed mounting holes spaced appropriately for size of unit for securing unit to wall.
 - b. Hooks: Minimum 0.079 inch thick welded to backplate.
 - 1) Size: Approximately 1 inch by 9-3/4 inches high.
 - 2) Projection: 1 inch top hook, 2-1/4 inches bottom hook.
 - c. Mop/Broom Holders: Spring-loaded rubber cams with anti-slip coating.
 3. Size: Nominal 14 inches high by 34 inches wide, with 8 inch deep shelf on top of unit.
 4. Quantity of Hooks and Mop/Broom Holders: 4 hook, 3 holders.
 5. Fasteners: Provide appropriate type and quantities of stainless steel mounting screws for specific substrates. Include plugs and expansion shields where required.

2.10 SCIENCE PREP ROOM

- A. Hook Strip/Coat Rack (LCH): Surface-mounted, multi-hook strip.
1. Products: Subject to compliance with requirements, provide one of the following:
 - a. American Specialties, Inc.: Series 1307-3.
 - b. Bobrick Washroom Equipment, Inc.: B-232x24.
 - c. Bradley Corporation: Bradex Model No. 9943.
 2. Material: 18-8, Type 304 stainless steel, with satin finish.
 - a. Backplate: Minimum 0.032 inch thick, with factory-formed mounting holes spaced appropriately for size of unit for securing unit to wall.
 - b. Hooks: Minimum 0.079 inch thick welded to backplate.
 3. Nominal Unit Size:
 - a. Hook: Approximately 1 inch by 7-1/4 inches high.
 - b. Total Projection: 2-5/8 inches.

4. Fasteners: Provide appropriate type and quantities of stainless steel mounting screws for specific substrates. Include plugs and expansion shields where required.

2.11 MATERIALS

- A. Stainless Steel: ASTM A 666, 18-8, Type 304, 0.031 inch minimum nominal thickness unless otherwise indicated.
- B. Galvanized-Steel Sheet: ASTM A 653, with G60 hot-dip zinc coating.
- C. Galvanized-Steel Mounting Devices: ASTM A 153, hot-dip galvanized after fabrication.
- D. Fasteners: Screws, bolts, and other devices of same material as accessory unit and tamper-and-theft resistant where exposed, and of galvanized steel where concealed unless indicated otherwise.
- E. Chrome Plating: ASTM B 456, Service Condition Number SC 2 (moderate service).
- F. Mirrors: ASTM C 1503, Mirror Glazing Quality, clear-glass mirrors, nominal 6.0 mm thick.

2.12 FABRICATION

- A. General: Fabricate units with tight seams and joints, and exposed edges rolled. Hang doors and access panels with full-length, continuous hinges. Equip units for concealed anchorage and with corrosion-resistant backing plates.
- B. Keys: Provide universal keys for internal access to accessories for servicing and resupplying. Provide minimum of six keys to Owner's representative.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install accessories according to manufacturers' written instructions, using fasteners appropriate to substrate indicated and recommended by unit manufacturer. Install units level, plumb, and firmly anchored in locations and at heights indicated.
- B. Grab Bars: Install to withstand a downward load of at least 250 lbf, when tested according to ASTM F 446.

3.2 ADJUSTING AND CLEANING

- A. Adjust accessories for unencumbered, smooth operation. Replace damaged or defective items.
- B. Remove temporary labels and protective coatings.
- C. Clean and polish exposed surfaces according to manufacturer's written instructions.

END OF SECTION 102800

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SECTION 104400 - FIRE PROTECTION SPECIALTIES**PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Portable fire extinguishers.
 - 2. Fire-protection cabinets for the following:
 - a. Portable fire extinguishers.
 - 3. Fire-protection accessories.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product. Show door hardware, cabinet type, trim style, and panel style. Include roughing-in dimensions and details showing recessed-, semirecessed-, or surface-mounting method and relationships of box and trim to surrounding construction.
- B. Shop Drawings: For fire-protection cabinets. Include plans, elevations, sections, details, and attachments to other work.
- C. Samples for Verification: For each type of exposed finish required, prepared on Samples 6 by 6 inches square.
- D. Product Schedule: For fire-protection cabinets. Indicate whether recessed, semirecessed, or surface mounted. Coordinate final fire-protection cabinet schedule with fire-extinguisher schedule to ensure proper fit and function. Use same designations indicated on Drawings.

1.4 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For fire-protection cabinets to include in maintenance manuals.

1.5 COORDINATION

- A. Coordinate size of fire-protection cabinets to ensure that type and capacity of fire extinguishers indicated are accommodated.
- B. Coordinate sizes and locations of fire-protection cabinets with wall depths.

1.6 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace fire extinguishers that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:
 - a. Failure of hydrostatic test according to NFPA 10.
 - b. Faulty operation of valves or release levers.
2. Warranty Period: Six years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Rated Fire-Protection Cabinets: Listed and labeled to comply with requirements in ASTM E 814 for fire-resistance rating of walls where they are installed.

2.2 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. Amerex Corporation.
 2. Ansul Incorporated.
 3. J.L. Industries.
 4. Larsens Manufacturing Company.
 5. Nystrom Building Products.
 6. Potter Roemer.
 7. Pyro-Chem.

2.3 PORTABLE FIRE EXTINGUISHERS

- A. General: Provide fire extinguishers of type, size, and capacity for each cabinet and other locations indicated.
- B. Multipurpose Dry-Chemical Type in Steel Container: UL-rated 4-A:60-B:C, 10-lb nominal capacity, with monoammonium phosphate-based dry chemical in enameled-steel container.
- C. Purple-K Dry-Chemical Type in Aluminum Container (At Kitchen): UL-rated, 30-B:C, 5-lb nominal capacity, with potassium bicarbonate-based dry chemical in enameled-aluminum container.
- D. Clean-Agent Type in Aluminum Container (At computer labs): UL-rated w-B:C, 2.5-lb nominal capacity, with HCFC Blend B agent and inert material in enameled-aluminum container, with pressure-indicating gage.

2.4 FIRE-PROTECTION CABINET

- A. Cabinet Type: Suitable for fire extinguisher.
- B. Cabinet Construction: Nonrated, unless otherwise indicated.
 1. Fire-Rated Cabinets: Construct fire-rated cabinets with double walls fabricated from 0.043-inch-thick cold-rolled steel sheet lined with minimum 5/8-inch-thick fire-barrier material. Provide factory-drilled mounting holes.
- C. Cabinet Material: Cold-rolled steel sheet.
 1. Shelf: Same metal and finish as cabinet.

-
- D. Semirecessed Cabinet: One-piece combination trim and perimeter door frame overlapping surrounding wall surface with exposed trim face and wall return at outer edge (backbend).
1. Rolled-Edge Trim: 2-1/2-inch backbend depth.
- E. Cabinet Trim Material: Steel sheet.
- F. Door Material: Steel sheet.
- G. Door Style: Vertical duo panel with frame.
- H. Door Glazing: Tempered float glass (clear).
- I. Door Hardware: Manufacturer's standard door-operating hardware of proper type for cabinet type, trim style, and door material and style indicated.
1. Provide projecting lever handle with cam-action latch.
 2. Provide manufacturer's standard hinge permitting door to open 180 degrees.
- J. Accessories:
1. Mounting Bracket: Manufacturer's standard steel, designed to secure fire extinguisher to fire-protection cabinet, of sizes required for types and capacities of fire extinguishers indicated.
 - a. Provide brackets for extinguishers not located in cabinets.
 2. Door Lock: Cam lock that allows door to be opened during emergency by pulling sharply on door handle.
 3. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location. Locate as directed by Architect.
 - a. Identify fire extinguisher in fire-protection cabinet with the words "FIRE EXTINGUISHER" with white letter decals applied to door.
 - b. Identify bracket-mounted extinguishers with the words "FIRE EXTINGUISHER" with red letter decals applied to wall surface.
 - c. Orientation: Vertical.
- K. Materials:
1. Cold-Rolled Steel: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B.
 - a. Finish: Factory primed for field painting.
 2. Tempered Float Glass: ASTM C 1048, Kind FT, Condition A, Type I, Class 1, Quality q3, 1.5 mm thick.

2.5 FABRICATION

- A. Fire-Protection Cabinets: Provide manufacturer's standard box (tub) with trim, frame, door, and hardware to suit cabinet type, trim style, and door style indicated.
1. Weld joints and grind smooth.
 2. Provide factory-drilled mounting holes.
 3. Prepare doors and frames to receive locks.
 4. Install door locks at factory.
- B. Cabinet Doors: Fabricate doors according to manufacturer's standards, from materials indicated and coordinated with cabinet types and trim styles.

1. Fabricate door frames with tubular stiles and rails and hollow-metal design, minimum 1/2 inch thick.
 2. Fabricate door frames of one-piece construction with edges flanged.
 3. Miter and weld perimeter door frames.
- C. Cabinet Trim: Fabricate cabinet trim in one piece with corners mitered, welded, and ground smooth.

2.6 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM's AMP 500, "Metal Finishes Manual for Architectural and Metal Products," for recommendations for applying and designating finishes.
- B. Protect mechanical finishes on exposed surfaces of fire-protection cabinets from damage by applying a strippable, temporary protective covering before shipping.
- C. Finish fire-protection cabinets after assembly.
- D. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine walls and partitions for suitable framing depth and blocking where recessed and semirecessed cabinets will be installed.
- B. Examine fire extinguishers for proper sizing, charging and tagging.
 1. Remove and replace damaged, defective or undercharged units.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Prepare recesses for semirecessed fire-protection cabinets as required by type and size of cabinet and trim style.

3.3 INSTALLATION

- A. Comply with manufacturer's written instructions for installing fire-protection specialties.
- B. General: Install fire-protection cabinets in locations and at mounting heights indicated or, if not indicated, at heights acceptable to authorities having jurisdiction.
 1. Prepare recesses for cabinets as required by type and size of cabinet and trim style.
 2. Fasten mounting brackets to structure and cabinets, square and plumb.
 3. Fasten cabinets to structure, square and plumb.

3.4 ADJUSTING AND CLEANING

- A. Remove temporary protective coverings and strippable films, if any, as fire-protection cabinets are installed unless otherwise indicated in manufacturer's written installation instructions.
- B. Adjust fire-protection cabinet doors to operate easily without binding. Verify that integral locking devices operate properly.
- C. On completion of fire-protection cabinet installation, clean interior and exterior surfaces as recommended by manufacturer.

END OF SECTION 104413

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SECTION 105113 – METAL LOCKERS**PART 1 - GENERAL****1.1 SUMMARY**

- A. Section Includes:
1. Welded athletic lockers.
 2. Locker benches.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of metal locker.
1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of metal locker and bench.
- B. Shop Drawings: For metal lockers.
1. Include plans, elevations, sections, details, and attachments to other work.
 2. Show locker trim and accessories.
 3. Include locker identification system and numbering sequence.
- C. Samples for Verification: For the following products, in manufacturer's standard size:
1. Lockers and equipment.
 2. Locker benches.
- D. Product Schedule: For lockers. Use same designations indicated on Drawings.

1.3 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Sample Warranty: For special warranty.

1.4 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For adjusting, repairing, and replacing locker doors and latching mechanisms to include in maintenance manuals.

1.5 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
1. Full-size units of the following metal locker hardware items equal to 10 units for each type and finish installed.
 - a. Locks.
 - b. Identification plates.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Do not deliver metal lockers until spaces to receive them are clean, dry, and ready for their installation.
- B. Deliver combination control charts to Owner by registered mail or overnight package service.

1.7 FIELD CONDITIONS

- A. Field Measurements: Verify actual dimensions of recessed openings by field measurements before fabrication.

1.8 COORDINATION

- A. Coordinate sizes and locations of concrete bases for metal lockers.
- B. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of work specified in other Sections to ensure that metal lockers can be supported and installed as indicated.

1.9 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of metal lockers that fail in materials or workmanship, excluding finish, within specified warranty period.
 - 1. Failures include the following:
 - a. Structural failures.
 - b. Faulty operation of latches and other door hardware.
 - 2. Damage from deliberate destruction and vandalism is excluded.
 - 3. Warranty Period for Knocked-Down Metal Lockers: Two years from date of Substantial Completion.
 - 4. Warranty Period for Welded Metal Lockers: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS**2.1 MANUFACTURERS (LKM-1, LKM-2, LKM-3)**

- A. Source Limitations: Obtain metal lockers, locker benches, and accessories from single source from single locker manufacturer.
 - 1. Obtain locks from single lock manufacturer.
- B. Basis-of-Design Products: Subject to compliance with requirements, provide lockers by Penco Products, Inc. or a comparable product by one of the following:
 - 1. Penco Products, Inc. (Basis-of-Design).
 - 2. List Industries, Inc.
 - 3. Lyon, LLC.
 - 4. Republic Storage Systems, LLC.

2.2 PERFORMANCE REQUIREMENTS

- A. Accessibility Requirements: For lockers indicated to be accessible, comply with applicable provisions in the U.S. Department of Justice 2010 ADA Standards for Accessible Design and ICC A117.1.

2.3 WELDED LOCKERS

- A. Perforated Doors: One piece; fabricated from 0.075-inch nominal-thickness steel sheet with manufacturer's standard diamond perforations; formed into channel shape with double bend at vertical edges and with right-angle single bend at horizontal edges and latch point (bottom) and right-angle single bend at remaining edges for box lockers.
1. Reinforcement: Manufacturer's standard reinforcing angles, channels, or stiffeners for doors more than 15 inches wide; welded to inner face of doors.
- B. Body: Assembled by welding body components together. Fabricate from unperforated steel sheet with thicknesses as follows:
1. Tops and Bottoms: 0.060-inch nominal thickness, with single bend at edges.
 2. Backs: 0.048-inch nominal thickness.
 3. Shelves: 0.060-inch nominal thickness, with double bend at front and single bend at sides and back.
- C. Perforated Sides: Fabricated from 0.060-inch nominal-thickness steel sheet with manufacturer's standard diamond perforations.
- D. Frames: Channel formed; fabricated from 0.060-inch nominal-thickness steel sheet or 0.097-inch nominal-thickness steel angles; lapped and factory welded at corners; with top and bottom main frames factory welded into vertical main frames. Form continuous, integral, full-height door strikes on vertical main frames.
1. Cross Frames for Double-Tier Lockers: Channel formed and fabricated from same material as main frames; welded to vertical main frames.
- E. Hinges: Welded to door and attached to door frame with no fewer than two factory-installed rivets per hinge that are completely concealed and tamper resistant when door is closed; fabricated to swing 180 degrees.
1. Hinges: Manufacturer's standard, steel.
- F. Recessed Door Handle and Latch: Stainless-steel cup with integral door pull, recessed so locking device does not protrude beyond door face; pry and vandal resistant.
1. Multipoint Latching: Finger-lift latch control designed for use with padlocks; positive automatic latching and prelocking.
 - a. Latch Hooks: Equip doors 48 inches and higher with three latch hooks and doors less than 48 inches high with two latch hooks; fabricated from 0.105 inch nominal-thickness steel sheet; welded or riveted to full-height door strikes; with resilient silencer on each latch hook.
 - b. Latching Mechanism: Manufacturer's standard, rattle-free latching mechanism and moving components isolated with vinyl or nylon to prevent metal-to-metal contact, and incorporating a prelocking device that allows locker door to be locked while door is open and then closed without unlocking or damaging lock or latching mechanism.
- G. Locks: User-provided padlocks.

- H. Identification Plates: Manufacturer's standard, etched, embossed, or stamped aluminum plates, with numbers and letters at least 3/8 inch high.
- I. Hooks: Manufacturer's standard ball-pointed type, aluminum or steel; zinc plated.
- J. Filler Panels: Fabricated from 0.048-inch nominal-thickness steel sheet.
- K. Materials:
 - 1. Cold-Rolled Steel Sheet: ASTM A 1008, Commercial Steel (CS), Type B, suitable for exposed applications.
- L. Finish: Baked enamel or powder coat.
 - 1. Color: As indicated on Interior Finish Legend on Drawings.

2.4 LOCKER BENCHES

- A. Provide bench units with overall assembly height of 17-1/2 inches.
- B. Bench Tops: Manufacturer's standard one-piece units, with rounded corners and edges.
 - 1. Size: Minimum 9-1/2 inches wide by 1-1/4 inches thick.
 - 2. Laminated clear hardwood with one coat of clear sealer on all surfaces and one coat of clear lacquer on top and sides.
- C. Fixed Pedestals: Manufacturer's standard supports, with predrilled fastener holes for attaching bench top and anchoring to floor, complete with fasteners and anchors, and as follows:
 - 1. Tubular Steel: 1-1/2-inch- diameter steel tubing threaded on both ends, with standard pipe flange at top and bell-shaped cast-iron base; with baked-enamel or powder-coat finish; anchored with exposed fasteners.
 - a. Color: As selected by Architect from manufacturer's full range.
- D. Materials: ASTM A 500 cold rolled steel tube.

2.5 FABRICATION

- A. Fabricate metal lockers square, rigid, without warp, and with metal faces flat and free of dents or distortion. Make exposed metal edges safe to touch and free of sharp edges and burrs.
 - 1. Form body panels, doors, shelves, and accessories from one-piece steel sheet unless otherwise indicated.
 - 2. Provide fasteners, filler plates, supports, clips, and closures as required for complete installation.
- B. Fabricate each metal locker with an individual door and frame; individual top, bottom, and back; and common intermediate uprights separating compartments. Factory weld frame members of each metal locker together to form a rigid, one-piece assembly.
- C. Equipment: Provide each locker with an identification plate and the following equipment:
 - 1. Double-Tier Units: One double-prong ceiling hook and two single-prong wall hooks.
 - 2. Triple-Tier Units: One double-prong ceiling hook.

- D. Welded Construction: Factory preassemble metal lockers by welding all joints, seams, and connections; with no bolts, nuts, screws, or rivets used in assembly of main locker groups. Factory weld main locker groups into one-piece structures. Grind exposed welds flush.
- E. Continuous Sloping Tops: Fabricated in lengths as long as practical, without visible fasteners at splice locations; finished to match lockers.
 - 1. Sloping-top corner fillers, mitered.
- F. Filler Panels: Fabricated in an unequal leg angle shape; finished to match lockers. Provide slip-joint filler angle formed to receive filler panel.

2.6 ACCESSORIES

- A. Fasteners: Zinc- or nickel-plated steel, slotless-type, exposed bolt heads; with self-locking nuts or lock washers for nuts on moving parts.
- B. Anchors: Material, type, and size required for secure anchorage to each substrate.
 - 1. Provide nonferrous-metal or hot-dip galvanized anchors and inserts on inside face of exterior walls for corrosion resistance.
 - 2. Provide toothed-steel or lead expansion sleeves for drilled-in-place anchors.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine walls, floors, and support bases, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General: Install lockers level, plumb, and true; shim as required, using concealed shims.
- B. Welded Lockers: Connect groups together with standard fasteners, with no exposed fasteners on face frames.
- C. Trim: Fit exposed connections of trim, fillers, and closures accurately together to form tight, hairline joints, with concealed fasteners and splice plates.
 - 1. Attach recess trim to recessed metal lockers with concealed clips.
 - 2. Attach sloping-top units to metal lockers, with closures at exposed ends.

3.3 ADJUSTING

- A. Clean, lubricate, and adjust hardware. Adjust doors and latches to operate easily without binding. Verify that integral locking devices operate properly.

3.4 PROTECTION

- A. Protect metal lockers from damage, abuse, dust, dirt, stain, or paint. Do not permit use during construction.
- B. Touch up marred finishes, or replace metal lockers that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by locker manufacturer.

END OF SECTION 105113

SECTION 105613 – METAL STORAGE SHELVING**PART 1 - GENERAL****1.1 SUMMARY**

- A. Section includes four-post metal storage shelving.

1.2 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate sizes and locations of blocking and backing required for installation of metal storage shelving attached to wall and ceiling assemblies.
2. Coordinate locations and installation of metal storage shelving that may interfere with ceiling systems including lighting, HVAC, speakers, sprinklers, access panels, electrical switches or outlets, and floor drains.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include rated capacities, construction details, material descriptions, dimensions of individual components and profiles, and finishes for metal storage shelving.
- B. Shop Drawings: For customized metal storage shelving.
1. Include plans, elevations, sections, and attachment details.
 2. Include installation details of connectors, lateral bracing, and special bracing.
- C. Delegated-Design Submittal: For metal storage shelving indicated to comply with performance requirements, including analysis data signed and sealed by qualified professional engineer responsible for their preparation.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Product Certificates: For each type of metal storage shelving from manufacturer.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.

1.6 SITE CONDITIONS

- A. Environmental Limitations: Do not deliver or install metal storage shelving until spaces are enclosed and weathertight, wet Work in spaces is complete and dry, and temporary HVAC

system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during remainder of construction period.

PART 2 - PRODUCTS

2.1 PERFORMANCE CRITERIA

- A. Delegated Design: Design metal storage shelving, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
- B. Structural Performance for Four-Post Metal Storage Shelving: Capable of withstanding loads indicated per MH 28.1.

2.2 FOUR-POST METAL STORAGE SHELVING

- A. Open Four-Post Metal Storage Shelving: Factory-formed, field-assembled, freestanding system, designed for shelves to span between and be supported by corner posts, with shelves adjustable over height of shelving unit. Fabricate initial shelving unit with post at each corner. Fabricate additional shelving units similarly, so each unit is independent. Provide fixed top and bottom shelves, adjustable intermediate shelves, and accessories indicated.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 2. Basis-of-Design Product: Subject to compliance with requirements, provide Clipper Hi-Performance Shelving System by Penco Products, Inc. or comparable product by one of the following:
 - a. Adjustable Shelving Products; Karp Associates, Inc.
 - b. Borroughs Corporation.
 - c. Excalibur Shelving Systems.
 - d. Lyon Workspace Products, LLC.
 - e. Penco Products, Inc.
 - f. Republic Storage Systems, LLC.
 - g. Spacesaver Corporation.
 - h. Tennsco.
 - 3. Load-Carrying Capacity per Shelf: 700 pounds.
 - 4. Posts: Fabricated from hot-rolled steel; in manufacturer's standard shape; with perforations at 1-1/2 inches on center to receive shelf-to-post connectors.
 - a. Steel Thickness, Nominal: Minimum 0.075 inch or as required for load-carrying capacity per shelf and number of shelves.
 - b. Post Base: Bolt leveler.
 - 5. Bracing: Manufacturer's standard, single or double diagonal cross bracing at back and ends; as required for stability, load-carrying capacity of shelves, and number of shelves.
 - 6. Solid-Type Shelves: Fabricated from steel sheet as follows:
 - a. Steel-Sheet Thickness, Nominal: As required for load-carrying capacity per shelf.
 - b. Slots or Holes for Shelf Dividers: 2 inches on center.
 - c. Fabricate fronts and backs of shelves with box-formed edges, with corners lapped and welded.

7. Shelf Quantity: Five shelves per shelving unit in addition to top and bottom shelf.
8. Shelf-to-Post Connectors: Compression clips.
9. Base: Open, with exposed post legs.
10. Overall Unit Sizes: As indicated on Drawings.
11. Finish: Baked enamel or powder coat.
 - a. Color and Gloss: Match existing metal storage shelving.

2.3 MATERIALS

- A. Hot-Rolled Steel Sheet: ASTM A1011, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.
- B. Cold-Rolled Steel Sheet: ASTM A1008, Commercial Steel (CS), Type B.
- C. Wall Anchors: Manufacturer's standard, galvanized-steel anchors designed to secure metal storage shelving to adjacent wall. Provide one per shelving unit for each shelving unit adjacent to wall unless additional anchors are indicated in calculations.

2.4 FABRICATION

- A. Shop Fabrication: Prefabricate shelving components in shop to greatest extent possible to minimize field fabrication; temporarily preassemble shelving components where necessary to ensure that field-assembled components fit together properly. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.
- B. Fabricate metal storage shelving square and rigid, with posts plumb and true and shelves flat and free of dents or distortion. Fabricate connections to form rigid structure, free of buckling and warping.
 1. Form exposed Work true to line and level with accurate angles and surfaces and straight sharp edges.
 2. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible. Locate joints where least conspicuous.
 3. Build in straps, plates, brackets, and other reinforcements as needed to support shelf loading.
 4. Cut, reinforce, drill, and tap metal fabrications to receive hardware, fasteners, and similar items.
- C. Form metal in maximum lengths to minimize joints. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing Work.
- D. Form edges and corners free of sharp edges or rough areas. Fold back and crimp exposed edges of unsupported sheet metal to form 1/2 inch wide hem on concealed side; ease edges of metal plate to radius of approximately 1/32 inch. Shear and punch metals cleanly and accurately. Remove burrs.
- E. Weld corners and seams continuously to develop strength, minimize distortion, and maintain corrosion resistance of base metals. At exposed locations, finish welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface. Weld before finishing components to greatest extent possible. Remove weld spatter and welding oxides from exposed surfaces before finishing.

2.5 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within range of approved Samples and are assembled or installed to minimize contrast.

2.6 STEEL FINISHES

- A. Surface Preparation: Remove mill scale and rust, if present, from uncoated steel, complying with SSPC-SP 5/NACE No. 1, "White Metal Blast Cleaning" or SSPC-SP 8, "Pickling."
- B. Baked-Enamel or Powder-Coat Finish: Manufacturer's standard baked-on finish consisting of prime coat and thermosetting topcoat. Comply with coating manufacturer's written instructions for cleaning, pretreatment, application, and minimum dry thickness.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of Work.
- B. Examine floors for suitable conditions where metal storage shelving will be installed.
- C. Examine walls to which metal storage shelving will be attached for properly located blocking, grounds, or other solid backing for attachment of support fasteners.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Vacuum finished floor and wet mop resilient flooring over which metal storage shelving is to be installed.

3.3 INSTALLATION

- A. Install metal storage shelving level, plumb, square, rigid, true, and with shelves flat and free of dents or distortion. Make connections to form rigid structure, free of buckling and warping.
 - 1. Install exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible.
 - 2. Install braces, straps, plates, brackets, and other reinforcements as needed to support shelf loading and as required for stability.
 - 3. Adjust post-base bolt leveler to achieve level and plumb installation.
 - 4. Connect side-to-side shelving units together.
 - 5. Install shelves in each shelving unit at spacing indicated on Drawings or, if not indicated, at equal spacing.

- a. Four-Post Metal Storage Shelving: Install 4 clips, one at each post, for support of each shelf; with clips fully engaged in post perforations.

3.4 ERECTION TOLERANCES

- A. Erect four-post metal storage shelving to maximum tolerance from vertical of 1/2 inch in up to 10 feet of height, not exceeding 1 inch for heights taller than 10 feet.

3.5 ADJUSTING

- A. Adjust metal storage shelving so that connectors and other components engage accurately and securely.
- B. Touch up marred finishes or replace metal storage shelving that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by metal storage shelving manufacturer.
- C. Replace metal storage shelving that has been damaged or has deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 105613

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SECTION 107316 - PRE-ENGINEERED METAL CANOPIES**PART 1 - GENERAL****1.1 SUMMARY****A. Section Includes:**

1. Pre-engineered metal canopy systems.

1.2 ACTION SUBMITTALS**A. Product Data:** Manufacturer's data sheets on each product to be used, including:

1. Construction details, material descriptions, dimensions of individual components and profiles, and finishes.
2. Preparation instructions and recommendations.
3. Storage and handling requirements and recommendations.
4. Installation methods.

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other Work.

1. Include anchorage details, including structural connections, indicating bolt sizes and connection plate thicknesses.
2. Submit Shop Drawings that have been engineered and certified by professional engineer licensed in the State of North Carolina. Include seal and signature of professional engineer on Shop Drawings.

C. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below:

1. Metal Deck: 12 inches long by actual panel width. Include fasteners, clips, battens, closures, and other metal canopy accessories.
2. Trim and Closures: 12 inches long. Include fasteners and other exposed accessories.
3. Color selections consisting of actual coating material or anodizing process on aluminum extrusions.

1.3 INFORMATIONAL SUBMITTALS**A. Certificates:** Signed by manufacturer certifying material compliance with specified performance characteristics and criteria, and physical requirements.**B. Warranties:** Samples of special warranties.**1.4 QUALITY ASSURANCE****A. Manufacturer Qualifications:** Company specializing in engineering and manufacturing pre-engineered canopy systems with a minimum documented experience of 5 years and with quality assurance program utilizing quality inspection for each system.

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- B. Welding Qualifications: Qualify procedures and personnel per AWS D1.1/D1.1M, "Structural Welding Code - Steel."
1. Perform structural shop welding by certified welders.
 2. Steel Shop Connections: Welded
 3. Field Connections: Bolted unless otherwise noted on Drawings. Shop welds may be changed to field welds with approval of Architect.
 4. Clean slag from welds and inspect. Paint steel with red oxide rust-inhibitive primer.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Store products in manufacturer's unopened packaging until ready for installation.
- B. Protect components and accessories from corrosion, deformation, damage, and deterioration when stored at Project site. Keep materials free from dirt and foreign matter.

1.6 WARRANTY

- A. Special Warranty: Manufacturer and fabricator agree to repair or replace components of canopy systems that fail in materials or workmanship within specified warranty period.
1. Failures include the following:
 - a. Structural failures including framework.
 - b. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
 2. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE CRITERIA

- A. Structural Performance: Provide pre-engineered canopy systems capable of withstanding effects of gravity loads and the following loads and stresses within limits and under conditions indicated for specific location where canopy will be installed:
1. Uniform pressure as indicated on Drawings: Minimum design wind load per ASCE 7, CH. 6.
- B. Thermal Movements: Provide pre-engineered canopy systems that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
1. Temperature Change (Range): 120 degrees F, ambient; 180 degrees F, material surfaces.

2.2 SUSPENDED CANOPIES

- A. Manufacturers: Subject to compliance with requirements, provide products from one of the following:

1. Austin Mohawk and Company, Inc.
2. Avadek Walkway Cover Systems.
3. Dittmer Architectural Aluminum.
4. East Coast TVM, LLC.
5. Floline Architectural Systems, LLC.
6. Mitchell Metals.
7. Peachtree Protective Covers.
8. Perfection Architectural Systems, Inc.

2.3 COMPONENTS

- A. Deck: Interlocking design fabricated from extruded aluminum.
 1. Thickness: As required to meet performance requirements.
 2. Size and Profile: As indicated on Shop Drawings and as required to comply with performance criteria.
- B. Gutter Fascia: Extruded aluminum in thickness required to comply with performance criteria, manufacturer's written recommendations, and Shop Drawings.
 1. Provide gutter fascia with factory-welded mitered corners. Mechanical connections of gutter fascia utilizing rivets are not acceptable.
 2. Depth: Minimum 6 inches long unless indicated otherwise.
 3. J Style, unless indicated otherwise.
- C. Flashing: Aluminum sheet in thickness recommended by manufacturer to meet Project requirements.
- D. Intermediate Framing: Extruded aluminum in thickness required to meet performance requirements and per manufacturer's written recommendations and Shop Drawings.
- E. Hanger Rod: Manufacturer's standard aluminum strut hanger assembly or galvanized steel pipe in size to meet performance criteria.

2.4 MATERIALS

- A. Aluminum Members: Extruded aluminum, ASTM B221, 6063 alloy, T6 temper.
- B. Fasteners:
 1. Deck Screws: Self-tapping, Type 18-8 stainless steel with neoprene washers.
 2. Trim Screws: Self-tapping, Type 18-8 stainless steel.
 3. Miscellaneous Fasteners: Type 18-8 stainless steel, type recommended by manufacturer to meet Project requirements.
 4. Structural Fasteners:
 - a. At Canopy Frame: 300 series alloy stainless steel bolts or anchors.
 - b. At Upper Wall Brackets: Hot-dipped galvanized A307 bolts.
 5. Paint exposed fasteners, prior to shipment, to match canopy color.
- C. Wall Connection Components:
 1. Hanging Rod Assemblies: 300 series alloy stainless steel.

2. Upper Wall Brackets: 3/8 inch plate steel with paint finish matching canopy components.

2.5 FABRICATION

- A. General: Fabricate and finish metal components and accessories at factory, by manufacturer's standard procedures and processes, and as necessary to fulfill indicated performance requirements. Comply with indicated profiles and with dimensional and structural requirements.
- B. Shop Assembly: Fabricate with corners mitered and heli-arc welded to extent that completed pieces can be shipped on local, state, and federal highways without special permit. Provide bolted connections for elements required to be shipped unassembled.
- C. Gutter Drainage: Manufacturer's standard concealed system designed to discharge water away from canopy, building, and pedestrians.

2.6 FINISHES

- A. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- B. Clear Anodic Finish: AAMA 611, AA-M12C22A41, Class I, 0.018 mm or thicker.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install canopy systems per manufacturer's instructions and approved Shop Drawings.
- B. Install canopy systems level, plumb, and aligned.
- C. Use proper fasteners and hardware for canopy systems attachments as specified.
- D. Use methods of attachment to structure allowing sufficient adjustment to accommodate tolerances.

3.2 ADJUSTING AND PROTECTION

- A. Protect installed products until completion of Project.
- B. After completing installation, inspect exposed finishes and repair damaged finishes. Touch-up, repair, or replace damaged products before Substantial Completion.

END OF SECTION 107316

SECTION 107516 - GROUND-SET FLAGPOLES**PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes ground-set flagpoles made from aluminum.
- B. Owner-Furnished Material: Flags.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, operating characteristics, fittings, accessories, and finishes for flagpoles.
- B. Shop Drawings: For flagpoles.
 - 1. Include plans, elevations, and attachment details. Show general arrangement, jointing, fittings, accessories, grounding, anchoring, and support.
 - 2. Include section, and details of foundation system.
- C. Samples for Verification: For each type of exposed finish, in manufacturer's standard sizes.

1.4 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For flagpoles to include in operation and maintenance manuals.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Spiral wrap flagpoles with heavy paper and enclose in a hard fiber tube or other protective container.

PART 2 - PRODUCTS**2.1 MANUFACTURERS**

- A. Source Limitations: Obtain flagpoles as complete units, including fittings, accessories, bases, and anchorage devices, from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design flagpole assemblies.
- B. Seismic Performance: Flagpole assemblies shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
- C. Structural Performance: Flagpole assemblies, including anchorages and supports, shall withstand design loads indicated within limits and under conditions indicated.
 - 1. Wind Loads: As indicated on Drawings

2.3 ALUMINUM FLAGPOLES

- A. Aluminum Flagpoles: Cone-tapered flagpoles fabricated from seamless extruded tubing complying with ASTM B 241/B 241M, Alloy 6063, with a minimum wall thickness of 3/16 inch.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. American Flagpole, Inc.
 - b. Concord Industries, Inc.
 - c. Eagle Mountain Flag & Flagpole.
 - d. Pole-Tech Co., Inc.
- B. Exposed Height: As indicated on Drawings.
- C. Construct flagpoles in one piece if possible. If more than one piece is necessary, comply with the following:
 - 1. Fabricate shop and field joints without using fasteners, screw collars, or lead caulking.
 - 2. Provide flush hairline joints using self-aligning, snug-fitting, internal sleeves.
- D. Sleeve for Aluminum Flagpole: Fiberglass or PVC pipe foundation sleeve, made to fit flagpole, for casting into concrete foundation.
 - 1. Flashing Collar: Same material and finish as flagpole.
- E. Hinged Baseplate: Cast-metal tilting hinged base and anchor plate joined by permanently secured pivot rod. Furnish with stainless-steel screws for securing tilting base to anchor plate when not tilted; furnish with anchor bolts.
 - 1. Furnish aluminum base or aluminum flashing collar finished to match flagpole.

2.4 FITTINGS

- A. Internal Halyard, Winch System: Manually operated winch with control stop device and removable handle, stainless-steel cable halyard, and concealed revolving truck assembly with plastic-coated counterweight and sling. Furnish flush access door secured with cylinder lock. Finish truck assembly to match flagpole.

1. Halyard Flag Snaps: Chromium-plated bronze swivel snap hooks with neoprene or vinyl covers. Furnish two per halyard.
2. Plastic Halyard Flag Clips: Made from injection-molded, UV-stabilized, acetal resin (Delrin). Clips attach to flag and have two eyes for inserting both runs of halyards. Furnish two per halyard.

2.5 MISCELLANEOUS MATERIALS

- A. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107/C 1107M.
- B. Drainage Material: Crushed stone, or crushed or uncrushed gravel; coarse aggregate.
- C. Sand: ASTM C 33/C 33M, fine aggregate.
- D. Elastomeric Joint Sealant: Single-component nonsag urethane joint sealant complying with requirements in Section 079200 "Joint Sealants."
- E. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187/D 1187M.

2.6 ALUMINUM FINISHES

- A. Clear Anodic Finish: AAMA 611, AA-M12C22A41.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Prepare uncoated metal flagpoles that are set in foundation tubes by painting below-grade portions with a heavy coat of bituminous paint.
- B. Foundation Excavation: Excavate to neat clean lines in undisturbed soil. Remove loose soil and foreign matter from excavation and moisten earth before placing concrete. Place and compact drainage material at excavation bottom.
- C. Provide forms where required due to unstable soil conditions and for perimeter of flagpole base at grade. Secure and brace forms to prevent displacement during concreting.
- D. Foundation Tube: Place foundation tube, center, and brace to prevent displacement during concreting. Place concrete. Plumb and level foundation tube and allow concrete to cure.
- E. Sleeves: Locate and secure sleeves in forms by bracing to reinforcement and forms.
- F. Anchor Bolts: Locate and secure anchor bolts in forms with templates and by tying to reinforcement.
- G. Place concrete, as specified in Section 033000 "Cast-in-Place Concrete." Compact concrete in place by using vibrators. Moist-cure exposed concrete for no fewer than seven days or use nonstaining curing compound.

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- H. Trowel exposed concrete surfaces to a smooth, dense finish, free of trowel marks, and uniform in texture and appearance. Provide positive slope for water runoff to perimeter of concrete base.

3.2 FLAGPOLE INSTALLATION

- A. General: Install flagpoles where indicated and according to Shop Drawings and manufacturer's written instructions.
- B. Foundation Tube: Place flagpole in tube, seated on bottom plate between steel centering wedges, and install hardwood wedges to secure flagpole in place. Place and compact sand in foundation tube and remove hardwood wedges. Seal top of foundation tube with a 2-inch layer of elastomeric joint sealant and cover with flashing collar.
- C. Baseplate: Cast anchor bolts in concrete foundation. Install baseplate on washers placed over leveling nuts on anchor bolts and adjust until flagpole is plumb. After flagpole is plumb, tighten retaining nuts and fill space under baseplate solidly with nonshrink, nonmetallic grout. Finish exposed grout surfaces smooth and slope 45 degrees away from edges of baseplate.

END OF SECTION 107516

SECTION 111313 – LOADING DOCK BUMPERS**PART 1 - GENERAL****1.1 SUMMARY**

- A. Section includes loading dock bumpers.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of loading dock bumper.
- B. Shop Drawings: For dock bumpers. Include plans, elevations, sections, details, and attachments to other Work.

PART 2 - PRODUCTS**2.1 DOCK BUMPERS**

- A. General: Surface-mounted bumpers; of type, size, and construction indicated; designed to absorb kinetic energy and minimize damage to loading dock structure.
 - 1. Carolina Dock Equipment.
 - 2. Kelley Entrematic
 - 3. Pioneer Dock Equipment.
 - 4. Rite-Hite Holding Corporation.
 - 5. Rotary Products Inc.
 - 6. Vestil Manufacturing Corporation.
- B. Laminated-Tread Dock Bumper: Fabricated from multiple, uniformly thick plies cut from fabric-reinforced rubber tires. Laminate plies under pressure on not less than two 3/4 inch diameter, steel supporting rods that are welded at one end to 1/4 inch thick, structural-steel end angle and secured with a nut and angle at the other end. Fabricate angles with predrilled anchor holes and sized to provide not less than 1 inch of tread plies extending beyond the face of closure angles.
 - 1. Thickness: 6 inches unless indicated otherwise.
 - 2. Horizontal Style: 10 inches high by length indicated on Drawings.
- C. Anchorage Devices: Galvanized-steel anchor bolts, nuts, washers, bolts, sleeves, cast-in-place plates, and other anchorage devices as required to fasten bumpers securely in place and to suit installation type indicated. Hot-dip galvanized per ASTM A153 or ASTM F2329.
- D. Materials: ASTM 36 for steel plates, shapes, and bars. Hot-dip galvanize per ASTM A123.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Dock Bumpers: Attach dock bumpers to face of loading dock in a manner that complies with requirements indicated for spacing, arrangement, and position relative to top of platform and anchorage.
 - 1. Welded Attachment: Plug-weld anchor holes in contact with steel inserts and fillet weld at other locations.
 - 2. Bolted Attachment: Attach dock bumpers to preset anchor bolts embedded in concrete or to cast-in-place inserts or threaded studs welded to embedded-steel plates or angles. If preset anchor bolts, cast-in-place inserts, or threaded studs welded to embedded-steel plates or angles are not provided, attach dock bumpers by drilling and anchoring with expansion anchors and bolts.

3.3 ADJUSTING

- A. After completing installation of exposed, factory-finished dock bumpers, inspect exposed finishes and repair damaged finishes.

END OF SECTION 111313

SECTION 112326 – COMMERCIAL WASHERS AND EXTRACTORS**PART 1 - GENERAL****1.1 SUMMARY**

- A. Section includes commercial washer-extractors and dryers.

1.2 COORDINATION

- A. Coordinate wiring requirements and current characteristics of laundry equipment with building electrical system. See Division 26 Sections.
- B. Coordinate layout and installation of plumbing, mechanical, and electrical services for laundry equipment.

1.3 ACTION SUBMITTALS

- A. Product Data: Manufacturer's data sheets, including:
 - 1. Preparation instructions and recommendations.
 - 2. Storage and handling requirements and recommendations.
 - 3. Installation methods.
- B. Shop Drawings: For each type of laundry equipment showing layout, elevations, rough-in dimensions, and sizes.
- C. Operating and Maintenance Data: For laundry equipment to include in operation and maintenance manuals. Submit Parts Manuals for laundry equipment.
 - 1. Include names, addresses, and phone numbers of service agencies to service various items of equipment.
- D. Sample Warranty: Special warranty.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: Factory trained and approved for installation of specified equipment with minimum two years' experience installing similar equipment.
- B. Manufacturer's Representative: Engage manufacturer's representative to supervise installation and hook-up of laundry equipment.
- C. Regulatory Requirements: Comply with provisions of the following product certifications:
 - 1. NFPA: Provide electrical appliances listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
 - 2. ANSI: Provide gas-burning appliances that comply with ANSI Z21 Series standards.
 - 3. UL and NEMA: Provide electrical components required as part of laundry equipment that are listed and labeled by UL and that comply with applicable NEMA standards.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver factory-assembled units, individually factory packaged and protected. Label with manufacturer's name, product name, and model number.

1.6 PROJECT CONDITIONS

- A. Environmental Limitations: Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

1.7 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace parts of equipment assembly that fail within specified warranty period. Chemical damage is excluded from warranty coverage.
1. Warranty Period: One year from date of original purchase.
- B. Special Warranty: Manufacturer agrees to repair or replace shell, welded frame assembly, basket, shaft assembly, bearings and seals that fail within specified warranty period. Chemical damage is excluded from warranty coverage.
1. Warranty Period: Five years from date of original purchase.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide specified products or approved substitutions from one of the following:
- a. American Dryer Corporation.
 - b. Belco Athletic Laundry Equipment, Inc.
 - c. Continental Girbau, Inc.
 - d. Huebsch; Alliance Laundry Systems LLC.
 - e. LaundryLux.
 - f. Maytag Commercial Laundry.
 - g. Pellerin Milnor Corp.
 - h. Speed Queen; Alliance Laundry Systems LLC.

2.2 PERFORMANCE REQUIREMENTS

- A. Safety Standards:
1. Washer/Extractor shall be approved for school use by ETL or another acceptable independent testing laboratory. Door lock shall prevent machine operation until door is securely locked.
 2. Dryer shall be approved for school use by CSA and CE or another acceptable independent testing laboratory.
- B. Extraction Force: Maximum of 90 G.

- C. Drain Valve: Designed for overnight soaking in washer/extractor.

2.3 LAUNDRY EQUIPMENT

A. Commercial-Grade Athletic Washer-Extractor:

1. Basis-of-Design Product: Subject to compliance with requirements, provide Belco 45 Lb. Washer by Belco Athletic Laundry Equipment, Inc. or approved substitution.
2. Maximum Capacity: 40-45 pounds.
3. Cylinder Size: 25-3/4 inches by 21-1/4 inches.
4. Gross Cylinder Volume: 6.4 cubic feet.
5. Wash Speed: 44 rpm.
6. Extract: 525 rpm.
7. Extract G Forces: 100.
8. Drain Valve: 3 inches.
9. Inlet Valve: 0.75 inches.
10. Overall Width: 29-1/2 inches.
11. Overall Depth: 34-5/8 inches.
12. Overall Height: 52-1/2 inches.
13. Approximate Net Weight: 502 pounds.
14. Electrical Characteristics:
 - a. Phase: Single phase.
 - b. Volts: 208 V.
 - c. Hertz: 60.
 - d. Fuse Amps: 7.
 - e. FRN15 Circuit Breaker Amps: 20.
 - f. Motor: 3 hp.

B. Commercial-Grade Athletic Dryer: Provide units with low dryer temperature setting of 100 degs. F.

1. Basis-of-Design Product: Subject to compliance with requirements, provide Belco Athletic Dryer by Belco Athletic Laundry Equipment, Inc. or approved substitution.
2. Maximum Capacity: 50 pounds .
3. Basket Size: 33 inches by 38 inches.
4. Basket Volume: 18.3 cubic feet.
5. Air Flow: 750 cfm.
6. Overall Width: 38-1/4 inches.
7. Overall Depth: 50 inches.
8. Overall Height: 72 inches.
9. Approximate Net Weight: 650 pounds .
10. Electrical Characteristics:
 - a. Phase: Polyphase.
 - b. Volts: 208 V.
 - c. Hertz: 60.
 - d. Motor: 3/4 hp.
11. Heating/Drying: Natural Gas.

PART 3 - EXECUTION**3.1 EXAMINATION**

- A. Examine walls and floors, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
- C. Examine roughing-in for electrical power plumbing and mechanical systems to verify actual locations of connections before installation of laundry equipment.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install laundry equipment in strict accordance with manufacturer's written instructions and approved Shop Drawings. Comply with requirements for anchorage and grouting.
- B. Comply with requirements specified in Divisions 22 and 23 Sections for connecting laundry equipment to plumbing and mechanical system(s).
- C. Comply with requirements specified in Division 26 Sections for connecting laundry equipment to electrical power system.
- D. Scope of Installation services:
 - 1. Set equipment in place and leave ready for final hook-up.
 - 2. Furnish Integral equipment required for proper operation of laundry equipment.
 - 3. Provide and install piping, fittings, valves and material required for final hook-up and perform final hook-up per manufacturer's and code requirements.
 - 4. Furnish wiring, conduit, fittings, all accessories and materials required for final hook-up and perform final hook-up per manufacturer's and code requirements.

3.3 ADJUSTING AND CLEANING

- A. Test, adjust, and verify operation of each appliance. Repair or replace items found to be defective or operating below rated capacity.
- B. Verify that controls and safety features are functioning.
- C. Repair or replace damaged parts, dents, buckles, abrasions, and other defects affecting appearance or serviceability. Touch up factory-applied finishes to restore damaged or soiled areas.

3.4 DEMONSTRATION

- A. Owner Instruction: Instruct Owner in proper operation and maintenance for each item of laundry equipment.

END OF SECTION 112300

SECTION 113013 - RESIDENTIAL APPLIANCES**PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Cooking appliances.
 - 2. Refrigeration appliances.
 - 3. Cleaning appliances.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include installation details, material descriptions, dimensions of individual components, and finishes for each appliance.
 - 2. Include rated capacities, operating characteristics, electrical characteristics, and furnished accessories.
- B. Product Schedule: For appliances. Use same designations indicated on Drawings.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For manufacturer.
- B. Product Certificates: For each type of appliance.
- C. Sample Warranties: For manufacturers' special warranties.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For each residential appliance to include in operation and maintenance manuals.

1.6 WARRANTY

- A. Special Warranties: Manufacturer agrees to repair or replace residential appliances or components that fail in materials or workmanship within specified warranty period except as qualified below:
 - 1. Warranty Period: Two years from date of Substantial Completion.

-
- B. Electric Range: Full warranty, including parts and labor, for on-site service on surface-burner elements.
 - 1. Warranty Period: Two years from date of Substantial Completion.
 - C. Refrigerator/Freezer Icemaker, Sealed System: Full warranty, including parts and labor, for on-site service on the product.
 - 1. Warranty Period for Sealed Refrigeration System: Two years from date of Substantial Completion.
 - 2. Warranty Period for Other Components: Two years from date of Substantial Completion.
 - D. Dishwasher: Full warranty, including parts and labor, for on-site service on the product.
 - 1. Warranty Period for Deterioration of Tub and Metal Door Liner: Three years from date of Substantial Completion.
 - 2. Warranty Period for Other Components: Two years from date of Substantial Completion.
 - E. Clothes Washer: Full warranty, including parts and labor, for on-site service on the product.
 - 1. Warranty Period: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations: Obtain residential appliances from single source and each type of residential appliance from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

- A. Electrical Appliances: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Accessibility: Where residential appliances are indicated to comply with accessibility requirements, comply with applicable provisions in the DOJ's 2010 ADA Standards for Accessible Design and ICC A117.1.

2.3 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide Basis-of-Design product or a comparable product by one of the following:
 - 1. GE Appliances.
 - 2. Frigidaire.
 - 3. KitchenAid.
 - 4. Maytag Corporation.
 - 5. Summit Appliance.

2.4 REFRIGERATOR/FREEZERS

- A. Refrigerator/Freezer (REF): Two-door refrigerator/freezer with freezer on top and complying with AHAM HRF-1.
1. Basis-of-Design Product: Frigidaire; Model FFHT1831QE.
 2. Type: Freestanding.
 3. Dimensions:
 - a. Width: 30 inches.
 - b. Depth: 30-1/8 inches.
 - c. Height: 66-5/8 inches.
 4. Storage Capacity:
 - a. Refrigeration Compartment Volume: 14 cu. ft.
 - b. Freezer Volume: 4 cu. ft.
 - c. Shelf Area: Two adjustable glass shelves, 22.6 sq. ft.
 5. General Features:
 - a. Door Configuration: Overlay.
 - b. Separate temperature controls for each compartment.
 6. Refrigerator Features:
 - a. Interior light in refrigeration compartment.
 - b. Compartment Storage: Vegetable crisper and meat compartment.
 - c. Door Storage: Modular compartments and gallon-milk-container storage.
 - d. Temperature-controlled meat/deli bin.
 7. Freezer Features: One freezer compartment(s) with door(s).
 - a. Automatic defrost.
 - b. Interior light in freezer compartment.
 - c. Provide with optional ice maker.
 8. ENERGY STAR: Provide appliances that qualify for the EPA/DOE ENERGY STAR product-labeling program.
 9. Appliance Color: Ebony.
- B. Refrigerator (ADA Undercounter Medical Ref): One-door, undercounter refrigerator and complying with AHAM HRF-1 and ADA.
1. Basis-of-Design Product: Summit Appliances; accucold Model FF511LBIMEADA.
 2. Type: Undercounter.
 3. Dimensions:
 - a. Width: 19.25 inches.
 - b. Depth: 22.25 inches.
 - c. Height: 32 inches.
 4. Storage Capacity:
 - a. Refrigeration Compartment Volume: 4.1 cu. ft.
 - b. Shelf Area: Three adjustable wire shelves.
 5. General Features:

- a. Door Configuration: Overlay.
6. Refrigerator Features:
 - a. Interior light in refrigeration compartment.
7. Front Panel(s): White.

2.5 ICEMAKERS

A. Icemaker (ADA Ice Maker):

1. Basis-of-Design Product: Summit Appliances; Model BIM44GADA.
2. Type: Undercounter.
3. Dimensions:
 - a. Width: 14.5 inches.
 - b. Depth: 23.5 inches.
 - c. Height: 32.38 inches.
4. Ice Capacity:
 - a. Production: 50 lb per day.
 - b. Storage: 25 lb.
5. Features:
 - a. Door Configuration: Overlay.
 - b. Automatic defrost.
 - c. Automatic shutoff.
 - d. Defrost drain with pump.
6. Front Panel: Stainless steel.

2.6 DISHWASHERS

A. Dishwasher (ADA DW): Complying with AHAM DW-1.

1. Basis-of-Design Product: Frigidaire; Model FDB2410HIB.
2. Type: Built-in undercounter.
3. Dimensions:
 - a. Width: 24 inches.
 - b. Depth: 24 inches.
 - c. Height: 32-1/2 to 35-1/4 inches.
4. Sound Level: Maximum 56 dB.
5. Tub and Door Liner: Stainless steel with sealed detergent and automatic rinsing-aid dispensers.
6. Rack System: Nylon-coated sliding dish racks, with removable cutlery basket.
7. Controls: Touch-pad controls with five wash cycles and hot-air and heat-off drying cycle options.
8. ENERGY STAR: Provide appliances that qualify for the EPA/DOE ENERGY STAR product-labeling program.
9. Appliance Color: Black.

2.7 CLOTHES WASHERS AND DRYERS**A. Clothes Washer (Washer 1): Complying with AHAM HLW-1.**

1. Basis-of-Design Product: Frigidaire; Model FFTW1001PW.
2. Type: Freestanding, top-loading unit.
3. Dimensions:
 - a. Width: 27 inches.
 - b. Depth: 29 inches.
 - c. Height: 42-1/2 inches.
4. Drum: Perforated stainless steel.
5. Controls: Rotary-dial controls for water-fill levels, wash/rinse water temperatures, and variable-speed and fabric selectors.
 - a. Wash Cycles: Seven wash cycles, including regular, delicate, and permanent press.
 - b. Wash Temperatures: Three settings.
6. Electrical Power: 120 V, 60 Hz, 1 phase, 15 A.
7. Motor: Manufacturer's standard with built-in overload protector.
8. Features:
 - a. Agitator: Center spindle.
 - b. Unbalanced-load compensator.
 - c. Inlet Hoses: Minimum length 60 inches.
 - d. Drain Hoses: Minimum length 48 inches.
 - e. Self-leveling legs.
 - f. Automatic dispenser for bleach and fabric softener.
 - g. Spin-cycle safety switch.
 - h. End-of-cycle signal.
 - i. Extra-rinse option.
 - j. Delay-wash option.
 - k. Electronic temperature control.
 - l. Water levels automatically set.
9. ENERGY STAR: Provide appliances that qualify for the EPA/DOE ENERGY STAR product-labeling program.
10. Appliance Finish: Enamel.
 - a. Color: White.

B. Clothes Dryer (Dryer 1): Complying with AHAM HLD-1.

1. Basis-of-Design Product: Frigidaire; Model FFRE1001PW.
2. Type: Freestanding, frontloading, electric unit.
3. Dimensions:
 - a. Width: 27 inches.
 - b. Depth: 29 inches.
 - c. Height: 42-1/2 inches.
4. Drum: Perforated porcelain-enameled steel.
 - a. Capacity: 7.0 cu. ft.

5. Controls: Rotary-dial controls for drying cycle, temperatures, and fabric selectors.
6. Electric-Dryer Power: 240 V, 60 Hz, 1 phase, 30 A.
7. Features:
 - a. Removable lint filter.
 - b. End-of-cycle signal.
 - c. Self-leveling legs.
8. Appliance Finish: Enamel.
 - a. Color: White.

2.8 GENERAL FINISH REQUIREMENTS

- A. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, power connections, and other conditions affecting installation and performance of residential appliances.
- B. Examine roughing-in for piping systems to verify actual locations of piping connections before appliance installation.
- C. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install appliances according to manufacturer's written instructions.
- B. Built-in Equipment: Securely anchor units to supporting cabinets or countertops with concealed fasteners. Verify that clearances are adequate for proper functioning and that rough openings are completely concealed.
- C. Freestanding Equipment: Place units in final locations after finishes have been completed in each area. Verify that clearances are adequate to properly operate equipment.
- D. Range Anti-Tip Device: Install at each range according to manufacturer's written instructions.

3.3 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections with the assistance of a factory-authorized service representative:
 - 1. Perform visual, mechanical, and electrical inspection and testing for each appliance according to manufacturers' written recommendations. Certify compliance with each manufacturer's appliance-performance parameters.
 - 2. Leak Test: After installation, test for leaks. Repair leaks and retest until no leaks exist.
 - 3. Operational Test: After installation, start units to confirm proper operation.
 - 4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and components.
- B. An appliance will be considered defective if it does not pass tests and inspections.
- C. Prepare test and inspection reports.

3.4 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain residential appliances.

END OF SECTION 113013

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SECTION 114000 - FOOD SERVICE EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. The general provisions of the contract including general and supplementary conditions and general requirements apply to the work specified in this section.

1.2 RELATED WORK SPECIFIED ELSEWHERE

- A. Plumbing: Refer to Division 22, including:
 - 1. Rough-in piping for gas and water supply and waste lines.
 - 2. Piping for supply and waste lines.
 - 3. Traps, grease traps, line strainers, tail pieces, valves, stops, shut-offs and miscellaneous fittings required for complete installation.
 - 4. Final connections.
 - 5. Indirect drains for sink compartments.
- B. Mechanical: Refer to Division 23.
 - 1. Roof mounted fans and connecting ductwork not shown as part of the kitchen equipment.
 - 2. Final connections, including approved welded duct connections to hoods.
- C. Electrical: Refer to Division 26, including:
 - 1. Rough-in conduit, wiring, line and disconnect switches, safety cut-offs and fittings, control panels, fuses, boxes and fittings required for complete installation.
 - 2. Final connections, including mounting and wiring of switches furnished as part of the food service equipment (unless otherwise indicated on the drawings).

1.3 WORK INCLUDED THIS SECTION:

- A. Furnish and install all food service equipment as specified herein, including that which is reasonably inferred, with all related items necessary to complete work shown on contract drawings and/or required by these specifications.
- B. Electrical Work:
 - 1. Interwiring of food service equipment between components within equipment, such as heating elements, switches, thermostats, motors, etc., complete with junction box as is applicable, ready for final connection.
 - 2. Voltages shall be as indicated on contract drawings. Any differences in electrical characteristics at job site from those shown on contract documents must be submitted to Architect for consideration prior to ordering equipment.
- C. Plumbing Work:
 - 1. Furnish all equipment with faucets, sink waste assemblies, and trim as specified in this section.

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2. Other than sink compartments, extend all indirect waste lines to nearest floor receptor. All such drain lines to be properly sized. Drain shall terminate with proper air gap above flood rim of floor receptor. Drain lines to be copper with silver paint unless specified otherwise. Drain lines in public areas to be chrome plated where exposed to view.

1.4 QUALITY ASSURANCE

- A. It is required that all custom fabricated equipment such as food serving units, tables, sinks, counter tops, etc., be manufactured by a food service equipment fabricator who has the plant, personnel and engineering equipment required. Such manufacturer shall be subject to approval of Architect.

All work in above category shall be manufactured by one manufacturer and shall be of uniform design and finish.

- B. Manufacturer of this equipment must be able to show that he is now and for the past five years has been engaged in manufacture or distribution of equipment, as required under this contract, as his principal product.
- C. Manufacturer of equipment herein specified shall be a recognized distributor for items of equipment specified herein which are of other manufacture than his own.
- D. Only manufacturers who can meet the foregoing qualifications will be acceptable.
- E. All work shall be done in an approved workmanlike manner, to the complete satisfaction of the Owner.

1.5 SUBMITTALS

- A. Submit shop drawings as required by General Conditions. All shop drawings and rough-in drawings shall be CAD drafted, and must be submitted in .DWF or .PDF electronic format. Multiple hard copies are not acceptable.
- B. Shop drawings and bound brochures covering manufactured or "buy-out" items covering all work and equipment included in this contract shall be submitted to Architect as soon as possible after award of contract. After approval, Food Service Equipment Contractor shall furnish to Architect electronic files of shop drawings and brochures, corrected as required by virtue of review comments, for distribution to various interested trades on project. All costs of reproduction and submission shall be part of contract.

Bound brochure and cut sheet submittals must be copied to Owner for review and comment.

- C. Provide fully dimensioned rough-in plans at 1/4" scale, consisting of a separate drawing for each discipline. Each drawing shall show equipment shaded down 50%. Rough-in set shall include all required mechanical, electrical, plumbing, services for equipment and dimensioned rough-in location for same. Rough-in locations shown shall make allowances for required traps, switches, etc., thereby not requiring interpretation or adjustment on the part of other Contractors.

Drawings shall indicate dimensions for floor depressions, wall openings, etc., for equipment.

Food Service Equipment Contractor shall visit site to verify all rough-in and sleeve locations prior to installation of finished floors and shall cooperate with other Contractors involved in proper location of same. Food Service Equipment Contractor shall be responsible for any required relocations of rough-in due to errors or inaccuracies on those rough-in plans which he prepares.

- D. Rough-in plans shall include all required services which relate to equipment but which may not directly connect thereto, such as convenience outlets at walls, hose stations, floor drains, etc.
- E. Rough-in plans shall also include all required outlet services for equipment which is designated on drawing schedule, even though such equipment may not be included in this contract.
- F. Fully dimensioned and detailed shop drawings of custom fabricated equipment items shall be submitted, drawn at 3/4" and 1 - 1/2" scale for plans, elevations and sections respectively.

Drawings shall show all details of construction, installation, and relation to adjoining and related work where cutting or close fitting is required. Drawings shall show all reinforcements, anchorage, and other work required for complete installation of all fixtures.

- G. Do not begin fabrication of custom manufactured equipment until approvals of shop drawings have been received and until field measurements have been taken by Food Service Equipment Contractor, where such measurements are necessary to assure proper conformance with intent of contract drawings and specifications.
- H. Make field measurements, giving due consideration to any architectural, mechanical, or structural discrepancies which may occur during construction of building. No extra compensation will be allowed for any difference between actual measurements secured at job site and dimensions indicated on contract drawings. Any differences which may be found at job site during field measurements shall be submitted to Architect for consideration before proceeding with fabrication of equipment.
- I. Submit illustrative brochures for manufactured or "buy-out" equipment items, complete with illustrations, specifications, line drawings, rough-in requirements, and list of accessories or other specified additional requirements. Brochures shall be bound and shall include data on all equipment which is to be provided, arranged in numerical sequence which conforms to item numbers of specifications. Omission of data does not reduce obligation to provide items as specified.
- J. Approval of shop schedules and brochures will be in general and shall be understood to mean that Architect has no objection to use of materials or processes shown. Approval does not relieve Food Service Equipment Contractor from responsibility for errors, omissions, or deviations from contract requirements.

1.6 SUBSTITUTIONS - STANDARDS

- A. Refer to Instructions to Bidders and Division 01 for requirements.
- B. All unspecified substitutions after bid must be submitted to Owner for written approval prior to acceptance.

1.7 DRAWINGS

- A. Drawings which constitute part of contract documents indicate general arrangement of piping and location of equipment. Should it be necessary to deviate from arrangement indicated in order to meet structural conditions, make such deviations without expense to Owner.
- B. Specifications and drawings are reasonably exact, but their extreme accuracy is not guaranteed. Drawings and specifications are for assistance and guidance of Contractor, and exact locations, distances and levels shall be governed by the building.

1.8 MANUFACTURER'S DIRECTIONS

- A. Follow manufacturer's directions in all cases where manufacturers of articles used in this contract furnish directions or prints covering points not shown on drawings or specifications.

1.9 INDUSTRY STANDARDS

- A. Electric operated and/or heated equipment, fabricated or otherwise, shall conform to latest standards of National Electric Manufacturers Association and of Underwriters Laboratories, Inc., and shall bear the U.L. label.
- B. Cooking and hot food holding equipment shall meet minimum construction standards as noted by NSF #4.
- C. Refrigeration equipment shall meet minimum construction standards as noted by NSF #7.
- D. Items of food service equipment furnished shall bear the N.S.F. seal.
- E. Food service equipment shall be installed in accord with N.S.F. standards.
- F. Work and materials shall be in compliance with requirements of applicable codes, ordinances and regulations, including but not limited to those of Occupational Safety and Health Act (OSHA), National Fire Protection Association, State Fire Marshal, State Accident Commission, U.S. Public Health Service, State Board of Health, local health codes, etc.
- G. No extra charge will be paid for furnishing items required by regulations, even though such may not be shown on drawings or called for in these specifications.
- H. Rulings and interpretations of enforcing agencies shall be considered part of regulations.

PART 2 - PRODUCTS

2.1 MANUFACTURED EQUIPMENT

- A. All like types of equipment such as all refrigerated and heated cabinets, all ovens, and all mixers shall be by the same manufacturer.

Bid Set

- B. Except as may be specified otherwise under individual item specifications in "Equipment Schedule", all items of standard manufactured equipment shall be complete in accord with manufacturer's standard specification for specific unit or model called for, including finishes, components, attachments, appurtenances, etc., except as follows:
- C. All items of standard equipment shall be that manufacturer's latest model at time of delivery.
- D. Substitutions for manufactured equipment specified will be accorded consideration under terms set forth in "Substitutions - Standards".

2.2 FABRICATED EQUIPMENT

- A. Stainless steel shall be U.S. standard gauges as called for, 18-8, Type 302, or Type 304, No. 4 finish.
- B. Galvanized iron shall be Armco or equal. Framework of galvanized iron shall be welded construction, having welds smooth, and where galvanizing has been burned off, touched up with high grade aluminum bronze.
- C. Legs and crossrails shall be continuously welded, unless otherwise noted, and ground smooth.
- D. Bottom of legs at floor shall be fitted with sanitary stainless-steel bullet type foot, with not less than 2" adjustment.
- E. Legs shall be fastened to equipment as follows:
 - 1. To sinks by means of closed gussets. Gussets shall be stainless steel, reinforced with bushing, having set screws for securing legs.
 - 2. To tables and drainboards with closed gussets which shall be welded to stainless steel hat sections or channels, 14 gauge or heavier, exposed hat sections having closed ends. Bracing shall be welded to underside of tops.
- F. Closed gussets shall be a 3" minimum diameter at top, continuously welded to frame members or to sink bottom.
- G. Sinks, unless otherwise specified, shall be furnished with rotary type waste outlets, without connected overflows: Atlantic Brass Works Model 772-RB; Fisher Brass Foundry Model 250A; T&S; or approved equal. Where exposed, furnish wastes chromium plated.
- H. Rolls shall be 1 1/2" diameter, except as detailed contrary, with corners bullnosed, ground and polished.
- I. Seams and joints shall be shop welded. Welds to be ground smooth and polished to match original finish. Materials 18 gauge or heavier shall be welded.
- J. Metal tops shall be one-piece welded construction, unless specified otherwise, reinforced on underside with stainless steel hat sections or channels welded in place. Crossbracing to be not more than 30" on centers.

Bid Set

- K. Drawers to be 18-gauge stainless steel channel type housing and drawer cradle, both housing and cradle being reinforced and welded at corners, housing being secured to underside of table top, and both housing and cradle being sized for and fitted with 18-gauge 20" x 20" x 5" deep stainless-steel drawer insert having coved corners. Drawer insert shall be easily removable from cradle without tools or having to remove entire drawer. Drawers to have stainless steel fronts. Provide with recessed flush type stainless steel pulls.
- L. Support drawer on fabricated 14-gauge stainless steel interlocking channel solid delrin ball bearing wheels. Support slides shall be load rated at 200 lb. per pair. Slides to be Component Hardware S52 Series.
- M. Enclosed cabinet type bases shall be made of formed steel sheets reinforced with formed steel sections to create a rigid structure. Steel shall be 18-gauge or heavier. Base shall be welded construction throughout with front rails, mullions, etc., welded to appear as one-piece construction. All exposed sections of interior and exterior shall be stainless steel, and unexposed sections shall be galvanized steel, unless specified contrary.
- N. Doors shall be double cased, unless otherwise noted. Outer pans shall be 18-gauge with corners welded, ground smooth, and polished. Inner pans shall be 20 gauge, fitted tightly into outer pan with sound-deadening material such as Celotex used as core. Two pans shall be tack-welded together with seam solder filled.
- Door shall finish approximately 3/4" thick and shall be fitted with flush recessed type stainless steel door pulls. Single pan type doors shall be reinforced and stiffened with closed hat sections.
- O. Hinged doors shall be flush type mounted on heavy duty stainless steel piano or concealed hinges.
- P. Hardware shall be solid materials and except where unexposed or specified contrary, of cast brass, chrome plated. Stampings are not acceptable. Identify all hardware with manufacturer's name and number so that broken or worn parts may be ordered and replaced.
- Q. Fabricate sink compartments with fully coved vertical and horizontal corners. Multiple compartment partition to be double thickness, continuously welded where sheets join at top. Front of multiple compartment sinks to be continuous on exterior. Bottoms shall be creased to drain.
- R. Ends of all fixtures, splashbacks, shelves, etc., shall be finished flush to walls or adjoining fixtures.
- S. Dishtables, draintables, splashbacks and turned-up edges shall have radius bends in all horizontal and vertical corners, coved at intersections.
- T. Rounded and coved corners or radius bends shall be 1/2" radius or longer.
- U. Shelves in fixtures with enclosed bases shall be turned up on back and sides and feathered slightly to insure tight fit to enclosure panels. Bottom shelves shall be made for easy removal unless otherwise noted.
- V. Undersides of tops to be coated with heavy-bodied resinous material compounded for permanent, non-flaking adhesion to metal, 1/8" thick, applied after reinforcing members have been installed, drying without dirt-catching crevices.

Bid Set

W. Metal components, unless specified or noted otherwise, to be the following gauges:

Counter and table tops	14 ga.	Stainless Steel
Wall shelves	16 ga.	Stainless Steel
Pipe leg undershelves	16 ga.	Stainless Steel
Drawer fronts	16 ga.	Stainless Steel
Enclosed cabinet bases	18 ga.	Stainless Steel
Sinks and drainboards	14 ga.	Stainless Steel
Legs 1 - 5/8" diameter	16 ga.	Stainless Steel
Doors (outer pan)	18 ga.	Stainless Steel
Doors (inner pan)	20 ga.	Stainless Steel

2.3 HEATING EQUIPMENT

- A. Wherever electric heating equipment or thermostat control for such equipment is specified, it shall be complete, and of the materials, size and rating specified within equipment item or details. All such equipment shall be designed and installed to be easily cleaned or to be easily removed for cleaning.
- B. Electrical appliances or heating element circuits of 120 volts shall not exceed 1650 watts, unless specifically shown contrary.

2.4 SWITCHES AND CONTROLS

- A. Food Service Equipment Contractor shall supply on each motor driven appliance or electrical heating unit suitable control switch of proper type in accord with Underwriter's Code.
- B. All internal wiring for fabricated equipment items included, all electrical devices, wiring, controls, switches, etc., built into or forming an integral part of these items shall be furnished and installed by Food Service Equipment Contractor in his factory or building site with all items complete to junction box for final connection to building lines by Electrical Contractor.
- C. Provide standard 3-prong plugs to fit "U" slot grounding type receptacles, similar to No. 5262, for all equipment items powered by plugging into 110-120 volts, single phase AC. Also, provide suitable length 3-wire cord for equipment.

2.5 CONNECTION TERMINALS

- A. All equipment shall be complete with connection terminals as standardized by equipment manufacturers, except where specified otherwise.

2.6 LOCKS

- A. Fit all doors for reach-in refrigerated compartments with locking type latches. Provide master keys.

2.7 GAS EQUIPMENT

- A. Equipment to be suitable for use with gas available at site, and to be furnished by F.S.E.C. with pressure regulators designed to work with incoming pressure.

2.8 GAS QUICK DISCONNECTS

- A. Where specified, gas quick disconnects shall be furnished complete with gas valve, gas connector hose, quick disconnect fitting elbows, and restraining cable, all AGA approved. Gas hose shall be flexible, braided or corrugated stainless steel with smooth plastic exterior coating or sleeve of heat shrink tubing (provide on all caster mounted gas equipment).
- B. All mobile cooking equipment requiring surface protection by fire suppression nozzles shall be secured in place by stainless steel cradle type wheel stops as manufactured by the Eagle Group or Select Stainless products. Plastic wheel stops are not acceptable.

PART 3 - EXECUTION

3.1 GENERAL

- A. Work under this contract and covered under this section of specifications includes but is not limited to:
 - 1. Cutting of holes and/or ferrules on equipment for piping, drains, electrical outlets, conduits, etc. as required to coordinate installation of food service equipment with work of other Contractors on project.
 - 2. Field checking of building and rough-in requirements, and submission of brochures and shop drawings, all as required hereinbefore under "Submittals".
 - 3. Repair of all damage to premises as result of this installation, and removal of all debris left by those engaged in this installation.
 - 4. Having all food service equipment fixtures completely cleaned and ready for operation when building is turned over to Owner.

3.2 INSTALLATION PROCEDURES

- A. Food Service Equipment Contractor shall make arrangements for receiving his custom fabricated and "buy out" equipment and shall make delivery into building as requisitioned by his installation superintendent. He shall not consign any of his equipment to Owner or to any other Contractor unless he has written acceptance from them and has made satisfactory arrangements for the payment of all freight and handling charges.
- B. Food Service Equipment Contractor shall deliver all of his custom fabricated and "buy out" equipment temporarily in its final location, permitting Trades to make necessary arrangements for connection of service lines; he shall then move equipment sufficiently to permit installation of service lines, after which he shall realign his equipment level and plumb, making final erection as shown on contract drawings.
- C. All portable or counter mounted equipment weighing in excess of 25 pounds shall be mounted on 4" stainless steel adjustable legs.

- D. This Contractor shall coordinate his work and cooperate with other trades working at site toward the orderly progress of the project.
- E. Architect or Owner's Agent shall have access at all times to plant or shop in which custom fabricated equipment is being manufactured, from time contract is let until equipment is shipped, in order that progress of work can be checked, as well as any technical problem which may arise in coordination of equipment with building. Any approval given at this point of manufacture shall be tentative, subject to final inspection and test after complete installation.
- F. Food Service Equipment Contractor shall assist Architect, Owner, and/or Owner's Agent in making any desired tests during or prior to final inspection of equipment; he shall remove immediately any work or equipment rejected by Architect, Owner, and/or Owner's Agent, replacing same with work conforming with contract requirements, and shall reimburse mechanical and/or other contractors involved for extra work made necessary by such replacement.
- G. This Contractor shall keep premises free from accumulation of his waste material and rubbish, and at completion of his work shall remove his rubbish and implements, leaving areas of his work broom clean.
- H. This Contractor shall provide and maintain coverings or other approved protection for finished surfaces and other parts of his equipment subject to damage during and after erection. After removal of protective coverings, all field joints shall be grounded, polished and entire work shall be thoroughly cleaned and polished.

3.3 TRIMMING AND SEALING EQUIPMENT

- A. Seal completely spaces between all units to walls, ceilings, floors, and adjoining (not portable) units with enclosed bodies against entrance of food particles or vermin by means of trim strips, welding, soldering, or commercial joint material best suited to nature of equipment and adjoining surface material.
- B. Close ends of all hollow sections.
- C. Equipment butting against walls, ceilings, floor surfaces and corners to fit tightly against same; backsplashes or risers which fit against wall to be neatly scribed and sealed to wall with DowCorning # 732 RTV or General Electric clear silicone sealant, wiping excess sealant out of joint to fillet radius. Where required to prevent shifting of equipment and breaking wall seal, anchor item to floor or wall.
- D. Treat enclosed spaces (inaccessible after equipment installation) for vermin prevention in accord with industry practice.

3.4 TESTING AND DEMONSTRATION OF EQUIPMENT

- A. After completion of installation, all equipment using water, gas, and electricity shall be performance inspected and tested by factory certified service agent, including wet test of hood fire suppression systems, if so required. Food Service Equipment Contractor shall document that these

inspections have been performed prior to scheduling demonstrations and Owner acceptance of equipment.

- B. Food Service Equipment Contractor shall arrange to have all manufactured, mechanically operated equipment furnished under this contract demonstrated by authorized representatives of equipment manufacturers, these representatives to instruct Owner's designated personnel in use, care and maintenance of all items of equipment after same are in working order. Demonstration and instruction shall be held on dates designated by Owner.
- C. Food Service Equipment Contractor shall provide a competent service representative to be present when installation is put into operation.

3.5 EQUIPMENT HANDLING AND STORAGE

- A. Deliver equipment to site, properly crated and protected, and store in safe place, protected from damage until time for installation.

3.6 GUARANTEE

- A. Special Project Warranty: Provide written warranty, signed by manufacturer, agreeing to replace/repair, within warranty period, with inadequate and defective materials and workmanship, including leakage, breakage, improper assembly, or failure to perform as required, provided manufacturer's instructions for handling, installing, protecting, and maintaining units have been adhered to during warranty period. This warranty shall be in addition to, and not limitation of, the rights the Owner may have against the Contractor under the Contract Documents.

- B. Warranty Period:

1 year from date of Substantial Completion, all new equipment furnished. However, manufacturer's warranty shall prevail when the period is longer than one year.

5-year warranty period on refrigeration compressors.

10-year warranty period on walk-in panels.

3.7 OPERATING AND MAINTENANCE MANUALS

- A. After completion of installation, Food Service Equipment Contractor shall present to Owner three sets of all operating and maintenance manuals, covering all mechanically operated equipment furnished under this contract, each set being neatly bound in looseleaf binder having durable cover.
- B. Include in each binder a list of names, addresses and telephone numbers of local servicing agencies authorized to make necessary repairs and/or adjustments of equipment furnished under this contract.

PART 4 – EQUIPMENT SCHEDULE

Bid Set

ITEM 01 COLD STORAGE ASSEMBLY QUANTITY AS SCHEDULED

Provide pre-fabricated cold storage room assembly of size and shape shown on plan and detail drawings. Exact overall size to be field verified prior to fabrication.

A. Insulation:

Panels shall be insulated with 4" thick urethane, foamed or poured in place using HCPC (no CFC) blowing agent. Foam shall be 2.25 lb. density, 95% closed cell. Panels shall meet ASTM E-84 (UL-723) and be listed by Underwriters laboratories. Panels shall have a maximum flame spread of 25, maximum smoke developed of 450 minimum. Flash ignition of 600 degrees and minimum self-ignition of 800 degrees F.

B. Coved corners:

Assembly shall be constructed so that all interior wall, floor and ceiling intersections shall comply with N.S.F. requirements.

C. Cam lock fasteners:

All panel intersections and wall, floor and ceiling intersections shall be secured by cam lock fasteners.

D. Finishes:

Exterior and interior finishes shall be as shown on drawings.

E. Doors:

Door size and finish shall be as shown on drawings, and shall be furnished complete with sill wiper gasket, lift type hinges.

Exterior door to be equipped with automatic door closer.

Freezer door to be equipped with perimeter heat.

All doors to be equipped with heavy duty padlocking pull-handle lever, with inside safety release.

F. Thermometers:

Each compartment to be provided with exterior flush mounted thermometer mounted at eye level to each door. Provide remote read-out for freezer compartment at exterior cooler door.

G. Lights:

Each compartment to be furnished complete with manufacturer's standard light fixtures, with LED bulb, having protective cover, mounted and pre-wired to switch with pilot light in door section. Extra LED light fixtures as needed to provide 30-foot candles 30" above floor. Lights to be furnished and installed by this section.

H. Ceiling panels to be one piece, self-supporting and span full width of assembly.

I. Floor:

Recessed floor by Food Service Equipment Contractor, with quarry tile by G.C.

Reinforced floor panels to support minimum 1200 pounds per square foot.

The floor and ceiling shall have maximum length panels to span full length of box if possible, otherwise stagger joints so there are no common "four corner" intersections and no joints occurring in doorways.

J. Refrigeration System:

Shall be furnished by manufacturer as part of cold storage room assembly, provide each compartment with complete refrigeration system sized to maintain appropriate temperature.

Provide temperature alarm system with remote read-out and recording capability.

Condensing units to be air-cooled, remote. Units to have performance and wiring characteristics as scheduled on drawings. Refrigeration systems to be designed for use with R404A or R-507 refrigerant only.

Condensing units to be provided with painted galvanized steel all-weather housing, controls, and crankcase heaters, all suitable for outdoor conditions, and located as shown on drawings.

Unit coolers to be low-silhouette type, mounted at locations shown on drawings.

Performance and wiring characteristics to be as scheduled on drawings. Freezer system to be provided with timed electric defrost.

Evaporator drain lines to be provided by this section and extended to floor receptors outside assembly.

Freezer drain lines to be wrapped with heater cable and insulated with pre-molded foamed plastic insulation suitable for the application. Thickness as recommended by manufacturer.

Refrigerant piping to be ACR copper tubing, hard temper, with wrought fittings and silver solder joints. Insulate suction lines with pre-molded foamed plastic insulation, thickness as recommended by manufacturer for temperature and application.

Refrigeration systems to be provided with all required refrigerant piping, insulation, sight glass vibration eliminator, solenoid(s), dryer, suction line filter, expansion valve(s), thermostat(s), heat exchangers, and defrost timers, etc. as necessary for complete installation. Provide pump down control circuit consisting of thermostat and solenoid valve. All components including piping and insulation to be installed using accepted industry standards, manufacturer's instructions and first-class workmanship.

K. Miscellaneous:

Assembly to be installed on depressed building slab. See detail drawing.

Provide 1/8" diamond tread wainscott along exposed front exterior of assembly mounted from floor to 48" A.F.F.

Provide trim strips, closure panels, etc., as necessary to trim assembly to adjacent building surfaces.

Provide removable top closure panels with "C" channel rails. Lift-out panel sections to have turn-down edges for strength and are not to exceed 4'-0" in length.

Provide plastic strip curtains at door locations, transparent vinyl overlapping strips, aluminum bar hanging rod and bracket, suitable for low temperature application, as manufactured by Curtron, Flexstrip Products, Inc., or equal. Size to suit openings.

Provide heated pressure relief port in freezer.

Provide sleeves properly located for utility entrance, drain lines, and refrigeration lines, and after lines are installed, fill sleeves with spray foam compound, suitable for use in refrigerated spaces. Trim excess foam away and cover with stainless steel escutcheon.

Cold storage room shall be erected by factory trained, or factory approved installers or shall be supervised by factory personnel. Refrigeration systems shall be furnished by cold storage room manufacturer and installed by factory approved personnel. Shop drawing submittal shall indicate who the installer is, and a letter of approval shall accompany the submittal indicating the manufacturer's acceptance of the installers.

This specification does not constitute a complete description of cold storage assembly, also see plan and detail drawings.

Cold storage room assembly to be as manufactured by Bally, Imperial/Brown, or Thermokool complying with specifications and drawings.

ITEM 02A PLASTIC W/METAL FRAME SHELVING QUANTITY AS SCHEDULED

Provide four-tier polymer shelving unit complete with tubular uprights and having the following features:

- A. Arrange using quantity and size as shown on plan drawings.
- B. Open grid polymer with antimicrobial protection.
- C. Epoxy coat steel frame.
- D. (4) wedge connectors.
- E. Post, 74" high, for use with stem casters, epoxy coated steel with built in antimicrobial product protection.
- F. (4) Polymer Stem Caster:
 - Brake
 - 5" diameter
 - 1-1/4" wide face
 - -20° F to 120°F temperature range

-
- Polyurethane wheel tread
 - 300 lb. capacity
 - Donut bumpers

Shelving to be as manufactured by Metro, Model MQ1848G, Eagle Group, Cambro, or SPG.

ITEM 02B PLASTIC W/METAL FRAME SHELVING QUANTITY AS SCHEDULED

Provide four-tier polymer shelving unit complete with tubular uprights and having the following features:

- A. Arrange using quantity and size as shown on plan drawings.
- B. Open grid polymer with antimicrobial protection.
- C. Epoxy coat steel frame.
- D. (4) wedge connectors.
- E. Post, 74" high, for use with stem casters, epoxy coated steel with built in antimicrobial product protection.
- F. (4) Polymer Stem Caster:
 - Brake
 - 5" diameter
 - 1-1/4" wide face
 - -20° F to 120°F temperature range
 - Polyurethane wheel tread
 - 300 lb. capacity
 - Donut bumpers

Shelving to be as manufactured by Metro, Model MQ1860G, Eagle Group, Cambro, or SPG.

ITEM 02C PLASTIC W/METAL FRAME SHELVING QUANTITY AS SCHEDULED

Provide four-tier polymer shelving unit complete with tubular uprights and having the following features:

- A. Arrange using quantity and size as shown on plan drawings.
- B. Open grid polymer with antimicrobial protection.
- C. (4) wedge connectors.
- D. Polymer Trilobal Post:
 - 74" high,
 - For use with stem casters,
 - Adjusts at 1" increments,
 - Corrosion proof all polymer construction
 - Built-in antimicrobial product protection.

- E. (4) Stem Caster:
- Brake
 - 5" diameter
 - 1-1/4" wide face
 - High modulus donut wheel tread
 - 300 lb. capacity
 - Donut bumpers

Shelving to be as manufactured by Metro, Model MQ1836G, Eagle Group, Cambro, or SPG.

ITEM 03A DUNNAGE RACK QUANTITY AS SCHEDULED

Provide single deck dunnage platform unit with the following features:

- A. Arrange using quantities and sizes as shown on plan drawings.
- B. Slotted deck.
- C. Separate polymer bow tie for joining racks.
- D. Corrosion proof polymer construction.

Platform unit to be as manufactured by Metro, Model HP2248PD, Cambro, or Eagle Group.

ITEM 03B DUNNAGE RACK QUANTITY AS SCHEDULED

Provide single deck dunnage platform unit with the following features:

- A. Arrange using quantities and sizes as shown on plan drawings.
- B. Slotted deck.
- C. Separate polymer bow tie for joining racks.
- D. Corrosion proof polymer construction.

Platform unit to be as manufactured by Metro, Model HP2260PD, Cambro, or Eagle Group.

ITEMS 04-05 NOT USED

ITEM 06 WALL MOUNTED SHELF QUANTITY AS SCHEDULED

Provide wall shelf with the following features:

- A. Wall mount.
- B. Arrange using quantity and size as shown on plan drawings.
- C. Ends turned down, back turned up 2".

D. 16/300 stainless-steel.

E. Mount 4'-6" A.F.F.

Wall shelf to be as manufactured by Eagle Group, Model WS1296-16/3, Titan, or fabricated equal.

ITEM 07 CART, UTILITY QUANTITY AS SCHEDULED

Provide stainless steel welded cart having the following features:

- A. (3) shelf, 36"W x 24"D x 40"H.
- B. Open base.
- C. Wire shelves.
- D. (2) handles.
- E. 500 lbs. capacity.
- F. Stainless-steel finish.
- G. (4) 5" swivel casters with resilient tread.

Cart to be as manufactured by Eagle Group, Model EU3-2436S, Lakeside, or Cambro.

ITEM 08 AIR CURTAIN INSECT FAN QUANTITY AS SCHEDULED

Provide air curtain fan having the following features:

- A. Air curtain for 48" wide door.
- B. Unheated.
- C. One (1) 1/2 HP motor.
- D. Voltage as scheduled, direct connection.
- E. Stainless steel cabinet.
- F. Micro switch at door.
- G. Obsidian Black powder coated cabinet.

Fan to be as manufactured by Mars Air Systems, Model STD248-1UA-OB, Universal Jet Industries, or Leading Edge.

ITEM 09 ONE-COMPARTMENT SINK QUANTITY AS SCHEDULED

Provide one-compartment sink as follows:

-
- A. One-compartment, 72"W x 30"D.
 - B. 14/300 stainless steel construction.
 - C. 24" wide x 24" front-to-back x 14" deep compartment.
 - D. 24" drainboards on left and right.
 - E. 9"H backsplash.
 - F. One (1) set of 1-1/8" splash mount faucet holes, 8" O.C.
 - G. 1-1/2" raised rolled edge on front and sides.
 - H. 1-1/2" NPS basket strainer.
 - I. Stainless steel H-frame legs with adjustable stainless-steel bullet feet.
 - J. Installation Kit:
 - Two (2) 1/2" NPT nipples, lock nuts and washers
 - Two (2) short "EII" 1/2" NPT female x male
 - K. End splash, to 14".
 - L. Twist handle lever drain, 1-1/2" drain outlet.

Sink to be as manufactured by Eagle Group, Model FN2424-1-24-14/3, Titan, or fabricated equal.
ON EQUIP SCH REMARKS – FAUCET INFO MOVE TO LINE 09.1
ITEM 09.1 FAUCET

- M. 12" swing nozzle.
- N. Wall mounted.
- O. 8" centers on sink faucet with 1/2" IPS eccentric flanged female inlets.
- P. Lever handles.

Faucet to be as manufactured by T&S Brass, Model B-0231, Chicago Faucet, or Fisher.

ITEM 10 WORKTABLE

QUANTITY AS SCHEDULED

Provide worktable with the following features:

- A. 60"W x 30"D, see direction of operation on Plan.
- B. 14/300 stainless steel top with turned down edges, 5" backsplash.
- C. 18-gauge stainless steel undershelf.
- D. 16-gauge stainless steel legs, (4) 5" casters (2 with brakes).

E. All-welded construction.

F. (2) Stainless steel 20" x 20" x 5" drawer, stainless steel pan.

Worktable to be as manufactured by Eagle Group, Model T3060SEM, Titan, or fabricated equal.

ITEM 11 WORKTABLE

QUANTITY AS SCHEDULED

Provide worktable with the following features:

A. 60"W x 30"D, see direction of operation on Plan.

B. 14/300 stainless steel top with turned down edges, 5" backsplash.

C. 18-gauge stainless steel undershelf.

D. 16-gauge stainless steel legs, (4) 5" casters (2 with brakes).

E. All-welded construction.

F. (2) Stainless steel 20" x 20" x 5" drawer, stainless steel pan.

Worktable to be as manufactured by Eagle Group, Model T3060SE-BS, Titan, or fabricated equal.

ITEM 12 TWO-COMPARTMENT SINK

QUANTITY AS SCHEDULED

Provide two-compartment sink with drainboards as follows:

A. 98"W x 30"D.

B. 14/300 stainless steel construction.

C. 24" wide x 24" front-to-back x 14" deep compartments.

D. 24" drainboards on left and right.

E. 9"H backsplash.

F. 8" O.C. splash mount faucet holes.

G. 1-1/2" raised-rolled edge on front and sides.

H. 1-1/2" NPS basket strainers.

I. Stainless steel H-frame legs with adjustable stainless steel flanged feet.

J. Sink Mixing Faucet: T&S B-0231 (or Chicago Faucet, Fisher)

- 12" swing nozzle
- Wall mounted

-
- 8" centers on sink faucet with 1/2" IPS eccentric flanged female inlets
 - Lever handles

K. Installation Kit:

- Two (2) 1/2" NPT nipples, lock nuts and washers
- Two (2) short "Ell" 1/2" NPT female x male

L. End splash, standard height, 9 1/2".

M. (2) Twist handle lever drain, 2" drain outlet.

Sink to be as manufactured by Eagle Group, Model FN2448-2-24-14/3, Titan, or fabricated equal.

ITEM 13 ICE MAKER, CUBE STYLE QUANTITY AS SCHEDULED

Provide ice maker and bin having the following features:

A. Air-cooled, self-contained condenser.

B. Approximately 316 lb. production/24 hours.

C. Durable stainless finish.

D. Water Filter Manifold:

- Single filter
- 1.5 gpm maximum flow
- Scale inhibitor
- .5-micron particle reduction
- Quick connect fittings
- Water filters must be changed every 180 days (6 months), minimum

E. Voltage as scheduled, direct connection.

Unit to be as manufactured by Ice-O-Matic, Model CIM0330FA, Scotsman, or Follett.

ITEM 13.1 ICE BIN

G. 344 lb. storage capacity.

H. 30"W x 31"D x 37-1/2"H.

I. Slope front door for top mounted ice maker.

J. Polyethylene interior.

K. Durable stainless-steel finish exterior.

L. 6" legs.

EQUIP SCH REMARKS – NEED ICE BIN & TOP MODELS ON LINE 13.1

Ice bin to be as manufactured by Ice-O-Matic, Model B40PS, Scotsman, or Follett.

ITEM 14 WORK TABLE QUANTITY AS SCHEDULED

Provide work table with the following features:

- A. 48"W x 30"D.
- B. 14/300 stainless steel top with 5" backsplash.
- C. 18-gauge stainless steel undershelf.
 CUTS OR SCHED DO NOT HAVE CASTERS/ ADAPTED
- D. 16-gauge stainless steel legs and casters.
- E. All-welded construction.
- F. (5) Drawer, 20" x 20" x 5", stainless-steel pan.

Work table to be as manufactured by Eagle Group, Model T3048SE-BS, Titan, or fabricated equal.

ITEM 15 WALL MOUNTED SHELF QUANTITY AS SCHEDULED

Provide wall shelf with the following features:

- A. Wall mount.
- B. Arrange using quantity and size as shown on plan drawings.
- C. Ends turned down, back turned up 2".
- D. 16/300 stainless steel.
- E. Mount 4'-6" A.F.F.

Wall shelf to be as manufactured by Eagle Group, Model SWS1260-16/3, Titan, or fabricated equal.

ITEM 16 TEA BREWER N.I.K.C.

This item is to be furnished and installed by Vendor.

ITEM 17 MICROWAVE OVEN QUANTITY AS SCHEDULED

Provide microwave convection oven having the following features:

- A. 0.6 cu. ft. capacity, 1200 watts, heavy volume.
- B. Capacity to program 100 menus.
- C. Eleven (11) power levels, four (4) cooking stages, 60-minute max cooking time.
- D. LED display, touch control.

- E. Interlock safety switch.
- F. ADA compliant Braille touch pads.
- G. Audible end of cycle signal.
- H. Side hinged door with tempered glass.
- I. Sealed ceramic interior shelf.
- J. Lighted interior, stainless steel exterior and interior.
- K. Voltage as scheduled.

Microwave oven to be as manufactured by ACP, Model HDC12A2, Merrychef, or Turbo-Chef.

ITEM 18

NOT USED

ITEM 19 PAN RACK, BUN

QUANTITY AS SCHEDULED

Provide aluminum pan rack having the following features:

- A. 21-1/2" x 26" x 73"H.
- B. 2" wide angle slides for thirty (30) 18" x 26" pans, slides on 2" centers.
- C. Heavy duty.
- D. Fully welded frame.
- E. Aluminum construction.
- F. (4) 6" x 2" non-marking swivel plate casters with upgrade.

Pan rack to be as manufactured by Eagle Group, Model 4330, Metro, or Cres-Cor.

ITEM 20 REACH-IN HEATED CABINET

QUANTITY AS SCHEDULED

Provide mobile hot cabinet, having the following features:

- A. Reach-in, single-section, 21.0 cubic feet.
- B. Stainless steel exterior front, sides and interior.
- C. Digital exterior temperature display.
- D. (3) chrome plated wire shelves.
- E. Solid full height door with handle and lock, hinged on right.

F. (4) 5" locking casters.

G. Voltage as scheduled, cord and plug.

Cabinet to be as manufactured by Delfield, Model CSH1-S, Victory, or Traulsen.

ITEM 21 NOT USED

ITEM 22 EXHAUST HOOD N.I.K.C.

This item is to be furnished and installed by Mechanical.

ITEM 23 UTILITY DISTRIBUTION SYSTEM N.I.K.C.

This item is to be furnished and installed by Mechanical.

ITEM 24 FIRE SUPPRESSION SYSTEM N.I.K.C.

This item is to be furnished and installed by Mechanical.

ITEM 25 COMBI OVEN, ELECTRIC QUANTITY AS SCHEDULED

Provide electric combi oven with the following features:

- A. Electric
- B. Boilerless
- C. (6) 18" x 26" full size sheet pan or (12) 12" x 20" x 1" hotel pan capacity ovens
- D. Stacking Kit on 12" base, for double stack 6.20 & 10.20 (3456267), feet
- E. Optipure Multi-Stage Water Filtration System
- F. Backflow prevention device
- G. Pull-out spay hose
- H. Multi-point core temperature probe
- I. Voltages as scheduled, direct connection

Combi oven steamer to be as manufactured by Convotherm Model C4 ET 6.20ES, Cleveland, or Rational.

ITEM 26 CONVECTION STEAMER, GAS QUANTITY AS SCHEDULED

Provide gas fired, two-compartment pressureless steamer having the following features:

- A. Gas:
 - Field verify type
 - 3/4" x 4' flex hose

-
- Quick disconnect
 - Restraining device
- B. (2) compartments on 24" cabinet base.
- C. (10) 12" x 20" x 2-1/2" deep pan total capacity.
- D. High output stainless steel steam generator with timed drainage and flush, staged water fill.
- E. Manual controls with 60-minute timer with buzzer for each compartment,
- F. Constant steam feature.
- G. Split water line.
- H. Stainless steel interior, exterior, frame and flanged feet.
- I. Electric ignition.
- J. Voltage as scheduled, 6' cord and 3-prong plug.
- K. Water filter treatment system.
- L. Backflow prevention device.

Steamer to be as manufactured by Vulcan, Model C24GA10, Cleveland, or Groen.

ITEM 27 CONVECTION OVEN, GAS QUANTITY AS SCHEDULED

Provide gas-fired convection double oven having the following features:

- A. Gas:
- Field verify type
 - 3/4" x 4' flex hose
 - Quick disconnect
 - Restraining device
 - Manifold piping included with stacking kit to provide single point gas connection
- B. Double-deck, standard depth.
- C. Computer controls.
- D. Electronic spark ignition.
- E. 99-hour timer.
- F. Roast and hold cycle.
- G. Programmable menu.
- H. Five (5) oven racks per section.

- I. Independently operated doors with windows.
- J. Porcelain interior.
- K. Stainless steel doors with windows, front, top, and sides.
- L. Two (2) 1/2 HP.
- M. Voltage as scheduled, (2) cords and plugs.
- N. (4) casters in lieu of standard legs.

Convection oven to be as manufactured by Vulcan, Model VC44GC, Southbend, or Blodgett.

ITEM 28 COMBI OVEN, GAS QUANTITY AS SCHEDULED

Provide combi-duo mobile self-cooking center with the following features:

- A. Combi oven/steamer, boilerless, countertop.
- B. Gas:
 - Field verify type
 - Quick disconnect kit
- C. (8) 18" x 26" full size sheet or (16) 12" x 20" full size hotel pan capacity.
- D. Classic control with steam/convection/combi cooking modes.
- E. Safe steam venting.
- F. Auto cleaning with (1) cleaning level.
- G. (2) side racks with (8) non-tilt support rails.
- H. Cool-to-touch glass window in door, door hinged right, see hinging as shown on Plan.
- I. High efficiency LED lighting.
- J. Stainless-steel construction.
- K. Adjustable stainless-steel legs.
- L. Technology for reduced energy usage.
- M. Voltage as scheduled, direct connection.
- N. Verify water test required for incoming supply for water filter system if needed.
- O. Combi Oven Stand:
 - Mobile

-
- 28- 15/16" x 38-3/4" x 38-5/16"
 - Pan slides and shelf
 - Spacing 2-11/16"
 - Stainless steel

P. Back flow preventer.

Combination oven steamer to be as manufactured by Alto-Shaam, Model CTC7-20G, Cleveland, or Rational.

ITEM 29 18" RANGE - 2 BURNER QUANTITY AS SCHEDULED

Provide gas-fired range, having the following features:

- A. Gas:
- Field verify type
 - 1-1/4" rear gas connection; cap and cover, both ends
 - 3/4" x 4' flex hose
 - Quick disconnect
 - Restraining device
- B. Heavy duty, 18".
- C. (2) 35,000 BTU open burners.
- D. Cast iron grates.
- E. Cabinet storage base with doors.
- F. Stainless steel front, front top ledge, sides, base, burner box and stub back.
- G. (4) casters in lieu of standard legs.

Range to be as manufactured by Vulcan, Model V2B18B, Garland, or South Bend.

ITEM 30 PASS-THRU HEATED CABINET QUANTITY AS SCHEDULED

Provide two-section pass-thru hot cabinet, having the following features:

- A. Pass-thru, two-section, 50.0 cubic feet.
- B. Stainless steel exterior front, sides & interior.
- C. Digital exterior temperature display.
- D. (6) chrome wire shelves.
- E. Solid hinged full height doors front and back, with locks and handles, see hinging as shown on Plan.

F. (4) 5" locking casters.

G. Voltage as scheduled, cord and plug.

Cabinet to be as manufactured by Delfield, Model CSHPT2-S, Traulsen, or Victory.

ITEM 31 PASS-THRU REFRIGERATOR QUANTITY AS SCHEDULED

Provide two-section pass-thru refrigerator with top mounted air-cooled condensing unit, exterior digital thermometer, cylinder door locks and top mounted condensate evaporator, having the following features:

A. Pass-thru, two-section, 50.0 cubic feet, self-contained refrigeration, R290 Hydrocarbon refrigerant.

B. Digital exterior temperature display.

C. (6) chrome wire shelves.

D. Solid hinged full height doors front and back, with door locks and handles, see hinging as shown on Plan.

E. LED interior light.

F. Stainless steel exterior front, sides and interior.

G. (4) 5" locking casters.

H. Voltage as scheduled, cord and plug.

Refrigerator to be as manufactured by Delfield, Model CSRPT2P-S, Traulsen, or Victory.

ITEM 32 NOT USED

ITEM 33 WORKTABLE QUANTITY AS SCHEDULED

Provide worktable with the following features:

A. 48"W x 30"D, see direction of operation as shown on Plan.

B. 14/300 stainless steel top with turned down edges.

C. 18-gauge stainless steel undershelf.

D. 16-gauge stainless steel legs and set of four (4) 5" casters (2 with brakes).

E. All-welded construction.

Worktable to be as manufactured by Eagle Group, Model T3048SE, Titan, or fabricated equal.

ITEM 34 PLASTIC W/METAL FRAME SHELVING QUANTITY AS SCHEDULED

Provide five-tier polymer shelving unit complete with tubular uprights and having the following features:

- A. Arrange using quantity and size as shown on plan drawings.
- B. (5) open grid polymer shelves with epoxy antimicrobial protection.
- C. (4) epoxy coated steel 74" posts and frame.
- D. (4) casters.

Shelving to be as manufactured by Metro, Model 5Q557G3, SPG, Eagle Group, or Cambro Cam-Shelving.

ITEMS 35-36

NOT USED

ITEM 37 THREE-COMPARTMENT SINK

QUANTITY AS SCHEDULED

Provide three-compartment sink with drainboards as follows:

- A. 124"W x 34"D.
- B. 14/300 stainless-steel construction.
- C. 20" wide x 28" front-to-back x 14" deep compartments.
- D. 30" drainboards, see direction of operation on Plan.
- E. 9"H backsplash.
- F. (2) sets of 8" O.C. splash mount faucet holes.
- G. 1-1/2" raised-rolled edge on front and sides.
- H. 1-1/2" NPS basket strainers.
- I. Stainless steel H-frame legs with adjustable stainless-steel bullet feet, extra support legs.
- J. Sink Mixing Faucet (2): T&S B-0231
 - 12" swing nozzle
 - Wall mounted
 - 8" centers on sink faucet with 1/2" IPS eccentric flanged female inlets
 - Lever handles
- K. Installation Kit:
 - Two (2) 1/2" NPT nipples, lock nuts and washers
 - Two (2) short "EII" 1/2" NPT female x male
- L. (3) Twist handle lever drain, 1-1/2" drain outlet.

Sink to be as manufactured by Eagle Group, Model FN2860-3-30-14/3, Titan, or fabricated equal.

ITEM 38 WALL SHELF W/POT RACK

QUANTITY AS SCHEDULED

Provide wall shelf with the following features:

- A. Wall mount.
- B. Arrange using quantity and size as shown on plan drawings.
- C. Ends turned down, back turned up 2”.
- D. 16/300-gauge stainless steel.
- E. Mount 4’-6” A.F.F.
- F. Single flat bar with one (1) stainless steel pot hook per foot.

Wall shelf to be as manufactured by Eagle Group, Model WSP12144, Titan, or fabricated equal.

ITEM 39 SOILED DISHTABLE QUANTITY AS SCHEDULED

This item to be custom fabricated in accord with General Requirements of specifications and with plan and detail drawings.

ITEM 40 DISHMACHINE, CONVEYOR TYPE QUANTITY AS SCHEDULED

Provide single-tank rack conveyor type dishmachine, having the following features:

- A. (202) racks/hour, .62 gallon/rack.
- B. Insulated hinged doors, see hinging as shown on Plan.
- C. Stainless-steel enclosure panels.
- D. Microprocessor controls with low temperature & dirty water indicators.
- E. NSF pot & pan mode.
- F. Energy efficient.
- G. Drain water tempering kit.
- H. Operational direction as shown on Plan.
- I. Back flow preventer.
- J. Voltage as scheduled, direct connections.
- K. Electric 30.0 KW booster and tank heat.
- L. Vent ducts by Mechanical.
- M. Standard height and feet.

N. For water over 3-grains of hardness, add water softener.

Dishmachine to be as manufactured by Hobart, Model CL44EN, Champion, or Meiko.

ITEM 41 CLEAN DISTABLE QUANTITY AS SCHEDULED

This item to be custom fabricated in accord with General Requirements of specifications and with plan and detail drawings.

ITEM 42 DISHWASHER VENT DUCTS N.I.K.C.

This item is to be furnished and installed by Mechanical.

ITEMS 43 NOT USED

ITEM 44 TRAY STAND QUANTITY AS SCHEDULED

Provide tray cart with the following features:

- A. 28" deep x 30" long.
- B. 14-gauge stainless-steel top with tray step-down.
- C. Fiberglass body.
- D. (4) 5" swivel casters.
- E. Color to be selected by Architect/Owner.

Cart to be as manufactured by Delfield, Model KCTS-28, Vollrath, or Randell.

ITEM 45 MILK COOLER QUANTITY AS SCHEDULED

Provide mobile carton milk cabinet having the following features:

- A. Forced-air, self-contained refrigeration, R290 Hydrocarbon refrigerant.
- B. (12) crates.
- C. Stainless-steel drop front/hold-open flip-up lids, lock.
- D. 33-38°F.
- E. Stainless-steel exterior.
- F. Stainless-steel interior & floor.
- G. (3) heavy-duty floor racks.
- H. Digital thermometer.

-
- I. (4) 4" casters.
- J. 1/5 HP.
- K. Voltage as scheduled, cord and plug set, daisy chain to single point connection.

Cabinet to be as manufactured by True, Model TMC-49-S-SS-HC, Beverage-Air, or Traulsen.

ITEM 46 COLD FOOD COUNTER QUANTITY AS SCHEDULED

Provide modular cold food serving counter having the following features:

- A. Self-contained refrigeration, R404A refrigerant, size as shown on Plan.
- B. Bloomington style cold pan, 39" x 21.62" x 7".
- C. Drain with valve.
- D. Reinforced stainless steel enclosed base.
- E. (4) 5" casters.
- F. Voltage as scheduled, cord and plug set, daisy chain to single point connection.
- G. 36" H.
- H. Line-up interlock device.
- I. Tray Slide:
- Drop down design
 - Solid
 - 12" W
 - "V" ridge
 - 14-gauge stainless steel
 - 34" H.
- J. Sneeze Guard:
- Single service
 - Flip-up
 - To meet NSF, State, and Local Codes
- K. LED light fixture.
- L. ¼ HP.

Counter to be as manufactured by Delfield, Model SCSC-50-B, Vollrath, or Randell.

ITEM 47 HOT FOOD COUNTER QUANTITY AS SCHEDULED

Provide 5-well hot food counter of size and content as shown on plan drawings, having the following

features:

- A. Electric, five (5) pan capacity.
- B. 14-gauge stainless steel top.
- C. 18-gauge stainless steel exterior.
- D. 14-gauge galvanized bottom.
- E. Enclosed base with no under storage.
- F. (4) 5" swivel casters.
- G. 2" drain(s) for hot food wells plumbed to common valve.
- H. 36" H.
- I. Dry storage compartments, double door.
- J. Line-up interlock device.
- K. Tray Slide:
 - 12"
 - V fold-down
 - 14-gauge stainless steel
 - 34" H.
- L. Glass front sneeze guard.
- M. Voltage as scheduled, cord and plug set, daisy chain to single point connection.

Counter to be as manufactured by Delfield, Model SH-5-NU, Vollrath, or Randell.

ITEM 48 SERVING COUNTER, UTILITY QUANTITY AS SCHEDULED

Provide modular serving counter of size and content as shown on Plan drawings having the following features:

- A. 36" long.
- B. 14-gauge stainless-steel countertop.
- C. Open understorage with shelf.
- D. (4) 5" swivel casters.
- E. Line-up interlock device.

Counter to be as manufactured by Delfield, Model SC-36, Vollrath, or Randell.

Bid Set

ITEM 49 ALL PURPOSE SERVING COUNTER QUANTITY AS SCHEDULED

Provide modular serving counter of size and content as shown on Plan drawings having the following features:

- A. 50" long.
- B. 14-gauge stainless-steel countertop.
- C. Storage unit.
- D. (4) 5" swivel casters.
- E. Line-up interlock device.
- F. Tray Slide:
 - Drop down design
 - Solid
 - 12" W
 - "V" ridge
 - 14-gauge stainless steel
 - 34" H.
- G. Coordinate cut out and air flow with refrigeration item 50.

Counter to be as manufactured by Delfield, Model SC-50, Vollrath, or Randell.

ITEM 50 DROP-IN REFRIGERATOR QUANTITY AS SCHEDULED

Provide refrigerated display case with the following features:

- A. 38-1/8"W, 22-3/4"H (above counter) 46-3/4"H (overall), open front.
- B. (1) non-lighted glass shelf.
- C. LED top light.
- D. Rear sliding clear glass doors with inner acrylic plenum.
- E. Black interior and exterior.
- F. (2) glass ends.
- G. Self-contained refrigeration, energy efficient system with evaporation pan (rear access). Undercounter compressor air intake from below counter and through rear, counter configuration must allow air to be drawn in and discharged out the back.
- H. ETL-Sanitation.
- I. Voltage as scheduled, cord and plug set, daisy chain to single point connection.

Bid Set

J. 29" minimum entry door clearance.

K. Digital Fahrenheit thermometer.

Display case to be as manufactured by Structural Concepts, Model DOS3623R, Delfield, or QBD.

ITEM 51 NOT USED

ITEM 52 CASHIER'S COUNTER QUANTITY AS SCHEDULED

Provide modular cashier counter having the following features:

- A. 50" deep.
- B. Stainless steel top, locking cash drawer, shelf, and base.
- C. (4) 5" swivel casters.
- D. Tray Slide:
 - Drop down design
 - Solid
 - 12" W
 - "V" ridge
 - 14-gauge stainless steel
 - 34" H.
- E. Line-up interlock device.
- F. Voltage as scheduled, (1) duplex outlet, cord and plug set, daisy chain to single point connection.

Cashier counter to be as manufactured by Delfield, Model SCS-50, Randell, or Vollrath.

ITEM 53 ALL PURPOSE SERVING COUNTER QUANTITY AS SCHEDULED

Provide modular serving counter of size and content as shown on Plan drawings having the following features:

- A. 120" long.
- B. Stainless-steel flat top.
- C. Front and rear removable panels.
- D. Open base.
- E. (4) casters.
- F. Tray Slide:
 - Drop down design
 - Solid

-
- 12" W
 - "V" ridge
 - 14-gauge stainless steel
 - 34" H.

G. SA49G

H. Provide duplex receptacle for item 54 heat merchandiser.

I. Grommet hole.

Counter to be as manufactured by Delfield, Model DCBU-120, Vollrath, or Randell.

ITEM 54 HEATED DISPLAY MERCHANDISER QUANTITY AS SCHEDULED

Provide heated display unit having the following features:

- A. Counter model, pass-thru design.
- B. (14) rods.
- C. (2) shelves.
- D. Top shelf horizontal, lower shelf forward-slanted.
- E. Stainless/aluminum construction.
- F. 4" legs.
- G. Voltage as scheduled, cord and plug set, daisy chain to single point connection, connect to Item 53.
- H. Glossy gray, gloss finish.

Display warmer to be as manufactured by Hatco, Model GRSDS/H-36D, Delfield, or Traulsen.

ITEM 55 TRAFFIC GUIDE RAIL QUANTITY AS SCHEDULED

Provide traffic guide rail having the following features:

- A. Double horizontal floor mounted welded uprights 16-gauge stainless-steel.
- B. 3-hole or cored type fastening.
- C. Bull nose on end uprights.
- D. Die formed with (3) 3/8" holes for fastening rail to floor.
- E. 2" diameter post, stainless steel finish with Architect/Owner.

Guide rail to be United Showcase, Model WRD200, Lawrence, Eagle Group, or equal fabricator.

ITEM 56 CASH REGISTER N.I.K.C.

This item is to be furnished and installed by Owner; (2) connections at Cashier Counter, Item 52.

ITEM 57 ICE/WATER DISPENSER QUANTITY AS SCHEDULED

Provide automatic ice and water dispenser having the following features:

- A. Countertop.
- B. 45-lb. storage capacity, manual fill.
- C. Dispenses ice cube size up to 1" square.
- D. Rocking chute lever.
- E. Stainless-steel exterior with "Ice" graphic.
- F. Voltage as scheduled, cord and plug.
- G. Water filter.
- H. Drain pan and bin.

Unit to be as manufactured by Multiplex, Model M-45, Scotsman, or Ice-O-Matic.

ITEM 58 HOSE REEL QUANTITY AS SCHEDULED

Provide hose station having the following features:

- A. Hose Reel Assembly, open.
- B. 35' hose, with blue front trigger water gun.
- C. 8" concealed mixing valve.
- D. Service sink faucet.
- E. Vacuum breaker.
- F. Control valves in riser.
- G. Coated metal hose reel.
- H. 3/8" NPT flex connector assembly.
- I. Mount on wall at location shown on Plan drawings.
- J. Backflow prevention device.

Hose reel assembly to be as manufactured by T&S Brass, Model B-1454, Chicago Faucet, or Fisher.

END OF SECTION 114000

SECTION 115213 – PROJECTION SCREENS**PART 1 - GENERAL****1.1 SUMMARY****A. Section Includes:**

1. Electrically-operated projection screens and controls.

1.2 COORDINATION

- A. Coordinate layout and installation of projection screens with adjacent construction, including ceiling suspension systems, light fixtures, HVAC equipment, fire-suppression system, and partitions.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.

- B. Shop Drawings: For projection screens. Show layouts and types of projection screens. Include the following:

1. For electrically operated projection screens and controls:
 - a. Location of screen centerline relative to ends of screen case.
 - b. Location of wiring connections for electrically operated units.
 - c. Location of seams in viewing surfaces.
 - d. Anchorage details, including connection to supporting structure for suspended units.
 - e. Wiring diagrams.

1.4 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For projection screens to include in maintenance manuals.

1.5 QUALITY ASSURANCE

- A. Source Limitations for Projection Screens: Obtain projection screens from single manufacturer. Obtain accessories, including necessary mounting hardware, from screen manufacturer.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Environmental Limitations: Do not deliver or install projection screens until spaces are enclosed and weathertight, wet work in spaces is complete and dry, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

PART 2 - PRODUCTS**2.1 ELECTRICALLY OPERATED PROJECTION SCREENS**

- A. General: Manufacturer's standard units consisting of case, screen, motor, controls, mounting accessories, and other components necessary for a complete installation.
1. Controls: Remote, three-position control switch installed in recessed device box with flush cover plate.
 - a. Provide three control switches.
 - b. Provide power supply for low-voltage systems if required.
 - c. Provide infrared remote control consisting of battery-powered transmitter and receiver.
 2. Motor in Roller: Instant-reversing motor of size and capacity recommended by screen manufacturer; with permanently lubricated ball bearings, automatic thermal-overload protection, preset limit switches to automatically stop screen in up and down positions, and positive-stop action to prevent coasting. Mount motor inside roller with vibration isolators to reduce noise transmission.
 3. Tab Tensioning: Provide units that have a durable low-stretch cord, such as braided polyester, on each side of screen connected to edge of screen by tabs to pull screen flat horizontally.
- B. Surface-Mounted, Metal-Encased, Electrically Operated Screens with Tab Tensioning: Motor-in-roller units designed and fabricated for surface mounting on wall or ceiling, fabricated from formed-steel sheet not less than 0.027 inch thick or from aluminum extrusions; with flat back design and vinyl covering or baked-enamel finish. Provide with matching end caps and concealed mounting.
1. Basis-of-Design Product: Subject to compliance with requirements, provide Da-Lite Screen Co. or comparable products approved by Architect by one of the following:
 - a. Motor in Roller:
 - 1) Draper Inc.
 - 2) Da-Lite Screen Co., Inc. (Basis-of-Design).
 - 3) Stewart Filmscreen.
 2. Provide metal or metal-lined motor enclosure on units with end-mounted motor.
 3. Provide screen case constructed to be installed with ceiling finish applied to underside.
 4. Finish on Exposed Surfaces: Vinyl covering or baked enamel.

2.2 FRONT-PROJECTION SCREEN MATERIAL

- A. Matte-White Viewing Surface: Peak gain not less than 0.9, and gain not less than 0.8 at an angle of 50 degrees from the axis of the screen surface.
- B. Material: Vinyl-coated, glass-fiber fabric or vinyl sheet.
- C. Mildew-Resistance Rating: 0 or 1 when tested according to ASTM G 21.
- D. Flame Resistance: Passes NFPA 701.
- E. Flame-Spread Index: Not greater than 75 when tested according to ASTM E 84.

- F. Seamless Construction: Provide screens, in sizes indicated, without seams.
- G. Edge Treatment: Without black masking borders.
- H. Size of Viewing Surface: As indicated on Drawings.

PART 3 - EXECUTION

3.1 FRONT-PROJECTION SCREEN INSTALLATION

- A. Install front-projection screens at locations indicated to comply with screen manufacturer's written instructions.
- B. Install front-projection screens with screen cases in position and in relation to adjoining construction indicated. Securely anchor to supporting substrate in a manner that produces a smoothly operating screen with vertical edges plumb and viewing surface flat when screen is lowered.
 - 1. Install low-voltage controls according to NFPA 70 and complying with manufacturer's written instructions.
 - a. Wiring Method: Install wiring in raceway except in accessible ceiling spaces and in gypsum board partitions where unenclosed wiring method may be used. Use UL-listed plenum cable in environmental air spaces, including plenum ceilings. Conceal raceway and cables except in unfinished spaces.
 - 2. Test electrically operated units to verify that screen controls, limit switches, closures, and other operating components are in optimum functioning condition.

END OF SECTION 115213

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SECTION 115850 – KILNS**PART 1 - GENERAL****1.1 SUMMARY**

- A. Section Includes:
1. Electric Kiln.
 2. Downdraft Ventilation System.
 3. Accessories.

1.2 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
1. Coordination: Furnish inserts and anchoring devices which must be set in concrete for installation of vocational equipment work. Coordinate delivery of inserts and anchorages with other work to avoid delay.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.
- B. Shop Drawings:
1. Include plans, elevations, sections, details, and attachments to other work.
 2. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
- C. Operation and Maintenance Data: For kiln and exhaust systems to include in operation and maintenance manuals.
- D. Warranties: Special warranties.

1.4 PROJECT CONDITIONS

- A. Field Measurements: Verify actual dimensions of construction contiguous with vocational shop equipment by field measurements before fabrication.

1.5 DELIVERY, STORAGE AND HANDLING

- A. Deliver kilns, ventilation systems, and accessories in manufacturer's original packaging with protective covering intact.
- B. Do not stack other items on top of packaged kilns during transportation and storage. Store kilns with top end up.
- C. Utilize equipment capable of moving vocational shop equipment without damage.

1.6 WARRANTY

- A. Special Warranties: Manufacturer agrees to repair or replace kilns that fail in material or workmanship within specified warranty period. Warranty includes labor for repair or replacement.
1. Warranty Period: Two years from date of Substantial Completion.
- B. Special Warranties: Manufacturer agrees to repair or replace cabinets that fail in material or workmanship within specified warranty period. Warranty includes labor for repair or replacement.
1. Warranty period: Ten years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source limitations: Obtain kilns, ventilation systems and accessories through one source from a single manufacturer. Kiln and ventilation system to be UL listed as a system.

2.2 PERFORMANCE CRITERIA

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements for motors as indicated in Division 26 Sections.

2.3 ELECTRIC KILNS

- A. Electric Kilns: Kilns in size indicated, factory-rewired for electrical switching devices and computer interface system, with holes factory predrilled in kiln lid and floor for downdraft ventilation system.
1. Basis-of-Design Product: Subject to compliance with requirements, provide KM 1227-3 with Stand by Skutt Kilns or approved substitution from one of the following:
 - a. American Art Clay Co.
 - b. Evenheat Kiln, Inc.
 - c. L&L Kiln Mfg.
 - d. Paragon Industries.
 - e. Vent-A-Kiln Corp.
 2. Chamber Capacity:
 - a. Depth: 27 inches.
 - b. Opening Width: 28.13 inches.
 - c. Opening Depth: 27 inches.
 - d. Volume: 9.9 cubic feet.
 - e. Temperature: 2,300 degs. F.
 - f. Electrical Requirements: 208V, 3-phase, 31.7A, 11,000W.

g. Cone Rating: 8.

B. Components: Provide kilns with the following components, a wall-mount controller, and accessories to comply with kiln requirements.

1. Shelves (Furniture kit).
2. Kiln stand.
3. Kiln floor or slab.
4. Fire brick.
5. Kiln elements.
6. Ring latch.
7. Chest handle.
8. Lid with lifter and latch.
9. Control box.
10. Thermocouple.
11. Controller touch pad.
12. Peep plugs.

2.4 DOWNDRAFT VENTILATION SYSTEM

A. Ventilation System: Wall-mounted, negative pressure downdraft ventilation system capable of removing hazardous fumes only, not heat.

1. Basis-of-Design Product: Subject to compliance with requirements, provide EnviroVent 2 by Skutt Kilns or approved substitution.

B. Ventilation System Components:

1. Blower motor with 6 foot power cord and in-line switch.
2. 8 inch by 12 inch mounting plate.
3. 8 foot by 3 inch flexible aluminum duct.
4. Spring-loaded plenum cup assembly.
5. Blower inlet tube.
6. Blower discharge tube.
7. Plenum spring.
8. 3 inch to 4 inch connector.
9. Floor mounting plate.
10. Mounting hardware.

C. Electrical Switching Device: Ventilation system manufacturer's electrical switching device utilizing a programmable power output in the controller to turn the downdraft ventilation system on and off, and to automatically turn off vent when kiln is finished firing.

1. Basis-of-Design Product: Subject to compliance with requirements, provide EnviroLink by Skutt Kilns or approved substitution.
2. Electrical Requirements: 208V, 3 phase.

2.5 ACCESSORIES

A. Angled touchpad mount.

B. Computer Interface System (CIS): Computer interface system including required software and hardware to connect a computer to the kiln controller.

- C. Furniture Kits: Kit includes shelves and one or more posts. Kits are designed to fire to Cone 10 temperatures.

PART 3 - EXECUTION

3.1 PREPARATION

A. Downdraft Ventilation System:

1. Ensure that kiln stand is a minimum of 8 inches high. If stand is lower than that, either shim legs to increase distance from floor to 8 inches or replace stand with one that meets required height.
2. If kiln does not have factory drilled holes, provide number and size of holes as recommended by kiln manufacturer for the specific kiln model. Locate holes in accordance with manufacturer's recommendations.

3.2 INSTALLATION

- A. Install according to manufacturer's written installation instructions and recommendations. Coordinate installation with adjacent Work to ensure proper clearances are met.
- B. Install units in final locations after finishes have been completed in each area. Verify that clearances are adequate to properly operate equipment.
- C. Set units level, plumb, properly aligned, and securely in place.
- D. Downdraft Ventilation System: Assemble and install system components on kiln in accordance with manufacturer's written instructions.
1. Install blower and motor assembly on wall where indicated that is close enough for the flexible aluminum duct to reach the kiln without overstretching the duct. Where wall-mounting is not possible, mount vent motor on the floor or above the ceiling.
- E. Comply with requirements for ventilation specified in Division 23.
- F. Comply with requirements for power specified in Division 26.

3.3 ADJUSTING

- A. Test electric kiln and downdraft ventilation to verify proper operation. Make necessary adjustments.
- B. Verify that required accessories have been properly installed and are in working order.

3.4 PROTECTION

- A. Take care to prevent scratching or damage. Replace damaged components which cannot be repaired to satisfaction of Architect.

END OF SECTION 115850

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SECTION 116143 - STAGE CURTAINS**PART 1 - GENERAL****1.1 SUMMARY****A. Section Includes:**

1. Stage curtains-
2. Draw-curtain tracks.

B. Related Requirements:

1. Section 055000 "Metal Fabrications" for steel framing and supports for stage-curtain systems.

1.2 ACTION SUBMITTALS**A. Product Data:** For each type of product and the following:

1. Tracks: Capability of each track to support the weight and operation of curtains that it supports.

B. Shop Drawings: For each installation and for special components not dimensioned or detailed in manufacturer's product data.

1. Include plans, elevations, sections, and attachment details of curtains.
2. Include fabric assembly and hanging details.
3. Dimension operating clearances.
4. Include documentation of capacity of each batten, track, attachment, and rigging component to support loads.
5. Locations of equipment components, switches, and controls. Differentiate between manufacturer-installed and field-installed wiring.

C. Samples for Verification: Full width by minimum 12-inch-long section of each fabric from dye lot to be used for the Work, with specified treatments applied. Show complete pattern repeat. Mark top and face of fabric.**1.3 INFORMATIONAL SUBMITTALS****A. Coordination Drawings:** Reflected ceiling plans and other details, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Structural members to which tracks, battens, and other stage-curtain equipment will be attached.
2. Locations of lighting fixtures and cabling, ductwork, piping, and sprinklers.
3. Rigging equipment for stage equipment.
4. Access panels.

B. Qualification Data: For Installer.**C. Product Certificates:** For the following, from manufacturer:

1. Fabric: Provide name of flame-retardant chemical used, identification of applicator, treatment method, application date, allowable life span for treatment, and details of any restrictions and limitations.

D. Sample Warranty: For manufacturer's special warranty.

1.4 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For stage curtains and rigging to include in operation and maintenance manuals.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Manufacturer of stage curtains.

1.6 FIELD CONDITIONS

- A. Environmental Limitations: Do not install stage curtains until spaces are enclosed and weathertight, wet work in spaces is complete and dry, work at and above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.
- B. Field Measurements: Verify locations of supporting structural elements and construction contiguous with stage curtains and rigging by field measurements before fabrication and indicate measurements on Shop Drawings.

1.7 WARRANTY

- A. Manufacturer's Special Warranty: Manufacturer agrees to repair or replace components of stage-curtain systems that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, faulty operation of rigging.
 - 2. Warranty Period: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 STAGE-CURTAIN SYSTEMS

- A. Description: Complete stage-curtain systems, including stage curtains, tracks, draw-curtain machines, and rigging; with necessary accessories for support and operation.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Georgia Stage, Inc.
 - b. Janson Industries
 - c. MainStage Theatrical Supplies.
 - d. Major Theatre Equipment Company.
 - e. NorthEast Stage.
 - f. Pittsburgh Stage, Inc.
 - g. Stagecraft Industries, Inc.
- B. Source Limitations: Obtain stage-curtain systems from single manufacturer. Obtain each color, grade, finish, type, and variety of fabric from single source with resources to provide materials of consistent quality in appearance and physical properties.

2.2 PERFORMANCE REQUIREMENTS

- A. Fire-Test-Response Characteristics: Provide stage curtains meeting the following requirements as determined by testing identical products by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.
1. Flame-Propagation Resistance: Passes NFPA 701.
 - a. Permanently attach label to each fabric of curtain assembly indicating whether fabric is inherently and permanently flame resistant or is treated with flame-retardant chemicals and whether it requires retreatment after cleaning or after a designated time period of use.
 - b. Permanently attach 12-inch-square swatch of same fabric and dye lot for each fabric of a curtain assembly to the back of assembly for use as fire-resistance test strip.

2.3 CURTAIN FABRICS (CRT-1)

- A. General: Provide fabrics inherently and permanently flame resistant or chemically flame resistant by immersion treatment according to performance requirements indicated. Provide fabrics of each type and color from same dye lot.
- B. Medium-Weight Woven Cotton Velour: Napped fabric of 100 percent cotton weighing not less than 20 oz./linear yd., with pile height not less than 75 mils; 54-inch minimum width.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Dazian LLC.
 - b. JB Martin Company.
 - c. KM Fabrics, Inc..
 - d. Valley Forge Fabrics, Inc.
 2. Color/Texture/Pattern: As indicated on Room Finish Legend on Drawings.

2.4 LINING

- A. Cotton Lining: Yarn-dyed denim cloth of 100 percent cotton; woven in a warp-faced twill; 54-inch minimum width; color to be selected by Architect.

2.5 CURTAIN FABRICATION

- A. General: Affix permanent label, stating compliance with requirements of authorities having jurisdiction, in accessible location on fabric not visible to audience. Provide vertical seams unless otherwise indicated. Arrange vertical seams so they do not fall on faces of pleats. Do not use fabric cuts less than one-half width.
- B. Vertical and Top Hems: Machine sew hems as follows unless otherwise indicated:
1. Vertical Hems: Minimum 2 inches wide, and not less than 4 inches wide at borders, valance, teasers, and tormentors, with not less than a 1-inch tuck and with no selvage material visible from front of curtain. Sew open ends of hems closed.
 2. Turnbacks: Provide leading-edge turnbacks for traveler curtains, formed by folding back not less than 12 inches of face fabric, with not less than a 1-inch tuck, and vertically secured by sewing.
 3. Top Hems: Reinforced by double-stitching 3-1/2-inch-wide, heavy, jute webbing to top edge on back side of curtain with not less than 2 inches of face fabric turned under.

- C. Fullness:
1. 50 Percent Fullness: Provide fullness, exclusive of turnbacks and hems, by sewing additional material into 3-inch double-stitched, flat, box pleats spaced at 12 inches o.c. along top hem reinforcement.
- D. Grommets: Brass, No. 3, or No. 4.
1. Pleated Curtains: Center grommets on each box pleat and place 1 inch from corner of curtain; for snap hooks or S-hooks.
- E. Bottom Hems: Machine sew hems as follows unless otherwise indicated:
1. For Curtains With Fullness:
 - a. Curtains That Do Not Hang to Floor: Hems not less than 3 inches deep, with 3/4-inch weight tape, and with open ends of hems sewn closed.
 - b. Floor-Length Curtains: Hems not less than 6 inches deep, with 1-inch weight tape sewn to top seam of the bottom hem, clear of the finished bottom edge, and with open ends of hems sewn closed.
 - c. Floor-Length Curtains: Hems not less than 6 inches deep, with individual weights in individual closed pockets sewn above finished bottom edge of curtain, and with open ends of hems sewn closed.
 - d. Floor-Length Curtains: Hems not less than 6 inches deep; with separate, interior, 100 percent cotton, heavy canvas chain pockets equipped with proof coil chain; with chain pockets sewn so that chain rides 2 inches above finished bottom edge of curtain; and with open ends of hems sewn closed.
 2. Lining: Where indicated, provide lining for curtain in same fullness as face fabric and finished 2 inches shorter than face fabric. Sew or otherwise securely attach lining to top hem of face fabric. Attach lining to face fabric along bottom and side seams with 4-inch-long strips of heavy woven cotton tape.

2.6 CURTAIN ACCESSORIES

- A. S-Hooks: Manufacturer's standard heavy-duty plated-wire hooks, not less than 2 inches long.
- B. Tie-Lines: No. 4 or No. 4-1/2 cord or braided soft cotton tape, black or white to best match curtain; not less than 5/8 inch wide by 36 inches long.

2.7 STEEL CURTAIN TRACK

- A. Steel Track: Roll-formed, galvanized, commercial-quality, zinc-coated steel sheet, ASTM A 653/A 653M; G60 coating designation; with continuous bottom slot and with each half of track in one continuous piece; complete with necessary accessories for support and operation.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Automatic Devices Company.
 - b. H & H Specialties Inc.
 - c. Tru-Roll, Inc.
 2. Steel Thickness: As recommended by manufacturer for loads and operation.
 - a. Heavy Duty: Minimum 0.079 inch.

- B. Heavy-Duty Track System: Equip track with heavy-duty components as recommended by manufacturer for loads and operation. Provide end stops for track.
 - 1. Curtain Carriers: Standard carriers of plated steel with a pair of nylon or neoprene-tired ball-bearing wheels riveted parallel to body. Equip carriers with rubber or neoprene bumpers to reduce noise, and heavy-duty, plated-steel swivel eye and trim chain for attaching curtain snap or S-hook. Provide quantity of curtain carriers sufficient for track length, to suit curtain fabrication.
- C. Manual Cord Operation: Provide with cord operating line, 3/8-inch-diameter, stretch-resistant operating cord of braided synthetic-fiber jacket over solid, synthetic-fiber, linear filaments.

2.8 CURTAIN RIGGING

- A. Battens: Fabricated from steel pipe with a minimum number of joints. Connect pipe at joints with a drive-fit pipe sleeve not less than 18 inches long, and secure with four flush rivets, plug welds, threaded couplings, or another equally strong method.
 - 1. Steel Pipe: ASTM A 53/A 53M, Grade A, standard weight (Schedule 40), black, NPS 1-1/2 nominal diameter unless otherwise indicated.
 - 2. Finish: Shop painted black, with a 1-inch-wide yellow stripe at center of each batten.
- B. Supports, Clamps, and Anchors: ASTM A 153/A 153M, Class B, galvanized sheet steel in manufacturer's standard thicknesses, galvanized after fabrication.
- C. Trim and Support Cable: 1/4-inch-diameter, 7x19 galvanized-steel cable with a breaking strength of 7000 lb. Provide fittings according to cable manufacturer's written instructions for size, number, and method of installation, including a drop-forged galvanized turnbuckle to allow for leveling.
- D. Trim and Support Chain: ASTM A 391/A 391M, Grade ~~80~~ **30**, hardened alloy steel chain rated for overhead lifting.
- E. Inserts, Bolts, Rivets, and Fasteners: Manufacturer's standard corrosion-resistant units.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and conditions, with Installer present, for compliance with requirements for supporting members, blocking, installation tolerances, clearances, and other conditions affecting performance of stage-curtain work.
- B. Examine inserts, clips, blocking, or other supports required to be installed by others to support tracks and battens.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

- A. Install stage-curtain system according to curtain and track manufacturer's written instructions.

3.3 BATTEN INSTALLATION

- A. Install battens by suspending at heights indicated with trim and supports spaced to support load, except do not exceed 10 feet between supports.
 - 1. Cable Trim and Support: Secure cables either directly to structures or to inserts, eye screws, or other devices that are secure and appropriate to substrate and that are not subject to deterioration or failure with age or elevated temperatures. Attach other cable end to pipe clamps with turnbuckles, housed or fixed with nuts after adjustment, to prevent loosening.
 - 2. Chain Trim and Support: Secure chain with load-rated terminations.

3.4 TRACK INSTALLATION

- A. Ceiling-Mounted Track: Drill track at intervals not greater than manufacturer's written instructions for spacing, and fasten directly to structure.
- B. Batten-Hung Track: Install track by suspending from pipe batten with manufacturer's track clamp hangers attached to batten pipe clamps at track-support spacing, according to manufacturer's written instructions.
- C. Track-Support Spacing: According to manufacturer's recommendations for applied loads, but not exceeding the following dimensions between supports:
 - 1. Heavy-Duty Track: 72 inches.
- D. Install track for center-parting curtains with not less than 24-inch overlap of track sections at center, supported by track lap clamps.

3.5 CURTAIN INSTALLATION

- A. Track Hung: Secure curtains to track carriers with S-hooks.
- B. Batten Hung: Secure curtains to pipe battens with S-hooks.

3.6 DRAW-CURTAIN-MACHINE INSTALLATION

- A. Install each draw-curtain machine by securely mounting to the supporting construction, according to manufacturer's written instructions.
- B. Adjust each installation to function smoothly and lubricate as recommended by manufacturer.

3.7 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain stage curtains and tracks.

END OF SECTION 116143

SECTION 116623 – GYMNASIUM EQUIPMENT**PART 1 - GENERAL****1.1 SUMMARY****A. Section Includes:**

1. Basketball and volleyball equipment.
2. Scoreboards.
3. Mat Lifters.

1.2 ACTION SUBMITTALS**A. Product Data:** For each type of product.

1. If applicable, include assembly, disassembly, and storage instructions for removable equipment.
2. Motors: Show nameplate data, ratings, characteristics, and mounting arrangements.

B. Shop Drawings: For gymnasium equipment.

1. Blocking and Reinforcement: Show locations of blocking and reinforcement required for support of gymnasium equipment.
2. Setting Drawings: For cast-in-place insert sleeves for post standards.
3. Design Calculations: Verify capacity of members and connections to support loads and verify loads, point reactions, and locations for attachment of gymnasium equipment to structure with those indicated on Drawings.
4. Include plans, elevations, sections, details, and attachments to other work.
5. Include details of field assembly for removable equipment, connections, installation, mountings, floor inserts, attachments to other work, and operational clearances.

C. Samples for Verification: For the following products:

1. Basketball Net: Full size.
2. Volleyball Net: Minimum 12-inch length by full height, including one edge and net accessories.
3. Volleyball Floor Insert: Full-size unit.
4. Volleyball Post Standard: Full-size unit with net tensioner.

1.3 INFORMATIONAL SUBMITTALS**A. Coordination Drawings:** Court layout plans, drawn to scale, and coordinated with floor inserts, game lines, and markers applied to finished flooring.**B. Qualification Data:** For Installer.**C. Product Certificates:** For each type of gymnasium equipment.**D. Sample Warranty:** For special warranty.

1.4 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For gymnasium equipment to include in emergency, operation, and maintenance manuals.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

1.6 FIELD CONDITIONS

- A. Environmental Limitations: Do not install gymnasium equipment until spaces are enclosed and weatherproof, wet work in spaces is complete and dry, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.
- B. Field Measurements: Verify position and elevation of floor inserts and layout for gymnasium equipment.

1.7 COORDINATION

- A. Coordinate installation of floor inserts with structural floors and finish flooring installation and with court layout and game lines and markers on finish flooring.
- B. Coordinate layout and installation of overhead-supported gymnasium equipment and suspension-system components with other construction including light fixtures, HVAC equipment, fire-suppression-system components, and partition assemblies.

1.8 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of gymnasium equipment that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Basketball backboard failures including glass breakage.
 - b. Faulty operation of basketball backstops.
 - 2. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS, GENERAL

- A. Source Limitations: Obtain each type of gymnasium equipment from single source from single manufacturer.

2.2 EQUIPMENT BASIS-OF-DESIGN

- A. Basketball Equipment:

1. Basis-of-Design: Subject to compliance with requirements, provide Draper, Inc. or comparable products by one of the following:
 - a. AALCO Manufacturing/SportsCon LLC.
 - b. Draper, Inc. (Basis-of-Design).
 - 1) Products:
 - a) Forward-Folding, Front Brace: Model TF-20.
 - b) Side-Folding: TB5-26-B.
 - c. Jaypro Sports, Inc.
 - d. Porter Athletic Equipment Co.
 - e. Performance Sports Systems, Inc.

B. Volleyball Equipment:

1. Basis-of-Design: Subject to compliance with requirements, provide Draper, Inc. or comparable products by one of the following:
 - a. AALCO Manufacturing/SportsCon LLC.
 - b. Draper, Inc. (Basis-of-Design).
 - 1) Products:
 - a) Part #501310 Judges' Stand with Protective Padding (total 2).
 - b) Part #501010 4" Floor Sleeve.
 - c) Part #501034 8" Chrome Cover Plate.
 - d) Part #501110 Protective Pads for Volleyball Standards.
 - e) Part #501017 Wall Storage Hooks (total 2).
 - f) Part #500001PVS-01 Power Volleyball System with center standard, two nets, antennae and boundary markers.
 - c. Porter Athletic Equipment Co.
 - d. Jaypro Sports, Inc.
 - e. Performance Sports Systems, Inc.

2.3 INDOOR BASKETBALL EQUIPMENT

- A. General: Provide equipment complying with requirements in NFHS's "NFHS Basketball Rules Book."
- B. Protruding fasteners or exposed bolt heads on front face of backboards are not permitted.
- C. Provide manufacturer's recommended connections complying with Section 055000 "Metal Fabrications" of size and type required to transfer loads to building structure.
- D. Overhead-Supported Backstops:
 1. Folding Type: Provide manufacturer's standard assembly for forward-folding, front-braced and side-folding backstop, with hardware and fittings to permit folding.
 2. Framing: Steel pipe, tubing, and shapes. Design framing to minimize vibration during play.
 - a. Center-Mast Frame: Welded with side sway bracing.
 - b. Dual-Mast Frame: Welded with cross bracing.
 - c. Finish: Manufacturer's standard polyester powder-coat finish.

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3. Goal Height Adjuster: Adjustable from 8 to 10 feet with gear-drive mechanism, locking in any position within adjustment range, with visible height scale attached to side of framing.
 - a. Operation: Electric with integral gear-drive motor, with limit switches preset to goal heights and the following:
 - 1) One detachable electric control device.
 - E. Backstop Safety Device: Designed to limit free fall if support cable, chains, pulleys, fittings, winch, or related components fail; with mechanical automatic reset; 6,000-lb load capacity; one per folding backstop.
 1. Retractor Device: Manufacturer's standard device designed to retract both support and safety cables, chains, and straps away from play of the basketball when backstop is in playing position; one per folding backstop.
 - F. Backstop Electric Operator: Provide operating machine of size and capacity recommended by manufacturer for equipment specified, with electric motor and factory-prewired motor controls, starter, gear-reduction unit, and remote controls. Coordinate wiring requirements and electrical characteristics with building electrical system.
 1. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
 2. Operator Type: Cable drum with grooved drum and cable tension device to automatically take up cable slack and retain cable in grooves.
 3. Operator Mounting: Wall-mounted board.
 4. Motor Electrical Characteristics:
 - a. Voltage: NEMA standard voltage selected to operate on nominal circuit voltage to which motor is connected.
 - b. Horsepower: 1/2 hp.
 - c. Phase: Single.
 5. Limit Switches: Adjustable switches, interlocked with motor controls and set to automatically stop basketball equipment at fully retracted and fully lowered positions.
 - G. Basketball Backboards:
 1. Shape and Size:
 - a. Rectangular, 72 by 42 inches width by height.
 2. Backboard Material: With predrilled holes or preset inserts for mounting goals, and as follows:
 - a. Glass: Not less than 1/2-inch- thick, transparent tempered glass complying with ASTM C 1048 Kind FT (fully tempered) and with impact testing requirements in 16 CFR 1201 Category II or ANSI Z97.1 Class A for safety glazing. Provide glass and framing system manufactured to comply with FIBA Level 1 or Level 2 requirement that glass does not split off if broken. Provide glass with impact-absorbing resilient rubber or PVC gasket around perimeter in a fully welded, brushed-natural-finish, extruded-aluminum frame, with steel subframe,

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- reinforcement, bracing, and mounting slots for mounting backboard frame to backboard support framing.
3. Target Area and Border Markings: Permanently etched in white color, marked in pattern and stripe width according to referenced rules.
 4. Finish: Manufacturer's standard factory-applied, white background.
- H. Goal Mounting Assembly: Compatible with goal, backboard, and support framing; with hole pattern that is manufacturer's standard for goal attachment.
1. Glass Backboard Goal Mounting Assembly: Goal support framing and reinforcement designed to transmit load from goal to backboard frame and to minimize stresses on glass backboard.
- I. Basketball Goals: Complete with flanges, braces, attachment plate, and evenly spaced loops welded around underside of ring.
1. Single-Rim Basket Ring Competition Goal: Materials, dimensions, and fabrication complying with referenced rules.
 2. Type: Fixed, nonremovable.
 3. Mount: Front.
 4. Net Attachment: No-tie loops for attaching net to rim without tying.
 5. Finish: Manufacturer's standard finish.
- J. Basketball Nets: 12-loop-mesh net, between 15 and 18 inches long, sized to fit rim diameter, and as follows:
1. Competition Cord: Antiwhip, made from white nylon cord not less than 120-gm thread and not more than 144-gm thread.
- 2.4 VOLLEYBALL EQUIPMENT
- A. General: Provide equipment complying with requirements in NFHS's "NFHS Volleyball Rules Book."
- B. Floor Insert: Chrome-finished steel floor plate; and steel pipe sleeve, concealed by floor plate, with capped bottom end, sized with ID to fit post standards, not less than length required to securely anchor pipe sleeve below finished floor in concrete footing; with anchors designed for securing floor insert to floor substrate indicated; one per post standard.
1. Floor Plate: Lockable swivel access cover, designed for use with floating wood floors and to be flush with adjacent flooring. Provide two tool(s) for unlocking access covers.
- C. Post Standards: Removable, paired volleyball post standards as indicated. Fixed height. Designed for easy removal from permanently placed floor insert supports. Fabricated from manufacturer's standard metal pipe or tubing, with nonmarking plastic or rubber end cap or floor bumper to protect permanent flooring. Finished with manufacturer's standard factory-applied, polyester powder-coat finish complying with finish manufacturer's written instructions for surface preparation, including pretreatment, application, baking, and minimum dry film thickness or plated metal finish.
1. Nominal Pipe or Tubing Diameter: 3-1/2-inch OD at base.

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2. Net Height Adjuster: Manufacturer's standard mechanism for height adjustment, complete with fittings; designed for positioning net at heights indicated.
 - a. Net Heights: Between sitting volleyball net height and boys'/men's volleyball net height, 36 and 95-5/8 inches or more.
 3. Height Markers: Clearly marked at regulation play heights for elementary school.
- D. Net: 32 feetlong; one per pair of paired post standards; and as follows:
1. Width and Mesh: Competition volleyball net, 39 inches with 4-inch-square mesh made of black nylon string.
 - a. Hem Band Edges: White, not less than 2-inch-wide top, bottom, and side bindings; tie offs at top, bottom, and midpoint of each side end of net; end sleeves for dowels; and lines with linkage fittings threaded through top and bottom hems of binding. Provide lengths of lines and linkage fittings as required to properly connect to and set up net for post standard spacing indicated on Drawings.
 - 1) Top Line: Not less than 1/8-inch-diameter, galvanized- or coated-steel cable.
 - 2) Bottom Line: Not less than 1/8-inch-diameter, galvanized- or coated-steel cable.
 2. Dowels: Not less than 1/2-inch-diameter fiberglass or 1-inch-diameter wood. Provide two dowels per net threaded through each side hem sleeve for straightening net side edges.
 3. Net Antennas: 3/8-inch-diameter, high-tensile-strength, extruded-fiberglass or plastic rods, 72 inches long, extending above top hem band of net, with alternating white and red bands according to competition rules. Provide two antennas per net.
 - a. Clamps: Designed to secure antenna to top and bottom of net.
 4. Boundary Tape Markers: 2-inch-wide white strip, secured to net top and bottom with hook-and-loop attachment. Provide two tape markers per net for marking court boundaries.
- E. Net-Tensioning System: Designed to adjust and hold tension of net. Fully enclosed, nonslip manufacturer's standard-type winch with cable length and fittings for connecting to net lines, positive-release mechanism, and manufacturer's standard handle. Mount net tensioner on post standard at side away from court. Provide end post with post top pulley. Provide opposing post with welded-steel loops, hooks, pins, or other devices for net attachment and post top grooved line guide.
- F. Safety Pads: Comply with NCAA and NFHS requirements. Provide pads consisting of not less than 1-1/4-inch- thick, multiple-impact-resistant manufacturer's standard foam filler covered by puncture- and tear-resistant fabric cover, not less than 14-oz./sq. yd. PVC-coated polyester, treated with fungicide for mildew resistance, not less than 14-oz./sq. yd. nylon-reinforced PVC; with fire-test-response characteristics indicated, and lined with fire-retardant liner. Provide pads with hook-and-loop closure or attachments for the following components:
1. Post Standards: Wraparound style, designed to totally enclose each standard to a height of not less than 72 inches; one per post.
 2. Net Lines: Four per net.
 3. Judges' Stands: Designed to totally enclose each unit.
 4. Fabric Cover Flame-Resistance Ratings: Complies with NFPA 701.
 5. Fabric Color: As selected by Architect from full range of industry standard colors and color densities.

- G. Storage Cart: Manufacturer's standard wheeled unit designed for transporting and storing volleyball equipment and passing through 36-inch- wide door openings. Fabricate welded-steel tubing units with heavy-duty casters, including no fewer than two swivel casters. Fabricate wheels from materials that do not damage or mark floors; number of units as required to provide transport and storage for specified equipment.
- H. Post Standard Transporter: Manufacturer's standard wheeled unit designed for transporting a single post.

2.5 SCOREBOARDS

- A. Single Source: Provide all components of scoreboard systems from a single source by a single manufacturer.
- B. Basketball Scoreboard: Subject to compliance with requirements, provide Nevco or an approved equal by one of the following:
 - 1. Nevco (Basis-of-Design).
 - a. Product: Model 2700 Basketball Scoreboard.
 - 2. All American Scoreboards.
 - 3. Daktronics, Inc.
 - 4. Electro-Mech.
- C. Construction: All aluminum unit for standard wall mounting; size 8 ft. wide x 3 ft. high x 8 ft. deep.
- D. Lighting: Provide digital LED lighting with 9- and 13-inch high digits.
- E. Provide timing indicators on four-lamp banks with capability of indicating 59:59; counting up or down as programmed by operator; and with zero reset.
- F. Provide scoring to register through 199 for each team.
- G. Provide period and bonus indication.
- H. Provide vibrating horn that sounds automatically at end of period.
- I. Captions: Provide words "HOME", "GUESTS" and "PERIOD" in white vinyl applied directly to display face.
- J. Color: As selected by Architect from full range of standard colors.

2.6 SCOREBOARD CONTROL CENTER

- A. Control Center for Scoreboard: Provide wireless microprocessor-based operator's control center and receiver to operate scoreboard by interchange of keyboard overlay. Basis-of-Design is Model MPCW-7 as manufactured by Nevco Integrated Display & Scoring Solutions.
 - 1. Console: High impact, break-resistant black plastic with improved UV resistance; 11 x 9-1/2 x 4-1/8 inches.
 - 2. Features:

- a. Provide with LED displays, lithium cell battery backup to maintain scoreboard memory and time of day, self-test mode, power on-off switch, alternate time control, and multiple scoreboard operation.
- b. Split and raised 40 key soft touch keyboard.
- c. Keyboard shall be spill resistant.
- d. Internal beeper acknowledging each entry
- e. System Profiles feature set all parameters of operation including choice of controlled accessories and scoreboards.
- f. Colorful graphic rich keyboard overlays for scoreboard or accessory.
- g. Remote hand-held main time switch with programmable integral horn button.
- h. 25 feet control cable with connectors.
- i. Timer features: Time of day display, multiple time out timers with warning, interval horn, up-count auto stop with horn, 1/10th second display during last minute, changeable horn tone on scoreboards with the feature.
- j. Segment timing for practice and workout.
- k. Dimmer control for scoreboard.
- l. MPC features shall be accessed through yes/no abbreviated questions in a drop down menu format.
- m. Multiple receiver management shall be accomplished through direct keyboard input.
- n. Electronic Team Names and automatic Electronic Caption Plates shall be controlled from MPC control without need to change overlays.
- o. Power requirements: 120 volts, 12 watts, 50/60 Hz.
- p. Provide option of battery supply for control operation if utility power not available.
- q. Provide carrying case for control center, cable, and hand-held switch; Model CC-3 as manufactured by Nevco Inc.
 - 1) Size: 18-1/2 x 14-1/2 x 6 inches.
 - 2) Construction: Double wall, high-density black polyethylene with padded interior, mechanical latches, and hinges.

2.7 MATERIALS

- A. Aluminum: Alloy and temper recommended by manufacturer for use and finish type indicated.
 1. Extruded Bars, Profiles, and Tubes: ASTM B 221.
 2. Cast Aluminum: ASTM B 179.
 3. Flat Sheet: ASTM B 209.
- B. Steel: Comply with the following:
 1. Steel Plates, Shapes, and Bars: ASTM A 36.
 2. Steel Tubing: ASTM A 500 or ASTM A 513, cold formed.
 3. Steel Sheet: ASTM A 1011.
- C. Support Cable: Manufacturer's standard galvanized stranded-steel wire rope with a breaking strength of 7,000 lb. Provide fittings complying with cable manufacturer's written instructions for size, number, and method of installation.
- D. Support Chain and Fittings: For chains used for overhead lifting, provide Grade 80 heat-treated alloy steel chains, complying with ASTM A 391, with commercial-quality, hot-dip galvanized or zinc-plated steel connectors and hangars.
- E. General-Purpose Chain: For chains not used for overhead lifting, provide carbon steel chain, complying with ASTM A 413, Grade 30 proof coil chain or other grade recommended by gymnasium equipment

manufacturer. Provide coating type, chain size, number, and installation method complying with manufacturer's written instructions.

- F. Castings and Hangers: Malleable iron, complying with ASTM A 47; grade required for structural loading.
- G. Softwood Plywood: DOC PS 1, Exterior.
- H. Particleboard: ANSI A208.1
- I. Anchors, Fasteners, Fittings, and Hardware: Manufacturer's standard corrosion-resistant or noncorrodible units; concealed; tamperproof, vandal- and theft-resistant design.
- J. Grout: Nonshrink, nonmetallic, premixed, factory-packaged, nonstaining, noncorrosive, nongaseous grout, complying with ASTM C 1107 with minimum strength recommended in writing by gymnasium equipment manufacturer.

2.8 MAT LIFTERS

- A. Single Mat Lifters: Standard two-cable steel framed mat lifter.
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide #502020 Single Mat Lifter by Draper, Inc. or approved substitution from one of the following:
 - a. AALCO Manufacturing/SportsCon LLC.
 - b. Jaypro Sports, Inc.
 - c. Porter Athletic Equipment Co.
 - d. Performance Sports Systems, Inc.
- B. Mat Lifter Construction: Two cable system of welded steel frame with drive and lifting mechanisms enclosed in sheet metal housing.
 - 1. Cables: Attached to load bar that connects to fabric sling. Standard unit, load bar, and sling shall be capable of supporting a standard 45 foot by 45 foot wrestling mat or sectional mats placed end to end with a 5 to 1 safety ratio.
 - 2. Power: Provide unit with 210:1 ratio double reduction worm attached to instantly-reversing 2 hp motor, operating with 208/230/460 volts in 3-phase, including a 6 pound per foot electric safety brake.
 - a. Lifting and Lowering Speed: Approximately 10 feet per minute.
 - 3. Lifting Drums: Machine-synchronized for cable wrap with 210:1 ratio gearbox.
 - a. Drum Shaft: 1-7/16 inch diameter cold-finished steel.
 - 4. Lift Cables: Two steel cables consisting of 5/16 inch 6-strand, 37 wires per strand, fiber core.
 - a. Cable Rating: 1,704 pounds each at a 5-to-1 safety factor.
 - 5. Load Bar: Connected to 22 ounce per square yard vinyl fabric sling with heavy duty straps and fasteners. Fabric sling incorporates continuous straps that wrap completely around mat to prevent mat from falling should fabric sling become torn.
 - a. Sling Color: Black.
 - 6. Encase motors, drive assembly, and control mechanisms in a fireproof safety cover.
 - 7. Movement control shall be by surface mounted control enclosure with limit switches.

8. Wiring and conduit from hoist to key switch and electrical hook-up of unit as specified in Division 26 Sections.
9. Finish: Manufacturer's standard factory-applied gray enamel paint.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for play court layout, alignment of mounting substrates, installation tolerances, operational clearances, accurate locations of connections to building electrical system, and other conditions affecting performance of the Work.
 1. Verify critical dimensions.
 2. Examine supporting structure, subgrades, subfloors, and footings below finished floor.
 3. Examine wall assemblies, where reinforced to receive anchors and fasteners, to verify that locations of concealed reinforcements are clearly marked. Locate reinforcements and mark locations.
- B. Where mat lifters will be installed after installation of wood gymnasium flooring, provide protection acceptable to wood flooring manufacturer, and use care to not damage flooring.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

- A. General: Comply with manufacturer's written installation instructions. Complete equipment field assembly where required.
- B. Unless otherwise indicated, install gymnasium equipment after other finishing operations, including painting, are completed.
- C. Permanently Placed Gymnasium Equipment and Components: Install rigid, level, plumb, square, and true; anchored securely to supporting structure; positioned at locations and elevations indicated; in proper relation to adjacent construction; and aligned with court layout.
 1. Floor Insert Location: Coordinate location with application of game lines and markers, and core drill floor for inserts after game lines are applied.
 2. Floor Insert Elevation: Coordinate installed heights of floor insert with installation and field finishing of finish flooring and floor-plate type.
 3. Operating Gymnasium Equipment: Verify clearances for movable components of gymnasium equipment throughout entire range of operation and for access to operating components.
- D. Floor Insert Setting: Position sleeve in oversized, recessed voids in concrete slabs. Clean voids of debris. Fill void around sleeves with grout, mixed and placed to comply with grout manufacturer's written instructions. Protect portion of sleeve above subfloor from splatter. Verify that sleeves are set plumb, aligned, and at correct height and spacing; hold in position during placement and finishing operations until grout is sufficiently cured. Set insert so top surface of completed unit is flush with finished flooring surface.

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- E. Anchoring to In-Place Construction: Use anchors and fasteners where necessary to secure built-in and permanently placed gymnasium equipment to structural support and to properly transfer load to in-place construction.
 - F. Connections: Connect electric operators to building electrical system as specified in Division 26 Sections.
 - G. Removable Gymnasium Equipment and Components: Assemble in place to verify that equipment and components are complete and in proper working order. Instruct Owner's designated personnel in properly handling, assembling, adjusting, disassembling, transporting, storing, and maintaining units. Disassemble removable gymnasium equipment after assembled configuration is approved by Architect, and store units in location indicated on Drawings.

3.3 ADJUSTING AND CLEANING

- A. Adjust movable components of gymnasium equipment to operate safely, smoothly, easily, and quietly, free from binding, warp, distortion, nonalignment, misplacement, disruption, or malfunction, throughout entire operational range. Lubricate hardware and moving parts.
- B. After completing gymnasium equipment installation, inspect components. Remove spots, dirt, and debris and touch up damaged shop-applied finishes according to manufacturer's written instructions.
- C. Replace gymnasium equipment and finishes that cannot be cleaned and repaired, in a manner approved by Architect, before time of Substantial Completion.

3.4 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain gymnasium equipment.

END OF SECTION 116623

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SECTION 116653 – GYMNASIUM DIVIDERS**PART 1 - GENERAL****1.1 SUMMARY**

- A. Section includes roll-up divider systems.

1.2 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate installation of overhead-supported gymnasium dividers and suspension-system components with other construction including light fixtures, HVAC equipment, fire-suppression-system components, and partition assemblies.
2. Electrically Operated Dividers: Coordinate electrical requirements for type and location of power supply, conduit, wiring, and control boxes.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Motors: Show mounting arrangements and wiring diagram to power source and controls.

B. Shop Drawings: For gymnasium dividers.

1. Include plans showing alignment of curtains in relation to court layout.
2. Include elevations, sections, details, and attachments to other work.
3. Include system clearances, stacking requirements, and limits for fitting into adjacent construction.
4. Include loads, point reactions, and locations for attachment of gymnasium dividers to structure.
5. Structural design and analysis, signed and sealed by qualified structural engineer responsible for preparation. Include loads, point reactions, and locations for attachment of gymnasium dividers to building structure.
 - a. Submit Shop Drawings that have been engineered and certified by professional engineer licensed in the State of North Carolina. Include seal and signature of professional engineer on Shop Drawings.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product Certificates: For each type of gymnasium divider.

C. Sample Warranty: For special warranty.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For gymnasium dividers to include in operation and maintenance manuals.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

1.7 FIELD CONDITIONS

- A. Environmental Limitations: Do not install gymnasium dividers until spaces are enclosed and weatherproof, wet work in spaces is complete and dry, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.
- B. Field Measurements: Verify size of space, available clearances, obstructions, and position for gymnasium dividers.

1.8 COORDINATION

- A. Coordinate installation of overhead-supported gymnasium dividers and suspension-system components with other construction including light fixtures, HVAC equipment, fire-suppression-system components, and partition assemblies.
- B. Electrically Operated Dividers: Coordinate electrical requirements for type and location of power supply, conduit, wiring, and control boxes.

1.9 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of gymnasium dividers that fail in materials or workmanship within specified warranty period.
1. Failures include the following:
 - a. Faulty operation of gymnasium dividers.
 - b. Tearing or deterioration of fabric, seams, or other materials beyond normal use.
 2. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations: Obtain gymnasium dividers from single source from single manufacturer.

2.2 ROLL-UP DIVIDER SYSTEMS

- A. Manufacturers: Subject to compliance with requirements, provide product approved by Architect from one of the following:
1. AALCO Manufacturing.
 2. ADP Lemco Inc.
 3. Draper Inc.
 4. Jaypro Sports, Inc.

5. Performance Sports Systems.
6. Pioneer Manufacturing.
7. Porter Athletic Equipment Co.

B. Divider Curtain System: Electrically operated with roll-up drive pipe, and as follows:

1. Top Hem: Double-thickness mesh or solid vinyl for continuous pipe batten.
2. Belts: 5-inch- wide polyester or polyurethane webbing or fabric belts, attached to top batten, passing under bottom batten, and terminating at drive pipe, with friction surface on one side of belt or other means of drawing up curtain by rolling at bottom batten.
3. Support Chain and Fittings: Hardened alloy steel chain rated for lifting loads indicated, with commercial-quality, corrosion-resistant steel connectors and hangers.
4. Curtain Battens and Drive Pipe: Fabricate from steel pipe or tubing with a minimum number of joints, as necessary for required lengths. Provide galvanized battens, or shop prime and shop finish with black paint.
 - a. Drive Pipe: 2-3/8-inch- nominal diameter steel pipe.
 - b. Top Batten: 1-1/2-inch- nominal diameter steel pipe.
 - c. Bottom Batten: 3-1/2-inch- nominal diameter steel pipe.

C. Fabric Colors: As selected by Architect from manufacturer's full range.

D. Divider Curtain Flame-Resistance Ratings: Passes NFPA 701, inherently and permanently flame resistant.

1. Permanently attach label to each fabric of curtain assembly indicating whether fabric is inherently and permanently flame resistant or treated with flame-retardant chemicals, and whether it will require retreatment after designated time period or cleaning.

2.3 MATERIALS

- A. Support Chain and Fittings: For chains used for overhead lifting, provide Grade 80 heat-treated alloy steel chains, complying with ASTM A 391, with commercial-quality, hot-dip galvanized or zinc-plated steel connectors and hangers.
- B. Anchors, Fasteners, Fittings, and Hardware: Manufacturer's standard corrosion-resistant or noncorrodible units; concealed; tamperproof, vandal-resistant design.

2.4 ELECTRIC OPERATORS

- A. General: Factory-assembled electric operation system of size and capacity recommended and provided by gymnasium divider manufacturer for gymnasium dividers specified, with electric motors, thermal-overload protection, factory-prewired motor controls, control devices, and accessories required for proper operation. Include wiring from control stations to motors. Coordinate operator wiring requirements and electrical characteristics with building electrical system.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- C. Motor Electrical Characteristics:

1. Voltage: NEMA standard voltage selected to operate on nominal circuit voltage to which motor is connected.
 2. Phase: Single.
 3. Hertz: 60.
 4. Horsepower: 3/4 to 1 hp.
- D. Limit Switches: Adjustable switches, interlocked with motor controls and set to automatically stop dividers at fully extended and fully retracted positions.
- E. Key Operated Control System: NEMA ICS 6, Type 1 enclosure, momentary-contact, three-position switch-operated control.
1. Keys: Provide two key per station.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for alignment of mounting substrates, installation tolerances, operational clearances, building electrical system connection types and locations, and other conditions affecting performance of the Work.
1. Verify critical dimensions.
 2. Examine supporting structure.
 3. Examine wall assemblies, where reinforced to receive anchors and fasteners, to verify that locations of concealed reinforcements are clearly marked. Locate reinforcements and mark locations.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

- A. General: Comply with manufacturer's written installation instructions. Complete field assembly, where required.
- B. Unless otherwise indicated, install gymnasium dividers after other finishing operations, including painting, are completed.
- C. Gymnasium Dividers and Components: Install level, rigid, plumb, square, and true; anchored securely to supporting structure; positioned at locations and elevations indicated on Shop Drawings; in proper relation to adjacent construction; and aligned with court layout.
1. Verify clearances for movable components of gymnasium dividers throughout entire range of operation and for access to operating components.
- D. Anchoring to In-Place Construction: Use anchors and fasteners where necessary to secure gymnasium dividers to structural support and to properly transfer load to in-place construction.
- E. Connections: Connect automatic operators to building electrical system.

3.3 ADJUSTING

- A. Adjust movable components of gymnasium dividers to operate safely, smoothly, easily, and quietly, free from binding, warp, distortion, uneven tension, nonalignment, misplacement, disruption, or malfunction, throughout entire operational range. Lubricate hardware and moving parts.
- B. Limit Switch Adjustment: Set and adjust upper and lower limit controls.

3.4 CLEANING

- A. After completing gymnasium divider installation, inspect components. Remove spots, dirt, and debris and touch up damaged shop-applied finishes according to manufacturer's written instructions.
- B. Replace gymnasium divider components and finishes that cannot be cleaned and repaired, in a manner approved by Architect, before time of Substantial Completion.

3.5 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain gymnasium dividers.

END OF SECTION 116653

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SECTION 116800 - EXTERIOR ATHLETIC EQUIPMENT**PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes the following exterior athletic equipment and accessories for the following:
 - 1. Football and soccer.
 - 2. Baseball and softball.
 - 3. Track and field.
 - 4. Scoreboards.
- B. Related Documents:
 - 1. Section 033000 "Cast-in-Place Concrete" for concrete footings for posts supporting exterior athletic equipment and scoreboards.
 - 2. Section 051200 "Structural Steel" for steel post and other structural framing to support scoreboards.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Product data for exterior athletic equipment, scoreboards, and accessories.
 - 2. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.
- B. Material and Equipment Lists: Submit a complete list of materials and equipment required. List shall include catalog numbers, catalog cuts, data sheets, and other descriptive information necessary to show that materials and equipment meet the requirements.
- C. Shop Drawings:
 - 1. Include plans, equipment and scoreboard layouts, elevations, sections, and mounting details.
 - 2. Include wiring diagrams for power, signal, and control wiring.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer and manufacturer.
- B. Welding certificates.
- C. Sample Warranty: For manufacturer's warranty.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For exterior athletic equipment and scoreboards and accessories to include in operation and maintenance manuals.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.
- B. Electrical Components, Devices and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- C. Source Limitations for Exterior Athletic Equipment: Obtain all components of exterior athletic equipment through one source from a single manufacturer.
- D. Source Limitations for Scoreboards: Obtain all components for electronic scoreboards through one source from a single manufacturer.
- E. Standard: Fabricate and label exterior scoreboards to comply with UL and NEC.
- F. Codes and Standards: Comply with current guidelines set forth by the International Association of Athletic Federations (IAAF), and National Federation of State High School Associations (NFSHSA). Where discrepancies are noted between these various governing bodies, the rules of the NFSHSA shall be enforced. Consult with NCHSAA, Raleigh, N.C.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Store exterior athletic equipment, scoreboards and accessories in a clean, dry environment.
- B. Protect exterior athletic equipment, scoreboards and accessories during shipment with a layer of cardboard or other sheet metal. Do not remove protective sheet until installation commences.
- C. Do not lay scoreboards face down or stack other objects upon them.

1.8 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace exterior athletic equipment, scoreboards, and accessories that fail(s) in materials or workmanship within specified warranty period.
 - 1. Warranty Period: Five year(s) from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 FOOTBALL AND SOCCER EQUIPMENT AND ACCESSORIES

- A. Football Goal Posts: Provide 8" Schedule 40 steel ground sleeve anchored in concrete footing, protector pad, flags, and sleeve cap. Goals shall meet NFSHSA specifications. Goal is 20' high x 3" o.d. aluminum uprights spaced 23'-4" apart. Goal has 6 5/8" o.d. cross bar and center

support post. Rotating gooseneck post is offset 96" behind crossbar, 4" o.d. aluminum uprights. Color of goal post to be selected by Architect. Provide concrete footing and complete installation per manufacturer's recommendation. Specified football goal rotates to allow space for soccer goal in front of football goal.

1. Basis-of-Design: Subject to compliance with requirements, provide the Basis-of-Design product indicated or a comparable product by one of the following:
 - a. SportsEdge (Basis-of-Design).
 - 1) Model SEF305R.
 - b. Bison, Inc.
 - c. Porter Athletic.
 - d. UCS.
 - e. Sportsfield Specialties, Inc.
 2. Post Padding: Provide manufacturer's standard protective post padding in color selected by Architect.
 3. Anchoring: Goal base shall accommodate subsurface anchoring of football goals.
- B. Soccer Goals: Provide 28'W x 8'H x 4'D (top)/10'D (bottom) anchored soccer goal. Goal has 4" square aluminum tube uprights and crossbars. Goal has 2" o.d. aluminum tube backstay and ground bar. Provide 3 mm HTTP, 4" square mesh net. Provide concealed anchor per manufacturer's recommendation. Provide optional flat free polyurethane tire with nylon bearing.
1. Basis-of-Design: Subject to compliance with requirements, provide the Basis-of-Design product indicated or a comparable product by one of the following:
 - a. SportsEdge (Basis-of-Design).
 - 1) Model SE700R.
 - b. Bison, Inc.
 - c. Porter Athletic.
 - d. UCS.
 - e. Sportsfield Specialties, Inc.
 2. Color: White.
- C. Football/Soccer Goal Anchor Frame: Provide and install football/soccer goal anchor access frame for each football/soccer goal. Provide synthetic turf around anchors to conceal to the greatest extent feasible. Provide dual stabilizing hooks for ground bar, rubber coping, treated nailer, access frame, dual ratchets, footing anchor bolts, and other fasteners needed for a turnkey installation per manufacturer's recommendation.
- D. Football/Soccer Scoreboards: Exterior, large-numbered, electronic "intelligent caption" scoreboard with integral horn and LED displays for time, scores, possession, and four-digit pairs for team features indicated.
1. Basis-of-Design: Subject to compliance with requirements, provide Basis-of-Design product indicated or a comparable product by one of the following:
 - a. Daktronics.
 - b. Electro-Mech.
 - c. Fair-Play Scoreboards by Translux Corporation.

- d. Nevco Integrated Display & Scoring Solutions (Basis-of-Design).
 - 1) Product: Model 3617 with MPC Wireless Control Center.
- E. Timing Display Clock: Pair of electronic units displaying delay of game with one unit installed at each end of field.
 - 1. Basis-of-Design: Subject to compliance with requirements, provide Basis-of-Design product indicated or a comparable product by one of the following:
 - a. Daktronics.
 - b. Electro-Mech.
 - c. Fair-Play Scoreboards by Translux Corporation.
 - d. Nevco Integrated Display & Scoring Solutions (Basis-of-Design).
 - 1) Product: Model DGT-6.
 - 2. Unit Size: 4 feet by 4 feet by 8 inches.

2.2 BASEBALL AND SOFTBALL EQUIPMENT AND ACCESSORIES

- A. Foul Ball Poles: Provide foul ball poles fabricated in two-piece design with 4/1/2" o.d. galvanized steel with powder coat finish in color selected by Architect.
 - 1. Basis-of-Design: Subject to compliance with requirements, provide the Basis-of-Design products or a comparable product by one of the following:
 - a. Beacon Athletics.
 - b. Jaypro Sports (Basis-of-Design).
 - 1) For Baseball: Model BBFP-30.
 - 2) For Softball: Model BBFP-20.
 - c. PW Athletic Mfg. Co.
- B. Bases: Field bases for baseball and softball, including pitching rubber, bases, and home plate.
 - 1. Basis-of-Design: Subject to compliance with requirements, provide the Basis-of-Design products or a comparable product by one of the following:
 - a. BSN Sports.
 - b. Beacon Athletics.
 - c. Jaypro Sports (Basis-of-Design).
 - 1) Home Plate: Model HP-150 Bury-All Home Plate.
 - 2) Bases: Model BB-500.
 - 3) Pitching Rubber: Model PR-624.
 - d. On Deck Sports.
- C. Wall Padding: Shall be installed behind baseball and softball home plate walls.
 - 1. Baseball: WPS exterior wood backed padding, 18 oz coated vinyl by SportsEdge. Color as selected by Architect from manufacturer's full range of standard colors. Provide approximately 155' x 3'-2" of 3" thick (dugout to dugout) removable wall padding in lengths not exceeding 8'-0".

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2. Softball: WPS exterior wood backed padding, 18 oz coated vinyl by SportsEdge. Color as selected by Architect from manufacturer's full range of standard colors. Provide approximately 100' x 3'-2" of 3" thick (dugout to dugout) removable wall padding in lengths not exceeding 8'-0".
- D. Player Benches: Provide 21' long portable player bench with back. Bench material is $\frac{3}{4}$ " 9 gauge expanded metal. Benches in dugouts shall be anchored per detail.
1. Products: Subject to compliance with requirements, provide products by one of the following:
- a. AALCO Athletic Equipment.
 - b. BSN Sports.
 - c. Belson Outdoors.
 - d. PW Athletic Mfg. Co.
- E. Fence Guards: Provide along entire fence line of outfield at baseball/softball fields. Return down sides and terminate at the 10'-high bull pen fence.
1. Basis-of-Design: Subject to compliance with requirements, provide Basis-of-Design product indicated or a comparable product by one of the following:
- a. SportsEdge (Basis-of-Design).
 - 1) Model SE01166 Premium Fence Guard.
 - b. Bison, Inc.
 - c. Porter Athletic.
 - d. UCS.
 - e. Sportsfield Specialties, Inc.
- F. Batting Cages: Provide batting cage frame and netting systems as indicated on Drawings.
1. Basis-of-Design: Subject to compliance with requirements, provide Basis-of-Design product indicated or a comparable product by one of the following:
- a. JUGS Sports (Basis-of-Design).
 - 1) Product: Batting Cage #3.
 - b. On Deck Sports.
 - c. Hitting World.
- G. Baseball/Softball Scoreboards: Exterior, large-numbered, electronic "intelligent caption" scoreboard with integral horn and LED displays for time, scores, possession, and four-digit pairs for team features indicated.
1. Basis-of-Design: Subject to compliance with requirements, provide Basis-of-Design product indicated or a comparable product by one of the following:
- a. Daktronics.
 - b. Electro-Mech.
 - c. Fair-Play Scoreboards by Translux Corporation.
 - d. Nevco Integrated Display & Scoring Solutions (Basis-of-Design).
 - 1) Product: Model 1650 with MPCW7 Wireless Control Center.

2.3 FIELD AND TRACK EQUIPMENT

- A. Aluminum Shot Circle: Designed to be incorporated into concrete to form a 3/4-inch deep depressed pad. The circle consists of two half sections fabricated from 2-inch by 2-inch by 1/4-inch, 6063-T5 aluminum square corner angle.
1. Basis-of-Design: Subject to compliance with requirements, provide Basis-of-Design product indicated or a comparable product by one of the following:
 - a. SportsEdge (Basis-of-Design).
 - 1) Model 374 Aluminum Shot Circle.
 - b. Bison, Inc.
 - c. Porter Athletic.
 - d. UCS.
 - e. Sportsfield Specialties, Inc.
- B. Cast Aluminum Depressed Pad Toeboard: Designed to be used with a 3/4-inch depressed throwing surface formed by an aluminum shot circle embedded in the concrete pad. Toeboards are cast from aluminum alloy with a wall thickness of 5/16". All toeboards are finished with a durable white powder coat. Provide drainage holes as directed.
- 1)
 2. Basis-of-Design: Subject to compliance with requirements, provide Basis-of-Design product indicated or a comparable product by one of the following:
 - a. SportsEdge (Basis-of-Design).
 - 1) Model 363 Cast Aluminum Toeboard.
 - b. Bison, Inc.
 - c. Porter Athletic.
 - d. UCS.
 - e. Sportsfield Specialties, Inc.
- C. Shot Cage: Fabricated from four painted steel net poles with ground sleeves, vinyl coated net support cable, and weather-treated nylon net. Poles are 14 ga., 2-1/2" square steel tube finished with white power coat paint. Each pole stands in a 20" deep ground sleeve. Net is 340 lb. test nylon weather treated. 18" steel flip arms shall secure 14' by 42'-6" net at the front two poles with ground stakes used at the back poles.
- a.
 2. Basis-of-Design: Subject to compliance with requirements, provide Basis-of-Design product indicated or a comparable product by one of the following:
 - a. SportsEdge (Basis-of-Design).
 - 1) Model 805 Shot Cage.
 - b. Bison, Inc.
 - c. Porter Athletic.
 - d. UCS.
 - e. Sportsfield Specialties, Inc.

- D. Aluminum Discus Circle: Circle consists of 1-inch by 3/4-inch by 1/4-inch, 6061-T6 aluminum angle roll bent to a 49-7/32" radius. Four arcs of chord length 62-5/8" form the circle. To assemble and secure the circle, 1/4" diameter mounting holes are used at the center and ends of each arc.
1. Basis-of-Design: Subject to compliance with requirements, provide Basis-of-Design product indicated or a comparable product by one of the following:
 - a. SportsEdge (Basis-of-Design).
 - 1) Model 370 Aluminum Discus Circle.
 - b. Bison, Inc.
 - c. Porter Athletic.
 - d. UCS.
 - e. Sportsfield Specialties, Inc.
- E. Competition Discus Cage: Cage consists of six painted steel net poles with ground sleeves, a vinyl coated net support cable to reduce net sag, and a weather treated nylon net. Poles are 14 ga., 2-1/2" square steel tube finished with white powder coat paint. Each pole stands in a 20" deep ground sleeve. Net is 200 lb. test nylon which has been weather treated. 18" steel flip arms secures 14' by 56' net at the front two poles with ground stakes used at the back poles.
1. Basis-of-Design: Subject to compliance with requirements, provide Basis-of-Design product indicated or a comparable product by one of the following:
 - a. SportsEdge (Basis-of-Design).
 - 1) Model 8030 High School Competition Discus Cage.
 - b. Bison, Inc.
 - c. Porter Athletic.
 - d. UCS.
 - e. Sportsfield Specialties, Inc.
- F. Aluminum Vault Box: Vault box sides are cut from 6061 structural aluminum tempered to a T6 condition, 1/8" thick sheet. Box bottom and backstop plates are formed from 1/4-inch plate welded to the sides along the outside edges. Outer edges of box are folded down to eliminate sharp edges. Two outer side wings secure the box position when placed in concrete. Provide 3/8-inch drainage holes as directed.
1. Basis-of-Design: Subject to compliance with requirements, provide Basis-of-Design product indicated or a comparable product by one of the following:
 - a. SportsEdge (Basis-of-Design).
 - 1) Model 502 Aluminum Vault Box.
 - b. Bison, Inc.
 - c. Porter Athletic.
 - d. UCS.
 - e. Sportsfield Specialties, Inc.
- G. Take-Off Board and Tray: Fabricated from 1/2-inch-thick marine grade plywood and finished in white paint. Each board is attached to sturdy aluminum sheet planking, to resist weathering and deformation.

1. Basis-of-Design: Subject to compliance with requirements, provide Basis-of-Design product indicated or a comparable product by one of the following:
 - a. SportsEdge (Basis-of-Design).
 - 1) Model 441 Wood High School Take-Off Boards with Model 442 Aluminum Take-Off Trays.
 - b. Bison, Inc.
 - c. Porter Athletic.
 - d. UCS.
 - e. Sportsfield Specialties, Inc.

2.4 ALUMINUM FINISHES

- A. Concealed Finish: Mill finished.
- B. Baked-Enamel or Powder-Coat Finish: AAMA 2603 except with a minimum dry film thickness of 1.5 mils. Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.
 1. Color and Gloss: As selected by Architect from manufacturer's full range.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Coordinate requirements for electrical power, concrete, steel erection, auxiliary framing and supports, suspension cables, and other components to ensure adequate provisions are made for complete, functional installation of exterior athletic equipment and scoreboards.
- B. Coordinate scoreboard and accessories electrical requirements to ensure proper power source, conduit, wiring, and boxes are provided. Prior to installation, verify type and location of power supply.

3.2 INSTALLATION

- A. Install exterior athletic equipment, scoreboards and accessories in strict accordance with manufacturer's written instructions and approved Shop Drawings.

3.3 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain exterior athletic equipment, electronic scoreboards, control centers and accessories.

END OF SECTION 116800

SECTION 122413 - ROLLER WINDOW SHADES**PART 1 - GENERAL****1.1 SUMMARY****A. Section Includes:**

1. Manually operated, single-roller shades.

1.2 ACTION SUBMITTALS**A. Product Data:** For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, features, finishes, and operating instructions for roller shades.
2. Include product data to show compliance with ANSI/WCMA A100.1 "Standard for Safety of Window Coverings."

B. Shop Drawings: Show fabrication and installation details for roller shades, including shadeband materials, their orientation to rollers, and their seam and batten locations.**C. Samples for Verification:** For each type of roller shade.

1. Shadeband Material: Not less than 3 inches square. Mark interior face of material if applicable.
2. Roller Shade: Full-size operating unit, not less than 16 inches wide by 36 inches long for each type of roller shade indicated.
3. Installation Accessories: Full-size unit, not less than 10 inches long.

D. Product Schedule: For roller shades. Use same designations indicated on Drawings.**1.3 INFORMATIONAL SUBMITTALS****A. Qualification Data:** For Installer.**B. Product Certificates:** For each type of shadeband material.**C. Product Test Reports:** For each type of shadeband material, for tests performed by manufacturer and witnessed by a qualified testing agency.

1. Include testing reports to show compliance with ANSI/WCMA A100.1.

1.4 CLOSEOUT SUBMITTALS**A. Operation and Maintenance Data:** For roller shades to include in maintenance manuals.**1.5 MAINTENANCE MATERIAL SUBMITTALS****A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.**

1. Roller Shades: Full-size units equal to 5 percent of quantity installed for each size, color, and shadeband material indicated, but no fewer than two units.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver roller shades in factory packages, marked with manufacturer, product name, and location of installation using same designations indicated on Drawings.

1.7 FIELD CONDITIONS

- A. Environmental Limitations: Do not install roller shades until construction and finish work in spaces, including painting, is complete and dry and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.
- B. Field Measurements: Where roller shades are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on Shop Drawings. Allow clearances for operating hardware of operable glazed units through entire operating range. Notify Architect of installation conditions that vary from Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

PART 2 - PRODUCTS

2.1 SOURCE LIMITATIONS

- A. Obtain roller shades from single source from single manufacturer.

2.2 MANUALLY OPERATED, SINGLE-ROLLER SHADES

- A. Manufacturers: Subject to compliance with requirements, provide product by Basis-of-Design indicated or a comparable product by one of the following:
 - 1. Draper (Basis-of-Design).
 - a. Product: Techmatic Roller Shade.
 - 2. Hunter Douglas Contract.
 - 3. MechoShade.
- B. Roller shades shall be cordless or operating mechanism to comply with ANSI/WCMA A100.1.
- C. Chain-and-Clutch Operating Mechanisms: With continuous-loop bead chain and clutch that stops shade movement when bead chain is released; permanently adjusted and lubricated.
 - 1. Bead Chains: Manufacturer's standard stainless steel, pre-installed spring-loaded chain tension device with bead chain threaded through device, to comply with ANSI/WCMA A100.1.
- D. Rollers: Corrosion-resistant steel or extruded-aluminum tubes of diameters and wall thicknesses required to accommodate operating mechanisms and weights and widths of shadebands indicated without deflection. Provide with permanently lubricated drive-end assemblies and idle-end assemblies designed to facilitate removal of shadebands for service.
 - 1. Roller Drive-End Location: As indicated on Drawings.
 - 2. Direction of Shadeband Roll: Regular, from back (exterior face) of roller.
 - 3. Shadeband-to-Roller Attachment: Manufacturer's standard method.
- E. Mounting Hardware: Brackets or endcaps, corrosion resistant and compatible with roller assembly, operating mechanism, installation accessories, and mounting location and conditions indicated.

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- F. Roller-Coupling Assemblies: Coordinated with operating mechanism and designed to join up to three inline rollers into a multiband shade that is operated by one roller drive-end assembly.
- G. Shadebands:
1. Shadeband Material: Light-filtering fabric.
 2. Shadeband Bottom (Hem) Bar: Steel or extruded aluminum.
 - a. Type: Enclosed in sealed pocket of shadeband material.
 - b. Color and Finish: As indicated on Room Finish Legend on Drawings.
- H. Installation Accessories:
1. Front Fascia: Aluminum extrusion that conceals front and underside of roller and operating mechanism and attaches to roller endcaps without exposed fasteners.
 - a. Shape: L-shaped .
 - b. Height: Manufacturer's standard height required to conceal roller and shadeband assembly when shade is fully open, but not less than 4 inches .
 2. Endcap Covers: To cover exposed endcaps.
 3. Closure Panel and Wall Clip: Removable aluminum panel designed for installation at bottom of site-constructed ceiling recess or pocket and for snap-in attachment to wall clip without fasteners.
 - a. Closure-Panel Width: As indicated on Drawings.
 4. Installation Accessories Color and Finish: As selected from manufacturer's full range.

2.3 SHADEBAND MATERIALS

- A. Shadeband Material Flame-Resistance Rating: Comply with NFPA 701. Testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
- B. Light-Filtering Fabric: Woven fabric, stain and fade resistant.
1. Source: Roller shade manufacturer.
 2. Type: PVC-coated fiberglass.
 3. Weave: Basketweave.
 4. Thickness: 0.028 inch.
 5. Weight: 13.83 oz./sq. yd.
 6. Roll Width: 72 inches.
 7. Orientation on Shadeband: Up the bolt.
 8. Openness Factor: 1 percent.
 9. Color: As indicated on Room Finish Legend on Drawings.

2.4 ROLLER SHADE FABRICATION

- A. Product Safety Standard: Fabricate roller shades to comply with WCMA A 100.1, including requirements for flexible, chain-loop devices; lead content of components; and warning labels.
- B. Unit Sizes: Fabricate units in sizes to fill window and other openings as follows, measured at 74 deg F:
1. Between (Inside) Jamb Installation: Width equal to jamb-to-jamb dimension of opening in which shade is installed less 1/4 inch per side or 1/2-inch total, plus or minus 1/8 inch. Length equal to head-to-sill or -floor dimension of opening in which shade is installed less 1/4 inch, plus or minus 1/8 inch.

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- C. Shadeband Fabrication: Fabricate shadebands without battens or seams to extent possible, except as follows:
1. Vertical Shades: Where width-to-length ratio of shadeband is equal to or greater than 1:4, provide battens and seams at uniform spacings along shadeband length to ensure shadeband tracking and alignment through its full range of movement without distortion of the material.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, operational clearances, and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 ROLLER SHADE INSTALLATION

- A. Install roller shades level, plumb, and aligned with adjacent units according to manufacturer's written instructions.
 1. Opaque Shadebands: Located so shadeband is not closer than 2 inches to interior face of glass. Allow clearances for window operation hardware.
- B. Roller Shade Locations: As indicated on Drawings.

3.3 ADJUSTING

- A. Adjust and balance roller shades to operate smoothly, easily, safely, and free from binding or malfunction throughout entire operational range.

3.4 CLEANING AND PROTECTION

- A. Clean roller shade surfaces, after installation, according to manufacturer's written instructions.
- B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure that roller shades are without damage or deterioration at time of Substantial Completion.
- C. Replace damaged roller shades that cannot be repaired, in a manner approved by Architect, before time of Substantial Completion.

END OF SECTION 122413

SECTION 123550 – MEDIA CENTER CASEWORK**PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY**A. Section Includes:**

1. Manufactured wood media casework of stock design.
2. Media center detection system.

B. Related Requirements:

1. Section 061053 "Miscellaneous Rough Carpentry" for wood blocking for anchoring casework.
2. Section 092216 "Non-Structural Metal Framing" for reinforcements in metal-framed partitions for anchoring casework.
3. Section 096513 "Resilient Base and Accessories" for resilient base applied to wood casework.

1.3 DEFINITIONS

- A. **Exposed Surfaces of Casework:** Surfaces visible when doors and drawers are closed, including bottoms of cabinets more than 48 inches above floor, and visible surfaces in open cabinets or behind glass doors.

1. Ends of cabinets, including those installed directly against walls or other cabinets, are defined as "exposed."
2. Ends of cabinets indicated to be installed directly against and completely concealed by walls or other cabinets are defined as "concealed."

- B. **Semiexposed Surfaces of Casework:** Surfaces behind opaque doors, such as cabinet interiors, shelves, and dividers; interiors and sides of drawers; and interior faces of doors. Tops of cases 78 inches or more above floor and bottoms of cabinets more than 24 inches but less than 48 inches above floor are defined as semiexposed.

- C. **Concealed Surfaces of Casework:** Include sleepers, web frames, dust panels, and other surfaces not usually visible after installation.

- D. **Hardwood Plywood:** A panel product composed of layers, or plies, of veneer, or of veneers in combination with lumber core, hardboard core, MDF core, or particleboard core, joined with adhesive and faced both front and back with hardwood veneers.

1.4 PREINSTALLATION MEETINGS

- A. **Preinstallation Conference:** Conduct conference at Project site.

1.5 COORDINATION

- A. Coordinate layout and installation of framing and reinforcements for support of casework and electrical wiring for media center detection system.

1.6 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For casework and detection system. Include plans, elevations, sections, and attachment details.
 - 1. Indicate locations of blocking and reinforcements required for installing casework.
 - 2. Show adjacent walls, doors, windows, other building components. Indicate clearances from above items.
 - 3. Indicate locations of wiring and electrical components for media center detection systems.
- C. Samples for Initial Selection: For cabinet finishes and other materials requiring color selection.
- D. Samples for Verification: 8-by-10-inch Samples for each type of finish.

1.7 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For manufacturer.
- B. Product Test Reports for Casework: Based on evaluation of comprehensive tests performed by a qualified testing agency, indicating compliance of casework with requirements of specified product standard.

1.8 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For media center detection systems to include in operation and maintenance manuals.

1.9 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Obtain each type of casework from a manufacturer with a minimum three year experience in production of the type of casework specified and with the capacity to produce the required units without delaying the work. Manufacturer shall have a representative available for consultation and assistance during the installation of the casework.

1.10 DELIVERY, STORAGE, AND HANDLING

- A. Protect finished surfaces during handling and installation with protective covering of polyethylene film or other suitable material.

1.11 FIELD CONDITIONS

- A. Environmental Limitations: Do not deliver or install casework until building is enclosed, utility roughing-in and wet work are complete and dry, and temporary HVAC system is operating and

maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.

- B. Locate concealed framing, blocking, and reinforcements that support casework by field measurements before being enclosed, and indicate measurements on Shop Drawings.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Solid Wood: Clear hardwood lumber, selected for compatible grain and color.
 - 1. Wood Species and Cut: As indicated on Room Finish Legend on Drawings.
 - 2. Staining and Finish: As indicated on Room Finish Legend on Drawings.
- B. Veneer-Faced Panels: HPVA HP-1, with face veneer of species indicated, with Grade A faces.
 - 1. Wood Species and Cut: As indicted on Room Finish Legend on Drawings.
 - 2. Staining and Finish: As indicated on Room Finish Legend on Drawings.
- C. Edgebanding: Minimum 1/8-inch thick, solid wood of same species as solid wood.

2.2 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide Basis-of-Design products as scheduled on Drawings or comparable products by one of the following:
 - 1. Brodart Company.
 - 2. Bretford.
 - 3. Buckstaff Company (The).
 - 4. ModuForm | Library Bureau.
 - 5. Tesco Industries.
 - 6. Worden Company (The).
 - 7. Fraser Manufacturing Company Inc.
- B. Source Limitations: Obtain casework from single source from single manufacturer unless otherwise indicated.
- C. Products and Components: As scheduled on Drawings.
- D. Product Designations: Drawings indicate sizes and configurations of casework by referencing designated manufacturer's catalog numbers. Other manufacturers' casework of similar sizes and similar door and drawer configurations and complying with Specifications may be considered. See Section 016000 "Product Requirements."

2.3 COMPONENTS

- A. Vertical Panels: Panels consisting of sold hardwood boards glued together, 3/4 inch thick, or veneer panels, 9 plies with 1/4-inch solid-wood banding. Provide two rows of holes at 1-1/4-inch intervals for 5/16-inch shelf support pins on 1 side of end panels and both sides of intermediate panels.

- B. Base Frames: Solid hardwood toe kick, back rail, and 2 end cleats, 3 inches high, designed to support bottom shelf and fabricated to attach and tie together vertical panels.
- C. Tops: 3/4-inch thick, veneer panel banded with 2-inch solid hardwood fasciae on 1 side for single-faced units on 2 sides for double-faced units, fabricated to attach and tie together vertical panels.
- D. Back and Divider Panels: Veneer-faced panels, 3/4-inch plywood where exposed, 1/4-inch hardboard dadoed into sides, bottoms, and tops where not exposed.
- E. Wood Shelves: Panels consisting of solid hardwood boards glued together, 3/4-inch thick or veneer panels, with 1/4-inch-thick solid-wood banding, and grooved on underside to rest securely on supporting pins.
- F. Base Shelf: Fixed base shelves shall be 3/4-inch thick solid hardwood of same material and construction as adjustable shelves. Base shelves shall be drilled at each end where attached to base assembly with wood screws or inset firmly on bolting cleats.
 - 1. Provide base shelf with hidden casters for mobile shelving units.
- G. Shelf Clips: Heavy-duty brass-plated steel shelf clips.
- H. Base Molding: As specified in Section 096513 "Resilient Base and Accessories."
- I. Glass for Glazed Doors: Clear laminated tempered glass complying with ASTM C 1172, Kind LT, Condition A, Type I, Class I, Quality-Q3; with two plies not less than 3.0 mm thick and with clear, polyvinyl butyral interlayer.

2.4 HARDWARE

- A. General: Provide casework manufacturer's standard, commercial-quality, heavy-duty hardware complying with requirements indicated for each type.
- B. Butt Hinges: Stainless-steel, five-knuckle hinges complying with BHMA A156.9, Grade 1, with antifriction bearings and rounded tips. Provide two for doors 48 inches high or less and three for doors more than 48 inches high.

2.5 FINISH

- A. Preparation: Sand lumber and plywood for manufactured wood casework construction before assembling. Sand edges of doors and drawer fronts and molded shapes with profile-edge sander. Sand casework after assembling for uniform smoothness at least equivalent to that produced by 220-grit sanding and without machine marks, cross sanding, or other surface blemishes.
- B. Staining: Remove fibers and dust and apply wash-coat sealer and stain to exposed and semiexposed surfaces as required to provide uniform color and to match approved samples.
- C. Finishing Closed-Grain Woods: Apply manufacturer's standard two-coat, baked, clear finish consisting of a thermosetting catalyzed sealer and a thermosetting catalyzed conversion varnish. Sand and wipe clean between applications of sealer and topcoat. Topcoat may be omitted on concealed surfaces.

2.6 MEDIA CENTER DETECTION SYSTEM

- A. Detection System: Two corridor electronic detection system consisting of three panels mounted directly to the floor and protection against stray electronic noise to prevent false alarms. Provide 42-inch wide corridors with power and electrical wiring buried under finished floor. System shall be OSHA and ADA compliant.
1. Basis-of-Design Product: Subject to compliance with requirements, provide media center detection system by 3M or a comparable product by one of the following:
 - a. 3M Library Systems (Basis-of-Design).
 - 1) Product: Model 3802 Detection System.
 - b. Demco, Inc.
 - c. D-Tech.
 - d. Sentry Technologies Corp.
 2. Digital Electronics: Integrally mounted in panels for continuous operation and detection.
 3. Power Cord: 14 feet in length with NEMA 5-15 plug type.
 4. Power Requirements: 110/120 V, 60 Hz single phase circuit.
 5. Power Consumption: 6 to 9 amps at 120 V.
 6. Alarm light located on top of each end panel to indicate which corridor is alarming.
 7. Audible alarm located on top of center panel; adjustable alarm volume.
 8. Options:
 - a. CCTV monitor.
 - b. Auxiliary relay contacts.
 - c. Voice alarm.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas, with Installer present, for compliance with requirements for installation tolerances, location of reinforcements, and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARTION

- A. Vacuum or sweep finished floor over which shelving is to be installed.

3.3 INSTALLATION OF CABINETS

- A. Comply with installation requirements in SEFA 2.3. Install level, plumb, and true; shim as required, using concealed shims. Where casework abuts other finished work, apply filler strips and scribe for accurate fit, with fasteners concealed where practical. Do not exceed the following tolerances:
1. Variation of Tops of Base Cabinets from Level: 1/16 inch in 10 feet.
 2. Variation of Bottoms of Upper Cabinets from Level: 1/8 inch in 10 feet.
 3. Variation of Faces of Cabinets from a True Plane: 1/8 inch in 10 feet.

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4. Variation of Adjacent Surfaces from a True Plane (Lippage): 1/32 inch.
 5. Variation in Alignment of Adjacent Door and Drawer Edges: 1/16 inch.
- B. Base Cabinets: Fasten cabinets to utility-space framing, partition framing, wood blocking, or reinforcements in partitions, with fasteners spaced not more than 16 inches o.c. Bolt adjacent cabinets together with joints flush, tight, and uniform.
1. Where base cabinets are installed away from walls, fasten to floor at toe space at not more than 24 inches o.c. and at sides of cabinets with not less than two fasteners per side.
- C. Wall Cabinets: Fasten to hanging strips, masonry, partition framing, blocking, or reinforcements in partitions. Fasten each cabinet through back, near top, at not less than 16 inches o.c.
- D. Adjust casework and hardware so doors align and operate smoothly without warp or bind and contact points meet accurately. Lubricate operating hardware as recommended by manufacturer.

3.4 INSTALLATION OF MEDIA CENTER DETECTION SYSTEM

- A. General: Install media center detection systems at locations indicated to comply with manufacturer's written instructions and approved Shop Drawings. Install detection system panels straight, level, and plumb. Secure units in position with manufacturer's recommended fasteners and anchoring devices.

3.5 CLEANING AND PROTECTING

- A. Clean finished surfaces, touch up as required, and remove or refinish damaged or soiled areas to match original factory finish, as approved by Architect.

3.6 DEMONSTRATION

- A. Engage a factory-authorized representative to train Owner's personnel to adjust, operate, and maintain media center detection systems.

END OF SECTION 123555

SECTION 123551 – MUSIC INSTRUMENT STORAGE CASEWORK**PART 1 - GENERAL****1.1 SUMMARY**

- A. Section includes music instrument storage casework.

1.2 ADMINISTRATIVE REQUIREMENTS

- A. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Section 013100 – Project Management and Coordination.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings:
 - 1. Include plans, elevations, sections, and mounting and attachment details.
 - 2. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
- C. Samples: For each exposed product and for each color and texture specified.

1.4 INFORMATIONAL SUBMITTALS

- A. Samples: For each color and finish for each exposed casework component.
- B. Warranty sample.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance data.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver music instrument storage casework only after painting, utility roughing-in, and similar operations that could damage, soil, or deteriorate casework have been completed in installation areas. If casework must be stored in other than installation areas, store only in areas where environmental conditions meet requirements specified in “Project Conditions” Article.
- B. Keep finished surfaces covered with polyethylene film or other protective covering during handling and installation.

1.7 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install music instrument storage casework until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.

1.8 COORDINATION

- A. Coordinate layout and installation of metal framing and reinforcements in gypsum board assemblies for support of music instrument storage casework.

1.9 WARRANTY

- A. Manufacturer's Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of music instrument storage casework that fail(s) in materials or workmanship within specified warranty period. Failures include, but are not limited to, the following:
1. Delamination of components or other failures of glue bond.
 2. Warping of components.
 3. Failure of operating hardware.
 4. Deterioration of finishes.
- B. Warranty Period: Ten years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Wood Products: Comply with the following:
1. Medium-Density Fiberboard: ANSI A208.2, Grade MD, made with binder containing no urea formaldehyde.
 2. Particleboard: ANSI A208.1, Grade M-2.
 3. Softwood Plywood: DOC PS 1.
- B. Thermoset Decorative Panels: Medium-density fiberboard finished with thermally fused, melamine-impregnated decorative paper complying with LMA SAT-1.
- C. High-Pressure Decorative Laminate: Manufacturer's standard decorative laminate.
1. Color: As selected by Architect from manufacturer's full standard color range.

2.2 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide AcosutiCabinets by Wenger Corporation or comparable products by one of the following:
1. Music Instrument Storage Casework:

-
- a. LSI Corporation of America.
 - b. Solid Solutions.
 - c. Stevens Industries.
 - d. Wenger Corporation (Basis-of-Design).
 - e. TMI Systems
- B. Components for Sheet Music Storage Casework:
1. Basis-of-Design: Wenger; Choral Folio Cabinets.
 2. Wall Panels and Doors: 3/4-inch thick industrial grade composite wood with no added formaldehyde and polyester laminate finish.
 3. Shelves: 1/8-inch thick tempered hardboard.
 4. Shelf Height Openings: 1 inch.
 5. Shelf Supports: Extruded aluminum; black powder-coated finish.
 6. Casework Levelers: Manufacturer's standard levelers.
 7. Mounting Brackets: Manufacturer's standard wall mounting brackets.
- C. Components for Music Library Storage System:
1. Basis-of-Design: Wenger; 7-Shelve Unit.
 2. Side and Top Panels: 3/4-inch thick industrial grade composite wood with no added formaldehyde and polyester laminate finish.
 3. Frame is 16-gauge, 1-inch square tubular steel, painted black.
 4. Back Panel: 7/32-inch thick finished medium-density fiberboard.
 5. Casters: Manufacturer's standard casters for easy movement of unit.
 6. Shelves: For 7-shelve unit.
 - a. Four adjustable shelves.
 - b. Three fixed shelves.
 7. Dimensions:
 - a. Closed Position: 16 inches by 44 inches by 92 inches.
 - b. Opened Position: 16 inches by 80 inches by 92 inches.
 8. Sheet Music Capacity: 240 titles at 1-inch spacing.
- D. Components for Wardrobe Cabinet: Modular instrument storage casework with integral bases, adjustable levelers, and through-bolted fastening, enabling owner reconfiguration of unit layout.
1. Basis-of-Design: As indicated on Drawings.
 2. Acoustically enhanced instrument storage casework finished with interior lining of sound-absorbent material providing sound absorption and noise reduction properties.
 3. Sound Absorption Average: Minimum SAA of 0.80, based upon sound absorption coefficient for twelve one-third octave bands from 200 to 2500 Hz, inclusive, with a minimum Noise Reduction Coefficient (NRC) of 0.75, per ASTM C 423 and ASTM E 795.
 4. Wall Panels and Door: 3/4-inch thick thermoset particleboard with no added formaldehyde.
 5. Shelving: Sized with adequate gap between shelving and casework side panels to allow air movement inside casework. Quantity as indicated on Drawings.
 6. Filler Panels and Closure: 3/4 inch thick particleboard thermoset panels with no urea formaldehyde in Oyster color. Provide where indicated on Drawings or as recommended by manufacturer.
 7. Dimension: As indicated on Drawings.
- E. Conductor's Stand: Conductor's stand with curved desk design bolted to upright stand.
1. Basis-of-Design: Wenger; Model 238B001 – Preface Conductor's Stand.

2. Desktop: 3/64 inch thick aluminum.
 - a. Size: 18-1/2 inches by 29 inches.
 3. Storage Box: 5/64 inch thick aluminum box that extends full width of desk with access on both sides.
 - a. Size: 12-1/2 inches by 25 inches by 2 inches.
 4. Upright Stand: Double upright steel posts, with brass spring height adjustment and metal tie bar, securely inset into steel double base.
 - a. Upright Posts: Adjustable from 25-1/2 inches by 49-1/2 inches from desk lip to floor.
 - b. Base Footprint: 19 inches by 25 inches.
 5. Finish: Manufacturer's black powder-coat paint.
- F. Conductor's Podium: Conductor's steel double podium including carpeted base and upper podiums with detachable safety rail. Provide podium with built-in wheels.
1. Basis-of-Design: Wenger; Conductor's Podium.
 2. Base Podium: 43 inches 38 inches by 6 inches.
 3. Upper Podium: 32 inches 38 inches by 6 inches. Upper podium locks onto base podium.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas, with Installer present, for compliance with requirements for installation tolerances, location of reinforcements, and other conditions affecting performance of music instrument storage casework.
 1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 CASEWORK INSTALLATION

- A. Install music instrument storage casework plumb, level, and true; using integral levelers. Install in accordance with manufacturer's recommendations and approved Shop Drawings.
- B. Install hardware uniformly and precisely. Set hinges snug and flat in mortises, unless otherwise indicated. Adjust and align hardware so moving parts operate freely and contact points meet accurately. Allow for final adjustment after installation.
- C. Adjust casework and hardware so doors and drawers operate smoothly without warp or bind. Lubricate operating hardware as recommended by manufacturer.

3.3 INSTALLATION OF SHELVING

- A. Securely fasten adjustable shelving supports to partition framing, wood blocking, or reinforcements in partitions.

3.4 CLEANING AND PROTECTION

- A. Repair or remove and replace defective work as directed on completion of installation.
- B. Clean finished surfaces, touch up as required, and remove or refinish damaged or soiled areas to match original factory finish, as approved by Architect.
- C. Protection: Provide 6-mil plastic or other suitable water-resistant covering over countertop surfaces. Tape to underside of countertop at a minimum of 48 inches o.c. Remove protection Substantial Completion.

END OF SECTION 123551

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SECTION 123553 – LABORATORY CASEWORK**PART 1 - GENERAL****1.1 SUMMARY****A. Section Includes:**

1. Wood laboratory casework and shelves.
2. Laboratory epoxy countertops.
3. Laboratory sinks and troughs.
4. Laboratory accessories.
5. Water, electrical service fittings and data connections.

1.2 DEFINITIONS

- A. **Exposed Surfaces of Casework:** Surfaces visible when doors and drawers are closed, including bottoms of cabinets more than 48 inches above floor, and visible surfaces in open cabinets or behind glass doors.
1. Ends of cabinets, including those installed directly against walls or other cabinets, are defined as "exposed."
 2. Ends of cabinets indicated to be installed directly against and completely concealed by walls or other cabinets are defined as "concealed."
- B. **Semiexposed Surfaces of Casework:** Surfaces behind opaque doors, such as cabinet interiors, shelves, and dividers; interiors and sides of drawers; and interior faces of doors. Tops of cabinets 78 inches or more above floor are defined as "semiexposed."
- C. **Concealed Surfaces of Casework:** Include sleepers, web frames, dust panels, and other surfaces not usually visible after installation.
- D. **Hardwood Plywood:** A panel product composed of layers or plies of veneer, or of veneers in combination with lumber core, joined with adhesive and faced both front and back with hardwood veneers.

1.3 ADMINISTRATIVE REQUIREMENTS**A. Coordination:**

1. Coordinate layout and installation of framing and reinforcements for support of laboratory casework.
2. Coordinate installation of laboratory casework with installation of fume hoods and other laboratory equipment.
3. Coordinate and provide piping and conduit connections from rough-in point to fixtures.

B. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Section 013100 – Project Management and Coordination.**C. Keying Conference:** Conduct conference at Project site. Incorporate keying conference decisions into final keying requirements.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: For laboratory casework. Include plans, elevations, sections, details, and attachments to other work.
 - 1. Indicate locations of hardware and keying of locks.
 - 2. Indicate locations and types of service fittings.
 - 3. Indicate locations of blocking and reinforcements required for installing laboratory casework.
 - 4. Include details of utility spaces showing supports for conduits and piping.
 - 5. Include details of exposed conduits, if required, for service fittings.
 - 6. Indicate locations of and clearances from adjacent walls, doors, windows, other building components, and other laboratory equipment.
 - 7. Include coordinated dimensions for laboratory equipment specified in other Sections.
- C. Samples for Verification: Unless otherwise directed, approved full-size Samples may become part of the completed Work, if in an undisturbed condition at time of Substantial Completion. Notify Architect of their exact locations. If not incorporated into the Work, retain acceptable full-size Samples at Project site and remove when directed by Architect.
 - 1. One full-size, finished base cabinet complete with hardware, doors, and drawers.
 - 2. One full-size, finished wall cabinet complete with hardware, doors, and adjustable shelves.
 - 3. One of each service fitting specified, complete with accessories and specified finish.
 - 4. One of each type of sink and accessory item specified.
 - 5. One of each type of hardware item specified.
 - 6. Maintain Samples at Project site during construction in an undisturbed condition as a standard for judging the completed Work. Unless otherwise directed, approved Sample units in an undisturbed condition at the time of Substantial Completion may become part of the completed Work. Notify Architect of their exact locations. If not incorporated into the Work, retain acceptable Sample units at Project site and remove when directed by Architect.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For manufacturer.
- B. Product Test Reports for Casework: Based on evaluation of comprehensive tests performed by a qualified testing agency, indicating compliance of laboratory casework with requirements of specified product standard.
- C. Product Test Reports for Epoxy Countertop Surface Material: Based on evaluation of comprehensive tests performed by a qualified testing agency, indicating compliance of laboratory countertop surface materials with requirements specified for chemical and physical resistance.

1.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A manufacturer that produces casework of types indicated for this Project that has been tested, by a third party independent testing agency, for compliance with SEFA 8.
- B. Product Designations: Drawings indicate sizes and configurations of laboratory casework by referencing designated manufacturer's catalog numbers. Other manufacturers' laboratory casework of similar sizes

and similar door and drawer configurations and complying with the Specifications may be considered. Refer to Section 016000 "Product Requirements."

- C. Casework Product Standard: Comply with SEFA 8, "Laboratory Furniture - Casework, Shelving and Tables - Recommended Practices."
- D. Flammable Liquid Storage: Where cabinets are indicated for solvent or flammable liquid storage, provide units that are listed and labeled as complying with requirements in NFPA 30 by a testing and inspecting agency acceptable to authorities having jurisdiction.
- E. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Protect finished surfaces during handling and installation with protective covering of polyethylene film or other suitable material.

1.8 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install laboratory casework until building is enclosed, utility roughing-in and wet work are complete and dry, and temporary HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.

1.9 EXTRA MATERIALS

- A. Furnish complete touchup kit for each type and color of wood laboratory casework provided. Include scratch fillers, stains, finishes, and other materials necessary to perform permanent repairs to damaged laboratory casework finish.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. Cabinets by Design, Inc.
 2. Campbell Rhea.
 3. E&D Specialty Stands, Inc.
 4. Hamilton Laboratory Solutions LLC.
 5. Harwil Fixtures, Inc.
 6. Kewaunee Scientific Corporation; Laboratory Products Group.
 7. Leonard Peterson & Co.
 8. Sheldon Laboratory Systems, Inc.
 9. Sturdisteel.
 10. Wood-Metal Industries.
 11. Diversified Casework

- B. Source Limitations: Obtain laboratory casework from single source from single manufacturer unless otherwise indicated.

2.2 WOOD CABINET AND TABLE MATERIALS

A. General:

1. Adhesives: Do not use adhesives that contain urea formaldehyde.
2. Maximum Moisture Content for Lumber: 7 percent for hardwood and 12 percent for softwood.
3. Hardwood Plywood: HPVA HP-1, veneer core, unless otherwise indicated.
4. Edgebanding for Wood-Veneered Construction: Minimum 1/8-inch thick, solid wood of same species as face veneer.

B. Exposed Materials:

1. General: Provide materials that are selected and arranged for compatible grain and color. Do not use materials adjacent to one another that are noticeably dissimilar in color, grain, figure, or natural character markings.
2. Wood Species: Maple.
 - a. Face Veneer Cut: Plain sliced.
3. Stain Colors and Finishes: As selected by Architect from manufacturer's full range.
4. Solid Wood: Clear hardwood lumber of species indicated and selected for grain and color compatible with exposed hardwood plywood.
5. Plywood: Hardwood plywood with face veneer of species indicated, selected for compatible color and grain. Grade A exposed faces at least 1/50 inch thick, and Grade J crossbands. Provide backs of same species as faces.

C. Semiexposed Materials:

1. Solid Wood: Sound hardwood lumber, selected to eliminate appearance defects, of any species similar in color and grain to exposed solid wood.
2. Plywood: Hardwood plywood of any species similar in color and grain to exposed plywood. Grade B faces, Grade J crossbands, and backs of same species as faces. Semiexposed backs of plywood with exposed faces shall be same species as faces.

D. Concealed Materials:

1. Solid Wood: Any hardwood or softwood species, with no defects affecting strength or utility.
2. Plywood: Hardwood plywood. Concealed backs of plywood with exposed or semiexposed faces shall be same species as faces.
3. Medium-density fiberboard.
4. Hardboard: AHA A135.4, Class 1 tempered.

2.3 AUXILIARY CABINET MATERIALS

- A. Acid Storage-Cabinet Lining: 1/4-inch thick, glass-fiber cement board complying with ASTM C 1186.
- B. Glass for Glazed Doors: Clear tempered glass complying with ASTM C 1048, Kind FT, Condition A, Type I, Class 1, Quality-Q3; not less than 5.0 mm thick.

2.4 LABORATORY COUNTERTOP, TABLE TOP, AND SINK MATERIALS

- A. Epoxy: Factory-molded, modified epoxy-resin formulation with smooth, nonspecular finish.
1. Physical Properties:
 - a. Flexural Strength: Not less than 10,000 psi.
 - b. Modulus of Elasticity: Not less than 2,000,000 psi.
 - c. Hardness (Rockwell M): Not less than 100.
 - d. Water Absorption (24 Hours): Not more than 0.02 percent.
 - e. Heat Distortion Point: Not less than 260 deg F.
 2. Chemical Resistance: Epoxy-resin material has the following ratings when tested with indicated reagents according to NEMA LD 3, Test Procedure 3.4.5:
 - a. No Effect: Acetic acid (98 percent), acetone, ammonium hydroxide (28 percent), benzene, carbon tetrachloride, dimethyl formamide, ethyl acetate, ethyl alcohol, ethyl ether, methyl alcohol, nitric acid (70 percent), phenol, sulfuric acid (60 percent), and toluene.
 - b. Slight Effect: Chromic acid (60 percent) and sodium hydroxide (50 percent).
 3. Color: Black.

2.5 WOOD CABINETS AND TABLES

- A. Design: Lipped overlay with radiused edges.
- B. Grain Direction:
1. Vertical on doors and drawer fronts.
 2. Lengthwise on face frame members.
 3. Vertical on end panels.
 4. Side to side on bottoms and tops of units.
 5. Vertical on knee-space panels.
 6. Vertical on aprons and table frames.
- C. Construction: Provide wood-faced laboratory casework of the following minimum construction:
1. Bottoms of Base Cabinets and Tall Cabinets: 3/4-inch thick hardwood plywood.
 2. Tops and Bottoms of Wall Cabinets and Tops of Tall Cabinets: 3/4-inch thick veneer-core hardwood plywood.
 3. Ends of Cabinets: 3/4-inch thick hardwood plywood.
 4. Shelves: 1-inch thick veneer-core hardwood plywood at base cabinets and 1-inch thick veneer-core hardwood plywood at wall cabinets.
 5. Base Cabinet Top Frames: 3/4-by-2-inch solid wood with mortise and tenon or doweled connections, glued and pinned or screwed.
 6. Base Cabinet Stretchers: 3/4-by-4-1/2-inch panel product strips or solid wood boards at front and back of cabinet, glued and pinned or screwed. May be provided as an option to base cabinet top frames.
 7. Base Cabinet Subtops: 3/4-inch-thick panel product glued and pinned or screwed. May be provided as an option to base cabinet top frames.
 8. Backs of Cabinets: 3/4-inch thick, hardwood plywood where exposed, 1/4-inch thick, hardwood plywood dadoed into sides, bottoms, and tops where not exposed.
 9. Vertical Partitions: 3/4-inch thick, hardwood plywood.

10. Drawer Fronts: 3/4-inch thick, hardwood plywood or solid hardwood.
 11. Drawer Sides and Backs: 1/2-inch thick, solid hardwood or hardwood plywood, with glued dovetail or multiple-dowel joints.
 12. Drawer Bottoms: 1/4-inch thick, veneer-core hardwood plywood glued and dadoed into front, back, and sides of drawers. Use 1/2-inch thick material for drawers more than 24 inches wide.
 13. Doors 48 Inches or Less in Height: 3/4 inch thick, with medium-density fiberboard cores, solid hardwood stiles and rails, and hardwood face veneers and crossbands.
 14. Doors More Than 48 Inches High: 1-1/16 inches thick, with honeycomb cores, solid hardwood stiles and rails, and hardwood face veneers and crossbands.
 15. Stiles and Rails of Glazed Doors: 3/4-inch thick, solid hardwood.
- D. Filler and Closure Panels: Provide where indicated and as needed to close spaces between cabinets and walls, ceilings, and indicated equipment. Fabricate from same material and with same finish as adjacent exposed cabinet surfaces unless otherwise indicated.
1. Provide utility-space closure panels at spaces between base cabinets where utility space would otherwise be exposed, including spaces below countertops.
 2. Provide closure panels at ends of utility spaces where utility space would otherwise be exposed.
 3. Provide knee-space panels (modesty panels) at spaces between base cabinets, where cabinets are not installed against a wall or where space is not otherwise closed. Fabricate from same material and with same finish as exposed cabinet backs.

2.6 WOOD FINISH

- A. Preparation: Sand lumber and plywood before assembling. Sand edges of doors, drawer fronts, and molded shapes with profile-edge sander. Sand after assembling for uniform smoothness at least equivalent to that produced by 220-grit sanding and without machine marks, cross sanding, or other surface blemishes.
- B. Chemical-Resistant Finish: Apply laboratory casework manufacturer's standard two-coat, chemical-resistant, transparent finish. Sand and wipe clean between coats. Topcoat(s) may be omitted on concealed surfaces.
1. Chemical and Physical Resistance of Finish System: Finish complies with acceptance levels of cabinet surface finish tests in SEFA 8. Acceptance level for chemical spot test shall be no more than four Level 3 conditions.

2.7 HARDWARE

- A. General: Provide laboratory casework manufacturer's standard, commercial-quality, heavy-duty hardware complying with requirements indicated for each type.
- B. Hinges: Stainless-steel, 5-knuckle hinges complying with BHMA A156.9, Grade 1, with antifriction bearings and rounded tips. Provide 2 for doors 48 inches high or less and 3 for doors more than 48 inches high.
- C. Hinged Door and Drawer Pulls: Solid aluminum, stainless steel, or chrome-plated brass back-mounted pulls. Provide 2 pulls for drawers more than 24 inches wide.
1. Design: As selected by Architect from manufacturer's full range.
 2. Overall Size: As selected from manufacturer's full range.

- D. Door Catches: Nylon-roller spring catches. Provide 2 catches on doors more than 48 inches high.
- E. Drawer Slides: Powder-coated, full-extension, self-closing, heavy-duty drawer slides; designed to prevent rebound when drawers are closed; with nylon-tired, ball-bearing rollers; and complying with BHMA A156.9, Type B05091, and rated for 100 lbf.
- F. Label Holders: Stainless steel, aluminum, or chrome plated; sized to receive standard label cards approximately 1 by 2 inches, attached with screws or rivets. Provide on all drawers.
- G. Locks for Wood Cabinets: Cam type with 5-pin tumbler, brass with chrome-plated finish; complying with BHMA A156.11, Type E07281.
 - 1. Provide a minimum of two keys per lock and two master keys.
 - 2. Provide on all drawers and doors.
 - 3. Keying: Key locks within each room alike, key each room separately.
 - 4. Master Key System: Key all locks to be operable by master key.
- H. Adjustable Shelf Supports for Wood Cabinets: Clear polycarbonate, laboratory standard grade with shelf lock hold-down.
- I. Grommets for Cable Passage through Countertops: 2-inch OD, molded-plastic grommets and matching plastic caps with slot for wire passage.

2.8 LABORATORY COUNTERTOPS, TABLE TOPS, AND SINKS

- A. Countertops, General: Provide units with smooth surfaces in uniform plane free of defects. Make exposed edges and corners straight and uniformly beveled. Provide front and end overhang of 1 inch, with continuous drip groove on underside 1/2 inch from edge.
- B. Sinks, General: Provide sizes indicated or laboratory casework manufacturer's closest standard size of equal or greater volume, as approved by Architect.
 - 1. Outlets: Provide with strainers and stoppers, NPS 1-1/2, unless otherwise indicated.
 - 2. Overflows: For each sink except cup sinks, provide overflow of standard beehive or open-top design with separate strainer. Height 2 inches less than sink depth. Provide in same material as strainer.
- C. Epoxy Countertops Table Tops and Sinks:
 - 1. Countertop Fabrication: Fabricate with factory cutouts for sinks, holes for service fittings and accessories, and with butt joints assembled with epoxy adhesive.
 - a. Countertop Configuration: Flat, 1 inch thick, with beveled edge and corners, and with drip groove and applied backsplash.
 - b. Countertop Construction: Uniform throughout full thickness.
 - c. Countertops shall be level between sections. Lippage shall be unacceptable.
 - 2. Sink Fabrication: Molded in 1 piece with smooth surfaces, coved corners, and bottom sloped to outlet; 1/2-inch minimum thickness.
 - a. Provide with polypropylene strainers and stoppers.
 - b. Provide integral sinks in epoxy countertops, bonded to countertops with invisible joint line.

- D. Cup Sinks: Material and size as indicated.
 - 1. Provide epoxy cup sinks with polypropylene strainers and integral tailpieces.
- E. Troughs: Epoxy. Comply with requirements for materials and construction as specified for countertops and sinks. Pitch to drains not less than 1/8 inch/foot.
 - 1. Outlets: Except where troughs empty into sinks, provide NPS 1-1/2 outlets with strainers and tailpieces.
 - 2. Provide epoxy troughs with polypropylene strainers and tailpieces.

2.9 LABORATORY ACCESSORIES

- A. Pegboards: Epoxy, or phenolic-composite pegboards with removable polypropylene pegs and stainless-steel drip troughs with drain outlet.
- B. Flammable Storage Cabinets: 2-door cabinet with 24-gallon capacity, complying with OSHA and NFPA standards.
 - 1. Basis-of-Design: Provide Scientific Materials Company, Inc.; Model SC8080 Jumbo Stacking Flammables Cabinet or an approved equal.
 - a. Acceptable Product: SC 310 with ADA Spacer Apron by CiF Lab Solutions.
- C. Acid Storage Cabinets: 2- door cabinet with 24-gallon capacity and leakproof tray top, complying with OSHA and NFPA standards.
 - 1. Basis-of-Design: Provide Scientific Materials Company, Inc.; Model SC8081 Jumbo Stacking Acid Cabinet or an approved equal.
 - a. Accessories: Provide slide-in isolation compartment for nitric acid.
 - b. Acceptable Product: SC 230 with ADA Spacer Apron by CiF Lab Solutions.
- D. Goggle Storage Cabinet and Goggles: Equal to Campbell Rhea Model # 6784, wall-mounted.
 - 1. Construction: Reinforced steel.
 - 2. Capacity: 40 pairs of goggles.
 - 3. Germicidal lamp with automatic five-minute timer.
 - 4. Lock: Vandal-resistant.
 - 5. Finish: White, baked enamel.
 - 6. Goggles: Provide Campbell Rhea Model #6786 Chemical Splash Goggles or equal.
 - a. Amount: 40 goggles.
- E. Fire Blanket and Cabinet: Wall-mounted.
 - 1. Construction: 22 gauge steel cabinet.
 - 2. Finish: Red; baked-enamel.
 - 3. Wool Blanket: 62 by 84 inches.

2.10 WATER SERVICE FITTINGS

- A. Service Fittings: Provide units that comply with SEFA 7, "Laboratory and Hospital Fixtures - Recommended Practices." Provide fittings complete with washers, locknuts, nipples, and other

installation accessories. Include wall and deck flanges, escutcheons, handle extension rods, and similar items.

1. Provide units that comply with "Vandal-Resistant Faucets and Fixtures" recommendations in SEFA 7.

B. Materials: Fabricated from cast or forged red brass unless otherwise indicated.

1. Reagent-Grade Water Service Fittings: Polypropylene, PVC, or PVDF for parts in contact with water.

C. Finish: Chromium plated.

D. Water Valves and Faucets: Provide units complying with ASME A112.18.1, with renewable seats, designed for working pressure up to 80 psig.

1. Vacuum Breakers: Provide ASSE 1035 vacuum breakers on water fittings with serrated outlets.
2. Aerators: Provide aerators on water fittings that do not have serrated outlets.

E. Hand of Fittings: Furnish right-hand fittings unless fitting designation is followed by "L."

F. Remote-Control Valves: Provide needle valves, straight-through or angle type as indicated for fume hoods and where indicated.

G. Handles: Provide three- or four-arm, forged-brass handles for valves unless otherwise indicated.

1. Provide lever-type handles for ground-key cocks. Lever handle aligns with outlet when valve is closed and is perpendicular to outlet when valve is fully open.
2. Provide heat-resistant plastic handles for steam valves.
3. Provide knurled, molded plastic handles for needle valves.

H. Service-Outlet Identification: Provide color-coded plastic discs with embossed identification, secured to each service-fitting handle to be tamper resistant. Comply with SEFA 7 for colors and embossed identification.

2.11 ELECTRICAL SERVICE FITTINGS

A. Service Fittings, General: Provide units complete with metal housings, receptacles, terminals, switches, pilot lights, device plates, accessories, and gaskets required for mounting on laboratory casework.

B. Receptacles: Comply with NEMA WD 1, NEMA WD 6, and UL 498. Duplex type, Configuration 5 20R.

1. Receptacle Grade: Hospital grade unless otherwise indicated.
2. Color of Receptacles: As selected by Architect unless otherwise indicated or required by NFPA 70.
3. GFCI Receptacles: Straight blade, feed-through or non-feed-through type. Comply with UL 943, Class A, Hospital grade, and include indicator light that is lighted when device is tripped.
4. TVSS (Transient Voltage Surge Suppressor) Receptacles: Comply with UL 1449, with integral TVSS in line to ground, line to neutral, and neutral to ground.

-
- a. TVSS Components: Multiple metal-oxide varistors; with a nominal clamp-level rating of 400 V and a minimum single transient pulse energy dissipation of 240 J, according to IEEE C62.41.2 and IEEE C62.45.
 - b. Active TVSS Indication: Visual and audible, with light visible in face of device to indicate device is "active" or "no longer in service."
 - c. Receptacle Type: Hospital grade, with isolated-ground terminal.
 - d. Identification: Distinctive marking on face of device to denote TVSS-type unit.
 - e. Color of TVSS Receptacles: Blue.
- C. Data Outlets: Coordinate with Electrical Contractor for installation of data and voice outlets.
- D. Switches: Comply with NEMA WD 1 and UL 20. Provide single-pole, double-pole, or 3-way switches as required; rated 120 to 277-V ac; and in amperage capacities to suit units served.
- 1. Color of Switches: As selected by Architect unless otherwise indicated or required by NFPA 70.
 - 2. Provide pilot light adjacent to switch or neon-lighted handle, illuminated when switch is "ON," where noted as "PL" next to switch identification.
 - 3. Provide key-operated switch where noted as "KEY" next to switch identification.
 - 4. Provide thermal-overload switches, single or double pole, as required, with maximum overcurrent trip setting to suit particular motor controlled.
- E. Service Fittings, General: Provide units with metal housings and gaskets required for mounting on laboratory casework. Receptacles, terminals, switches, pilot lights, device plates, and accessories are specified in Section 262726 "Wiring Devices."
- F. Recessed-Type Fittings: Provide with galvanized-steel boxes.
- G. Finishes for Service-Fitting Components: Provide housings or boxes for pedestal- and line-type fittings with manufacturer's standard baked-on, chemical-resistant enamel in color as selected by Architect from manufacturer's full range.
- H. Cover Plates: Provide satin finish, Type 304, stainless-steel cover plates with formed, beveled edges.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas, with Installer present, for compliance with requirements for installation tolerances, location of reinforcements, and other conditions affecting performance of laboratory casework.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION OF CABINETS

- A. Comply with installation requirements in SEFA 2.3. Install level, plumb, and true; shim as required, using concealed shims. Where laboratory casework abuts other finished work, apply filler strips and scribe for accurate fit, with fasteners concealed where practical. Do not exceed the following tolerances:

1. Variation of Tops of Base Cabinets from Level: 1/16 inch in 10 feet.
 2. Variation of Bottoms of Upper Cabinets from Level: 1/8 inch in 10 feet.
 3. Variation of Faces of Cabinets from a True Plane: 1/8 inch in 10 feet.
 4. Variation of Adjacent Surfaces from a True Plane (Lippage): 1/32 inch.
 5. Variation in Alignment of Adjacent Door and Drawer Edges: 1/16 inch.
- B. Base Cabinets: Fasten cabinets to partition framing, wood blocking, or reinforcements in partitions with fasteners spaced not more than 24 inches o.c. Bolt adjacent cabinets together with joints flush, tight, and uniform.
1. Where base cabinets are installed away from walls, fasten to floor at toe space at not more than 24 inches o.c. and at sides of cabinets with not less than 2 fasteners per side.
- C. Wall Cabinets: Fasten to hanging strips, masonry, partition framing, blocking, or reinforcements in partitions. Fasten each cabinet through back, near top, at not less than 24 inches o.c.
- D. Install hardware uniformly and precisely. Set hinges snug and flat in mortises.
- E. Adjust laboratory casework and hardware so doors and drawers align and operate smoothly without warp or bind and contact points meet accurately. Lubricate operating hardware as recommended by manufacturer.

3.3 INSTALLATION OF COUNTERTOPS

- A. Comply with installation requirements in SEFA 2.3. Abut top and edge surfaces in one true plane with flush hairline joints and with internal supports placed to prevent deflection. Locate joints only where shown on Shop Drawings.
- B. Field Jointing: Where possible, make in same manner as shop-made joints using dowels, splines, fasteners, adhesives, and sealants recommended by manufacturer. Prepare edges in shop for field-made joints.
- C. Fastening:
1. Secure epoxy countertops to cabinets with epoxy cement, applied at each corner and along perimeter edges at not more than 48 inches o.c.
 2. Where necessary to penetrate countertops with fasteners, countersink heads approximately 1/8 inch and plug hole flush with material equal to countertop in chemical resistance, hardness, and appearance.
- D. Provide required holes and cutouts for service fittings.
- E. Abut top and edge surfaces in one true plane, with internal supports placed to prevent deflection.
- F. Provide scribe moldings for closures at junctures of countertop, curb, and splash with walls as recommended by manufacturer for materials involved. Match materials and finish to adjacent laboratory casework. Use chemical-resistant, permanently elastic sealing compound where recommended by manufacturer.
- G. Carefully dress joints smooth, remove surface scratches, and clean entire surface.

3.4 INSTALLATION OF SINKS

- A. Comply with installation requirements in SEFA 2.3.
- B. Underside Installation of Epoxy Sinks: Use laboratory casework manufacturer's recommended adjustable support system for table- and cabinet-type installations. Set top edge of sink unit in a continuous bead of epoxy resin adhesive, as recommended by sink and countertop manufacturers, and firmly secure to produce a tight and fully leakproof joint. Adjust sink and securely support to prevent movement. Remove excess adhesive while still wet and finish joint for neat appearance.

3.5 INSTALLATION OF LABORATORY ACCESSORIES

- A. Install accessories according to Shop Drawings, installation requirements in SEFA 2.3, and manufacturer's written instructions.
- B. Securely fasten adjustable shelving supports, shelves, and pegboards to partition framing, wood blocking, or reinforcements in partitions.
- C. Install shelf standards plumb and at heights to align shelf brackets for level shelves. Install shelving level and straight, closely fitted to other work where indicated.
- D. Securely fasten pegboards to partition framing, wood blocking, or reinforcements in partitions.

3.6 INSTALLATION OF SERVICE FITTINGS

- A. Comply with requirements in Divisions 22 and 26 Sections for installing water service fittings and electrical devices.
- B. Install fittings according to Shop Drawings, installation requirements in SEFA 2.3, and manufacturer's written instructions. Set bases and flanges of sink- and countertop-mounted fittings in sealant recommended by manufacturer of sink or countertop material. Securely anchor fittings to laboratory casework unless otherwise indicated.

3.7 CLEANING AND PROTECTING

- A. Repair or remove and replace defective work as directed on completion of installation.
- B. Clean finished surfaces, touch up as required, and remove or refinish damaged or soiled areas to match original factory finish, as approved by Architect.
- C. Protect countertop surfaces during construction with 6-mil plastic or other suitable water-resistant covering. Tape to underside of countertop at a minimum of 48 inches o.c. Remove protection at Substantial Completion.

END OF SECTION 123553

SECTION 123616 - METAL COUNTERTOPS**PART 1 - GENERAL****1.1 SUMMARY**

- A. Section Includes:
1. Stainless-steel countertops.

1.2 COORDINATION

- A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to support loads imposed by installed and fully loaded wall-mounted shelves.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For metal fabrications.
1. Include plans, sections, details, and attachments to other work. Detail fabrication and installation, including field joints.
 2. For countertops, show locations and sizes of cutouts and holes for items installed in metal countertops.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products only after casework and supports on which they will be installed has been completed in installation areas.
- B. Keep finished surfaces of products covered with polyethylene film or other protective covering during handling and installation.

1.5 FIELD CONDITIONS

- A. Field Measurements: Where products are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication, and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
- B. Established Dimensions: Where products are indicated to fit to other construction, establish dimensions for areas where products are to fit. Provide allowance for trimming at site, and coordinate construction to ensure that actual dimensions correspond to established dimensions.

PART 2 - PRODUCTS**2.1 STAINLESS-STEEL FABRICATIONS**

- A. Countertops: Fabricate from 0.062-inch- thick, stainless-steel sheet. Provide smooth, clean exposed tops and edges in uniform plane, free of defects. Provide front and end overhang of 1 inch over the base cabinets.
1. Joints: Fabricate countertops in sections for joining in field, with joints at locations indicated.
 2. Weld shop-made joints.
 3. Sound deaden the undersurface with heavy-build mastic coating.
 4. Extend the top down to provide a 1-inch- thick edge with a 1/2-inch return flange.
 5. Form the backsplash coved to and integral with top surface, with a 1/2-inch- thick top edge and 1/2-inch return flange.
 6. Provide raised (marine) edge around perimeter of tops containing sinks; pitch tops containing sinks two ways to provide drainage without channeling or grooving.

2.2 MATERIALS

- A. Stainless-Steel Sheet: ASTM A240/A240M, Type 304.
- B. Sealant for Countertops: Manufacturer's standard sealant that complies with applicable requirements in Section 079200 "Joint Sealants" and the following:
1. Mildew-Resistant Joint Sealant: Mildew resistant, single component, nonsag, neutral curing, silicone.
 2. Color: Clear.

2.3 STAINLESS-STEEL FINISH

- A. Grind and polish surfaces to produce uniform, directional satin finish matching No. 4 finish, with no evidence of welds and free of cross scratches. Run grain with long dimension of each piece. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces clean.

PART 3 - EXECUTION**3.1 EXAMINATION**

- A. Examine areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of products.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install metal countertops level, plumb, and true; shim as required, using concealed shims.
- B. Field Jointing: Where possible, make field jointing in the same manner as shop jointing; use fasteners recommended by manufacturer. Prepare edges to be joined in shop so Project-site processing of top and edge surfaces is not required. Locate field joints where shown on Shop Drawings.

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- C. Secure countertops to cabinets with Z- or L-type fasteners or equivalent; use two or more fasteners at each front, end, and back.
 - D. Abut top and edge surfaces in one true plane, with internal supports placed to prevent deflection.
 - E. Seal junctures of countertops, splashes, and walls with sealant for countertops.

3.3 CLEANING AND PROTECTION

- A. Repair or remove and replace defective work as directed on completion of installation.
- B. Clean finished surfaces. Remove and replace damaged products or touch up and refinish damaged areas to match original factory finish, as approved by Architect.
- C. Protection: Provide 6-mil plastic or other suitable water-resistant covering over countertop surfaces. Tape to underside of countertop at a minimum of 48 inches o.c. Remove protection at Substantial Completion.

END OF SECTION 123616

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SECTION 123661 - SOLID SURFACING COUNTERTOPS**PART 1 - GENERAL****1.1 SUMMARY****A. Section Includes:**

1. Solid surface material countertops.
2. Solid surface material backsplashes.

B. Related Requirements:

1. Section 064116 "Plastic-Laminate-Clad Architectural Cabinets" for casework and cabinets with solid surfacing countertops.

1.2 ACTION SUBMITTALS**A. Product Data:** For countertop materials.**B. Shop Drawings:** For countertops. Show materials, finishes, edge and backsplash profiles, methods of joining, and cutouts for plumbing fixtures.

1. Show locations and details of joints.
2. Show direction of directional pattern, if any.

C. Samples for Verification: For the following products:

1. One full-size solid surface material countertop, with front edge, 8 by 10 inches, of construction and in configuration specified.

1.3 INFORMATIONAL SUBMITTALS**A. Qualification Data:** For fabricator.**1.4 QUALITY ASSURANCE****A. Fabricator Qualifications:** Shop that employs skilled workers who custom-fabricate countertops similar to that required for this Project, and whose products have a record of successful in-service performance.**B. Installer Qualifications:** Fabricator of countertops.**C. Mockups:** Build mockups to demonstrate aesthetic effects and to set quality standards for fabrication and execution.

1. Build mockup of typical countertop as shown on Drawings.
2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.5 FIELD CONDITIONS**A. Field Measurements:** Verify dimensions of countertops by field measurements before countertop fabrication is complete.

1.6 COORDINATION

- A. Coordinate locations of utilities that will penetrate countertops or backsplashes.

PART 2 - PRODUCTS

2.1 SOLID SURFACE COUNTERTOP MATERIALS (SSM1, SSM2)

- A. Solid Surface Material: Homogeneous-filled plastic resin complying with ICPA SS-1.
 - 1. Basis-of-Design Products Subject to compliance with requirements, provide Basis-of-Design products indicated on Finish Legend on Drawings or a comparable product by one of the following:
 - a. Corian; DuPont (Basis-of-Design).
 - b. Hanstone.
 - c. Formica Corporation.
 - d. InPro Corporation.
 - e. LG Sausys HI-MACS.
 - f. Wilsonart LLC.
 - 2. Type: Provide Standard type unless Special Purpose type is indicated.
 - 3. Colors and Patterns: As indicated on Room Finish Legend on Drawings..
- B. Particleboard: ANSI A208.1, Grade M-2 and Grade M-2-Exterior Glue.
- C. Plywood: Exterior softwood plywood complying with DOC PS 1, Grade C-C Plugged, touch sanded.

2.2 COUNTERTOP FABRICATION

- A. Fabricate countertops according to solid surface material manufacturer's written instructions and to the AWI/AWMAC/WI's "Architectural Woodwork Standards."
 - 1. Grade: Custom.
- B. Countertops: 1/2-inch- thick, solid surface material.
- C. Fabricate tops with shop-applied edges unless otherwise indicated. Comply with solid surface material manufacturer's written instructions for adhesives, sealers, fabrication, and finishing.
 - 1. Joint Locations: Not within 18 inches of a sink or cooktop and not where a countertop section less than 36 inches long would result, unless unavoidable.
 - 2. Splined Joints: Accurately cut kerfs in edges at joints for insertion of metal splines to maintain alignment of surfaces at joints. Make width of cuts slightly more than thickness of splines to provide snug fit.

2.3 INSTALLATION MATERIALS

- A. Adhesive: Product recommended by solid surface material manufacturer.
- B. Sealant for Countertops: Comply with applicable requirements in Section 079200 "Joint Sealants."

PART 3 - EXECUTION**3.1 EXAMINATION**

- A. Examine substrates to receive solid surface material countertops and conditions under which countertops will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of countertops.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install countertops level to a tolerance of 1/8 inch in 8 feet, 1/4 inch maximum. Do not exceed 1/64-inch difference between planes of adjacent units.
- B. Fasten countertops by screwing through corner blocks of base units into underside of countertop. Pre-drill holes for screws as recommended by manufacturer. Align adjacent surfaces and, using adhesive in color to match countertop, form seams to comply with manufacturer's written instructions. Carefully dress joints smooth, remove surface scratches, and clean entire surface.
- C. Fasten subtops to cabinets by screwing through subtops into cornerblocks of base cabinets. Shim as needed to align subtops in a level plane.
- D. Secure countertops to subtops with adhesive according to solid surface material manufacturer's written instructions. Align adjacent surfaces and, using adhesive in color to match countertop, form seams to comply with manufacturer's written instructions. Carefully dress joints smooth, remove surface scratches, and clean entire surface.
- E. Bond joints with adhesive and draw tight as countertops are set. Mask areas of countertops adjacent to joints to prevent adhesive smears.
 - 1. Install metal splines in kerfs in countertop edges at joints where indicated. Fill kerfs with adhesive before inserting splines and remove excess immediately after adjoining units are drawn into position.
 - 2. Clamp units to temporary bracing, supports, or each other to ensure that countertops are properly aligned and joints are of specified width.
- F. Install backsplashes and end splashes by adhering to wall and countertops with adhesive. Mask areas of countertops and splashes adjacent to joints to prevent adhesive smears.
- G. Install aprons to backing and countertops with adhesive. Mask areas of countertops and splashes adjacent to joints to prevent adhesive smears. Fasten by screwing through backing. Pre-drill holes for screws as recommended by manufacturer.
- H. Complete cutouts not finished in shop. Mask areas of countertops adjacent to cutouts to prevent damage while cutting. Make cutouts to accurately fit items to be installed, and at right angles to finished surfaces unless beveling is required for clearance. Ease edges slightly to prevent snipping.
 - 1. Seal edges of cutouts in particleboard subtops by saturating with varnish.
- I. Apply sealant to gaps at walls; comply with Section 079200 "Joint Sealants."

END OF SECTION 123661

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SECTION 126223 – PORTABLE BLEACHERS**PART 1 - GENERAL****1.1 SUMMARY**

- A. Section includes angle-framed portable bleachers.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for portable bleachers.
 2. Include load capacities, assembly characteristics, and furnished accessories.
- B. Shop Drawings: For portable bleachers in both stacked and extended positions.
1. Include plans, elevations, sections, and attachment details.
 2. For portable bleachers, include structural analysis data signed and sealed by a professional engineer, licensed in the State of manufacturer, responsible for their preparation.
 3. Include load capacities for spectators and wheel point load diagrams for coordination with athletic floor manufacturer.
 4. Show seating layout, aisle widths, and wheelchair accessibility provisions.
- C. Samples for Verification: For the following products prepared on Samples of size indicated below:
1. Decking: 6 inch square Samples of finished material.
 2. Metal Components: 6 inch- square Sample of each color and finish indicated.
 3. Seating Material: 6 inch- square Sample of each seating material, color, and finish indicated.

1.3 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Welding certificates.
- C. Product Certificates: For each type of bleacher assembly.

1.4 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For portable bleachers to include in operation and maintenance manuals.

1.5 QUALITY ASSURANCE

- A. Manufacturer's Engineering Responsibility: Preparation of data for portable bleachers, including Shop Drawings, and comprehensive engineering analysis by a qualified professional engineer.

- B. NFPA Standard: Comply with requirements of NFPA 102, "Standard for Assembly Seating, Tents, and Membrane Structures," Chapter 5, "Folding and Telescopic Seating," except where more stringent requirements are indicated or imposed by authorities having jurisdiction.
- C. Welding Qualifications: Qualify procedures and personnel according to the following:
 - 1. AWS D1.3/D1.3M, "Structural Welding Code - Sheet Steel."

1.6 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of bleachers that fail in materials or workmanship within specified warranty period.
 - 1. Failures include the following:
 - a. Delamination of components or other failures of glue bond.
 - b. Warping of components.
 - c. Failure of operating hardware.
 - 2. Warranty Period: One year from date of Substantial Completion.
- B. Special Finish Warranty: Manufacturer agrees to repair finishes or replace aluminum that shows evidence of deterioration of factory-applied finishes within specified warranty period.
 - 1. Deterioration includes loss of structural strength or finish deterioration due to exposure to weather conditions or UV rays. Discoloration of mill finish aluminum due to galvanic reaction is not covered.
 - 2. Warranty Period: Five years from date of Substantial Completion.

1.7 FIELD CONDITIONS

- A. Finished Spaces: Do not deliver or install portable bleachers until finishes in spaces to receive them are complete, including suspended ceilings, floors, and painting.
- B. Field Measurements: Indicate measurements on Shop Drawings.

PART 2 - PRODUCTS

2.1 PERFORMANCE CRITERIA

- A. Structural Performance: Design portable bleachers to withstand the effects of gravity loads, operational loads, and other loads and stresses according to ICC 300.
- B. Design Loads:
 - 1. Live Loads: Uniform loading for the following:
 - a. Structure: 100 psf.
 - b. Seat and Foot Plank: 120 plf.
 - 2. Sway Loads:
 - a. Perpendicular to Seats: 10 plf.
 - b. Parallel to Seats: 24 plf.

3. Guardrail Loads:
 - a. Uniform Vertical Load: 100 plf.
 - b. Uniform Horizontal Load: 50 plf.
 - c. Concentrated Horizontal Load: 200 pounds.
 4. Wind Loads: Basic design wind speed equals 150 mph (exposure "B").
- C. Accessibility Standard: Comply with applicable provisions in the DOJ's 2010 ADA Standards for Accessible Design and ICC A117.1.

2.2 LOW RISE ALUMINUM ANGLE FRAME TIP-N-ROLL BLEACHERS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide Low Rise Aluminum Angle Frame Tip-N-Roll by National Recreation Systems, Inc. or approved substitution.
- B. Unit Size: Three rows high.
 1. Net Seating Capacity per Unit: 15, excluding aisles, based on 18 inches per seat.
- C. Framework: Prefabricated aluminum angle spaced at 72 inch intervals joined by means of aluminum angle cross bracing.
- D. Shop Connections: Welded to meet AWS standards and local code requirements
- E. Rise and Depth Dimensions: 6 inches vertical rise and 24 inch tread depth.
 1. Row One seat is approximately 11-1/2 inches high.
- F. Seats: Nominal 2 inch by 12 inch anodized aluminum with anodized end caps.
- G. Treads: Nominal 2 inch by 10 inch mill finished aluminum with anodized end caps on each row.
- H. Casters: High grade swivel casters with 5 inch non-marring wheels and non-marring foot pads.

2.3 MATERIALS

- A. Framework:
 1. Aluminum: Structural fabrication with aluminum alloy 6061-T6 mill finish. Unit-weld each frame using metal inert gas method under guidelines by the American Welding Society.
 2. Hot-dip galvanized steel after fabrication according to ASTM A-123.
 3. Crossbracing and Horizontal Bracing: Aluminum angle, 6061-T6 mill finish.
- B. Extruded Aluminum:
 1. Seat planks: Aluminum alloy 6063-T6 with a nominal wall thickness of 0.078 inch.
 - a. Finish: Clear anodized, 204R1, AA-M10C22A31, Class II.
 2. Tread and Riser Planks: Aluminum alloy 6063-T6 with a nominal wall thickness of 0.078 inch.

a. Finish: Mill.

C. Accessories:

1. Channel End Caps: Aluminum alloy 6063-T6.
 - a. Finish: Clear anodized, 204R1, AA-M10C22A31, Class II.
2. Hardware: Hot-dip galvanized.
3. Hold-Down Clip Assembly: Aluminum alloy 6063-T6, mill finish.
4. Joint Sleeve Assembly: Aluminum alloy 6061-T6, mill finish.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

3.2 INSTALLATION

- A. Install portable bleachers according to manufacturer's written instructions.

3.3 ADJUSTING

- A. Adjust hardware and moving parts to function smoothly, and lubricate, test, and adjust each unit to operate according to manufacturer's written instructions.
- B. Clean installed portable bleachers on exposed and semiexposed surfaces.

3.4 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to inspect, adjust, operate, and maintain portable bleachers.

END OF SECTION 126223

SECTION 126600 – TELESCOPING STANDS**PART 1 - GENERAL****1.1 SUMMARY****A. Section Includes:**

1. Electrically operated, wall-attached telescoping stands.

1.2 ACTION SUBMITTALS**A. Product Data: For each type of product.**

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for telescoping stands.
2. Include load capacities, assembly characteristics, and furnished accessories.
3. Include electrical characteristics of electrical components, devices, and accessories.

B. Shop Drawings: For telescoping stands in both stacked and extended positions.

1. Include plans, elevations, sections, and attachment details.
2. For telescoping stands, include structural analysis data signed and sealed by a professional engineer, licensed in the State of manufacturer, responsible for their preparation.
3. Include wiring diagrams for electrically operated units. Show locations and details for electrically operator components. Electrical systems within bleacher stand including pendant switch and control wiring shall be UL listed.
4. Provide Certification from Underwriters Laboratory (U.L.) showing compliance with specified listing.
5. Include load capacities for spectators and wheel point load diagrams for coordination with athletic floor manufacturer.
6. Show seating layout, aisle widths, and wheelchair accessibility provisions.
7. Provide UL listing numbers on all shop drawings. Indicate motor size, electrical characteristics, drive arrangement, mounting, and grounding provisions.
8. Include diagrams for electrical power requirement. Electrical power supply along with required connection boxes and disconnects to be provided by Electrical Contractor.

C. Samples for Verification: For the following products prepared on Samples of size indicated below:

1. Decking: 6-inch- square Samples of finished material.
2. Metal Components: 6-inch- square Sample of each color and finish indicated.
3. Seating Material: 6-inch- square Sample of each seating material, color, and finish indicated.

1.3 INFORMATIONAL SUBMITTALS**A. Qualification Data: For Installer.****B. Welding certificates.****C. Product Certificates: For each type of telescoping stand assembly.**

1.4 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For telescoping stands to include in operation and maintenance manuals.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.
- B. Manufacturer's Engineering Responsibility: Preparation of data for telescoping stands, including Shop Drawings, and comprehensive engineering analysis by a qualified professional engineer.
- C. NFPA Standard: Comply with requirements of NFPA 102, "Standard for Assembly Seating, Tents, and Membrane Structures," Chapter 5, "Folding and Telescopic Seating," except where more stringent requirements are indicated or imposed by authorities having jurisdiction.
- D. Professional Engineer Qualifications: A professional engineer who is legally authorized to practice in the jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of telescoping stands that are similar to that indicated for this Project in material, design, and extent.
- E. Electrical Components, Devices, and Accessories: Listed and labeled as defined by UL Listing # E467277 "Electrical Drive Controls for Folding and Telescopic Seating."
- F. Welding Qualifications: Qualify procedures and personnel according to the following:
 - 1. AWS D1.3/D1.3M, "Structural Welding Code - Sheet Steel."
- G. Service Requirement: The bleacher contractor must be able to show proof of full time service capability by factory certified technicians. Technicians shall be full time employees of the Bleacher Contractor and Licensed in Accordance in the practice of General Contracting within the State of project location. Subcontractors to the bleacher contractor do not qualify under this service requirement.
 - 1. The bleacher contractor shall maintain a supply of reasonable service oriented parts in order to service bleachers on an on-going basis.
- H. WARRANTY
 - 1. Manufacturer's Warranty: Provide manufacturer's standard form in which manufacturer agrees to repair or replace components that fail in materials or workmanship within specified warranty period.
 - a. Warranty Period: Five years from the date of Substantial Completion.

1.6 FIELD CONDITIONS

- A. Finished Spaces: Do not deliver or install telescoping stands until finishes in spaces to receive them are complete, including suspended ceilings, floors, and painting.
- B. Field Measurements: Indicate measurements on Shop Drawings.

PART 2 - PRODUCTS**2.1 PERFORMANCE REQUIREMENTS**

- A. **Structural Performance:** Telescoping stands shall withstand the effects of gravity loads, operational loads, and other loads and stresses according to ICC 300.
- B. **Accessibility Standard:** Comply with applicable provisions in the DOJ's 2010 ADA Standards for Accessible Design and ICC A117.1.

2.2 TELESCOPING STANDS

- A. **System Description:** Operable system of multiple-tiered seating on interconnected folding platforms that close for storage, without being dismantled, into a nested stack. Telescoping-stand units permit opening and closing of adjacent, individual and multiple rows, and close with vertical faces of platforms in the same vertical plane.
 - 1. **Electrical Components, Devices, and Accessories:** Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
 - 2. **Telescoping-Stands Standard:** ICC 300.
- B. **Wall-Attached Telescoping Stands:** Forward-folding system, in which the bleachers open in the forward direction by moving the front row away from the stack to the fully extended position and the rear of bleacher understructure permanently attaches to wall construction. System shall be designed to close to a constant vertical plane.
 - 1. **Basis-of-Design Product:** Subject to compliance with requirements, provide the Model 4500 by Irwin Seating Company; Telescopic Division or a comparable product by one of
 - a. Hussey Seating.
 - b. Interkal, Inc.
 - c. Sheridan Seating.
 - 2. **Row Spacing:** 24 inches.
 - 3. **Row Rise:** 10 inches.
 - 4. **Seat Type:** Benches.
 - 5. **Elevated Front Row:** Height indicated on Drawings.
 - 6. **Operation:** Electrically operated, with friction-type, integral power unit.

2.3 COMPONENTS

- A. **Wall-Attached Telescoping Stands:** Rear of understructure permanently attaches to wall construction. Upper connection shall utilize a continuous 2" x 6" wall brace.
 - 1. **Operation:** Automatic, friction-type integral power unit, with drive wheels located to allow for manual operation of entire first row seating.
 - a. **Limit Switches:** Automatically stop integral power system when telescoping stands reach fully opened or closed positions.

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- b. Motion Monitor: Flashing light with self-contained warning horn, rated at 85 decibels (dB) at 10 feet, mounted under telescoping seating for audio and visual warning during integral power operation.
 - c. Electrical Requirements: Coordinate with electrical subcontractor to provide properly rated electrical source and location. The electrical subcontractor shall provide all required disconnects and perform all wiring connections in junction boxes that are attached to the building.
 - d. Motor/Drivetrain: Minimum ½ horsepower, 208V, 3Phase, 1.25 service factor. All motor drive chains shall be fitted with covers for safety and maintenance.
- B. Benches: Seats and skirts.
- 1. Material: Molded plastic with contour surfaces.
 - a. Color: As selected by Architect from manufacturer's standard.
 - 2. Bench Height: Not less than 16 inches or more than 18 inches.
 - 3. Bench Depth: 12 inches.
- C. Wheelchair-Accessible Seating: Locate seating cutouts to provide wheelchair-accessible seating at locations indicated on Drawings.
- 1. Equip tiers adjacent to wheelchair-accessible seating with front rails as required by ICC 300.
 - 2. Equip cutouts with full-width front closure panels that match decking construction and finish and that extend from underside of tiers adjacent to cutouts to 1-1/2 inches from finished floor.
- D. Deck: Plywood, 5/8 inchthick.
- 1. Finish: Transparent.
 - 2. Joints of plywood decking shall be tongue and groove or continuous metal splice. Metal splices must be recessed to prevent tripping hazard.
- E. Risers: Steel sheet with manufacturer's standard, rust-inhibiting coating or hot-dip galvanized finish.
- F. Safety Rails: Steel, finished with manufacturer's standard powder coat system.
- 1. Self-storing mid-aisle handrails located at centerline of each aisle with seating on both sides located at centerline of each vertical aisle.
 - 2. End rails (guards) that are telescoping and self-storing.
 - 3. Removable rails around accessible seating cutouts and truncations.
 - 4. Color: Manufacturer's standard neutral color.
- G. Understructure: Structural steel.
- 1. Finish: Manufacturer's standard rust-inhibiting finish.
 - 2. Color: Manufacturer's standard.
- H. Support Column Wheels: Nonmarring, vulcanized, rubber-face wheel assembly under each support column.
- 1. Include wheels of size, number, and design required to support stands and operate smoothly without damaging the flooring surface, but no fewer than four per column or less than 5 inches in diameter and 1-1/2 inch wide.

I. Control Devices:

1. Wall Attached: Keyed-switch control station, located within full view of each stand and its movement area. Provide two keys per station.

J. Fasteners: Vibration proof, in manufacturer's standard size and material.

2.4 ACCESSORIES

A. Steps:

1. Slip-resistant, abrasive tread surfaces at aisles.
2. Intermediate aisle steps, fully enclosed, at each aisle.
3. Transitional top step, fully enclosed, at each aisle where last row of telescoping stands is adjacent to a cross aisle.
4. Removable front steps, fully enclosed, at each aisle, that engage with front row to prevent accidental separation or movement and are equipped with a minimum of four skid-resistant feet.

B. Closure Panels and Void Fillers:

1. Aisle closures at foot level that produce flush vertical face at aisles when system is stored.
2. End panels covering exposed ends of stands in the stored position.
3. Back panels covering rear of freestanding units. Panels extend full height and width of unit.
4. Panels at cutouts and truncations for accessible seating.
5. Rear fillers including supports for closing openings between top row and rear wall of adjoining construction.
6. Gap fillers for closing openings between stand units or between stand units and adjoining construction.
7. Safety End Curtains: Provide closure curtains fabricated of vinyl coated 14 oz. polyester fabric on open ends of telescopic seating. Curtains to be permanently attached to wall and secured to individual rows of seating. Curtain to open with seating unit into taught secure configuration and fold automatically as seating unit closes. Provide in color as standard with manufacturer, selected by architect from a minimum of 6 choices.

2.5 MATERIALS

A. Plywood: PS 1 as standard with manufacturer.

B. Molded Plastic: High-density polyethylene; blow or injection molded, color-pigmented, textured, impact-resistant, with integral reinforcing ribs for attachment and anchoring points. Provide with UV inhibitors to retard fading.

2.6 FABRICATION

A. Fabricate telescoping stands to operate easily without special tools or separate fasteners unless otherwise indicated.

B. Fabricate understructure from structural steel members in size, spacing, and form required to support design loads specified in referenced safety standard.

C. Weld understructure to comply with applicable AWS standards.

- D. Round corners and edges of components and exposed fasteners to reduce snagging and pinching hazards.
- E. Form exposed work with flat, flush surfaces, level and true in line.
- F. Supports: Fabricate supports to withstand, without damage to components, the forces imposed by use of stands without failure or other conditions that might impair their usefulness.
 - 1. Cantilever bench seat supports to produce toe space uninterrupted by vertical bracing.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

3.2 INSTALLATION

- A. Install telescoping stands according to ICC 300 and manufacturer's written instructions.

3.3 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- B. Perform the following tests and inspections:
 - 1. ICC 300 Inspection: Inspect installed telescoping stands to verify that construction, installation, and operation are according to ICC 300 requirements.
 - 2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- C. Telescoping stands will be considered defective if they do not pass tests and inspections.
- D. Prepare test and inspection reports.

3.4 ADJUSTING

- A. Adjust backrests so that they are at proper angles and aligned with each other in uniform rows.
- B. Adjust hardware and moving parts to function smoothly, and lubricate, test, and adjust each telescoping stand unit to operate according to manufacturer's written instructions.
- C. Clean installed telescoping stands on exposed and semiexposed surfaces. Touch up factory-applied finishes or replace components as required to restore damaged or soiled areas.
- D. Replace upholstery fabric damaged during installation or work of other trades.

3.5 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to inspect, adjust, operate, and maintain telescoping stands.

END OF SECTION 126600

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SECTION 133416 – GRANDSTANDS**PART 1 - GENERAL**

- A. Section includes permanent grandstands.

1.2 ADMINISTRATIVE REQUIREMENTS

- A. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Section 013100 – Project Management and Coordination.

1.3 ACTION SUBMITTALS

- A. Shop Drawings:
 - 1. Include layout, spacings, sizes, thicknesses, and types of framing; fabrication; and fastening and anchorage details, including mechanical fasteners.
 - 2. Indicate reinforcing channels, opening framing, supplemental framing, strapping, bracing, bridging, splices, accessories, connection details, and attachment to adjoining work.
- B. Delegated-Design Submittal: For grandstand framing.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For testing agency.
- B. Welding certificates.
- C. Product Test Reports: For each listed product, for tests performed by manufacturer and witnessed by a qualified testing agency.
 - 1. Steel sheet.
 - 2. Expansion anchors.
 - 3. Power-actuated anchors.
 - 4. Mechanical fasteners.
 - 5. Miscellaneous structural clips and accessories.

1.5 QUALITY ASSURANCE

- A. Welding Qualifications: Qualify procedures and personnel according to the following:
 - 1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
 - 2. AWS D1.3/D1.3M, "Structural Welding Code - Sheet Steel."
- B. Electrical Components, Devices and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- C. Accessibility Requirements: Provide grandstands that comply with requirements in the U.S. Department of Justice 2010 ADA Standards for Accessible Design and ICC/ANSI A117.1.

PART 2 - PRODUCTS**2.1 MANUFACTURERS**

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following or a comparable product by the following:
1. All Star Bleachers, Inc.
 2. Dant-Clayton Corporation (Basis-of-Design).
 3. Sturdisteel Company.
 4. Southern Bleacher Company.

2.2 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 – Quality Requirements, to design cold-formed steel framing.
- B. Structural Performance:
1. Wind Loads: Determine loads based on the following minimum design wind pressures:
 - a. Uniform pressure as indicated on Drawings.
 2. Snow Loads: As indicated on Drawings.

2.3 MATERIALS

- A. Steel Tubing: ASTM A500 (cold formed) unless indicated otherwise.
- B. Galvanized Sheet Steel, ASTM A653, commercial steel, Type B, Grade 33, with G90 coating; mill phosphatized.
- C. Steel Mechanical Tubing: ASTM A 513, welded steel mechanical tubing, hot-dip galvanized according to ASTM A123.
- D. Aluminum Plate and Sheet: ASTM B209, Alloy 6061-T6.
- E. Aluminum Extrusions: ASTM B221, Alloy 6063-T6.
- F. Aluminum-Alloy Rolled Tread Plate: ASTM B632, Alloy 6061-T6.
- G. Anchorages: Anchor bolts, hot-dip galvanized according to ASTM A153.
- H. Concrete for Grandstand Foundations: Minimum compressive strength 3,000 psi/28 days. Refer to requirements of Section 033000 – Cast-in-Place Concrete.
- I. Chain-Link Fence Fabric: Provide fabric in one-piece heights measured between top and bottom of outer edge of selvage knuckle or twist. Comply with ASTM A 392, CLFMI CLF 2445, and requirements indicated below:
1. Steel Wire Fabric: Metallic-coated wire with a minimum diameter of 0.120 inches.
 - a. Mesh Size: 2-1/8 inches.

- b. Weight of Metallic (Zinc) Coating: ASTM A 392, Type II, Class 2, 2.0 oz./sq. ft. with zinc coating applied after weaving.
2. Selvage: Knuckled at both selvages.

2.4 FIXED GRANDSTANDS

- A. Understructure:
 1. Structural Steel, with galvanized finish.
 2. Frame Spacing: As determined by manufacturer based upon requirements.
- B. Row Spacing and Rise: As indicated on Drawings.
- C. Seat Planks: Extruded aluminum, 6063-T6, with ribbed top and anodized finish.
 1. Size indicated, with end caps on exposed end and matching joint sleeve assembly.
- D. Tread Planks: Extruded aluminum, 6063-T6, with ribbed top, mill finish.
 1. Depth indicated, with end caps on exposed end and matching joint sleeve assembly.
- E. Step Planks: Extruded aluminum, 6063T6, with ribbed top, mill finish.
 1. Depth indicated, with end caps on exposed end.
 2. Contrasting color nosing.
- F. Riser Planks: Extruded aluminum, 6063-T6, mill finish.
 1. Height indicated, with end caps on exposed end and matching joint sleeve assembly.
- G. Railings: Anodized aluminum pipe railing with formed elbows at corners and caps at end of straight runs, fastened to framing system.
 1. Pipe Size: 1.66 inch outside diameter.
 2. Infill: Chain-link fence fabric.
 3. Wheelchair-Accessible Seating: At locations indicated.
- H. Accessories:
 1. Mid-aisle handrails located at centerline of each vertical aisle with seating on both sides.
 2. End rails (guards) that are fixed.
 3. Back rails (guards) along rear of units.
 4. Front rails (guards) along front of units.
 5. Back panels covering rear of freestanding units. Panels extend full height and width of unit.
 6. Row letters at each row end.
 7. Seat numbers.

2.5 FINISHES, GENERAL

- A. Finish metal fabrications after assembly.
- B. Finish exposed surfaces to remove tool and die marks and stretch lines, and to blend into surrounding surface.

C. Steel and Iron Finishes:

1. Galvanizing: Hot-dip galvanize items as indicated to comply with applicable standard listed below:
 - a. ASTM A123, for galvanizing steel and iron products.
 - b. ASTM A153, for galvanizing steel and iron hardware.
 - c. Provide not less than 1.5 ounces per square foot.
 - d. Do not quench or apply post galvanizing treatments that might interfere with paint adhesion.
2. Preparation for Shop Priming Galvanized Items: After galvanizing, thoroughly clean railings of grease, dirt, oil, flux, and other foreign matter, and treat with metallic phosphate process.

D. Aluminum Finishes:

1. Clear Anodic Finish: AAMA 611, AA-M12C22A41, Class I, 0.018 mm or thicker.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install grandstands to comply with referenced safety standard and manufacturer's written instructions.

END OF SECTION 133416

SECTION 133419 – METAL BUILDING SYSTEMS**PART 1 - GENERAL****1.1 SUMMARY****A. Section Includes:**

1. Structural-steel framing.
2. Metal roof panels.
3. Metal wall panels.
4. Thermal insulation.
5. Accessories.

1.2 DEFINITIONS

- A. Terminology Standard: See MBMA's "Metal Building Systems Manual" for definitions of terms for metal building system construction not otherwise defined in this Section or in standards referenced by this Section.

1.3 ADMINISTRATIVE REQUIREMENTS**A. Coordination:**

1. Coordinate sizes and locations of concrete foundations and casting of anchor-rod inserts into foundation walls and footings. Anchor rod installation, concrete, reinforcement, and formwork requirements are specified in Section 033000 – Cast-in-Place Concrete.
2. Coordinate metal panel assemblies with rain drainage work, flashing, trim, and construction of supports and other adjoining work to provide a leakproof, secure, and noncorrosive installation.

- B. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Section 013100 – Project Management and Coordination.

1. Review methods and procedures related to metal building systems including the following:
 - a. Condition of foundations and other preparatory work performed by other trades.
 - b. Structural load limitations.
 - c. Construction schedule. Verify availability of materials and erector's personnel, equipment, and facilities needed to make progress and avoid delays.
 - d. Required tests, inspections, and certifications.
 - e. Unfavorable weather and forecasted weather conditions and impact on construction schedule.
2. Review methods and procedures related to metal roof panel assemblies including the following:
 - a. Compliance with requirements for purlin and rafter conditions, including flatness and attachment to structural members.
 - b. Structural limitations of purlins and rafters during and after roofing.
 - c. Flashings, special roof details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that will affect metal roof panels.

- d. Temporary protection requirements for metal roof panel assembly during and after installation.
3. Review methods and procedures related to metal wall panel assemblies including the following:
 - a. Compliance with requirements for support conditions, including alignment between and attachment to structural members.
 - b. Structural limitations of girts and columns during and after wall panel installation.
 - c. Flashings, special siding details, wall penetrations, openings, and condition of other construction that will affect metal wall panels.
 - d. Temporary protection requirements for metal wall panel assembly during and after installation.
 - e. Wall observation and repair after metal wall panel installation.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of metal building system component.
 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for the following:
 - a. Metal roof panels.
 - b. Metal wall panels.
 - c. Thermal insulation and vapor-retarder facings.
- B. Shop Drawings: Indicate components by others. Include full building plan, elevations, sections, details and the following:
 1. Anchor-Rod Plans: Submit anchor-rod plans and templates before foundation work begins. Include location, diameter, and minimum required projection of anchor rods required to attach metal building to foundation. Indicate column reactions at each location.
 2. Structural-Framing Drawings: Show complete fabrication of primary and secondary framing; include provisions for openings. Indicate welds and bolted connections, distinguishing between shop and field applications. Include transverse cross-sections.
 3. Metal Roof and Wall Panel Layout Drawings: Show layouts of panels including methods of support. Include details of edge conditions, joints, panel profiles, corners, anchorages, clip spacing, trim, flashings, closures, and special details. Distinguish between factory- and field-assembled work; show locations of exposed fasteners.
 - a. Show roof-mounted items including penetrations.
 - b. Show wall-mounted items including personnel doors, louvers, and lighting fixtures.
 4. Accessory Drawings: Include details of the following items, at a scale of not less than 1-1/2 inches per 12 inches:
 - a. Flashing and trim.
 - b. Gutters.
 - c. Downspouts.
- C. Samples for Verification: For the following products:
 1. Panels: Nominal 12 inches long by actual panel width. Include fasteners, closures, and other exposed panel accessories.
 2. Flashing and Trim: Nominal 12 inches long. Include fasteners and other exposed accessories.

3. Vapor-Retarder Facings: Nominal 6-inch-square Samples.
4. Accessories: Nominal 12-inch-long Samples for each type of accessory.

D. Delegated-Design Submittal: For metal building systems.

1. Include analysis data indicating compliance with performance requirements and design data signed and sealed by the qualified professional engineer responsible for their preparation.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For erector.

B. Welding certificates.

C. Letter of Design Certification: Signed and sealed by a qualified professional engineer. Include the following:

1. Name and location of Project.
2. Order number.
3. Name of manufacturer.
4. Name of Contractor.
5. Building dimensions including width, length, height, and roof slope.
6. Indicate compliance with AISC standards for hot-rolled steel and AISI standards for cold-rolled steel, including edition dates of each standard.
7. Governing building code and year of edition.
8. Design Loads: Include dead load, roof live load, collateral loads, roof snow load, deflection, wind loads/speeds and exposure, seismic design category or effective peak velocity-related acceleration/peak acceleration, and auxiliary loads (cranes).
9. Load Combinations: Indicate that loads were applied acting simultaneously with concentrated loads, according to governing building code.
10. Building-Use Category: Indicate category of building use and its effect on load importance factors.

D. Erector Certificates: For qualified erector, from manufacturer.

E. Material Test Reports: For each of the following products:

1. Structural steel including chemical and physical properties.
2. Bolts, nuts, and washers including mechanical properties and chemical analysis.
3. Tension-control, high-strength, bolt-nut-washer assemblies.
4. Shop primers.
5. Nonshrink grout.

F. Sample Warranties: For special warranties.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For metal panel finishes to include in maintenance manuals.

1.7 QUALITY ASSURANCE

A. Manufacturer Qualifications: A qualified manufacturer.

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1. Accreditation: Manufacturer's facility accredited according to the International Accreditation Service's AC472, "Accreditation Criteria for Inspection Programs for Manufacturers of Metal Building Systems."
 2. Engineering Responsibility: Preparation of comprehensive engineering analysis and Shop Drawings by a professional engineer who is legally qualified to practice in jurisdiction where Project is located.
- B. Erector Qualifications: An experienced erector who specializes in erecting and installing work similar in material, design, and extent to that indicated for this Project and who has been trained and certified by manufacturer. Submit the following for five previous metal building constructed in the three years immediately preceding this Agreement:
1. Project Name, Address.
 2. Manufacturer Name.
 3. Owner/Architect Contact Information: Name, Address, phone number or email.
- C. Welding Qualifications: Qualify procedures and personnel according to the following:
1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
 2. AWS D1.3, "Structural Welding Code - Sheet Steel."
- 1.8 DELIVERY, STORAGE, AND HANDLING
- A. Deliver components, sheets, panels, and other manufactured items so as not to be damaged or deformed. Package metal panels for protection during transportation and handling.
 - B. Unload, store, and erect metal panels in a manner to prevent bending, warping, twisting, and surface damage.
 - C. Stack metal panels horizontally on platforms or pallets, covered with suitable weathertight and ventilated covering. Store metal panels to ensure dryness, with positive slope for drainage of water. Do not store metal panels in contact with other materials that might cause staining, denting, or other surface damage.
- 1.9 FIELD CONDITIONS
- A. Weather Limitations: Proceed with panel installation only when weather conditions permit metal panels to be installed according to manufacturers' written instructions and warranty requirements.
- 1.10 WARRANTY
- A. Special Warranty on Metal Panel Finishes: Manufacturer agrees to repair finish or replace metal panels that show evidence of deterioration of factory-applied finishes within specified warranty period.
 1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:
 - a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
 - b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
 - c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
 2. Finish Warranty Period: 25 years from date of Substantial Completion.

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- B. Special Weathertightness Warranty for Standing-Seam Metal Roof Panels: Manufacturer agrees to repair or replace standing-seam metal roof panel assemblies that leak or otherwise fail to remain weathertight within specified warranty period.
1. Warranty Period: 25 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide metal building system by Arco Building Systems, Inc. or comparable product by one of the following:
1. All American Systems; a division of NCI Building Systems, Inc.
 2. American Buildings Company, A Nucor Corporation Company.
 3. Butler Manufacturing Company; a division of BlueScope Buildings North America, Inc.
 4. Dean Steel Buildings, Inc.
 5. Nucor Building Systems.
 6. Varco-Pruden Buildings; a division of BlueScope Buildings North America, Inc.
- B. Source Limitations: Obtain metal building system components, including primary and secondary framing and metal panel assemblies, from single source from single manufacturer.

2.2 SYSTEM DESCRIPTION

- A. Provide a complete, integrated set of mutually dependent components and assemblies that form a metal building system capable of withstanding structural and other loads, thermally induced movement, and exposure to weather without failure or infiltration of water into building interior.
- B. Primary-Frame Type: Provide one, or a combination of the following, as required to meet spatial and structural criteria.
1. Rigid Clear Span: Solid-member, structural-framing system without interior columns.
- C. End-Wall Framing: Manufacturer's standard, for buildings not required to be expandable, consisting of primary frame, capable of supporting one-half of a bay design load, and end-wall columns or load-bearing end-wall and corner columns and rafters.
- D. Secondary-Frame Type: Manufacturer's standard purlins and joists and partially inset-framed girts.
- E. Roof Slope: As indicated on Drawings.
- F. Roof System: Manufacturer's standard standing-seam, vertical-rib, metal roof panels.
- G. Exterior Wall System: Manufacturer's standard exposed-fastener, reverse-rib, metal wall panels.

2.3 PERFORMANCE CRITERIA

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 – Quality Requirements, to design metal building system.
- B. Structural Performance: Metal building systems shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated according to procedures in MBMA's "Metal Building Systems Manual."
 - 1. Design Loads: As indicated on Drawings.
 - 2. Deflection and Drift Limits: Design metal building system assemblies to withstand serviceability design loads without exceeding deflections and drift limits recommended in AISC Steel Design Guide No. 3 "Serviceability Design Considerations for Steel Buildings."
- C. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
 - 1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.
- D. Structural Performance for Metal Roof and Wall Panels: Provide metal panel systems capable of withstanding the effects of the following loads, based on testing according to ASTM E 1592:
 - 1. Wind Loads: As indicated on Drawings.
- E. Air Infiltration for Metal Roof Panels: Air leakage of not more than 0.06 cfm/sq. ft. when tested according to ASTM E 1680 or ASTM E 283 at the following test-pressure difference:
 - 1. Test-Pressure Difference: 6.24 lbf/sq. ft.
- F. Air Infiltration for Metal Wall Panels: Air leakage of not more than 0.06 cfm/sq. ft. when tested according to ASTM E 283 at the following test-pressure difference:
 - 1. Test-Pressure Difference: 6.24 lbf/sq. ft.
- G. Water Penetration for Metal Roof Panels: No water penetration when tested according to ASTM E 1646 or ASTM E 331 at the following test-pressure difference:
 - 1. Test-Pressure Difference: 6.24 lbf/sq. ft.
- H. Water Penetration for Metal Wall Panels: No water penetration when tested according to ASTM E 331 at the following test-pressure difference:
 - 1. Test-Pressure Difference: 6.24 lbf/sq. ft.
- I. Wind-Uplift Resistance (gateway): Provide metal roof panel assemblies that comply with UL 580 for wind-uplift-resistance class indicated.
 - 1. Uplift Rating: UL 90.

2.4 STRUCTURAL-STEEL FRAMING

- A. Structural Steel: Comply with AISC 360, "Specification for Structural Steel Buildings."

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- B. Bolted Connections: Comply with RCSC's "Specification for Structural Joints Using High-Strength Bolts."
- C. Cold-Formed Steel: Comply with AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members" for design requirements and allowable stresses.
- D. Primary Framing: Manufacturer's standard primary-framing system, designed to withstand required loads and specified requirements. Primary framing includes transverse frames; rafters, rake, and canopy beams; sidewall, intermediate, end-wall, and corner columns; and wind bracing.
1. General: Provide frames with attachment plates, bearing plates, and splice members. Factory drill for field-bolted assembly. Provide frame span and spacing indicated.
 - a. Slight variations in span and spacing may be acceptable if necessary to comply with manufacturer's standard, as approved by Architect.
 2. Rigid Clear-Span Frames: I-shaped frame sections fabricated from shop-welded, built-up steel plates or structural-steel shapes. Interior columns are not permitted.
- E. End-Wall Framing: Manufacturer's standard primary end-wall framing fabricated for field-bolted assembly to comply with the following:
1. End-Wall and Corner Columns: I-shaped sections fabricated from structural-steel shapes; shop-welded, built-up steel plates; or C-shaped, cold-formed, structural-steel sheet.
 2. End-Wall Rafters: C-shaped, cold-formed, structural-steel sheet; or I-shaped sections fabricated from shop-welded, built-up steel plates or structural-steel shapes.
- F. Secondary Framing: Manufacturer's standard secondary framing, including purlins, girts, eave struts, flange bracing, base members, gable angles, clips, headers, jambs, and other miscellaneous structural members. Unless otherwise indicated, fabricate framing from either cold-formed, structural-steel sheet or roll-formed, metallic-coated steel sheet, prepainted with coil coating, to comply with the following:
1. Purlins: C- or Z-shaped sections; fabricated from built-up steel plates, steel sheet, or structural-steel shapes; minimum 2-1/2-inch-wide flanges.
 - a. Depth: As needed to comply with system performance requirements.
 2. Purlins: Steel joists of depths indicated on Drawings.
 3. Girts: C- or Z-shaped sections; fabricated from built-up steel plates, steel sheet, or structural-steel shapes. Form ends of Z-sections with stiffening lips angled 40 to 50 degrees from flange, with minimum 2-1/2-inch-wide flanges.
 - a. Depth: As required to comply with system performance requirements.
 4. Eave Struts: Unequal-flange, C-shaped sections; fabricated from built-up steel plates, steel sheet, or structural-steel shapes; to provide adequate backup for metal panels.
 5. Flange Bracing: Minimum 2-by-2-by-1/8-inch structural-steel angles or 1-inch-diameter, cold-formed structural tubing to stiffen primary-frame flanges.
 6. Sag Bracing: Minimum 1-by-1-by-1/8-inch structural-steel angles.
 7. Base or Sill Angles: Manufacturer's standard base angle, minimum 3-by-2-inch, fabricated from zinc-coated (galvanized) steel sheet.
 8. Purlin and Girt Clips: Manufacturer's standard clips fabricated from steel sheet. Provide galvanized clips where clips are connected to galvanized framing members.

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9. Framing for Openings: Channel shapes; fabricated from cold-formed, structural-steel sheet or structural-steel shapes. Frame head and jamb of door openings and head, jamb, and sill of other openings.
 10. Miscellaneous Structural Members: Manufacturer's standard sections fabricated from cold-formed, structural-steel sheet; built-up steel plates; or zinc-coated (galvanized) steel sheet; designed to withstand required loads.
- G. Bracing: Provide adjustable wind bracing using any method as follows:
1. Rods: ASTM A 36; ASTM A 572, Grade 50; or ASTM A 529, Grade 50; minimum 1/2-inch-diameter steel; threaded full length or threaded a minimum of 6 inches at each end.
 2. Cable: ASTM A 475, minimum 1/4-inch-diameter, extra-high-strength grade, Class B, zinc-coated, seven-strand steel; with threaded end anchors.
- H. Anchor Rods: Headed anchor rods as indicated in Anchor Rod Plan for attachment of metal building to foundation.
- I. Materials:
1. W-Shapes: ASTM A 992; ASTM A 572, Grade 50 or 55; or ASTM A 529, Grade 50 or 55.
 2. Channels, Angles, M-Shapes, and S-Shapes: ASTM A 36; ASTM A 572, Grade 50 or 55; or ASTM A 529, Grade 50 or 55.
 3. Plate and Bar: ASTM A 36; ASTM A 572, Grade 50 or 55; or ASTM A 529, Grade 50 or 55.
 4. Steel Pipe: ASTM A 53, Type E or S, Grade B.
 5. Cold-Formed Hollow Structural Sections: ASTM A 500, Grade B or C, structural tubing.
 6. Structural-Steel Sheet: Hot-rolled, ASTM A 1011, Structural Steel (SS), Grades 30 through 55, or High-Strength Low-Alloy Steel (HSLAS) or High-Strength Low-Alloy Steel with Improved Formability (HSLAS-F), Grades 45 through 70; or cold-rolled, ASTM A 1008, Structural Steel (SS), Grades 25 through 80, or HSLAS, Grades 45 through 70.
 7. Metallic-Coated Steel Sheet: ASTM A 653, SS, Grades 33 through 80, or HSLAS or HSLAS-F, Grades 50 through 80; with G60 coating designation; mill phosphatized.
 8. Metallic-Coated Steel Sheet prepainted with Coil Coating: Steel sheet, metallic coated by the hot-dip process and prepainted by the coil-coating process to comply with ASTM A 755.
 - a. Zinc-Coated (Galvanized) Steel Sheet: ASTM A 653, SS, Grades 33 through 80, or HSLAS or HSLAS-F, Grades 50 through 80; with G90 coating designation.
 9. Joist Girders: Manufactured according to "Standard Specifications for Joist Girders," in SJI's "Standard Specifications and Load Tables for Steel Joists and Joist Girders"; with steel-angle, top- and bottom-chord members, and end- and top-chord arrangements as indicated on Drawings and required for primary framing.
 10. Steel Joists: Manufactured according to "Standard Specifications for Open Web Steel Joists, K-Series," in SJI's "Standard Specifications and Load Tables for Steel Joists and Joist Girders"; with steel-angle, top- and bottom-chord members, and end- and top-chord arrangements as indicated on Drawings and required for secondary framing.
 11. Non-High-Strength Bolts, Nuts, and Washers: ASTM A 307, Grade A, carbon-steel, hex-head bolts; ASTM A 563 carbon-steel hex nuts; and ASTM F 844 plain (flat) steel washers.
 - a. Finish: Plain.
 12. Structural Bolts, Nuts, and Washers: ASTM A 325, Type 1, heavy-hex steel structural bolts; ASTM A 563 heavy-hex carbon-steel nuts; and ASTM F 436 hardened carbon-steel washers.
 - a. Finish: Plain.

13. Unheaded Anchor Rods: ASTM F 1554, Grade 36, ASTM A 572, Grade 50, ASTM A 36, or ASTM A 307, Grade A.
 - a. Configuration: Straight.
 - b. Nuts: ASTM A 563 heavy-hex carbon steel.
 - c. Plate Washers: ASTM A 36 carbon steel.
 - d. Washers: ASTM F 436 hardened carbon steel.
 - e. Finish: Plain.
14. Headed Anchor Rods: ASTM F 1554, Grade 36 or ASTM A 307, Grade A.
 - a. Configuration: Straight.
 - b. Nuts: ASTM A 563 heavy-hex carbon steel.
 - c. Plate Washers: ASTM A 36 carbon steel.
 - d. Washers: ASTM F 436 hardened carbon steel.
 - e. Finish: Plain.
15. Threaded Rods: ASTM A 193, ASTM A 572, Grade 50, ASTM A 36, or ASTM A 307, Grade A.
 - a. Nuts: ASTM A 563 heavy-hex carbon steel.
 - b. Washers: ASTM F 436 hardened or ASTM A 36 carbon steel.
 - c. Finish: Plain.

- J. Finish: Factory primed. Apply specified primer immediately after cleaning and pretreating.
1. Clean and prepare in accordance with SSPC-SP2.
 2. Coat with manufacturer's standard primer. Apply primer to primary and secondary framing to a minimum dry film thickness of 1 mil.
 - a. Prime secondary framing formed from uncoated steel sheet to a minimum dry film thickness of 0.5 mil on each side.

2.5 METAL ROOF PANELS

- A. Standing-Seam, Vertical-Rib, Metal Roof Panels: Formed with vertical ribs at panel edges and flat pan between ribs; designed for sequential installation by mechanically attaching panels to supports using concealed clips located under one side of panels and engaging opposite edge of adjacent panels.
1. Material: Zinc-coated (galvanized) steel sheet, 0.024 inch nominal uncoated steel thickness. Prepainted by the coil-coating process to comply with ASTM A 755.
 - a. Exterior Finish: Two-coat fluoropolymer.
 - b. Color: As selected by Architect from manufacturer's full range.
 2. Clips: Two-piece floating to accommodate thermal movement.
 3. Joint Type: Mechanically seamed.
 4. Panel Coverage: 16 inches.
 5. Panel Height: 2 inches.
- B. Finishes:
1. Exposed Coil-Coated Finish: Two-coat fluoropolymer, AAMA 621. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in color coat. Prepare,

pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

2. Concealed Finish: Apply pretreatment and manufacturer's standard white or light-colored acrylic or polyester backer finish, consisting of prime coat and wash coat with a minimum total dry film thickness of 0.5 mil.

2.6 METAL WALL PANELS

- A. Exposed-Fastener, Reverse-Rib, Metal Wall Panels: Formed with recessed, trapezoidal major valleys and flat pan between major valleys; designed to be installed by lapping side edges of adjacent panels and mechanically attaching panels to supports using exposed fasteners in side laps.

1. Material: Zinc-coated (galvanized) steel sheet, 0.024 inch nominal uncoated steel thickness. Prepainted by the coil-coating process to comply with ASTM A 755.
 - a. Exterior Finish: Fluoropolymer.
 - b. Color: As selected by Architect from manufacturer's full range.
2. Major-Rib Spacing: 12 inches o.c.
3. Panel Coverage: 36 inches.
4. Panel Height: 1.125 inches.

- B. Finishes:

1. Exposed Coil-Coated Finish: Two-coat fluoropolymer, AAMA 621. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
2. Concealed Finish: Apply pretreatment and manufacturer's standard white or light-colored acrylic or polyester backer finish, consisting of prime coat and wash coat with a minimum total dry film thickness of 0.5 mil.

2.7 THERMAL INSULATION

- A. Faced Metal Building Insulation: ASTM C 991, Type II, glass-fiber-blanket insulation; 0.5-lb/cu. ft. density; 2 inch wide, continuous, vapor-tight edge tabs; with a flame-spread index of 25 or less.
- B. Retainer Strips: For securing insulation between supports, 0.025 inch nominal-thickness, formed, metallic-coated steel or PVC retainer clips colored to match insulation facing.

2.8 PERSONNEL DOORS AND FRAMES

- A. Swinging Personnel Doors and Frames: Metal building system manufacturer's standard doors and frames; prepared and reinforced at strike and at hinges to receive factory- and field-applied hardware according to BHMA A156 Series.
 1. Comply with requirements specified in Section 081113 – Hollow Metal Doors and Frames.

2.9 ACCESSORIES

- A. General: Provide accessories as standard with metal building system manufacturer and as specified. Fabricate and finish accessories at the factory to greatest extent possible, by manufacturer's standard procedures and processes. Comply with indicated profiles and with dimensional and structural requirements.
1. Form exposed sheet metal accessories that are without excessive oil-canning, buckling, and tool marks and that are true to line and levels indicated, with exposed edges folded back to form hems.
- B. Roof Panel Accessories: Provide components required for a complete metal roof panel assembly including copings, fasciae, corner units, ridge closures, clips, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal roof panels unless otherwise indicated.
1. Closures: Provide closures at eaves and ridges, fabricated of same material as metal roof panels.
 2. Clips: Manufacturer's standard, formed from steel sheet, designed to withstand negative-load requirements.
 3. Cleats: Manufacturer's standard, mechanically seamed cleats formed from steel sheet.
 4. Backing Plates: Provide metal backing plates at panel end splices, fabricated from material recommended by manufacturer.
 5. Closure Strips: Closed-cell, expanded, cellular, rubber or crosslinked, polyolefin-foam or closed-cell laminated polyethylene; minimum 1 inch thick, flexible closure strips; cut or premolded to match metal roof panel profile. Provide closure strips where indicated or necessary to ensure weathertight construction.
 6. Thermal Spacer Blocks: Where metal panels attach directly to purlins, provide thermal spacer blocks of thickness required to provide 1 inch standoff; fabricated from extruded polystyrene.
- C. Wall Panel Accessories: Provide components required for a complete metal wall panel assembly including copings, fasciae, mullions, sills, corner units, clips, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal wall panels unless otherwise indicated.
1. Closures: Provide closures at eaves and rakes, fabricated of same material as metal wall panels.
 2. Backing Plates: Provide metal backing plates at panel end splices, fabricated from material recommended by manufacturer.
 3. Closure Strips: Closed-cell, expanded, cellular, rubber or crosslinked, polyolefin-foam or closed-cell laminated polyethylene; minimum 1 inch thick, flexible closure strips; cut or premolded to match metal wall panel profile. Provide closure strips where indicated or necessary to ensure weathertight construction.
- D. Flashing and Trim: Zinc-coated (galvanized) or aluminum-zinc alloy-coated steel sheet, 0.018 inch nominal uncoated steel thickness, prepainted with coil coating; finished to match adjacent metal panels.
1. Provide flashing and trim as required to seal against weather and to provide finished appearance. Locations include eaves, rakes, corners, bases, framed openings, ridges, fasciae, and fillers.

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- E. Gutters: Zinc-coated (galvanized) or aluminum-zinc alloy-coated steel sheet, 0.018 inch nominal uncoated steel thickness, prepainted with coil coating; finished to match roof fascia and rake trim. Match profile of gable trim, complete with end pieces, outlet tubes, and other special pieces as required. Fabricate in minimum 96 inch long sections, sized according to SMACNA's "Architectural Sheet Metal Manual."
1. Gutter Supports: Fabricated from same material and finish as gutters.
 2. Strainers: Bronze, copper, or aluminum wire ball type at outlets.
- F. Downspouts: Zinc-coated (galvanized) or aluminum-zinc alloy-coated steel sheet, 0.018 inch nominal uncoated steel thickness, prepainted with coil coating; finished to match metal wall panels. Fabricate in minimum 10-foot- long sections, complete with formed elbows and offsets.
1. Mounting Straps: Fabricated from same material and finish as gutters.
- G. Pipe Flashing: Premolded, EPDM pipe collar with flexible aluminum ring bonded to base.
- H. Materials:
1. Fasteners: Self-tapping screws, bolts, nuts, self-locking rivets and bolts, end-welded studs, and other suitable fasteners designed to withstand design loads. Provide fasteners with heads matching color of materials being fastened by means of plastic caps or factory-applied coating.
 - a. Fasteners for Metal Roof Panels: Self-drilling or self-tapping, zinc-plated, hex-head carbon-steel screws, with a stainless-steel cap or zinc-aluminum-alloy head and EPDM sealing washer.
 - b. Fasteners for Metal Wall Panels: Self-drilling or self-tapping, zinc-plated, hex-head carbon-steel screws, with EPDM sealing washers bearing on weather side of metal panels.
 - c. Fasteners for Flashing and Trim: Blind fasteners or self-drilling screws with hex washer head.
 - d. Blind Fasteners: High-strength aluminum or stainless-steel rivets.
 2. Corrosion-Resistant Coating: Cold-applied asphalt mastic, compounded for 15-mil dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.
 3. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107, factory-packaged, nonmetallic aggregate grout, noncorrosive, nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.
 4. Metal Panel Sealants: As recommended by building manufacturer for intended use.

2.10 FABRICATION

- A. General: Design components and field connections required for erection to permit easy assembly.
1. Mark each piece and part of the assembly to correspond with previously prepared erection drawings, diagrams, and instruction manuals.
 2. Fabricate structural framing to produce clean, smooth cuts and bends. Punch holes of proper size, shape, and location. Members shall be free of cracks, tears, and ruptures.
- B. Tolerances: Comply with MBMA's "Metal Building Systems Manual" for fabrication and erection tolerances.

- C. Primary Framing: Shop fabricate framing components to indicated size and section, with baseplates, bearing plates, stiffeners, and other items required for erection welded into place. Cut, form, punch, drill, and weld framing for bolted field assembly.
1. Make shop connections by welding or by using high-strength bolts.
 2. Join flanges to webs of built-up members by a continuous, submerged arc-welding process.
 3. Brace compression flange of primary framing with steel angles or cold-formed structural tubing between frame web and purlin web or girt web, so flange compressive strength is within allowable limits for any combination of loadings.
 4. Weld clips to frames for attaching secondary framing if applicable, or punch for bolts.
 5. Shop Priming: Prepare surfaces for shop priming according to SSPC-SP 2. Shop prime primary framing with specified primer after fabrication.
- D. Secondary Framing: Shop fabricate framing components to indicated size and section by roll forming or break forming, with baseplates, bearing plates, stiffeners, and other plates required for erection welded into place. Cut, form, punch, drill, and weld secondary framing for bolted field connections to primary framing.
1. Make shop connections by welding or by using non-high-strength bolts.
 2. Shop Priming: Prepare uncoated surfaces for shop priming according to SSPC-SP 2. Shop prime uncoated secondary framing with specified primer after fabrication.
- E. Metal Panels: Fabricate and finish metal panels at the factory to greatest extent possible, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements. Provide panel profile, including major ribs and intermediate stiffening ribs, if any, for full length of metal panel.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with erector present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Before erection proceeds, survey elevations and locations of concrete- and masonry-bearing surfaces and locations of anchor rods, bearing plates, and other embedments to receive structural framing, with erector present, for compliance with requirements and metal building system manufacturer's tolerances.
1. Engage land surveyor to perform surveying.
- C. Proceed with erection only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean and prepare surfaces to be painted according to manufacturer's written instructions for each particular substrate condition.
- B. Provide temporary shores, guys, braces, and other supports during erection to keep structural framing secure, plumb, and in alignment against temporary construction loads and loads equal in intensity to design loads. Remove temporary supports when permanent structural framing, connections, and bracing are in place unless otherwise indicated.

3.3 ERECTION OF STRUCTURAL FRAMING

- A. Erect metal building system according to manufacturer's written instructions and drawings.
- B. Do not field cut, drill, or alter structural members without written approval from metal building system manufacturer's professional engineer.
- C. Set structural framing accurately in locations and to elevations indicated, according to AISC specifications referenced in this Section. Maintain structural stability of frame during erection.
- D. Base and Bearing Plates: Clean concrete- and masonry-bearing surfaces of bond-reducing materials, and roughen surfaces prior to setting plates. Clean bottom surface of plates.
 - 1. Set plates for structural members on wedges, shims, or setting nuts as required.
 - 2. Tighten anchor rods after supported members have been positioned and plumbed. Do not remove wedges or shims but, if protruding, cut off flush with edge of plate before packing with grout.
 - 3. Promptly pack grout solidly between bearing surfaces and plates so no voids remain. Neatly finish exposed surfaces; protect grout and allow to cure. Comply with manufacturer's written installation instructions for shrinkage-resistant grouts.
- E. Align and adjust structural framing before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that will be in permanent contact with framing. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.
 - 1. Level and plumb individual members of structure.
 - 2. Make allowances for difference between temperature at time of erection and mean temperature when structure will be completed and in service.
- F. Primary Framing and End Walls: Erect framing level, plumb, rigid, secure, and true to line. Level baseplates to a true even plane with full bearing to supporting structures, set with double-nutted anchor bolts. Use grout to obtain uniform bearing and to maintain a level base-line elevation. Moist-cure grout for not less than seven days after placement.
 - 1. Make field connections using high-strength bolts installed according to RCSC's "Specification for Structural Joints Using High-Strength Bolts" for bolt type and joint type specified.
 - a. Joint Type: Snug tightened or pretensioned as required by manufacturer.
- G. Secondary Framing: Erect framing level, plumb, rigid, secure, and true to line. Field bolt secondary framing to clips attached to primary framing.
 - 1. Provide rake or gable purlins with tight-fitting closure channels and fasciae.
 - 2. Locate and space wall girts to suit openings such as doors.
 - 3. Provide supplemental framing at entire perimeter of openings, including doors and other penetrations of roof and walls.
- H. Steel Joists and Joist Girders: Install joists, girders, and accessories plumb, square, and true to line; securely fasten to supporting construction according to SJI's "Standard Specifications and Load Tables for Steel Joists and Joist Girders," joist manufacturer's written instructions, and requirements in this Section.
 - 1. Before installation, splice joists delivered to Project site in more than one piece.
 - 2. Space, adjust, and align joists accurately in location before permanently fastening.

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3. Install temporary bracing and erection bridging, connections, and anchors to ensure that joists are stabilized during construction.
 4. Joist Installation: Bolt joists to supporting steel framework using carbon-steel bolts unless otherwise indicated or required by metal building manufacturer.
 5. Install and connect bridging concurrently with joist erection, before construction loads are applied. Anchor ends of bridging lines at top and bottom chords if terminating at walls or beams.
- I. Bracing: Install bracing in roof and sidewalls where indicated on erection drawings.
 1. Tighten rod and cable bracing to avoid sag.
 2. Locate interior end-bay bracing only where indicated.
 - J. Framing for Openings: Provide shapes of proper design and size to reinforce openings and to carry loads and vibrations imposed, including equipment furnished under mechanical and electrical work. Securely attach to structural framing.
 - K. Erection Tolerances: Maintain erection tolerances of structural framing within AISC 303.
- 3.4 METAL PANEL INSTALLATION, GENERAL
- A. Fabricate and finish metal panels and accessories at the factory, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements demonstrated by laboratory testing. Comply with indicated profiles and with dimensional and structural requirements.
 - B. On-Site Fabrication: Subject to compliance with requirements of this Section, metal panels may be fabricated on-site using UL-certified, portable roll-forming equipment if panels are of same profile and warranted by manufacturer to be equal to factory-formed panels. Fabricate according to equipment manufacturer's written instructions and to comply with details shown.
 - C. Examination: Examine primary and secondary framing to verify that structural-panel support members and anchorages have been installed within alignment tolerances required by manufacturer.
 1. Examine roughing-in for components and systems penetrating metal panels, to verify actual locations of penetrations relative to seams before metal panel installation.
 - D. General: Anchor metal panels and other components of the Work securely in place, with provisions for thermal and structural movement.
 1. Field cut metal panels as required for doors and other openings. Cut openings as small as possible, neatly to size required, and without damage to adjacent metal panel finishes.
 - a. Field cutting of metal panels by torch is not permitted unless approved in writing by manufacturer.
 2. Install metal panels perpendicular to structural supports unless otherwise indicated.
 3. Flash and seal metal panels with weather closures at perimeter of openings and similar elements. Fasten with self-tapping screws.
 4. Locate and space fastenings in uniform vertical and horizontal alignment.
 5. Locate metal panel splices over structural supports with end laps in alignment.
 6. Lap metal flashing over metal panels to allow moisture to run over and off the material.

- E. Lap-Seam Metal Panels: Install screw fasteners using power tools with controlled torque adjusted to compress EPDM washers tightly without damage to washers, screw threads, or metal panels. Install screws in predrilled holes.
1. Arrange and nest side-lap joints so prevailing winds blow over, not into, lapped joints. Lap ribbed or fluted sheets one full rib corrugation. Apply metal panels and associated items for neat and weathertight enclosure. Avoid "panel creep" or application not true to line.
- F. Metal Protection: Where dissimilar metals contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with corrosion-resistant coating, by applying rubberized-asphalt underlayment to each contact surface, or by other permanent separation as recommended by metal roof panel manufacturer.
- G. Joint Sealers: Install gaskets, joint fillers, and sealants where indicated and where required for weatherproof performance of metal panel assemblies. Provide types of gaskets, fillers, and sealants indicated; or, if not indicated, provide types recommended by metal panel manufacturer.
1. Seal metal panel end laps with double beads of tape or sealant the full width of panel. Seal side joints where recommended by metal panel manufacturer.
 2. Prepare joints and apply sealants to comply with requirements in Section 079200 – Joint Sealants.

3.5 METAL ROOF PANEL INSTALLATION

- A. General: Provide metal roof panels of full length from eave to ridge unless otherwise indicated or restricted by shipping limitations.
1. Install ridge caps as metal roof panel work proceeds.
 2. Flash and seal metal roof panels with weather closures at eaves and rakes. Fasten with self-tapping screws.
- B. Standing-Seam Metal Roof Panels: Fasten metal roof panels to supports with concealed clips at each standing-seam joint, at location and spacing and with fasteners recommended by manufacturer.
1. Install clips to supports with self-drilling or self-tapping fasteners.
 2. Install pressure plates at locations indicated in manufacturer's written installation instructions.
 3. Seamed Joint: Crimp standing seams with manufacturer-approved motorized seamer tool so that clip, metal roof panel, and factory-applied sealant are completely engaged.
 4. Rigidly fasten eave end of metal roof panels and allow ridge end free movement for thermal expansion and contraction. Pre-drill panels for fasteners.
 5. Provide metal closures at ridges, rake edges, rake walls, and each side of ridge caps.
- C. Metal Fascia Panels: Align bottom of metal panels and fasten with blind rivets, bolts, or self-drilling or self-tapping screws. Flash and seal metal panels with weather closures along lower panel edges, and at perimeter of all openings.
- D. Metal Roof Panel Installation Tolerances: Shim and align metal roof panels within installed tolerance of 1/4 inch in 20 feet on slope and location lines and within 1/8 inch offset of adjoining faces and of alignment of matching profiles.

3.6 METAL WALL PANEL INSTALLATION

- A. General: Install metal wall panels in orientation, sizes, and locations indicated on Drawings. Install panels perpendicular to girts, extending full height of building, unless otherwise indicated. Anchor metal wall panels and other components of the Work securely in place, with provisions for thermal and structural movement.
1. Unless otherwise indicated, begin metal panel installation at corners with center of rib lined up with line of framing.
 2. Shim or otherwise plumb substrates receiving metal wall panels.
 3. When two rows of metal panels are required, lap panels 4 inches minimum.
 4. When building height requires two rows of metal panels at gable ends, align lap of gable panels over metal wall panels at eave height.
 5. Rigidly fasten base end of metal wall panels and allow eave end free movement for thermal expansion and contraction. Pre-drill panels.
 6. Flash and seal metal wall panels with weather closures at eaves and rakes, and at perimeter of all openings. Fasten with self-tapping screws.
 7. Install screw fasteners in predrilled holes.
 8. Install flashing and trim as metal wall panel work proceeds.
 9. Apply elastomeric sealant continuously between metal base channel (sill angle) and concrete, and elsewhere as indicated on Drawings; if not indicated, as necessary for waterproofing.
 10. Align bottom of metal wall panels and fasten with blind rivets, bolts, or self-drilling or self-tapping screws.
 11. Provide weatherproof escutcheons for pipe and conduit penetrating exterior walls.
- B. Metal Wall Panels: Install metal wall panels on exterior side of girts. Attach metal wall panels to supports with fasteners as recommended by manufacturer.
- C. Installation Tolerances: Shim and align metal wall panels within installed tolerance of 1/4 inch in 20 feet, noncumulative; level, plumb, and on location lines; and within 1/8 inch offset of adjoining faces and of alignment of matching profiles.

3.7 THERMAL INSULATION INSTALLATION

- A. General: Install insulation concurrently with metal wall panel installation, in thickness indicated to cover entire surface, according to manufacturer's written instructions.
1. Set vapor-retarder-faced units with vapor retarder toward warm side of construction unless otherwise indicated. Do not obstruct ventilation spaces except for firestopping.
 2. Tape joints and ruptures in vapor retarder, and seal each continuous area of insulation to the surrounding construction to ensure airtight installation.
 3. Install blankets straight and true in one-piece lengths. Install vapor retarder over insulation, with both sets of facing tabs sealed, to provide a complete vapor retarder.
- B. Blanket Wall Insulation: Extend insulation and vapor retarder over and perpendicular to top flange of secondary framing. Hold in place by metal wall panels fastened to secondary framing.
1. Retainer Strips: Install retainer strips at each longitudinal insulation joint, straight and taut, nesting with secondary framing to hold insulation in place.
- C. Blanket Roof Insulation: Comply with Manufacturer's instructions:

1. Install retainer straps between purlins straight and taut, nesting with secondary framing. Unroll fabric lining and stretch between purlins and fasten securely to ensure continuous coverage.
2. Extend insulation between purlins. Install layer of filler insulation over first layer to fill space between purlins formed by thermal spacer blocks.

3.8 ACCESSORY INSTALLATION

- A. General: Install accessories with positive anchorage to building and weathertight mounting, and provide for thermal expansion. Coordinate installation with flashings and other components.
 1. Install components required for a complete metal roof panel assembly, including trim, copings, ridge closures, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items.
 2. Install components for a complete metal wall panel assembly, including trim, copings, corners, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items.
 3. Where dissimilar metals contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with corrosion-resistant coating, by applying rubberized-asphalt underlayment to each contact surface, or by other permanent separation as recommended by manufacturer.
- B. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, and set units true to line and level. Install work with laps, joints, and seams that will be permanently watertight and weather resistant.
 1. Install exposed flashing and trim that is without excessive oil-canning, buckling, and tool marks and that is true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and to result in waterproof and weather-resistant performance.
 2. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet with no joints allowed within 24 inches of corner or intersection. Where lapped or bayonet-type expansion provisions cannot be used or would not be sufficiently weather resistant and waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with mastic sealant (concealed within joints).
- C. Gutters: Join sections with riveted-and-soldered or lapped-and-sealed joints. Attach gutters to eave with gutter hangers spaced as required for gutter size, but not more than 36 inches o.c. using manufacturer's standard fasteners. Provide end closures and seal watertight with sealant. Provide for thermal expansion.
- D. Downspouts: Join sections with 1-1/2 inch telescoping joints. Provide fasteners designed to hold downspouts securely 1 inch away from walls; locate fasteners at top and bottom and at approximately 60 inches o.c. in between.
 1. Provide elbows at base of downspouts to direct water away from building.
 2. Tie downspouts to underground drainage system indicated.
- E. Pipe Flashing: Form flashing around pipe penetration and metal roof panels. Fasten and seal to panel as recommended by manufacturer.

3.9 CLEANING AND PROTECTION

- A. Repair damaged galvanized coatings on galvanized items with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.
- B. Touchup Painting: After erection, promptly clean, prepare, and prime or reprime field connections, rust spots, and abraded surfaces of prime-painted structural framing, bearing plates, and accessories.
 - 1. Clean and prepare surfaces by SSPC-SP 2, "Hand Tool Cleaning," or by SSPC-SP 3, "Power Tool Cleaning."
 - 2. Apply a compatible primer of same type as shop primer used on adjacent surfaces.
- C. Metal Panels: Remove temporary protective coverings and strippable films, if any, as metal panels are installed. On completion of metal panel installation, clean finished surfaces as recommended by metal panel manufacturer. Maintain in a clean condition during construction.
 - 1. Replace metal panels that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 133419

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SECTION 142100 - ELECTRIC TRACTION ELEVATORS**PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes electric traction passenger elevators.
- B. Related Requirements:
 - 1. Section 033000 "Cast-in-Place Concrete" for setting sleeves, inserts, and anchoring devices in concrete.
 - 2. Section 042000 "Unit Masonry" for setting sleeves, inserts, and anchoring devices in masonry and for grouting elevator entrance frames installed in masonry walls.
 - 3. Section 055000 "Metal Fabrications" for the following:
 - a. Hoist beams.
 - b. Attachment plates and angle brackets for supporting guide-rail brackets.
 - c. Structural-steel shapes for subsills.
 - d. Pit ladders.
 - e. Cants in hoistways made from steel sheet.
 - 4. Section 096519 "Resilient Tile Flooring" for finish flooring in elevator cars.

1.3 DEFINITIONS

- A. Definitions in ASME A17.1/CSA B44 apply to work of this Section.
- B. Service Elevator: A passenger elevator that is also used to carry freight.

1.4 ACTION SUBMITTALS

- A. Product Data: Include capacities, sizes, performances, operations, safety features, finishes, and similar information. Include product data for car enclosures, hoistway entrances, and operation, control, and signal systems.
- B. Shop Drawings:
 - 1. Include plans, elevations, sections, and large-scale details indicating service at each landing, machine room layout, coordination with building structure, relationships with other construction, and locations of equipment.
 - 2. Include large-scale layout of car-control station and standby power operation control panel.
 - 3. Indicate maximum dynamic and static loads imposed on building structure at points of support, and maximum and average power demands.

- C. Samples for Verification: For exposed car, hoistway door and frame, and signal equipment finishes; 3-inch- square Samples of sheet materials; and 4-inch lengths of running trim members.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Seismic Qualification Certificates: For elevator equipment, accessories, and components, from manufacturer.
- C. Manufacturer Certificates: Signed by elevator manufacturer certifying that hoistway, pit, and machine room layout and dimensions, as shown on Drawings, and electrical service including standby power generator, as shown and specified, are adequate for elevator system being provided.
- D. Sample Warranty: For special warranty.

1.6 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For elevators to include in emergency, operation, and maintenance manuals.
 - 1. In addition to items specified in Section 017823 "Operation and Maintenance Data," include diagnostic and repair information available to manufacturer's and Installer's maintenance personnel.
 - 2. Any diagnostic tools required to service the elevator shall remain with the owner.
- B. Inspection and Acceptance Certificates and Operating Permits: As required by authorities having jurisdiction for normal, unrestricted elevator use.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications: Elevator manufacturer or an authorized representative who is trained and approved by manufacturer.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, and handle materials, components, and equipment in manufacturer's protective packaging. Store materials, components, and equipment off of ground, under cover, and in a dry location.

1.9 COORDINATION

- A. Coordinate installation of sleeves, block outs, elevator equipment with integral anchors, and other items that are embedded in concrete or masonry for elevator equipment. Furnish templates, sleeves, elevator equipment with integral anchors, and installation instructions and deliver to Project site in time for installation.
- B. Coordinate sequence of elevator installation with other work to avoid delays.

- C. Coordinate locations and dimensions of other work relating to electric traction elevators including pit ladders; sumps and floor drains in pits; entrance subsills; electrical service; and electrical outlets, lights, and switches in hoistways, pits, and machine rooms.

1.10 WARRANTY

- A. Manufacturer's Special Warranty: Manufacturer agrees to repair, restore, or replace elevator work that fails in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, operation or control system failure, including excessive malfunctions; performances below specified ratings; excessive wear; unusual deterioration or aging of materials or finishes; unsafe conditions; need for excessive maintenance; abnormal noise or vibration; and similar unusual, unexpected, and unsatisfactory conditions.
 - 2. Warranty Period: 1 year from date of Final Acceptance of the Building.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Otis Elevator Co.
 - a. Basis-of-Design Product: Gen2.
 - 2. Schindler Elevator Corp.
 - 3. ThyssenKrupp Elevators Company.
- B. Source Limitations: Obtain elevators from single manufacturer.
 - 1. Major elevator components, including driving machines, controllers, signal fixtures, door operators, car frames, cars, and entrances, shall be manufactured by single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

- A. Regulatory Requirements: Comply with ASME A17.1/CSA B44.
- B. Accessibility Requirements: Comply with Section 407 in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines and with ICC A117.1.
- C. Seismic Performance: Elevator system shall withstand the effects of earthquake motions determined according to ASCE/SEI 7 and shall comply with elevator safety requirements for seismic risk Zone 2 or greater in ASME A17.1/CSA B44.

2.3 ELEVATORS

- A. Elevator System, General: Manufacturer's standard elevator systems. Unless otherwise indicated, manufacturer's standard components shall be used, as included in standard elevator systems and as required for complete system.

B. Elevator Description:

1. Machine Location: Hoistway; no machine room is provided.
2. Machine Type: Gearless traction.
3. Rated Load: 4000 lb.
4. Rated Speed: 150 fpm.
5. Construction: Cab and doors minimum 16 gage steel with 12 gage uprights.
6. Operation System: Selective-collective automatic operation.
7. Auxiliary Operations:
 - a. Standby power operation.
 - b. Standby-powered lowering.
 - c. Automatic dispatching of loaded car.
 - d. Nuisance call cancel.
8. Car Enclosures:
 - a. Inside Width: 89-9/16 inches from side wall to side wall.
 - b. Inside Depth: 65-9/16 inches from back wall to front wall (return panels).
 - c. Inside Height: 93 inches to underside of ceiling.
 - d. Front Walls (Return Panels): Satin stainless steel, No. 4 finish.
 - e. Car Fixtures: Satin stainless steel, No. 4 finish.
 - f. Side and Rear Wall Panels: Plastic laminate panels.
 - g. Reveals: Satin stainless steel, No. 4 finish.
 - h. Door Faces (Interior): Satin stainless steel, No. 4 finish.
 - i. Door Sills: Aluminum, mill finish.
 - j. Ceiling: Patterned stainless steel panel with 6 LED lights.
 - k. Handrails: 1/2 by 2 inches rectangular satin stainless steel, No. 4 finish at rear of car.
 - l. Subfloor: Exterior, underlayment grade plywood, not less than 5/8-inch nominal thickness.
 - m. Floor Finish: Prepared to receive resilient floor tile specified in Section 096519 "Resilient Tile Flooring."
9. Hoistway Entrances:
 - a. Width: 48 inches.
 - b. Height: 84 inches.
 - c. Type: Single-speed side sliding.
 - d. Frames at All Floors: Satin stainless steel, No. 4 finish.
 - e. Doors and Transoms at All Floor: Satin stainless steel, No. 4 finish.
 - f. Sills at All Floors: Aluminum, mill finish.
10. Hall Fixtures at All Floors: Satin stainless steel, No. 4 finish.
11. Additional Requirements:
 - a. Provide inspection certificate in each car, mounted under acrylic cover with frame made from satin stainless steel, No. 4 finish.
 - b. Provide sign indicating elevator capacity based on maximum number of passengers, based on University's directions.
 - c. Provide hooks for protective pads and one complete set(s) of full-height protective pads.

2.4 TRACTION SYSTEMS**A. Elevator Machines: Variable-voltage, variable-frequency, ac-type hoisting machines.**

1. Provide regenerative system.

2. Limit total harmonic distortion of regenerated power to 5 percent per IEEE 519.
3. Provide means for absorbing regenerated power when elevator system is operating on standby power.

- B. Fluid for Hydraulic Buffers: If using hydraulic buffers, use only fire-resistant fluid.
- C. Inserts: Furnish required concrete and masonry inserts and similar anchorage devices for installing guide rails, machinery, and other components of elevator work. Device installation is specified in another Section.
- D. Machine Beams: Provide framing to support elevator hoisting machine and deflector sheaves from the building structure. Comply with Section 055000 "Metal Fabrications" for materials and fabrication.
- E. Car Frame and Platform: Bolted- or welded-steel units.
- F. Guides: Roller guides or polymer-coated, nonlubricated sliding guides. Provide guides at top and bottom of car and counterweight frames.

2.5 OPERATION SYSTEMS

- A. General: Provide manufacturer's standard microprocessor operation systems as required to provide type of operation indicated.
- B. Auxiliary Operations: In addition to primary operation system features, provide the following operational features for elevators where indicated:
1. Single-Car Standby-Powered Lowering: On activation of standby power, if car is at a floor, it is lowered to the lowest level floor below, opens its doors, and shuts down.
 2. Sleep Mode: When elevator has not received a car/hall call for a pre-determined time, the elevator lights will turn off. Once a call is made, the elevator lights will turn on.

2.6 DOOR REOPENING DEVICES

- A. Infrared Array: Provide door reopening device with uniform array of 36 or more microprocessor-controlled, infrared light beams projecting across car entrance. Interruption of one or more light beams shall cause doors to stop and reopen.
- B. Nudging Feature: After car doors are prevented from closing for predetermined adjustable time, through activating door reopening device, a loud buzzer shall sound and doors shall begin to close at reduced kinetic energy.

2.7 CAR ENCLOSURES

- A. General: Provide steel-framed car enclosures with nonremovable wall panels, with removable car roof, access doors, power door operators, and ventilation.
1. Provide standard railings complying with ASME A17.1/CSA B44 on car tops where required by ASME A17.1/CSA B44.
- B. Materials and Finishes: Manufacturer's standards, but not less than the following:

1. Subfloor: Exterior, C-C Plugged grade plywood, not less than 7/8-inch nominal thickness.
2. Floor Finish: Specified in 096519 "Resilient Tile Flooring."
3. Plastic-Laminate Wall Panels: Plastic laminate adhesively applied to 1/2-inch fire-retardant-treated particleboard with manufacturer's standard protective edge trim. Panels have a flame-spread index of 25 or less, when tested according to ASTM E 84.
 - a. Basis-of-Design from manufacturer's full range: Fusion Maple 7909-60.
4. Fabricate car with recesses and cutouts for signal equipment.
5. Fabricate car door frame integrally with front wall of car.
6. Stainless-Steel Doors: Flush, hollow-metal construction; fabricated from stainless-steel sheet.
7. Sight Guards: Provide sight guards on car doors.
8. Sills: Extruded metal, with grooved surface, 1/4 inch thick.
9. Metal Ceiling: Patterned stainless-steel panels, with six LED lights.
10. Handrails: Manufacturer's standard handrails, of shape, metal, and finish indicated.

2.8 HOISTWAY ENTRANCES

- A. Hoistway Entrance Assemblies: Manufacturer's standard horizontal-sliding, door-and-frame hoistway entrances complete with track systems, hardware, sills, and accessories. Frame size and profile shall accommodate hoistway wall construction.
 1. Where gypsum board wall construction is indicated, frames shall be self-supporting with reinforced head sections.
- B. Fire-Rated Hoistway Entrance Assemblies: Door and frame assemblies shall comply with NFPA 80 and be listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction based on testing at as close-to-neutral pressure as possible according to UL 10B.
 1. Fire-Protection Rating: 1-1/2 hours with 30-minute temperature rise of 450 deg F.
- C. Materials and Fabrication: Manufacturer's standards, but not less than the following:
 1. Steel Subframes: Formed from cold- or hot-rolled steel sheet, with factory-applied enamel finish or rust-resistant primer. Fabricate to receive applied finish as indicated.
 2. Stainless-Steel Frames: Formed from stainless-steel sheet.
 3. Star of Life Symbol: Identify emergency elevators with star of life symbol, not less than 3 inches high, on both inside surfaces of hoistway door frames.
 4. Stainless-Steel Doors and Transoms: Flush, hollow-metal construction; fabricated from stainless-steel sheet.
 5. Sight Guards: Provide sight guards on doors matching door edges.
 6. Sills: Extruded metal, with grooved surface, 1/4 inch thick.
 7. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107/C 1107M.

2.9 SIGNAL EQUIPMENT

- A. General: Provide hall-call and car-call buttons that light when activated and remain lit until call has been fulfilled. Fabricate lighted elements with long-life lamps and acrylic or other permanent, non-yellowing translucent plastic diffusers or LEDs.
- B. Car-Control Stations: Provide manufacturer's standard recessed car-control stations. Mount in return panel adjacent to car door unless otherwise indicated.
 - 1. Mark buttons and switches for required use or function. Use both tactile symbols and Braille.
- C. Emergency Communication System: Two-way voice communication system, with visible signal, which dials preprogrammed number of monitoring station and does not require handset use. System is contained in flush-mounted cabinet, with identification, instructions for use, and battery backup power supply.
- D. Car Position Indicator: Provide illuminated, digital-type car position indicator, located above car door or above car-control station. Also, provide audible signal to indicate to passengers that car is either stopping at or passing each of the floors served. Include travel direction arrows if not provided in car-control station.
- E. Hall Push-Button Stations: Provide one hall push-button station at each landing.
 - 1. Provide units with flat faceplate for mounting with body of unit recessed in wall.
 - 2. Equip units with buttons for calling elevator and for indicating desired direction of travel.
 - 3. Equip units with buttons for calling elevator and for indicating direction of travel or destination as required by system. Provide a signaling system to verify floor selection, where destination registration is required, and to direct passengers to appropriate car.
 - a. Provide a means for passengers to indicate that they have disabilities so control system can allow extra room in assigned car.
 - b. Provide for connecting units that require destination registration to building security access system so a card reader can be used to register calls.
- F. Hall Lanterns: Units with illuminated arrows; but provide single arrow at terminal landings. Provide one of the following:
 - 1. Units with flat faceplate for mounting with body of unit recessed in wall and with illuminated elements projecting from faceplate for ease of angular viewing.
- G. Hall Annunciator: With each hall lantern, provide audible signals indicating car arrival and direction of travel. Signals sound once for up and twice for down.
 - 1. At manufacturer's option, audible signals may be placed on cars.
- H. Standby Power Elevator Selector Switches: Provide switches, as required by ASME A17.1/CSA B44, where indicated. Adjacent to switches, provide illuminated signal that indicates when normal power supply has failed. For each elevator, provide illuminated signals that indicate when they are operational and when they are at the designated emergency return level with doors open.

- I. Emergency Pictorial Signs: Fabricate from materials matching hall push-button stations, with text and graphics as required by authorities having jurisdiction, indicating that in case of fire, elevators are out of service and exits should be used instead. Provide one sign at each hall push-button station unless otherwise indicated.

2.10 FINISH MATERIALS

- A. General: Provide the following materials for exposed parts of elevator car enclosures, car doors, hoistway entrance doors and frames, and signal equipment as indicated.
- B. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, commercial steel, Type B, exposed, matte finish.
- C. Hot-Rolled Steel Sheet: ASTM A 1011/A 1011M, commercial steel, Type B, pickled.
- D. Stainless-Steel Sheet: ASTM A 240/A 240M, Type 304.
- E. Stainless-Steel Bars: ASTM A 276, Type 304.
- F. Stainless-Steel Tubing: ASTM A 554, Grade MT 304.
- G. Aluminum Extrusions: ASTM B 221, Alloy 6063.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine elevator areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work. Examine hoistways, hoistway openings, pits, and machine rooms as constructed; verify critical dimensions; and examine supporting structure and other conditions under which elevator work is to be installed.
- B. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Comply with manufacturer's written instructions.
- B. Welded Construction: Provide welded connections for installing elevator work where bolted connections are not required for subsequent removal or for normal operation, adjustment, inspection, maintenance, and replacement of worn parts. Comply with AWS standards for workmanship and for qualifications of welding operators.
- C. Sound Isolation: Mount rotating and vibrating equipment on vibration-isolating mounts to minimize vibration transmission to structure and structure-borne noise due to elevator system.
- D. Lubricate operating parts of systems, including ropes, as recommended by manufacturers.

- E. Alignment: Coordinate installation of hoistway entrances with installation of elevator guide rails for accurate alignment of entrances with car. Where possible, delay final adjustment of sills and doors until car is operable in shaft. Reduce clearances to minimum, safe, workable dimension at each landing.
- F. Leveling Tolerance: 1/8 inch, up or down, regardless of load and travel direction.
- G. Set sills flush with finished floor surface at landing. Fill space under sill solidly with nonshrink, nonmetallic grout.
- H. Locate hall signal equipment for elevators as follows unless otherwise indicated on drawings:
 - 1. Place hall lanterns either above or beside each hoistway entrance.
 - 2. Mount hall lanterns at a minimum of 72 inches above finished floor.

3.3 FIELD QUALITY CONTROL

- A. Acceptance Testing: On completion of elevator installation and before permitting elevator use (either temporary or permanent), perform acceptance tests as required and recommended by ASME A17.1/CSA B44 and by governing regulations and agencies.
- B. Operating Test: Load each elevator to rated capacity and operate continuously for 30 minutes over full travel distance, stopping at each level and proceeding immediately to the next. Record temperature rise of elevator machine during 30-minute test period. Record failure to perform as required.
- C. Advise Owner, Architect, and authorities having jurisdiction in advance of dates and times that tests are to be performed on elevators.

3.4 PROTECTION

- A. Temporary Use: Comply with the following requirements for each elevator used for construction purposes:
 - 1. Provide car with temporary enclosure, either within finished car or in place of finished car, to protect finishes from damage.
 - 2. Provide strippable protective film on entrance and car doors and frames.
 - 3. Provide padded wood bumpers on entrance door frames covering jambs and frame faces.
 - 4. Provide other protective coverings, barriers, devices, signs, and procedures as needed to protect elevator and elevator equipment.
 - 5. Do not load elevators beyond their rated weight capacity.
 - 6. Engage elevator Installer to provide full maintenance service. Include preventive maintenance, repair or replacement of worn or defective components, lubrication, cleanup, and adjustment as necessary for proper elevator operation at rated speed and capacity. Provide parts and supplies same as those used in the manufacture and installation of original equipment.
 - 7. Engage elevator Installer to restore damaged work, if any, so no evidence remains of correction. Return items that cannot be refinished in the field to the shop, make required repairs and refinish entire unit, or provide new units as required.

3.5 DEMONSTRATION

- A. Check operation of each elevator with Owner's personnel present before date of Final Acceptance and again not more than one month before end of warranty period. Determine that operation systems and devices are functioning properly.

3.6 MAINTENANCE

- A. Initial Maintenance Service: Beginning at Final Acceptance, maintenance service shall include 12 months' full maintenance by skilled employees of elevator Installer. Include monthly preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper elevator operation at rated speed and capacity. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.
 - 1. Perform maintenance during normal working hours.
 - 2. Include 24-hour-per-day, 7-day-per-week emergency callback service with response time of two hours or less.

END OF SECTION 142100