PROJECT MANUAL

CONSTRUCTION DOCUMENTS

MAY 21, 2025

BULLITT COUNTY PUBLIC SCHOOLS
Moving Forward

Bullitt County Public Schools
1040 Highway 44 East
Shepherdsville KY 40165

Bullitt County Public Schools
Bullitt Central High School
Physical Science Center

Bid Package 1: General Construction

Bullitt County, KY
BG# 25-145 | ska# 2023-50.1

SCOTT EDWARD KREMER
REGISTERED
NO. 4634
COMMONWEALTH OF KENTUCKY
ARCHITECT

Bid Date: **12 June 2025**

Time of Opening: **1:00 pm EST**

Location: **Bullitt County Public Schools Central Office**
1040 Highway 44 East, Shepherdsville, KY 40165

ARCHITECT
Studio Kremer Architects Inc
1231 S Shelby Street
Louisville, KY 40203

CIVIL ENGINEER
Buzick Construction, Inc.
702 Beechwood Avenue
Bardstown, KY 40004

STRUCTURAL ENGINEER
Brown + Kubican Structural Engineers
8900 Greeneway Commons Pl. #201
Louisville, KY 40220

M E P ENGINEER
CMTA, Inc.
10411 Meeting Street
Prospect, KY 40059

Volume 2

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Phase III Athletics
Bullitt County Public Schools
Bullitt CENTRAL Physical Science Center
BID PACKAGE 1: GENERAL CONSTRUCTION

Shepherdsville, Kentucky
SKA# 2023-50 | BG-1# 25-145

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VOLUME 2

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SECTION 02 01 00 – SITE CONDITIONS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

PART 2 PRODUCTS (not applicable)

PART 3 EXECUTION

3.01 EXAMINATION

A. The site is located at the following address:
   a. Bullitt Central High School
      i. 1330 KY-44
         Shepherdsville, KY 40165

B. Bidders, before submitting proposals, shall visit and examine the site to satisfy themselves as to be the nature and scope of the new construction and any difficulties attending to the execution. The submission of a proposal shall be construed as evidence that a visit and examination has been made. Later claims for labor, equipment or materials required or difficulties encountered which could have been foreseen had such an examination been made will not be recognized.

C. The Contractor is responsible to examine the site conditions prior to construction. The Contractor shall notify the Architect of any conditions that are not as shown in the Contract Documents. The Contractor shall determine and include any additional work required to construct the Project to the final conditions as shown in the Contract Documents.

D. Unknown conditions that are not shown in the Contract Documents and or not found by the site examination such as: poor foundation conditions, sinkholes, and/or underground structures shall be brought the immediate attention of the Architect. Determination will be made for work to be done to address each condition. Any additional cost of performing this work shall be paid for as described in other Sections of this Project Manual.

E. The Owner performed a soils test specifically for this Project. Refer to the Geotechnical Report performed by Consulting Services Incorporated (CSI), included in this Project Manual. The Contractor shall examine the site prior to bidding and the Contractor shall coordinate the site examination with the Owner.

   1. The Geotechnical Report is included in the Project Manual for informational purposes only and is not part of the Contract Documents.

3.02 LOCATION OF UNDERGROUND UTILITIES

A. The site has existing underground utilities.

B. **Prior to the beginning of Construction**, the Contractor shall locate and mark any/all existing underground utilities by obtaining the location by means of BUD *(Before you Dig)*, at 811 **and an independent utility location company**. Cost for locating the lines is the responsibility of the Contractor. Any active lines damaged shall be repaired by the Contractor at no additional cost to the Owner.

C. All Contractors shall exercise extreme caution while performing work in the area of existing underground work. Locate all underground utilities by careful hand excavation; provide all necessary and proper protection from damage.

END OF SECTION 02 01 00

SECTION 02 08 00 – STAKING

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Construction layout staking.

PART 2 PRODUCTS

2.01 MATERIALS

A. The survey stakes and markers shall be supplied and paid for by the Contractor.

PART 3 EXECUTION

3.01 EXECUTION

A. The Contractor shall furnish and manage the construction layout to the lines and grades as shown on the Construction Documents. All construction staking shall be performed by a licensed Kentucky Land Surveyor and their crew supplied by the Contractor at the Contractors expense.

B. The staking crew shall stake the lines and grades in accordance with the Plans and Specifications.

C. Any items found on the Plans that do not appear to be correct or are not clearly shown shall be brought to the attention of the Engineer. The Engineer will determine the correction or clarify the locations of points to be set.

D. The construction staking crew shall stake all of the required points to construct this project to the lines and grades as shown on the Plans.

END OF SECTION 02 08 00

SECTION 033000 – CAST-IN-PLACE CONCRETE

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section specifies cast-in-place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes. This section applies to concrete work shown on the structural drawings. See Division 32 for site concrete.

B. Cast-in-place concrete includes the following:

1. Lean concrete backfill and mudmats.
2. Foundations and footings.
3. Slabs-on-grade.
4. Foundation walls.
5. Equipment pads and bases.
6. Grout below column base and bearing plates.
7. Fill for steel pan stairs.

C. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 1 Section “Structural Special Inspection.”
2. Division 3 Section “Structural Excavation and Backfill” for preparation and excavation of foundations and stone drainage fill.
3. Division 3 Section “Structural Precast Concrete – Plant Cast.”
4. Division 5 Section “Structural Anchors.”
5. Division 5 Section “Steel Deck.”
6. Division 7 Section “Thermal and Moisture Protection.”
7. Division 31 Section “Earth Moving” for preparation and excavation of foundations and stone drainage fill.

D. Coordination: Unless other satisfactory agreements are specifically entered into by contractors concerned, all miscellaneous iron and steel, sleeves, anchors, etc., required by work of other contractors, will be furnished and installed by such other contractors with the cooperation of this contractor.

1.3 DEFINITIONS

A. Cementitious Materials: Portland cement alone or in combination with one or more of the following: blended hydraulic cement, fly ash, slag cement, other pozzolans, and silica fume; materials subject to compliance with requirements.

B. W/C Ratio: The ratio by weight of water to cementitious materials.

1.4 ACTION SUBMITTALS

A. General: Furnish submittals in quantity, format, and other Conditions of the Contract and as specified in Division 1 of the Project Manual.

B. Design Mixtures: For each concrete mixture with laboratory test reports for the following data. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.

1. Method used to determine the proposed mix design (per ACI 301, Section 4).
2. Gradation and quantity of fine and coarse aggregates.
3. Proportions of all ingredients including all admixtures added either at the time of batching or at the job site. Indicate amounts of mixing water to be withheld for later addition at Project site.
4. Water/cement ratio and water/cementitious ratio.
5. Slump – ASTM C143.
6. Certification and test results of the total water-soluble chloride ion content of the design mix – FHWA RD-77 or AASHTO T 260-84.
7. Air content of freshly mixed concrete by the pressure method, ASTM C231, or the volumetric method, ASTM C173.
8. Unit weight of concrete – ASTM C138.
9. Strength at 7- and 28-days for structural concrete– ASTM C39. Document strength on basis of previous field experience or trial mixtures, per ACI 301 Section 4. Submit strength test records, mix design materials, conditions, and proportions for concrete used for record of tests, standard calculation, and determination of required average compressive strength.
10. Strength at 7- and 28-days for polished concrete surfaces– ASTM C39. Document strength on basis of trial mixture (mandatory), per ACI 301 Section 4. Submit strength test records, mix design materials, conditions, and proportions for concrete used for record of tests, standard calculation, and determination of required average compressive strength.
11. conditions, and proportions for concrete used for record of tests, standard calculation, and determination of required average compressive strength.
12. Complete and include Structural Engineer's standard mix design submittal form for each mix. A blank copy is included at the end of this section.

C. Steel Reinforcement Shop Drawings: Fabrication and placing drawings for reinforcement detailing, fabricating, bending, and placing concrete reinforcement. Comply with ACI SP-066(04) "ACI Detailing Manual" showing bar sizes, lengths, material, grade, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, splices and laps, mechanical connections, tie spacing, hoop spacing, and supports for concrete reinforcement. Include special reinforcing required for openings through concrete structures.

1. Computer generated electronic structural construction document files (ACAD) will be made available to the Contractor. The Contractor will be required to sign the Engineer's standard release of liability form prior to receiving the drawing files. Rules for use of said files shall be as defined in the CRSI "Code of Standard Practice" Sections 4.19 and 6.4.1.
2. Shop drawing resubmittals are reviewed for conformance with review marks only. Any changes or questions originating on a resubmittal shall be clearly clouded.

D. Product Data: For proprietary materials and items, including reinforcement and forming accessories, admixtures, patching compounds, waterstops, vapor retarder/barrier, construction joint slip dowels, joint systems, mechanical reinforcing splice couplers, fiber reinforcing, curing compounds, dry-shake finish materials, and others if requested by Architect.

E. Samples of materials as requested by Architect, including names, sources, and descriptions, as follows:
1. Waterstops.
2. Vapor retarder/barrier.

F. Drawings showing proposed construction and/or contraction joint locations.

1.5 INFORMATIONAL SUBMITTALS

A. General: Furnish submittals in quantity, format, and other Conditions of the Contract and as specified in Division 1 of the Project Manual.

B. Welding certificates.

C. Laboratory test reports for concrete materials or material certificates in lieu of material laboratory test reports. Material certificates shall be signed by Manufacturer and Contractor, certifying that each material item complies with or exceeds specified requirements. Provide certification from admixture manufacturers that chloride content complies with specification requirements.

D. Survey of the as-built locations of anchor rods, foundation bolts, and other embedded items shall be submitted to the Architect, Engineer, and General Contractor/Construction Manager.

E. Written notification that the concrete in the footings, piers, walls, or other bearing support has attained, on the basis of an appropriate ASTM standard test method of field-cured samples, a minimum of 75% of the intended minimum compressive design strength.

F. Minutes of preinstallation conference.

1.6 QUALITY ASSURANCE

A. Codes and Standards: Comply with provisions of the following codes, specifications, and standards, except where more stringent requirements are shown or specified. Each contractor having reference to ACI Documents shall maintain copies of same on project site.

AMERICAN CONCRETE INSTITUTE

1. ACI 117-10 – Specifications for Tolerances for Concrete Construction and Materials.
2. ACI 211.1-91 – Standard Practice for Selecting Proportions Normal, Heavyweight and Mass Concrete (Reapproved 2009).
3. ACI 301-10 – Specification for Structural Concrete.
4. ACI 302.1R-04 – Guide for Concrete Floor and Slab Construction.
5. ACI 304.2R-96 – Placing Concrete by Pumping Methods (Reapproved 2008).
6. ACI 305R-10 – Guide to Hot Weather Concreting.
7. ACI 306R-10 – Guide to Cold Weather Concreting.
8. ACI 308R-01 – Guide to Curing Concrete (Reapproved 2008).
9. ACI 309R-05 – Guide for Consolidation of Concrete.
10. ACI 311.1R-07 – ACI Manual of Concrete Inspection.
11. ACI 318-14 – Building Code Requirements for Structural Concrete and Commentary.
12. ACI 347-04 – Guide to Formwork for Concrete.
13. SP-66 – ACI Detailing Manual.

CONCRETE REINFORCING STEEL INSTITUTE (CRSI):

1. CRSI – Manual of Standard Practice.
2. CRSI RB4.1 – Supports for Reinforcement Used in Concrete (2014a)
3. CRSI – Placing Reinforcing Bars (2011)

B. Qualifications of Workers: Use adequate numbers of skilled workers who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper execution of the work required by this Division.

1. Installer shall employ on Project personnel qualified as ACI-Certified *Flatwork Technician and Finisher* and a supervisor who is an ACI-certified Concrete *Flatwork Technician*.

C. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94 requirements for production facilities and equipment.

1. Manufacturer certified according to NRMCA's *Certification of Ready Mixed Concrete Production Facilities*.

D. Preinstallation Conference: Conduct conference at Project site to comply with requirements of Division 1 Section “Project Meetings”.

E. Contractor shall be responsible for conducting a survey of the as-built locations of anchor rods, foundation bolts, and other embedded items. Survey to include embed placement, bolt projection, and top of foundation elevation. Survey to be conducted by a Professional Land Surveyor.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver steel reinforcement and concrete 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 reinforcement off ground by using pallets, platforms, dunnage, or other supports and spacers.

C. Do not store materials on structure in a manner that might cause distortion, damage, or overload to members or supporting structures. Repair or replace damaged materials or structures as directed.

D. Store waterstops and packaged materials in sealed containers with manufacturer's labels intact. Place under cover to protect from moisture, sunlight, dirt, oil, and other contaminants.

PART 2 - PRODUCTS

2.1 FORM MATERIALS

A. Form-facing panels for Exposed (Architectural) Finish Concrete: New exterior-grade high-density overlay (Class 1 or better) or medium-density overlay (Class 1 or better with mill-release agent treated and edge sealed) plywood panels complying with DOC PS1 and with each piece bearing legible inspection trademark to provide continuous, straight, smooth, and true architectural exposed concrete surfaces. Furnish in largest practicable sizes to minimize number of joints and to conform to joint pattern and spacing indicated on Drawings.

1. Joints in formwork shall align with rustication joints shown on the design drawings. Coordinate placement with Architect.
2. Layout formwork with full form pieces (sheets) at the exposed portion of wall. Partial pieces are to be used as required, with the preferred location being below grade or above ceiling.

B. Forms for Exposed (Smooth) Finish Concrete: Exterior-grade high-density overlay (Class 1 or better), medium-density overlay (Class 1 or better with mill-release agent treated and edge sealed), or Structural1 or Class 1 (B-B or better, mill oiled and edge sealed) plywood panels complying with DOC PS1; or new metal-framed and metal faced panels; or other acceptable panel-type materials to provide continuous, straight, and smooth exposed surfaces. Furnish in largest practicable sizes to minimize number of joints.

C. Forms for Unexposed, Rough-Formed Finish Concrete: Plywood, lumber, metal or another acceptable material. Provide lumber dressed on at least two edges and one side for tight fit.

D. Chamfer Strips: Non-staining dressed wood, metal, PVC, or rubber strips; ¾ by ¾ inch, minimum, and as shown on Drawings; in longest practical lengths.

E. Rustication Strips: Non-staining dressed wood, metal, PVC, or rubber strips; with sides beveled and back-kerfed for ease of form removal; in longest practical lengths.

F. Form-Release Agent: Commercially formulated form-release agent with maximum volatile organic compounds (VOCs) not to exceed those allowable by jurisdictional regulations 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.

G. Form Ties (Standard): Factory-fabricated, adjustable-length, removable or snap-off glass-fiber-reinforced plastic or metal form ties designed to resist lateral pressure of plastic concrete on forms, prevent form deflection, and to prevent spalling of concrete upon removal.

1. Furnish units that leave no corrodible metal closer than 1 inch to the plane of the exposed concrete surface.
2. Furnish ties that, when removed, leave holes no larger than 1 inch in diameter in concrete surface.
3. Furnish ties with integral water-barrier plates to walls indicated to receive dampproofing or waterproofing.

H. Form Joint Tape: Compressible foam tape; pressure sensitive; AAMA800, “Specification 810.1, Expanded Cellular Glazing Tape”; minimum ¼ inch thick.

I. Form Joint Sealant: Elastomeric sealant complying with ASTM C920, Type M or S, Grade NS, that adheres to form joint substrates.

J. Sealer: Penetrating, clear, polyurethane wood form sealer formulated to reduce absorption of bleed water and prevent migration of set-retarding chemicals from wood.

2.2 REINFORCING MATERIALS

A. Reinforcing Bars: ASTM A 615, Grade 60, deformed.

B. Welded Wire Fabric: ASTM A 1064, plain, fabricated from as-drawn steel wire into flat sheets.

C. Smooth Joint Dowel Bars: ASTM A36, plain-steel bars, cut true to length with ends square and free of burrs.

D. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars in place. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice," 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 steel wire or CRSI Class 2 stainless-steel bar supports.
2. .

E. Fabric Supports: Chairs for spacing, supporting welded wire fabric in place. Use continuous wire chairs complying with CRSI specifications.

1. For slabs-on-grade, use supports with sand plates or horizontal runners where base material will not support chair legs.

2. For exposed-to-view concrete surfaces where legs of supports are in contact with forms, provide supports with legs that are protected by plastic (CRSI, Class 1) or stainless steel (CRSI, Class 2).

F. Mechanical Reinforcing Splices: The mechanical connection shall meet applicable building code requirements for developing in tension or compression. The connection shall be positive locking, taper threaded type coupler manufactured from high quality steel. Bar ends must be shop taper-threaded using the manufacturer's bar threading equipment to ensure proper taper and thread engagement.

G. urer's bar threading equipment to ensure proper taper and thread engagement.

1. Available Products: Subject to compliance with requirements, products that may be incorporated in the Work include, but are not limited to, the following:

a. Lenton Standard Coupler Type A2, by Erico for coupling between reinforcing bars.
b. Lenton Weldable Coupler type C2/C3J, by Erico for coupling between reinforcing bar and structural steel.
c. Dayton Richmond Dowel Bar Splicer, by Dayton/Richmond Concrete Accessories for coupling between reinforcing bars at forms.

2.3 CONCRETE MATERIALS

A. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, obtain aggregate from single source, and obtain admixtures from single source from single manufacturer.

B. Cementitious Materials:
1. Portland Cement: ASTM C 150, Type I. High early strength (when specified), ASTM C150, Type III. One brand of cement shall be used throughout Project duration unless otherwise acceptable to Engineer.
2. Fly Ash: ASTM C 618, Class F or C, except maximum loss on ignition: 3%.
3. Slag Cement: ASTM C 989, Grade 100 or 120.
4. Blended Hydraulic Cement: ASTM C 595, Type IS, portland blast-furnace slag, Type IP, portland-pozzolan, Type IL, portland-limestone, or Type IT, ternary blended cement.
5. Silica Fume: ASTM C 1240, amorphous silica.

C. Normal-Weight Aggregates: ASTM C 33 Class 3S coarse aggregate or better, graded, and as specified. Provide aggregates from a single source for exposed concrete.

1. For exposed exterior surfaces, do not use fine or coarse aggregates that contain substances considered deleterious or that cause spalling or surface discoloration due to oxidation.
2. Fine Aggregate to be free of materials with deleterious reactivity to alkali in cement.

D. Water: ASTM C 1602 and potable.

E. Chemical Admixtures: Certified by manufacturer to be compatible with other admixtures and that do not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.

1. Water-Reducing Admixture: ASTM C 494, Type A.
2. Retarding Admixture: ASTM C 494, Type B.
3. Water-Reducing and Retarding Admixture: ASTM C 494, Type D.
4. Water-Reducing and Accelerating Admixture: ASTM C 494, Type E.
5. High-Range, Water-Reducing Admixture: ASTM C 494, Type F.
6. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494, Type G.
7. Plasticizing and Retarding Admixture: ASTM C 1017, Type II.
8. Air-Entraining Admixture: ASTM C 260.

F. 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 C 494, Type C.

1. Manufacturers: Subject to compliance with requirements manufacturers offering products that may be incorporated into the work include, but are not limited to the following:

    a. BASF Corporation; Construction Systems.
    b. Euclid Chemical Company; an RPM company.
    c. GCP Applied Technologies, Inc.
    d. RussTech Admixtures, Inc.
    e. Sika Corporation.

G. Non-Set-Accelerating Corrosion-Inhibiting Admixture: Commercially formulated, non-set-accelerating, anodic inhibitor or mixed cathodic and anodic inhibitor; capable of forming a protective barrier and minimizing chloride reactions with steel reinforcement in concrete.

1. Manufacturers: Subject to compliance with requirements manufacturers offering products that may be incorporated into the work include, but are not limited to the following:

    a. BASF Corporation; Construction Systems.
    b. GCP Applied Technologies Inc.
    c. RussTech Admixtures, Inc.
    d. Sika Corporation.

H. Shrinkage-Reducing Admixture

1. Available Products: Subject to compliance with requirements, products that may be incorporated in the Work include, but are not limited to, the following:

    a. Eucon SRA, Euclid Chemical Company.
    b. Eclipse Floor or Eclipse Plus, GCP Applied Technologies, Inc.
    c. Masterlife CRA 007, BASF Corporation.
    d. SRA-157 EXT, RussTech Admixtures, Inc.

I. Controlled Low Strength Material (CLSM) Performance Additive

1. Available Products: Subject to compliance with requirements, products that may be incorporated in the Work include, but are not limited to, the following:

a. Darafill or Darafill Dry, GCP Applied Technologies, Inc.
b. MasterMatrix VMA 362, BASF Corporation.
c. RUSS-FLO, RussTech Admixtures, Inc.

2.4 RELATED MATERIALS

A. Reglets: Where sheet flashing or bituminous membranes are terminated in reglets, provide reglets of not less than 0.022-inch thick (26-gage) galvanized sheet steel. Temporarily fill reglet or cover face opening to prevent intrusion of concrete or debris.

B. Headed Steel Studs: ASTM A 108, Grade 1015 through 1020, cold finished carbon steel, AWS D1.1, Type B. Dimensions shall comply with AISC specifications.

C. Construction joint slip dowels: steel rod or plate in a plastic insert to allow contraction of the concrete while preventing vertical differential displacement.

1. Available Products: Subject to compliance with requirements, products that may be incorporated in the Work include, but are not limited to, the following:

a. #4x1'-6" long, Speed Dowel by Sika Greenstreak.
b. ¼" plate, Diamond Dowel by PNA, Inc.
c. ¼" plate, Speed Plate by Sika Greenstreak.

D. Slab Pourstop with mechanical shear transfer: galvanized steel, vinyl, or plastic forming pourstop with integral keyway or pre-drilled holes with dowel bars at 12" on center for use with slabs on grade.

1. Available Products: Subject to compliance with requirements, products that may be incorporated in the Work include, but are not limited to, the following:

a. Key-Loc Joint System, Cardinal Manufacturing Company, Inc.
b. K-Form system with ¾" diameter by 18" smooth dowels (minimum), Victory Bear Construction Products.

E. Self-Expanding Rubber Strip Waterstops: Manufactured rectangular or trapezoidal strip, bentonite-free hydrophilic polymer-modified chloroprene rubber, for adhesive bonding to concrete, 3/8 by 3/4 inch.

1. Manufacturers: Subject to compliance with requirements manufacturers offering products that may be incorporated into the work include, but are not limited to the following:

a. GCP Applied Technologies Inc.

b. Sika Greenstreak.

F. Expansion- and Isolation-Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber or non-impregnated, flexible, synthetic foam with standard bonding agent to hold in place.

G. Sheet Vapor Retarder: Polyethylene sheet, ASTM D 4397, not less than 10 mils thick.

H. Sheet Vapor Retarder: Provide vapor retarder that is resistant to deterioration when tested according to ASTM E 154, as follows:

1. Polyolefin/Resin or multi-ply extrusion coated polyethylene sheet not less than 10 mils thick conforming to ASTM E 1745 Class A. Maximum water vapor permeance when tested in accordance with Test Method ASTM E154, Sections 7, 8, 11, 12, and 13 (based on ASTM E96) or ASTM F1249 of 0.038 perms. Minimum tensile strength when tested to ASTM D154 of 45 lbs-force/inch.
2. Accessories: All must be from the same manufacturer of the vapor barrier material used, or must be approved by the vapor barrier manufacturer in writing and submitted to the Architect for record.

    a. Seams: Manufacturer approved seam tape.
    b. Sealing Permanent penetrations of vapor retarder: Manufacturer approved vaporproofing mastic or tape.
    c. Perimeter edge/seal: Manufacturer approved tape with a textured surface that creates a mechanical seal to freshly-placed concrete, termination bar, or double-sided sealant tape.
    d. Non-permanent penetration prevention: Manufacturer approved peel and stick stake base/foot and film safe screed system.

3. Available Products: Subject to compliance with requirements, products that may be incorporated in the Work include, but are not limited to, the following:

    a. Perminator Vapor-Mat with Perminator Tape Seal. W.R. Meadows, Inc.
    b. Stego Wrap with Stego Tape Seal. Stego Industries, LLC.
    c. Viper Vaporcheck II with manufacturer's recommended tape seal. Insulation Solutions, Inc.
    d. Vaporblock VB10 with Vapor Bond Plus Tape Seal. Raven Industries, Engineered Films Division.
    e. Xtreme with Xtreme Tape Seal. Tex-Trude, LP.

I. Semirigid Joint Filler: Two-component, semirigid, 100 percent solids, according to ASTM D 2240.

J. Bonding Agent: ASTM C 1059, Type II, nonredispersible, acrylic emulsion or styrene butadiene.

K. Epoxy Adhesive: ASTM C 881, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class suitable for application temperature and of grade to suit Project requirements.

1. Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the Work include, but are not limited to, the following:

    a. Dayton Superior.
    b. Euclid Chemical Company.
    c. BASF Corporation.
    d. W.R. Meadows, Inc.
    e. Sika Corporation.

L. Cartridge Injection Adhesive (for reinforcing dowels): two-component material for use in concrete. Anchor to be approved for use with cracked concrete per AC308.

1. Acrylic resin adhesive, suitable for use on dry or damp surfaces. Available Products: Subject to compliance with requirements, products that may be incorporated in the Work include, but are not limited to, the following:

    a. HIT HY 200 V3 System, Hilti.
    b. AC 200+, DeWalt/ Powers.
    c. AT-XP System, Simpson/Strong-Tie.

2. Epoxy adhesive, suitable for use on oversized, cored, and wet holes and in submerged applications. Available Products: Subject to compliance with requirements, products that may be incorporated in the Work include, but are not limited to, the following:

    a. A7+ System, ITW Red Head.
    b. HIT RE500 V3 System, Hilti.
    c. PURE 110+, DeWalt/Powers.
    d. SET-XP Epoxy System, Simpson/Strong-Tie.

M. 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 C1107, of consistency suitable for application, and a 30-minute working time. Grout to have a minimum compressive strength at 28 days of 8,000 psi when applied in a flowable consistency.

1. Available Products: Subject to compliance with requirements, products that may be incorporated in the Work include, but are not limited to, the following:

    a. SureGrip High Performance Grout, Dayton Superior.
    b. NS Grout, The Euclid Company.
    c. Masterflow 928, BASF Construction Chemicals.
    d. Sikagrout 328, SIKA.

2.5 LIQUID FLOOR TREATMENTS

A. Penetrating Concrete Sealer: Clear, chemically reactive, waterborne solution of inorganic silicate or siliconate materials and proprietary components; odorless; that penetrates, hardens, and densifies concrete surfaces.

1. Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the Work include, but are not limited to, the following:

a. BASF Corporation; Construction Systems.
b. ChemMasters, Inc.
c. Dayton Superior.
d. Euclid Chemical Company.
e. Kaufman Products, Inc.
f. L&M Construction Chemicals, Inc.
g. Metalcrete Industries.
h. PROSOCO, Inc.
i. SpecChem, LLC.
j. W. R. Meadows, Inc.

B. Penetrating Concrete Sealer and Liquid Densifier: The sealer shall be a lithium-based compound which penetrates concrete surfaces providing an increase in abrasion resistance and a reduction in the surface absorption of liquids. Sealer shall be a clear liquid that dries transparent.

1. Available Products: Subject to compliance with requirements, products that may be incorporated in the Work include, but are not limited to, the following:

a. Pentra-hard Finish, Dayton Superior.
b. Ultraguard, The Euclid Chemical Co.

C. Penetrating Concrete Sealer and Liquid Densifier: The sealer shall be a silicate and siliconate polymer or lithium based compound which penetrates concrete surfaces providing an increase in abrasion resistance, surface density, durability, and a reduction in the surface absorption of liquids. Sealer shall be a clear liquid that dries transparent.

1. Available Products: Subject to compliance with requirements, products that may be incorporated in the Work include, but are not limited to, the following:

a. Pentra-hard Densifier, Dayton Superior.
b. EUCO Diamond Hard, The Euclid Chemical Co.
c. Liqui-hard, W.R. Meadows, Inc.

2.6 CURING MATERIALS

A. Absorptive Cover for non-exposed concrete: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. when dry.

B. Wet-curing Blanket for exposed architectural concrete: ASTM C171-03 and AASHTO M171-00 natural cellulose fabric for single use application. Rolls to be new, shrink-wrapped in poly covering until used.

1. Available Products: Subject to compliance with requirements, products that may be incorporated in the Work include, but are not limited to, the following:

a. UltraCure NCF, Sika.
b. Single-Use Curing Blanket, Masco.

C. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.

D. Water: Potable.

E. General: All non-dissipating compounds shall be certified by curing compound manufacturer to not interfere with bonding of floor covering. .

F. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete for temporary protection from rapid moisture loss.

1. Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the Work include, but are not limited to, the following:

a. BASF Corporation.
b. ChemMasters, Inc.
c. Dayton Superior.
d. Euclid Chemical Company.
e. Kaufman Products, Inc.
f. L&M Construction Chemicals, Inc.
g. Lambert Corporation.
h. Metalcrete Industries.
i. RussTech Admixtures, Inc. (EVRT)
j. Sika Corporation.
k. SpecChem, LLC.
l. W. R. Meadows, Inc.

G. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, dissipating.

1. Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the Work include, but are not limited to, the following:

a. BASF Corporation.
b. ChemMasters, Inc.
c. Dayton Superior.
d. Euclid Chemical Company.
e. Kaufman Products, Inc.

f. L&M Construction Chemicals, Inc.
g. Lambert Corporation.
h. SpecChem, LLC.
i. W. R. Meadows, Inc.

H. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, nondissipating.

1. Coordinate compatibility and product with Polishing Contractor for all polished concrete surfaces.
2. Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the Work include, but are not limited to, the following:

a. BASF Corporation.
b. ChemMasters, Inc.
c. Dayton Superior.
d. Euclid Chemical Company.
e. Kaufman Products, Inc.
f. L&M Construction Chemicals, Inc.
g. Lambert Corporation.
h. Metalcrete Industries.
i. SpecChem, LLC.
j. W. R. Meadows, Inc.

I. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, 18 to 25 percent solids, nondissipating.

1. Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the Work include, but are not limited to, the following:

a. BASF Corporation.
b. ChemMasters, Inc.
c. Dayton Superior.
d. Euclid Chemical Company.
e. L&M Construction Chemicals, Inc.
f. Lambert Corporation.
g. Metalcrete Industries.
h. SpecChem, LLC.
i. W. R. Meadows, Inc.

J. Clear, Waterborne, Membrane-Forming Curing and Sealing Compound: ASTM C 1315, Type 1, Class A.

1. Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the Work include, but are not limited to, the following:

a. ChemMasters, Inc.

b. Dayton Superior.
c. Euclid Chemical Company.
d. Kaufman Products, Inc.
e. L&M Construction Chemicals, Inc.
f. Lambert Corporation.
g. SpecChem, LLC.
h. W. R. Meadows, Inc.

2.7 PROPORTIONING AND DESIGNING MIXES

A. Prepare design mixes for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field data methods, or both, according to ACI 301. Mix proportions shall be established so that the concrete can be placed readily without segregation into forms and around reinforcement under anticipated placement conditions. Use an independent testing agency for preparing and reporting proposed mixture designs based on laboratory trial mixtures. Trial batch and field experience tests shall have been performed within 24 months of submittal date. Use mix design submittal form included at the end of this section.

1. Do not use the same testing agency for field quality control testing.

B. Submit written reports to Architect of each proposed concrete mix type at least 15 days prior to start of Work. Do not begin concrete production until proposed mix designs have been reviewed by Architect. The approved mix designs shall be used throughout this project unless changes are approved by the Architect/Engineer prior to use.

C. Cementitious Materials: Supplier shall coordinate surface treatment compatibility with cementitious materials. Limit percentage, by weight, of cementitious materials other than portland cement in concrete as follows:
1. Fly Ash: 20 percent for Type F or 25% for Type C except for lean or flowable backfill. Use of fly ash in concrete for use in colored concrete, polished concrete floor systems, or where incompatible with admixtures or other treatments is prohibited.
2. Combined Fly Ash and Pozzolan: 25 percent.
3. Slag Cement: 50 percent.
4. Combined Fly Ash or Pozzolan and Slag Cement: 50 percent portland cement minimum, with fly ash or pozzolan not exceeding 25 percent.
5. Silica Fume: 10 percent.
6. Combined Fly Ash, Pozzolans, and Silica Fume: 35 percent with fly ash or pozzolans not exceeding 25 percent and silica fume not exceeding 10 percent.
7. Combined Fly Ash or Pozzolans, Slag Cement, and Silica Fume: 50 percent with fly ash or pozzolans not exceeding 25 percent and silica fume not exceeding 10 percent.

D. Admixtures: Use admixtures according to manufacturer's written instructions.

1. Use water-reducing, high-range water-reducing, or plasticizing admixture in concrete as required for placement and workability and in all pumped concrete, architectural concrete, and concrete required to be watertight.

2. Use accelerating and retarding admixtures at Contractor's discretion to control set time when required by extreme temperatures or humidity, or other adverse placement conditions. Use accelerating admixture in concrete slabs placed at ambient temperatures below 35 deg F.
3. Use shrinkage-reducing admixture in all concrete for polished concrete or other exposed architectural concrete floor systems. Dosage rate to be 2% by weight cementitious material. Coordinate compatibility with other admixtures and floor treatments.
4. Use corrosion-inhibiting admixture in concrete mixtures where indicated.

E. The minimum compressive strength measured 28 days after placement (f'_c), minimum cementitious content, slump, maximum water/cementitious content ratio (W/C), and air content of the concrete for each portion of the structure shall be as follows:

1. Mix Type **1**. Controlled Low Strength Material CLSM (Flowable fill). Provide blend of cement, flyash, and sand with minimum cementitious content as follows:

    a. Excavatable flowable fill: 100 lb cement and 250 lb fly ash per cubic yard.
    b. Structural flowable fill (250 psi): 175 lb cement and 200 lb fly ash per cubic yard. Add CLSM performance additive at manufacturer's recommended dosage rate, adjusting water content to provide desired flow and strength characteristics.

2. Mix Type **2**. Lean Concrete Backfill and Mudmats. Normal-weight concrete.

    a. Minimum Design Compressive Strength: 1,500 psi.
    b. Minimum Cementitious Material: 200 lbs/cy.
    c. Slump Limit: N/A.
    d. Air Content: Natural.

3. Mix Type **3**. Footings. Normal-weight concrete.

    a. Minimum Design Compressive Strength: 3,000 psi.
    b. Minimum Cementitious Material: 470 lbs/cy.
    c. Slump Limit: Minimum of 4 inches and maximum of 6 inches, plus or minus 1 inch.
    d. Air Content: Natural.

4. Mix Type **4**. Foundation walls and Piers. Normal-weight concrete.

    a. Minimum Design Compressive Strength: 4,000 psi.
    b. Minimum Cementitious Material: 550 lbs/cy.
    c. Water Reducing Admixture: Mandatory.
    d. Slump Limit: Maximum 4 inches or 8 inches after adding admixture to 2-to-3-inch slump concrete, plus or minus 1 inch.
    e. Air Content: Natural.

5. Mix Type **5**. Interior Slab on Grade, Topping Slabs, and Equipment Bases for non-polished surfaces. Normal-weight concrete.

a. Minimum Design Compressive Strength: 4,000 psi.
b. Minimum Cementitious Material: 505 lbs/cy.
c. Water Reducing Admixture: Mandatory.
d. Slump Limit: Maximum 8 inches after adding water reducing admixture to 2-to-3-inch slump concrete, plus or minus 1 inch.
e. Air Content: Maximum 3 percent.
f. Fiber Reinforcement: Uniformly disperse in concrete mixture at manufacturer's recommended rate, but not less than a rate of **[1.0 lb/cy for synthetic micro fibers] [4.0 lbs/cy for synthetic macro fibers] [21 lbs/cy for steel fibers]**.

6. Mix Type **6**. Exterior structural horizontal concrete exposed to weather or deicer chemicals. Normal-weight concrete.

a. Minimum Compressive Strength: 5,000 psi.
b. Minimum Cementitious Material: 564 lbs/cy.
c. Maximum W/C Ratio: 0.40.
d. Water Reducing Admixture: Optional.
e. Slump Limit: 4 inches or not more than 8 inches after adding admixture to 2-to-3-inch slump concrete, plus or minus 1 inch.
f. Air Content: 5.5 percent for 1 ½-inch maximum aggregate.
6.0 percent for 1-inch maximum aggregate.
6.0 percent for ¾-inch maximum aggregate.
7.0 percent for ½-inch maximum aggregate

F. Adjustment to Concrete Mixes: Mix design adjustments may be requested by Contractor when characteristics of materials, job conditions, weather, test results, or other circumstances warrant, as accepted by Architect. Laboratory test data for revised mix design and strength results must be submitted to and accepted by Architect before using in Work.

2.8 FABRICATING REINFORCEMENT

A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

2.9 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.

B. Project-Site Mixing: Measure, batch, and mix concrete materials and concrete according to ASTM C 94. Mix concrete materials in appropriate drum-type batch machine mixer.

1. For mixer capacity of 1 cu. yd. or smaller, continue mixing at least 1-1/2 minutes, but not more than 5 minutes after ingredients are in mixer, before any part of batch is released.

2. For mixer capacity larger than 1 cu. yd., increase mixing time by 15 seconds for each additional 1 cu. yd.
3. Provide batch ticket for each batch discharged and used in the Work, indicating Project identification name and number, date, mixture type, mixture time, quantity, and amount of water added. Record approximate location of final deposit in structure.

PART 3 - EXECUTION

3.1 GENERAL

A. Coordinate the installation of joint materials, vapor retarder/barrier, and other related materials with placement of forms and reinforcing steel.

3.2 FORMWORK INSTALLATION

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 correct size, shape, lines, alignment, elevation, position, level, plumb, and dimension and indicated. Maintain formwork construction tolerances and surface irregularities within limits of ACI 117.

C. Limit concrete surface irregularities, designated by ACI 347 as abrupt or gradual, as follows:

1. Class A, 1/8-inch tolerances for smooth-formed concrete surfaces exposed to view.
2. Class D tolerances for earth formed foundation elements. Tolerance applies as a variation inward towards reinforcing only. No tolerance limit away from reinforcing applies.
3. Class C, ½-inch tolerances for other concrete surfaces.

D. Solidly butt joints and provide backup at joints to prevent cement paste from leaking.

E. Construct 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 where slope is too steep to place concrete with bottom forms only. Kerf wood inserts for forming keyways, reglets, recesses, and the like for easy removal.

F. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and contours in finished surfaces. Provide and secure units to support screed strips using strike-off templates or compacting-type screeds.

G. Provide temporary openings for cleanouts and inspections where interior area of formwork is inaccessible before and during concrete placement. 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. nings in forms at inconspicuous locations.

I. Form openings, chases, offsets, sinkages, keyways, recesses, moldings, rustications, reglets, chamfers, blocking, screeds, bulkheads, and other features required in the Work. Chamfer exposed corners and edges at exterior corners and edges of permanently exposed concrete and as indicated, to produce uniform smooth, straight lines and tight edge joints.

J. Provisions for Other Trades: Provide openings in concrete formwork to accommodate work of other trades. Determine size and location of openings, recesses, and chases from trades providing such items. Accurately place and securely support items built into forms.

K. Earthen forms may be used for footings and foundation elements when ground is stable and capable of resisting erosion and fluid pressure of wet concrete without sloughing. All tolerances and clear covers shall be maintained. Excavation shall be clean of all loose soil and mud along bottom and sides.

L. an of all loose soil and mud along bottom and sides.

M. Use selected materials to obtain required finishes.

N. Coordinate pattern of tie holes to remain expressed in finished appearance of concrete surfaces exposed to view with Architect.

O. Cleaning and Tightening: Thoroughly clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, or other debris just before placing concrete. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.

P. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

1. Do not allow excess form-coating material to accumulate in forms or come into contact with in-place concrete surfaces against which fresh concrete will be placed.
2. Do not spray reinforcing with form oil.
3. Coat steel forms with a nonstaining, rust-preventative material. Do not use rust-stained steel form-facing material.

3.3 INSTALLING EMBEDDED ITEMS

A. Place and secure anchorage devices, anchor rods, and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, diagrams, templates, instructions, and directions furnished with items to be embedded.

1. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of AISC 303. Column anchor rods shall be set in a rigid template and securely braced to formwork or ground prior to placing concrete. Anchor rods shall not be “wet set” in plastic concrete.
2. Install dovetail anchor slots in concrete structures as indicated.

3. Install reglets to receive sheet waterproofing and to receive through-wall flashings in outer face of concrete frame at exterior walls, where flashing is shown at lintels, relieving angles, and other conditions.
4. Aluminum conduit shall not be installed in concrete.

3.4 REMOVING AND REUSING FORMS

A. Formwork not supporting weight of concrete, walls, piers, and similar parts of the work, may be removed after cumulatively curing at not less than 50 deg F for 24 hours after placing concrete. Concrete must first be sufficiently hard to not be damaged by form-removal operations, and provided curing and protection operations shall be maintained.

1. Remove forms only if shores and other vertical supports have been arranged to permit removal without loosening or disturbing shores.

B. 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 as specified for new formwork.

C. When forms are reused, clean surfaces, remove fins and laitance, and tighten forms to close joints. Align and secure joint to avoid offsets.

1. Do not use patched forms for exposed concrete surfaces except as acceptable to Architect.
2. For Architectural Exposed formed surfaces, tie holes may not be plugged. Reuse tie holes or use new form for each pour.

3.5 STEEL REINFORCEMENT INSTALLATION

A. General: Comply with Concrete Reinforcing Steel Institute’s (CRSI) "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.

1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.

B. Deliver reinforcement to job site bundled, tagged and marked. Use waterproof tags indicating bar size, length, and mark corresponding to placing drawings.

C. Clean reinforcement of loose rust and mill scale, earth, ice, and other materials that reduce or destroy bond with concrete.

D. When permitted, field bend bars cold, except during cold weather when moderate heating is necessary to avoid brittle failures.

E. Install reinforcing to mechanical splices in accordance with the manufacturer’s requirements.

F. Accurately position, support, and secure all bar reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum coverages as indicated for concrete protection.

1. Arrange, space and securely tie bars and bar supports to hold reinforcement in position during concrete placement operations.
2. Walls with reinforcing mats on each face shall have bent U-bar spacers tied to each mat to hold spacing between mats. U-bar spacers shall be minimum #3 bars spaced a maximum of 6 feet on center horizontally and vertically with a row of bars placed at the top of any wall over 4 feet tall.
3. All walls shall have chairs or bolsters placed between reinforcing mat(s) and both form faces spaced a maximum of 6 feet on center to maintain clear cover.

G. Install welded- wire fabric reinforcement in longest practicable lengths on fabric supports spaced to minimize sagging. Lap edges and ends of adjoining pieces at least one full mesh spacing. Offset laps of adjoining sheet widths to prevent continuous laps in either direction. Lace outermost cross wires of lace splices with wire to prevent lifting of the ends during concrete placement.

H. he ends during concrete placement.

1. Chair welded wire fabric slab reinforcement with continuous chairs spaced a maximum of 32 inches on center. Provide additional chairs as required. Lift welded wire fabric back into position between chairs where depressed during concrete placement. Lifting welded wire fabric into position during concrete placement without the use of chairs is not permitted.

I. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.

J. Weld reinforcing bars and fabric, only where indicated, according to AWS D1.4. Do not tack weld crossing reinforcing bars.

K. Construction tolerances shall be in accordance with ACI 117 and the following:

1. For member depths 12” and smaller, tolerance on concrete cover shall be the smaller of -3/8” and -(1/3)*[specified cover].
2. For member depths larger than 12”, tolerance on concrete cover shall be the smaller of -1/2” and -(1/3)*[specified cover].
3. At formed soffits, tolerance on concrete cover shall be -1/4”.
4. Tolerance for longitudinal location of bends and ends of reinforcement:
   a. At discontinuous ends of brackets and corbels, ±1/2”.
   b. At discontinuous ends of other members, ±1”.
   c. At other locations, ±2”.

3.6 PLACING ADHESIVE SYSTEM

A. General: Clean all holes per manufacturer instructions to remove loose material and drilling dust prior to installation of adhesive. Holes may be dry, damp or wet. Inject adhesive into holes proceeding from the bottom of the hole and progressing toward the surface in such a manner as to

avoid introduction of air pockets in the adhesive. Follow manufacturer recommendations to ensure proper mixing of adhesive components. Sufficient adhesive shall be injected in the hole to ensure that the annular gap is filled to the surface. Remove excess adhesive from the surface. Shim anchors with suitable device to center the anchor in the hole. Do not disturb or load anchors before manufacturer specified cure time has elapsed.

B. lled to the surface. Remove excess adhesive from the surface. Shim anchors with suitable device to center the anchor in the hole. Do not disturb or load anchors before manufacturer specified cure time has elapsed.

1. Drill holes with rotary impact hammer drills using carbide-tipped bits and core drills using diamond core bits. Drill bits shall be of diameters as specified by the anchor manufacturer. Unless otherwise shown on the Drawings, all holes shall be drilled perpendicular to the concrete surface.
2. Cored Holes: Where anchors are to be installed in cored holes, use core bits with matched tolerances as specified by the manufacturer. Acrylic Adhesive Anchors shall not be installed in core drilled holes.
3. Embedded Items: Identify position of reinforcing steel and other embedded items prior to drilling holes for anchors. Exercise care in coring or drilling to avoid damaging existing reinforcing or embedded items. Notify the Engineer if reinforcing steel or other embedded items are encountered during drilling.
4. ling.
5. Observe manufacturer recommendations with respect to installation temperatures for cartridge injection adhesive anchors and capsule anchors.
6. Perform anchor installation in accordance with manufacturer instructions.

3.7 JOINTS

A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.

B. Construction Joints in Foundations: Locate and install construction joints so they do not impair strength or appearance of the structure, at locations indicated or otherwise as acceptable to 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 continuous keyways as indicated. Embed keys at least 1-1/2 inches into concrete. Provide keyways 1/3 the member thickness, or 3 ½" minimum, in walls, footings, and between walls and footings centered in the member thickness unless shown otherwise. Provide keyways ½ member width by ½ member depth in grade beams, beams, and columns and between grade beams / beams and supporting members centered in the member unless shown otherwise.
3. Locate joints for beams, slabs, joists, and girders in the middle third of spans. Offset joints in girders a minimum distance of twice the beam width from a beam-girder intersection.

4. Locate horizontal joints in walls and columns at underside of floors, slabs, beams, and girders and at the top of footings or floor slabs.
5. Space vertical joints in walls as indicated. Locate joints beside piers integral with walls, near corners, and in concealed locations where possible.
6. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.

C. Construction Joints in Slab on Grade: Provide slip dowels (as shown on drawings) for construction joints in field of slabs on grade less than 6" thickness. Provide continuous keyways at least 1 1/2 inches deep by 1 ½" wide or slip dowels (as shown on drawings) in construction joints in slabs on grade 6" or thicker. Provide continuous keyways at least 1 1/2 inches deep by one third the slab thickness centered in the construction joint of all formed concrete slabs.

1. Bulkheads designed and accepted for this purpose shall be used for doweled joints. Use manufactured plastic sleeves as indicated. Lubricate or asphalt coat one-half of dowel length to prevent concrete bonding to one side of joint for non-sleeved dowels.
2. Prefabricated pourstop with keyway may be used for simultaneous placement of adjacent slab panel at Contractor's option, where approved by Architect. Use leave-in-place joint system that is compatible with floor finish or treatment system.
3. Where construction joints at doorways that align with both faces of bearing wall are specified, utilize preformed pourstop with keyway in lieu of slip dowels.
4. Where joints will be exposed to view in public spaces or warehousing areas, joints shall be straight, crisp, and with sharp edges. Slabs shall be flush across joint.

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 flush with top of slab to prevent contact or bonding between the slab and the adjoining member. Use strips with perforated strips that remove the top portion to be not less than 1/2 inch or more than 1 inch below finished concrete surface where joint sealants 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.
4. At locations where drawings do not specifically call for premolded filler, provide bond breaker between slab and vertical surface. The vapor retarder may be turned up and used for this purpose.
5. Provide ½" expansion joint between slab and all door jambs (at end of walls in opening).
6. Joint fillers and sealants are specified in Division 7 Section "Joint Sealants."

E. Contraction (Control) Joints in Slabs-on-Grade: Construct weakened-plane contraction joints, sectioning concrete into areas as indicated, and to a depth equal to at least one-fourth depth of concrete thickness as follows:

1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8 inch. Repeat grooving of contraction joints after applying surface finishes. Eliminate groove-tool marks on concrete surfaces.
2. 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 does not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks.
3. Contraction joints may be formed by saw cuts as soon as possible after slab finishing as may be safely done without dislodging aggregate.
4. If joint pattern is not shown, provide joints not exceeding 15 feet in either direction and located to conform to bay spacing wherever possible (at column centerlines, half bays, third bays).
5. Joint fillers and sealants are specified in Division 7 Section “Joint Sealants.”
6.

F. Control Joints in Suspended Slab on Deck and Topping Slabs: Do not install or cut contraction (control) joints in elevated concrete slabs on composite steel floor deck or hollow-core precast plank.

G. Provide waterstops in construction joints in all retaining walls (and their integral piers and columns) below grade and as indicated.

3.8 WATERSTOP INSTALLATION

A. Install in construction joints and at other joints indicated to form a continuous diaphragm. Install in longest lengths practicable. Protect exposed waterstops during progress of the Work.

1. Locate waterstop within joint relative to face and reinforcing as per manufacturer’s printed instructions. Location varies with manufacturer. Location shown on drawings is diagrammatic only. Do not locate waterstop within shear key.
2. Support and protect exposed waterstops during progress of Work.
3. Cut ends square, using a razor knife or circular saw equipped with a carbide tipped blade. Weld splices per manufacturer’s recommendations.
4. Field-fabricate joints in waterstops according to manufacturer’s printed instructions.

B. Concrete surfaces to receive bonded waterstop shall be reasonably smooth with either a formed or float finish. Where such a concrete surface is scheduled to be rough to facilitate interlocking with the adjacent concrete placement, a 2” wide ribbon of flat surface shall be tooled into the concrete surface to facilitate the proper installation of waterstop. Any irregularities in the concrete surface that would interfere with the waterstop being placed in intimate contact with the concrete surface shall be ground smooth prior to installation.

C. Install waterstop per manufacturer’s recommended installation instructions with primer or adhesive as required.

3.9 VAPOR RETARDER / BARRIER INSTALLATION

A. Sheet vapor retarders and barriers: Place, protect, and repair sheet vapor retarder according to ASTM E 1643 and manufacturer's written instructions. Place sheeting in position with longest dimension parallel with direction of pour.

1. Extend film fully over slab area to the full perimeter of the slab. Turn film up 2" onto surrounding wall/column/piers/etc. and seal to vertical element with continuous mastic or tack tape capable of adhering to concrete and masonry. Film and tape shall not extend above finished floor.

2. shed floor.

a. At the point of termination, seal vapor retarder to the foundation wall, footing, grade beam or slab itself. Where obstructed by impediments (such as dowels, waterstops, or any other site condition requiring early termination of the vapor retarder), use manufacturer's recommended accessories for such non-standard terminations.

3. Lap joints 6 inches and seal with manufacturer's recommended mastic or pressure-sensitive tape.
4. Apply seam tape to a clean and dry film only.

B. Seal around all penetrations (including all conduit and pipes) through film with manufacturer's recommended mastic or pressure-sensitive tape. Cut slit around penetrations to place initial layer of film.

C. tions to place initial layer of film.

1. For small penetrations, tape film directly to the penetrating element.
2. For penetrations larger than 2", create collar for penetration of 12" wide by 1 ½ times the penetration's circumference with fingers cut half the width of the film. Wrap the collar around the penetration, tape the collar onto the strip of film, and tape the fingers at each edge/slit to the initial layer of film.

D. Avoid the use of non-permanent stakes driven through film. If non-permanent stakes are driven through film, repair and seal as recommended by film manufacturer.

E. Repair damaged areas of film material of similar (or better) permeance, puncture resistance, and tensile strength.

3.10 CONCRETE PLACEMENT

A. Inspection: Before placing concrete, inspect and complete formwork installation, reinforcing steel, and items to be embedded or cast in. Notify other trades to permit installation of their work.

B. General: Comply with ACI 304, "Guide for Measuring, Mixing, Transporting, and Placing Concrete," and as specified. Concrete delivery tickets shall show:

1. Batch number.

2. Mix by number with cement content in pounds and maximum size aggregate.
3. Admixtures.
4. Air content.
5. Slump.
6. Time dispatched and discharged.
7. Date.
8. Contractor.
9. Ready Mix Supplier.
10. Project Name and Address.
11. Volume of Concrete.

C. Do not add water to the concrete mix during delivery, at Project site, or during placement unless approved by the General Contractor's representative, noted on the delivery ticket with the amount of water, and signed by the General Contractor's representative. The maximum water/cement ratio of an approved mix design shall not be exceeded.

1. When the ambient air temperature is between 80 and 90 degrees Fahrenheit, one (1) gallon of water per cubic yard of concrete may be added at the job site to compensate for water evaporation during transit.
2. When the ambient air temperature exceeds 90 degrees Fahrenheit, two (2) gallons of water per cubic yard of concrete may be added at the job site to compensate for water evaporation during transit.
3. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.

D. Discharge concrete within 1 ½ hours after water has been added to the cement, unless a longer time has been authorized by the Architect/Engineer. During hot weather or other conditions contributing to a quick stiffening of the concrete, the Architect/Engineer may require discharge in less than 1 ½ hours.

E. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete is 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 indicated. Deposit concrete to avoid segregation. Do not allow concrete to drop more than 5 feet or from a height which allows concrete to fall against reinforcing.

1. Deposit concrete in forms in horizontal layers of depth not to exceed formwork design pressures and in a manner to avoid inclined construction joints. Where placement consists of several layers, place each layer while preceding layer is still plastic to avoid cold joints. Do not subject concrete to any procedure that will cause segregation. Deposit concrete as near as possible to the final position to avoid segregation.
2. Consolidate placed concrete by mechanical vibrating equipment supplemented by hand-spading, rodding, or tamping. Use equipment and procedures for consolidation of concrete complying with ACI 301.
3. 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 machine. 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 set. 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 to segregate.

4. s without causing mix to segregate.
5. without causing mix to segregate.

F. 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 that concrete is thoroughly worked around reinforcement and other embedded items and into corners.
2. Maintain reinforcement in proper 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, before excess bleedwater appears on the surface. Do not further disturb slab surfaces before starting finishing operations.

G. Cold-Weather Placement: When air temperature is expected to fall below 40 degrees Fahrenheit (4 deg C) within the first 72 hours after concrete placement, comply with provisions of 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 mean daily air temperature is expected to fall below 40 deg F (4 deg C) for more than three successive days after concrete placement, uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature at point of placement as follows:

    a. Not less than 55 deg F (13 deg C) or more than 75 deg F (24 deg C) for concrete sections less than 12 inches in the least dimension (width or thickness).
    b. Not less than 50 deg F (10 deg C) or more than 70 deg F (21 deg C) for concrete sections 12 inches or greater in the least dimension (width or thickness).

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 accepted in mix designs.

H. Hot-Weather Placement: When hot weather conditions exist that would impair quality and strength of concrete, place concrete complying with ACI 305.1 and as specified.

1. Cool ingredients before mixing to maintain concrete temperature at time of placement to below 90 deg F (32 deg C). Mixing water may be chilled 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 reinforcing steel with water-soaked burlap if it becomes too hot, so that steel temperature will not exceed the ambient air temperature immediately before embedding in concrete.
3. oncrete.
4. Fog spray forms, reinforcing steel, and subgrade just before placing concrete. Keep subgrade moisture uniform without puddles or dry areas.
5. Use water-reducing retarding admixture when required by high temperatures, low humidity, or other adverse placing conditions, as acceptable to Architect.

I. Pumping Concrete: Grout used to prime a pump shall not be placed in the forms of any concrete exposed to view in the final structure. Concrete shall not be pumped through pipe made of aluminum or aluminum alloys.

3.11 FINISHING FORMED SURFACES

A. Rough-Formed Finish: Provide a rough-formed finish on formed concrete surfaces not exposed to view in the finished Work or concealed by other construction. This is an as-cast concrete surface having texture imparted by form-facing material used. Repair and patch tie holes, honeycombing over ½ inch in depth, and other defective areas. Remove fins and other projections exceeding ¼ inch in height by rubbing down, chipping, or grinding off.

B. Smooth-Formed Finish: Provide a smooth-formed finish on formed concrete surfaces exposed to view in non-public rooms (storage, mechanical rooms, etc.) or to be covered with a coating or covering material applied directly to concrete. This is an as-cast concrete surface obtained with selected form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes, honeycombing over ¼" in depth, and other defective areas. Remove fins and other projections exceeding 1/8" in height by rubbing down or grinding off until completely removed and smoothed.

C. ons exceeding 1/8" in height by rubbing down or grinding off until completely removed and smoothed.

D. ceeding 1/8" in height by rubbing down or grinding off until completely removed and smoothed.

E. Smooth-Formed Finish / Grout-Cleaned Finish: Provide a smooth-formed / grout-cleaned finish on formed concrete surfaces exposed to view in public spaces and exterior. This is an as-cast concrete surface obtained with selected form-facing material arranged in an orderly and symmetrical manner with a minimum of seams. Special care should be taken to avoid consolidation problems, honeycombing, fins, or projections. Repair and patch tie holes, honeycombing over 1/8" in depth, and other defective areas. Remove fins and other projections exceeding 1/8" in height by rubbing down or grinding off until completely removed and smoothed.

1. Perform grout-cleaned finish immediately after stripping forms and no later than 3 days after initial casting of concrete.
2. Combine 1-part portland cement to 1-part fine sand by volume, and a 50:50 mixture of bonding agent and water. Blend standard portland cement and white portland cement in

amounts determined by trial patches so that final color of dry grout will match adjacent surfaces.

3. Thoroughly wet concrete surfaces to prevent absorption of water from the grout. Apply grout uniformly to initially coat surfaces and fill small holes. Immediately after applying the grout, float the surface with a cork or other suitable float, scouring the wall vigorously. While the grout is still plastic the surface shall be finished with a sponge rubber float to remove all excess grout. Finishing shall be done at the time when grout will not be pulled from holes or depressions. Next allow the surface to dry thoroughly, then vigorously rub with clean burlap to completely remove any dried grout and so that there is no visible film of grout remaining. The entire cleaning operation for any area must be completed on the day that it is started. Keep damp by fog spray over covered burlap for at least 36 hours after rubbing.

F. 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.

3.12 FINISHING FLOORS AND SLABS

A. General: Comply with ACI 302.1R recommendations for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.

B. Scratch Finish: Apply scratch finish to monolithic slab surfaces to receive concrete floor topping or mortar setting beds (thick-set) for tile, portland cement terrazzo, and other bonded applied cementitious finish flooring material, and where indicated.

1. Slope surfaces uniformly to drains where required. While still plastic, texture concrete surface that has been screeded and bull-floated or darbied. Use stiff brushes, brooms, or rakes to produce a profile amplitude of 1/4 inch in one direction.

C. Float Finish: Apply float finish to monolithic slab surfaces to receive trowel finish and other finishes as specified; slab surfaces to be covered with fluid-applied or sheet waterproofing, built-up or membrane roofing, or sand-bed terrazzo; and where indicated.

1. After screeding, consolidating, and leveling concrete slabs, do not work surface until ready for floating. Begin floating, using float blades or float shoes only, when surface water has disappeared, or when concrete has stiffened sufficiently to permit operation of power-driven floats, or both. Consolidate surface with power-driven floats or by hand-floating if area is small or inaccessible to power units. Cut down high spots and fill low spots. Uniformly slope surfaces to drains. Immediately after leveling, refloat surface to a uniform, smooth, granular texture.

D. Trowel Finish: Apply a trowel finish to monolithic slab surfaces exposed to view and slab surfaces to be covered with resilient flooring, carpet, ceramic or quarry tile, paint, or another thin film-finish coating system.

1. After screeding, consolidating, and leveling concrete slabs, do not work surface until ready for floating. Begin floating, using float blades or float shoes only, when surface water has disappeared, or when concrete has stiffened sufficiently to permit operation of power-driven floats, or both. Consolidate surface with power-driven floats or by hand-floating if area is small or inaccessible to power units.
2. Allow moisture film or sheen to disappear from the floated surface and allow the concrete to harden enough to prevent fine material and water from being worked into the concrete surface. Then begin first trowel-finish operation using a power-driven trowel. Begin final troweling when surface produces a ringing sound as trowel is moved over surface. Consolidate concrete surface by final hand-troweling operation, free of trowel marks and uniform in texture and appearance.
3. For concrete surfaces to be covered with hardwood flooring, immediately prior to installation of wood flooring the Wood Flooring Contractor shall profile the floor on a 5-foot grid pattern. At that time, the General Contractor shall be responsible for all labor and materials necessary to achieve a tolerance level of 1/8" in 10'-0", subject to approval of the Wood Flooring Contractor.
4. Finish surface to specified tolerances for floor flatness and floor levelness measured according to ASTM E 1155. Minimum local values shall be 2/3 of the specified composite F-number. Unless otherwise shown or noted on the drawings, comply with the following table:
5. Unless otherwise shown or noted on the drawings, comply with the following table:

Slabs on Grade and Formed Elevated Concrete Slabs (Shored Construction)		
Composite Flatness F(F)	Composite Levelness F(L)	Typical Use
20	15	Mechanical rooms, non-public areas, surfaces to receive thick-set tile floors, parking structure slabs
25	20	Surfaces to receive carpet, light traffic (foot) areas in office and industrial buildings
50	50	Surfaces to receive hardwood flooring or sports rubber systems
Suspended Slabs on Metal Deck and Topping Slabs (Unshored Construction). Slabs on metal deck or precast concrete and topping slabs shall be finished level, compensating for the deflection of the deck and structure. Floor levelness criteria apply only to non-sloping, formed surfaces and shall be measured within 72 hours of slab placement.		
20	N/A	Mechanical rooms, non-public areas, surfaces to receive thick-set tile floors, parking structure slabs

25	N/A	Surfaces to receive carpet, light traffic (foot) areas in office and industrial buildings
50	N/A	Surfaces to receive hardwood flooring or sports rubber systems

E. Nonslip Broom Finish: Apply a nonslip broom finish to exterior concrete platforms, steps, ramps, and elsewhere as indicated.

1. Immediately after float finishing, slightly roughen concrete surface by brooming with fiber-bristle broom perpendicular to main traffic route. Coordinate required final finish with Architect before application.

F. Slip-Resistive Finish: Apply nonslip aggregate finish to concrete stair treads, platforms, ramps, and sloped walks as indicated. Apply according to manufacturer's written instructions and as follows:

1. After completing float finishing and before starting trowel finish, uniformly spread 25 lb of dampened slip-resistive aggregate per 100 sq. ft. of surface in one or two applications. Tamp aggregate flush with surface, but do not force below surface.
2. After broadcasting and tamping, apply trowel finishing as specified.
3. After curing, lightly work surface with a steel wire brush or an abrasive stone and water to expose slip-resistive aggregate.

G. Surface Cleaning: Where concrete surface is to be left exposed or sealed with thin film or penetrating coating, burnish or burn to remove all protruding synthetic fiber reinforcing.

H. Exposed Concrete Slabs: Slabs exposed to view in the public spaces shall be free of trowel marks and uniform in texture and appearance. Sharply defined low and high spots are prohibited and cause for rejection by Architect. Grinding and patching to correct discrepancies will be prohibited unless acceptable to Architect. Use new, clean blankets and other protections that will not discolor or dull the finish.

I. ll not discolor or dull the finish.

3.13 MISCELLANEOUS CONCRETE ITEMS

A. Filling In: Fill in holes and openings left in concrete structures for passage of work by other trades, unless otherwise shown or directed, 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 shown 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. ntersections, and terminations slightly rounded.

D. Equipment Bases and Foundations: Provide machine and equipment bases and foundations as shown on drawings. Coordinate sizes and locations of concrete bases with actual equipment to be provided.

1. Construct concrete bases 3 1/2 inches**]** high unless otherwise indicated, and extend base not less than 6 inches in each direction beyond the maximum dimensions of supported equipment unless otherwise indicated or unless required for seismic anchor support.
2. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around the full perimeter of concrete base.
3. Prior to pouring concrete, place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
4. Cast anchor-bolt insert into bases. Install anchor bolts to elevations required for proper attachment to supported equipment.
5. Finish all mechanical housekeeping pads to a finished tolerance of 1/8” in 10 feet.

E. Grouting of Column Base Plates: Promptly pack grout solidly between bearing surfaces and plates so no voids remain. Neatly finish exposed surfaces, protect installed materials, and allow to cure.

1. Comply with manufacturer’s instructions for proprietary grout materials.
2. Grout shall be installed and cured before any elevated concrete slab supported on said columns are placed and prior to installing structural framing in excess of the third story above.

F. Steel Pan Stairs: Provide concrete fill for steel pan stair treads, landings, and associated items. Cast-in inserts and accessories as shown on drawings. Screed, tamp, and trowel-finish concrete surfaces.

3.14 CONCRETE PROTECTING AND CURING

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.

B. Compatibility: Use membrane curing compounds that will not affect surfaces to be covered with finish materials applied directly to concrete. Dosage rate and material compatibility of curing compound shall be coordinated with the Polishing Contractor for polished concrete floor systems.

C. Cleanliness for Architecturally Exposed Concrete Slabs: Slabs to be left exposed in public places and to be sealed with densifier/sealers, hardeners, or similar shall remain clean from dirt and other agents which might discolor the finish. Install new, clean polyethylene film over slabs and below curing blankets and other protection which might discolor or stain the raw concrete.

D. For cold-weather protection during curing, comply with ACI 306.1 and the following:

1. All freshly placed concrete shall be kept from freezing for the following periods:

   a. 3 days for all concrete with an air entraining admixture.
   b. 4 days for all concrete without an air entraining admixture.

2. A cumulative curing time of seven days at a minimum surface temperature of 50 degrees F (10 degrees C) shall be provided or until concrete has attained 75% of its design strength. This shall be followed by cooling of concrete in a gradual transition to surrounding conditions. The temperature drop during this period shall not be at a rate exceeding 2 degrees F per hour until the outside or surrounding temperature is reached.
3. When concrete is placed under conditions of cold weather concreting (defined as a period when the mean daily temperature drops below 40 degrees F for more than three successive days), take additional precautions as specified in "Cold Weather Concreting" by the American Concrete Institute (ACI Report 306) when placing, curing, monitoring and protecting the fresh concrete.
4. riod when the mean daily temperature drops below 40 degrees F for more than three successive days), take additional precautions as specified in "Cold Weather Concreting" by the American Concrete Institute (ACI Report 306) when placing, curing, monitoring and protecting the fresh concrete.

E. For hot-weather protection during curing, comply with ACI 301 and the following:

1. When concrete is placed under conditions of hot weather concreting, provide extra protection of the concrete against excessive placement temperatures and excessive drying throughout the placing and curing operations. Hot weather is defined as air temperature which exceeds 80 degrees F or any combination of high temperature, low humidity and/or high wind velocity that causes a rate of evaporation in excess of 0.2 pounds per square foot per hour as determined by Figure 2.1.5 of ACI Report 305. Hot weather curing is required if these conditions occur within a 24-hour period after completion of concrete placement.
2. Forms, reinforcing and the air shall be cooled by water fog spraying immediately before placing concrete.
3. Immediately following screeding, protect concrete by applying the specified evaporation retarder in accordance with the recommendations of the manufacturer.

F. 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.

G. Formed Surfaces: Cure formed concrete surfaces, including walls, columns, sides and underside of beams, supported slabs, and other similar surfaces, by moisture curing with forms in place for 7 days or until forms are removed. If forms are removed within the first 7 days, continue moisture curing without forms for the balance of the 7-day curing period.

1. For vertical surfaces, after the concrete has hardened and while the forms are still in place, the form ties shall be loosened and water shall be applied to run down the inside of the form to keep the concrete wet.
2. After formwork has been removed from vertical surfaces, keep surface continuously wet by water spray or water-saturated absorptive cover.

H. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces, including floors and slabs, concrete floor toppings, and other surfaces.

1. Cure interior and exterior slab surfaces exposed to deicing salts and slabs where the finish flooring is not compatible with curing compounds by Moisture Curing.
2. Cure slab surfaces to receive hardwood flooring or sports rubber systems by Moisture Curing.

I. Cure concrete according to ACI 308.1 by one or a combination of the following methods:

1. Moisture Curing (standard surfaces): Keep surfaces continuously moist for not less than seven days with the following materials:

    a. Water.
    b. Continuous water-fog spray.
    c. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with 12-inch lap over adjacent absorptive covers.

2. Moisture Curing (Architectural surfaces): Keep surfaces continuously moist for not less than seven days with the following materials:

    a. Install wet cure covering in widest practical width as soon as concrete has hardened sufficiently to prevent surface damage. Sides and ends to be lapped 3” minimum. Immediately repair holes and tears with additional ply.
    b. Cover entire surface with 1/8” to ¼” water, then slowly unroll the blanket onto the slab using the roller squeegee applicator.
    c. Maintain in place for not less than 7 days after placement.
    d. No portion of the blanket shall be reused once it has been put into use.

3. 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.

c. Cure concrete surfaces to receive floor coverings with either a moisture-retaining cover or a curing compound that the manufacturer certifies does not interfere with bonding of floor covering used on Project.

4. 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.

   a. Curing Polished Concrete Surface: Apply UV dissipative curing compound as soon as possible after the concrete receives its final finishing.
   b. Curing Exposed Architectural Slab Surfaces: Apply curing aid as soon as possible after the concrete receives its final finishing using a short nap roller to apply a uniform film. Spray application is prohibited.
   c. Removal: After curing period has elapsed, remove curing compound without damaging concrete surfaces by method recommended by curing compound manufacturer unless manufacturer certifies curing compound does not interfere with bonding of floor covering used on Project.

5. Curing and Sealing Compound: Apply uniformly to floors and slabs indicated in a 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. Repeat process 24 hours later and apply a second coat. Maintain continuity of coating and repair damage during curing period.

3.15 JOINT FILLING

A. Prepare, clean, and install joint filler according to manufacturer's written instructions.

B. Defer joint filling until concrete has aged at least one month. Do not fill joints until construction traffic has permanently ceased.

C. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact faces of joints clean and dry.

D. Install semirigid 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.

3.16 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. Repair architectural exposed formed and exposed slab surfaces only with specific prior approval by Architect (cutting, grinding, and patching of these surfaces will generally be prohibited).

B. Contractor shall make mockup of any repairs for review by Architect prior to performing repairs. Coordinate placement and size with Architect prior to proceeding.

C. Patching Mortar: Mix dry-pack patching mortar, consisting of 1-part portland cement to 2-1/2 parts fine aggregate passing a No. 16 sieve, and a 50:50 mixture of acrylic or styrene butadiene-based bonding admixture and water. Use only enough liquid as required for handling and placing.

D. 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 to solid concrete. Limit cut depth to 3/4 inch. 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.

2. les and voids with bonding agent. Fill and compact with patching mortar before bonding agent has dried.
3. Cut tie rods and bolts flush with the surface and drill out to minimum depth of 1 inch below the surface.
4. Fill through wall tie holes with nonmetallic, shrinkage-resistant grout to within 1 ½" of wall face using a grout bag or other similar means to completely fill the void. Fill any remaining tie hole, including holes from snap-off type form ties, with patching mortar or cone plugs secured in place with bonding agent.
5. Repair defects on surfaces exposed to view by blending white portland cement and standard portland cement so that, when dry, patching mortar matches 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.
6. spicuous locations to verify mixture and color match before proceeding with patching. Compact mortar in place and strike off slightly higher than surrounding surface.
7. Repair defects on concealed formed surfaces that affect concrete's durability and structural performance as determined by Architect.

E. 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. ess of width, and other objectionable conditions.
3. After concrete has cured at least 14 days, correct high areas by grinding smooth (at covered slabs only) any surface defects that would telegraph through applied floor covering system.
4. 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.

5. Correct other low areas scheduled to receive floor coverings with a repair underlayment. Prepare, mix, and apply repair underlayment and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface. Feather edges to match adjacent floor elevations.
6. Correct other low areas scheduled to remain exposed with a repair topping. Cut out low areas to ensure a minimum repair topping depth of 1/4 inch to match adjacent floor elevations. Prepare, mix, and apply repair topping and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.
7. topping and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.
8. Repair defective areas, except random cracks to be covered with covering capable of bridging and concealing crack 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 a 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 mixture as original concrete, except without coarse aggregate. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.
9. Repair random cracks to be covered with covering capable of bridging and concealing crack 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.
10. Repair random cracks in exposed architectural concrete slab on grade by fully removing and replacing slab between existing control or construction joints. Drill and install dowel bars between new and existing slab as directed by Engineer.
11. etween existing control or construction joints. Drill and install dowel bars between new and existing slab as directed by Engineer.
12. Repair random cracks in exposed architectural suspended concrete slab by fully removing and replacing slab as directed by Architect. Slab replacement shall extend to third point of framing infill bay and girder span at composite beam systems.

F. Perform structural repairs of concrete, subject to Architect's approval, using epoxy adhesive and patching mortar.

G. Repair methods not specified above may be used, subject to acceptance of Architect.

3.17 QUALITY CONTROL

A. The Owner will employ an independent testing and inspection agency that meets the requirements of ASTM E329 to perform inspections and tests and to prepare test reports. The agency will monitor concrete quality by means of site and laboratory tests. They will be authorized to reject plastic concrete not conforming to specifications. Failure to detect any defective materials shall not prevent later rejection when such defect is discovered, or obligate the Architect or Owner for final acceptance.

1. See Section 014110 – Structural Special Inspections and Contract Drawings for testing and inspection to be performed.
2. Test results will be reported in writing to the Architect, Engineer, ready-mix producer and General Contractor within 24 hours after tests.
3. Additional Tests: The testing agency will make additional tests of in-place concrete when test results indicate specified concrete strengths and other characteristics have not been attained in the structure, as directed by Architect.

B. The Special Inspector will provide testing of the floor slab F-number tolerances conducted in accordance with the provisions set forth by ASTM E 1155. All tests shall be performed within three working days after concrete placement and prior to any form removal. If in-place floor slabs do not comply with the minimum values shown, the Contractor shall propose remedial measures to bring the surfaces of the floors into compliance. These measures might include grinding, planning, surface repair, retopping, or removal and replacement. Remedial measures shall be approved by the Architect/Engineer prior to the Contractor's commencement of the work.

1. Slabs shall be tested for F-number tolerances at gym, cafeteria, all corridors, and two out of every ten classrooms. Classrooms tested shall be spaced evenly throughout the building. Quantity of test readings for each area shall be per ASTM E1155.

    a. Test one additional classroom for each classroom not within specified F-number tolerances.

2. All slab areas shall be tested for F-number tolerances for the first 10,000 square feet placed at each level. Thereafter, test an additional 1,000 square feet per 10,000 square feet of slab area at each level. Quantity of test readings for each area shall be per ASTM E1155.

C. Commissioning of Vapor Retarder/Barrier System: Comply with requirements in Section "Commissioning of Vapor Barrier System."

D. Correct deficiencies in the Work that test reports and inspections indicate do not comply with the Contract Documents.

END OF SECTION 033000

BROWN + KUBICAN, PSC

STRUCTURAL ENGINEERS

CONCRETE MIX DESIGN SUBMITTAL FORM

Project: _____

City, State: _____

General Contractor: _____

Concrete Contractor: _____

Mix Design Number: _____

Concrete Strength (Mix Type): _____

Use (describe): _____

Design Mix Information

	Check one
Based on Standard Deviation Analysis	
Based on Trial Mix Laboratory Test Data	

Design Characteristics

Density		pcf
Strength		psi (28 days)
Air		%
Slump		inches

If trial mixes are used, the Mix Design is proportioned to achieve f'cr = f'c + 1200 psi (1400 psi for strength higher than 5000 psi at 28 days)

Materials

	Type	Source	Specific Gravity	Weight (lb.)	Absolute Vol. (cu. ft.)
cement					
flyash					
silica fume					
coarse aggregate					
fine aggregate					
water					
other ( )					
			Total		27.0 cu. ft.

Water/Cementitious Ratio (W/C) = _____% (lbs. water /lbs. cementitious)

Admixtures

	Manufacturer	Dosage (oz./cwt)
water reducer		
air entraining agent		
high range water reducer		
non-corrosive accelerator		
other ( )		

Slump before high range water reducer = _____inches
Slump after high range water reducer = _____inches

Standard Deviation Analysis (field experience records)

Number of test cylinders evaluated: _____ Standard deviation (s): _____
k-factor:

Number of Tests	k
15	1.16
20	1.08
25	1.03
≥30	1.00

Required avg. compressive strength (≤5000 psi: Max [f'c + 1.34ks, f'c + 2.33 ks – 500])
(>5000 psi: Max [f'c + 1.34ks, 0.9f'c + 2.33ks]): _____
Actual avg. compressive strength:_____
(Refer to ACI 301 for standard deviation calculation – attach copies of laboratory test reports)

Trial Mix Laboratory Test Data

	Mix #1 (w/c=)		Mix #2 (w/c=)		Mix #3 (w/c=)	
Age	Date	Compressive Strength	Date	Compressive Strength	Date	Compressive Strength
7 days		psi		psi		psi
7 days		psi		psi		psi
28 days		psi		psi		psi
28 days		psi		psi		psi
28 days average	NA	psi	NA	psi	NA	psi

(Refer to ACI 301 for trial mix procedure – attach copies of laboratory test reports)

Required Attachments

	Please check
Coarse aggregate gradation report	
Fine aggregate gradation report	
Laboratory test reports (strength tests)	
Admixture compatibility certification letters	

Ready Mix Supplier

Name and Address:

_____

_____

Phone: _____ Miles from project: _____ Date: _____

SECTION 03 40 00 – PRECAST CONCRETE

MODULAR RETAINING WALL SYSTEM

PART 1 – GENERAL

1.01 RELATED WORK

(A) Drawings and general provisions of the contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this section.
(B) Related Sections:
Section 2: Geogrid Reinforcement Systems

1.02 SUMMARY

(A) Work includes furnishing and installing modular concrete retaining wall units to the lines and grades designated on the construction drawings and as specified here.

1.03 REFERENCES

(A) ASTM C1372 Standard for segmented retaining walls
(B) ASTM C1262 Evaluating the freeze / thaw durability of manufactured CMSs and related concrete units
(C) ASTM D698 Moisture density relationship for soils, standard method
(D) ASTM D422 Gradation of soils
(E) ASTM C140 Sample and testing concrete masonry units

1.04 SUBMITTALS

(A) Submittal procedures: under provisions of Division 01 sections

1.05 CLOSEOUT SUBMITTALS

(A) Closeout procedures: under provisions of Division 01 sections

1.06 COORDINATION

(A) Coordination and project conditions: under provisions of Division 01 sections

1.07 DELIVERY, STORAGE, AND HANDLING

(A) The contractor is responsible for inspecting material upon delivery to ensure proper material has been received.
(B) The contractor is responsible for preventing excessive mud, cementitious material, and construction debris from encountering the material.
(C) The contractor shall protect the material from damage. Damaged material shall not be incorporated in the project (ASTM C1372).

PART 2 – MATERIALS

2.01 ACCEPTABLE MANUFACTURERS

(A) Allan Block Retaining Walls
(B) Redi-Rock Retaining Walls
(C) Alta Pro Rock Retaining Walls
(D) Firma Wall Retaining Walls
(E) Keystone Compac Retaining Walls

2.02 MODULAR WALL UNITS

(A) Wall units shall have s minimum 28-daym comprehensive strength of 3000-psi (20.7 MPa) in accordance with ASTM C1372. The concrete units shall have adequate freeze /thaw protection with an average absorption rate in accordance with ATM C1372 or an average absorption rate of 7.5 lb./ft^3 (120 kg/m^3) for northern climates and 10 lb./ft^3 (160 kg/m^3) for southern climates.
(B) Exterior dimensions shall be uniform and consistent. Maximum dimensional deviations on the height of any two units shall be 0.125 in. (3mm).
(C) Wall units shall provide a minimum of 110 lbs. total wight per square foot of wall face area (555 kg/m^2). Fill contained within the units may be considered 80% effective weight.
(D) Exterior face shall be textured. Color as specified by owner.

2.03 WALL ROCK

(A) Material must be well-graded compactable aggregate, 0.25 in. to 1.5 in. (6 mm – 38m) with no more than 10% passing the #200 sieve (ASTM D422).
(B) Material behind and within the blocks may be the same material.

2.04 INFILL SOIL

(A) Infill material shall be excavated soils when approved by the on-site soils engineer unless otherwise specified in the drawings. Unsuitable soils for backfill (heavy clays or organic soils) shall not be used in the reinforced soil mass. Fine rained cohesive soils ($\varphi < 31$) may be used in wall construction, but additional backfilling, compaction, and water management efforts are required. Poorly graded sands, expansive clays, and / or soils with a plasticity index (PI) > 20 or a liquid limit (LL) > 40 should not be used in wall construction.
(B) The infill soil used must meet or exceed the designed friction angle and description noted on the design cross sections, and must be free of debris, and consist of one of the following inorganic USCS soil types: GP, GW, SW, SP meeting the following gradation as determined in accordance with ASTM D422.

Sieve Sizes	Percent Passing
4 inch (100 mm)	100 – 75
No. 4 (4.75 mm)	100 – 20
No. 40 (0.425 mm)	0 – 60

No. 200 (0.075 mm)	0 – 35

(C) Where additional fill is required, the contractor shall submit samples and specifications to the wall design engineer or the onsite soils engineer for approval. The approving engineer must certify that the soils proposed for use have properties meeting or exceeding original design standards.

PART 3 – WALL CONSTRUCTION

3.01 EXCAVATION

(A) The contractor shall excavate to the lines and grades shown on the construction drawings. The contractor shall use caution not to over-excavate beyond the lines shown, or to disturb the base elevations beyond those shown.
(B) The contractor shall verify locations of existing structures and utilities prior to excavation. The contractor shall ensure that all surrounding structures are protected from the effects of wall excavation.

3.02 FOUNDATION SOIL PREPARATION

(A) Foundation soil shall be defined as any soil located beneath a wall.
(B) Foundation soil shall be excavated as dimensioned on the plans and compacted to a minimum of ` 95% of Standard Proctor (ASTM D698) prior to placement of the base material.
(C) Foundation soil shall be examined by the on-site soils engineer to ensure that the actual foundation soil strength meets or exceeds assumed designed strength. Soil not meeting the required strength shall be removed and replaced with acceptable material

3.03 BASE

(A) The base material shall be the same as the wall rock material (Section 2.2) or a low permeable granular material.
(B) Base material shall be placed as shown on the construction drawings. Top if base shall be located to allow bottom wall units to be buried to proper depths as per wall heights and specifications.
(C) Base material shall be installed on undisturbed native soils or suitable replacement fills compacted to a minimum of 95% Proctor Standard (ASTM D698).
(D) Base shall be compacted at 95% Proctor Standard (ASTM D698) to provide a level hard surface on which to place the first course of blocks. The base shall be constructed to ensure proper wall embedment and the final elevation on the plans. Well-graded sand can be used to smooth the top ½ in. (13 mm) on the base material.
(E) Base material shall be a 4 in. (100 mm) minimum depth for walls under ft. (1.2 m) and a 6 in. (150 mm) minimum depth for walls over 4 ft. (1.2 m).

3.04 UNIT INSTALLATION

(A) The first course of wall units shall be placed on the prepared base with the raised lip facing up and out and the front edges tight together. The units shall be checked for level and alignment as they are placed.

(B) Ensure that units are in full contact with base. Proper care shall be taken to develop straight lines and smooth curves on the base course as per wall layout.

(C) Fill all cores and cavities and a minimum of 12 in. (300 mm) behind the base course with wall rock. Use infill soils behind the wall rock and approved soils in front of the base course to firmly lock in place. Check again for level and alignment. Use a plate compactor to consolidate the area behind the base course. All excess material shall be swept from the top of units.

(D) Install the next course of wall units on top of base course. Position blocks to be offset from seams of blocks below. Perfect "running bond" is not essential, but a 3 in. (75 mm) minimum offset is recommended. Check each block or proper alignment and fill. Fiil all cavities in and around wall units and to a minimum of 12 in. (300 mm) depth behind block with wall rock. For taller wall application the depth of wall rock wall behind the block should be increased; walls from 15 ft. (4.57 m) to 25 ft. (7.62 m) should have a minimum of 2 ft.(0.61 m) and walls above 25' (7.62 m) should have a minimum of 3 ft. (0.9 m). Spread infill soil in uniform lifts not exceeding 8 in. (200 mm) un uncompacted thickness and compacted to 95% of Standard Proctor (ASTM D698) behind the consolidation zone.

(E) The consolidation zone shall be defined as 3 ft. (0.9 m) behind the wall. Compaction within the consolidation zone shall be accomplished by using a hand operated plate compactor and shall begin by running the plate compactor directly on the block and then compacting in parallel paths from the wall face until the entire consolidation zone has been compacted. A minimum of two passes of the plate compactor are required with maximum lifts of 8 in. (200 m). Expansive or fine-grained soils may require additional compaction passes and / or specific compaction equipment such as a sheepfoot roller. Maximum lifts of 4 in. (100 mm) may be required to achieve adequate compaction within the consolidation zone. Employ methods using lightweight compaction equipment that will not disturb the stability or batter of the wall. Final compaction requirements in the consolidation zone shall be established by the engineer of record.

(F) Install each subsequent course in the same manner. Repeat procedures to the extent of wall height.

(G) As with any construction work, some deviation from construction drawing alignments will occur. Variability in construction of SRWs (segmental retaining wall) is approximately equal to that of cast-in-place concrete retaining walls. As opposed to cast-in-place concrete walls, alignment of SRWs can be simply corrected or modified during construction. Based upon examination of numerous completed SRWs, the following recommended minimum tolerances can be achieved with good construction techniques.

Vertical Control - ± 1.25 in (32 mm) max. over 10 ft. (3 m) distance
Horizontal Location Control – straight lines ±1.25 in (32 mm) over a 10 ft. (3 m) distance
Rotation – from established plan wall batter: 2.0◦
Bulging – 1.0 in. (25 mm) over a 10 ft. (3.0 m) distance

3.05 ADDITIONAL CONSTRUCTION NOTES

(A) When one wall branches into two terraced walls, it is important to note that the soil behind the lower wall is also the foundation soil beneath the upper wall. This soil shall be compacted to a minimum of 95% of Standard Proctor (ASTM D698) prior to placement of the base material. Achieving proper compaction in the soil beneath an upper terrace prevents settlement and deformation of the upper wall. One way is to replace the soil with wall rock and compact in 8 in. (200 mm) lifts. When using on-site soils, compact in maximum lifts of 4 in. (100 mm) or as required to achieve specified compaction.

(B) Filter fabric use Is not suggested for use with cohesive soils. Clogging of such fabrics creates unacceptable hydrostatic pressures in soil reinforced structures. When filtration is deemed necessary in cohesive soils, use a three-dimensional system of clean sand or filtration aggregate.
(C) Embankment protection fabric is used to stabilize rip rap and foundation soils in water applications and to separate infill materials from the retained soils. This fabric should permit the passage of fines to preclude the clogging of the material. Embankment protection fabric shall be a high strength polypropylene monofilament material designed to meet or exceed typical Corps of Engineers plastic filter fabric specifications (CW=-02215); stabilized against ultraviolet (UV) degradation.
(D) Water management is of extreme concern during and after construction. Steps must be taken to ensure that drainpipes are properly installed and vented to daylight and a grading plan has been developed that routes water away from the retaining wall location. Site water management is required both during construction of the wall and after the completion of construction.

PART 4 – GEOGRID REINVORCEMENT SYSTEMS

PART 1 – GENERAL

4.01 SCOPE

(A) Work includes furnishing and installing geogrid reinforcement, wall block, and backfill to the lines and grades designated on the construction drawings and as specified here.

4.02 APPLICABLE SECTION OF RELATED WORK

(A) Modular retaining wall system, Parts 1 through 3.

4.03 REFERENCE STANDARDS

(A) ASTM D4595 – Tensile properties of geotextiles by the wide-width strip method
(B) ASTM D5262 – Test method for evaluating the unconfined creep behavior of geogrids
(C) ASTM D6638 – Grid connection strength (SRW-U1)
(D) ASTM D6916 – SRW block shear strength (SRW-U2)
(E) GRI-GG4 – Grid long term allowable design strength (LTADS)
(F) ASTM D6706 – Grid pullout of soil

See specific geogrid manufacturer's reference standards.

4.04 DELIVERY, STORAGE, AND HANDLING

(A) The contractor shall check the geogrid upon delivery to assure that the proper material has been received.
(B) Geogrid shall be stored above -10 F (-23 C)
(C) The contractor shall prevent excessive mud, cementitious material, or other foreign materials from meeting the geogrid material

PART 2 – MATERIALS

5.01 DEFINITIOINS

(A) Geogrid products shall be of high-density polyethylene or polyester yarns encapsulated in a protective coating specifically fabricated for use as a soil reinforcement material.
(B) Concrete retaining walls are as detailed on the drawings.
(C) Drainage material is free draining granular material as defined in Section 1, 2.03 Wall Rock.
(D) Infill soil is the soil used as fill for the reinforced soil mass.
(E) Foundation soil is the in-situ soil.

5.02 PRODUCTS

(A) Geogrid shall be the type as shown on the drawings having the property requirements as described withing the manufacturer's specifications.

5.03 ACCEPTABLE MANUFACTURERS

(A) A manufacturer's product shall be approved by the wall design engineer.

PART 3 – WALL CONSTRUCTION

6.01 FOUNDATION SOIL PREPARATION

(A) Foundation soil shall be excavated to the lines and grades shown on the construction drawings, or as directed by the on-site soils engineer.
(B) Foundation soil shall be examined by the on-site soils engineer to assure that the actual foundation soil strength meets or exceeds assumed design strength.
(C) Over-excavated areas shall be filled with compacted backfill material approved by the on-site soils engineer.
(D) The contractor shall verify locations of existing structures and utilities prior to excavation. The contractor shall ensure all surrounding structures are protected from the effects of wall excavation.

6.02 WALL CONSTRUCTION

(A) Wall construction shall be as specified under Section 1, Part 3, Wall Construction.

6.03 GEOGRID INSTALLATION

(A) Install wall block to designated height of first geogrid layer. Backfill and compact the wall rock and infill soil in layers not to exceed 8 in. (200 mm) lifts behind wall depth equal to designed grid length before grid is installed.
(B) Cut geogrid to designated embedment length and place on top of block wall to back edge of lip. Extend away from wall approximately 3% above horizontal on compacted infill soils.
(C) Lay geogrid at the proper elevation and orientations shown on the drawings or as directed by the wall design engineer.

(D) Correct orientation of the geogrid shall be verified by the contractor and on-site soils engineer. Strength direction is typically perpendicular to wall face.
(E) Follow the manufacturer's guidelines for overlap requirements.
(F) Place next course of wall block on top of the grid and backfill cores with wall rock to lock in place. Remove slack and folds in the grid and stake to hold in place.
(G) Adjacent sheets of geogrid shall be butted against each other at the wall face to achieve 100 percent coverage.
(H) Geogrid lengths shall be continuous. Splicing parallel to the wall face is not allowed.

6.04 FILL PLACEMENT

(A) Infill soil shall be placed in lifts and compacted as specified under Section 1, Part 3.4 Unit Installation.
(B) Infill soil shall be placed, spread, and compacted in such a manner that minimizes the development of slack or movement of the geogrid.
(C) Only hand-operated compaction equipment shall be allowed with 3 ft. (0.9 m) behind the wall. This area shall be defined as the consolidation zone. Compaction in this zone shall begin by running the place compactor directly 0n the block and then compacting in parallel paths to the wall face until the entire consolidation zone has been compacted. A minimum of two passes of the place compactor are required with maximum lifts of 8 in. (200 mm). Section 1 Part 3.4 E.
(D) When fill is placed and compaction cannot be defined in terms of Standard Proctor Density, then compaction shall be performed using ordinary compaction process and compacted so that no deformation is observed from the compaction equipment or to the satisfaction of the engineer of record or the site soils engineer.
(E) Tracked construction equipment shall not be operated directly on the geogrid. A minimum fill thickness of 6 in. (150 mm) is required prior to operation of tracked vehicles over the geogrid. Turning of tracked vehicles should be kept to a minimum to prevent tracks from displacing the fill and damaging the geogrid.
(F) Rubber-tired equipment may pass over the geogrid reinforcement at slow speeds, less than 10 mph (16 Km/h). Sudden braking and sharp turning shall be avoided.
(G) The infill soil shall be compacted to achieve 95% Proctor Standard (ASTM D698). Compaction tests shall be taken at 3 ft. (0.9 m) behind the block and at the back of the reinforced zone. The frequency shall be as determined by the on-site soils engineer or as specified on the plan.
Soil tests of the infill soil shall be submitted to the on-site soils engineer for review and approval prior to the placement of any material. The contractor is responsible for achieving the specified compaction requirements. The on-site soils engineer may direct the contractor to remove, correct, or amend any soil found not in compliance with these written specifications.

6.05 SPECIAL CONSIDERATIONS

(A) Geogrid can be interrupted by periodic penetration of a column, pier, or footing structure.
(B) Verify that wall block will accept vertical and horizontal reinforcing with rebar and grout.
(C) If site considerations will not allow geogrid embedment length, consider the following alternatives:

- ◦Masonry Reinforced Walls
- ◦Increased Wall Batter
- ◦Double Block Wall
- ◦Soil Nailing
- ◦Earth Anchors
- ◦Rock Bolts

◦No-Fines Concrete

7 – WATER MANAGEMENT

PART 1 – GENERAL DRAINAGE

7.01 SURFACE DRAINAGE

Rainfall or other water resources such as irrigation activities collected by the ground surface atop the retaining wall can be defined as surface water. Retaining wall design shall be taken into consideration of the management of this water.

(A) At the end of the day's construction and at final completion, grade the backfill to avoid water accumulation behind the wall or in the reinforced zone.
(B) Surface water must not be allowed to pond or to be trapped in the area above the wall or at the toe of the wall.
(C) Existing slopes adjacent to retaining wall or slopes created during the grading process shall include drainage details so that surface water will not be allowed to drain over the top of the slope face and / or wall. This may require a combination of berms and surface drainage ditches.
(D) Irrigation activities at the site shall be done in a controlled and reasonable manner. If an irrigation system is employed, the design engineer or the irrigation manufacturer shall provide details and specifications for required equipment to ensure against over irrigation which could damage the structural integrity of the retaining wall system.
(E) Surface water that cannot be diverted from the wall must be collected with surface drainage swales and drained laterally to disperse the water around the wall structure.

7.02 GRADING

The shaping and recontouring of land to prepare it for site development is grading. Site grading shall be designed to route water around the walls.

(A) Establish the final grade with a positive gradient away from the wall structure. Concentration of surface water runoff shall be managed by providing necessary structures, such as paved ditches, drainage swales, catch basins, etc.
(B) Grading designs must divert sources of concentrated surface flow, such as parking lots, away from the wall.

7.03 DRAINAGE SYSTEM

The internal drainage systems of the retaining wall can be described as the means of eliminating the buildup of incidental water which infiltrates the soils behind the wall. Drainage system design will be a function of the water conditions on the site. Possible drainage facilities include Toe and Heel drainage collection pipes and blanket or chimney rock drains or others. Design engineer shall determine the required drainage facilities to completely drain the retaining wall structure for each site condition.

(A) All walls will be constructed with a minimum of 12 in. (300 mm) of wall rock directly behind the wall facing. The material shall meet or exceed the specification for wall rock outlined in Section 1 2.3 Wall Rock.
(B) The drainage collection pipe, drainpipe, shall be a 4 in. (100 mm) perforated or slotted PVC or corrugated HDPE pipe as approved the by engineer of record.
(C) All walls will be constructed with a 4 in. (100 mm) diameter drainpipe placed at the lowest possible elevation within the 12 in. (300 mm) of wall rock. This drainpipe is referred to as a toe drain, Section 7, 7.04 Toe Drain.
(D) Geogrid reinforced walls shall be constructed with an additional 4 in. (100 mm) drainpipe at the back bottom of the reinforced soil mass. This drainpipe is referred to as a heel drain, Section 7, 7.05 Heel Drain.

7.04 TOE DRAIN

A toe drainpipe should be located at the back of the wall rock behind the wall as close to the bottom of the wall as allowed while still maintaining a positive gradient for drainage to daylight, or a storm management system. Toe drains are installed for incidental water management, not as a primary drainage system.

(A) For site configurations with bottoms of the base on a level plane, it is recommended that a minimum one percent gradient be maintained on the placement of the pipe with outlets at 50 ft. (15 m) centers, or 100 ft. (30 m) centers if pipe is crowned between the outlets. This would provide for a maximum height above the bottom of the base in a flat configuration of no more than 6 in. (150 mm).
(B) For rigid drainpipes with drain holes, the pipes should be positioned with the holes located down. Refer to wall block manufacturer's specifications to see if toe drainpipes are to be wrapped when installed into base rock complying with the specified wall rock material.
(C) Pipes shall be routed to storm drains where appropriate or through or under the wall at low points when the job site grading and site layout allows for routing. Appropriate details shall be included to prevent pipes from being crushed, plugged, or infested with rodents.
(D) On sites where the natural drop in grade exceeds the one percent minimum, drainpipe outlets shall be on maximum 100 ft. (30 m) centers. This will provide outlets if excessive water flow exceeds the capacity of pipe over long stretches.

7.05 HEEL DRAIN

The purpose of the heel drain is to pick up any water that migrates from behind the retaining wall structure at the cut and route the water away from the reinforced mass during the construction process and for incidental water for the life of the structure.

(A) The piping used at the back of the reinforced mass shall have a one percent minimum gradient over the length, but it is not critical for it to be positioned at the very bottom of the cut. Additionally, the entire length of the pipe may be vented at one point and should not be tied into the toe drain.
(B) The pipe may be a rigid pipe with holes at the bottom with an integral sock encasing the pipe of a corrugated perforated flexible pipe with a sock to filter out fines when required based on soil conditions. For infill soils with a high percentage of sand and / or gravel, the heel drain does not

need to be surrounded by drainage rock. When working with soils containing more than fifty percent clay, one cubic foot of drainage rock is required for each foot of pipe.

7.06 GROUND WATER

Ground water can be defined as water that occurs within the soil. It may be present because of surface infiltration or water table fluctuation. Ground water movement must not be allowed to meet the retaining wall.

(A) If water is encountered around the wall during excavation or construction, a drainage system (chimney, composite, or blanket) must be installed as directed by the wall design engineer.
(B) Standard retaining wall designs do not include hydrostatic forces associated with the presence of ground water. If adequate drainage is no provided, the retaining wall design must consider the presence of the water.
(C) When non-free draining soils are used in the retained zone, the incorporation of a chimney and blanket drain should be added to minimize the water penetration into the reinforced mass.

7.07 CONCENTRATED WATER SOURCES

All collection devices such as roof downspouts, storm sewers, and curb gutters are concentrated water sources. They must be designed to accommodate maximum flow rates and to vent outside of wall areas.

(A) All roof downspouts of nearby structures shall be sized with adequate capacity to carry storm water from the roof away from the wall area. They shall be connected to a drainage system in closed pipe and routed around the retaining wall area.
(B) The site layout must consider locations of retaining wall structures and all site drainage paths. Drainage paths should always be away from retaining wall structures.
(C) Storm sewers and catch basins shall be located away from retaining wall structures and designed so as not to introduce any incidental water into the reinforce soil mass.
(D) A path to route storm sewer overflow must be incorporated into the site layout to direct water away from the retaining wall structure.

7.08 WATER APPLICATION

Retaining walls constructed in conditions that allow standing moving water to meet the wall face are considered water applications. These walls require specific design and construction steps to ensure performance.

(A) Embankment protection fabric is used to stabilize rip rap foundation soils in water applications and to separate infill materials from the retained soils. This fabric should permit the passage of fines to preclude clogging of the material. Embankment protection fabric shall be a high strength polypropylene monofilament material designed to meet or exceed typical Corps of Engineers plastic filter fabric specifications (CW-02215); stabilized against ultraviolet (UV) degradation and typically exceeding the values in Table 1.
(B) Infill material shall be free draining to meet the site requirements based on wave action and rapid draw down conditions.

(C) Rip rap or alternative products such as “Trilock” may be required as a toe protector to eliminate scour at the base of the wall.

Table 1: Embankment Protection Fabric Specifications

Mechanical Property	Determination Method
Tensile Strength = 375 lbs. (170 kg)	ASTM D-4632
Puncture Strength = 145 lbs. (66 kg)	ASTM D-3787
Equivalent Opening Size (EOS) = 70 (U.S. Sieve #)	CW-02215
Mullen Burst = 480 psi (3.3 Mpa)	ASTMD-3786
Trapezoidal Tear 105 lbs. (48 kg)	ASTM D-4533
Percent Open Area = 4%	CW-02215
Permeability = 0.01 cm/sec	ASTM D-4491

END OF SECTION 30 40 00

SECTION 03 41 00 – PRECAST STRUCTURAL CONCRETE – PLANT CAST

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes structural precast concrete units, plant cast, including the following:

1. Hollow-core slab units.
2. Steel header members for support of panels at openings in floor plate.
3. Steel header members for support of panels over openings in bearing walls (for openings which extend to precast bearing elevation).
4. Steel connection plates and brackets.
5. Welding of precast structural elements to supporting beam, column, or embed.
6. Provision and installation of all loose deformed bar dowels into the precast members.
7. Grouting of precast members, voids below and within the precast system, and around perimeter within the depth of the precast members.
8. Anchor bolting.

B. Related Sections: The following sections contain requirements that relate to this section.

1. Division 1 Section “Structural Special Inspection.”
2. Division 3 Section “Cast-in-Place Concrete.”
3. Division 5 Section “Structural Steel Framing.”

1.3 PERFORMANCE REQUIREMENTS

A. Engineering Responsibility: Engage a fabricator who uses a qualified professional engineer to prepare design calculations, fire-resistance calculations, shop drawings, and other structural data.

B. Structural Performance: Engineer, fabricate, and install structural precast concrete units to withstand design loadings indicated within limits and under conditions indicated.

1. The design of precast-prestressed hollow core slabs shall be in accordance with the latest recommendations of the PCI and ACI building code requirements.
2. Manufacturer shall use contract drawing information indicating depth and loading of member to design precast-prestressed hollow core slabs. Where the topping is to provide composite action, the topping slab weight is not included in the superimposed dead load.
3. Engineer shall consider accurate composite structure depth reduced topping dead load due to deflection of the pre-composite plank under wet topping weight. Total depth and dead loading might be reduced from theoretic due to plank camber.

4. Concentrated and line loads, resulting from bearing walls or other special cases, are shown with diagrammatic sketches of the member, showing the placement and magnitude of the loads.
5. Design steel headers where required. Design shall comply with AISC specifications.

C. Deflection Limits: Deflection limits for D (Dead Load) + L (Live Load) combinations only applies to the deflection due to superimposed dead and partition load plus the creep component of long-term total dead load deflection plus the short-term live load deflection. Design framing systems to withstand design loads without deflections greater than the following:
1. Exterior Spandrels supporting glass window walls: Vertical deflection of Span/480 due to D+L.
2. Exterior Spandrels supporting masonry: Vertical deflection of Span/600 due to D+L.
3. Floor Members supporting stud and gypsum partitions: Vertical deflection of Span/240 due to D+L and Span/360 due to L.
4. Floor Members supporting masonry partitions: Vertical deflection of Span/600 due to D+L.

1.4 SUBMITTALS

A. General: Furnish submittals in quantity, format, and other Conditions of the Contract and as specified in Division 1 of the Project Manual.

B. Product data and instructions for manufactured materials and products.

1. Certification by paint and curing compound manufacturers that products supplied comply with local regulations controlling use of volatile organic compounds (VOCs).

C. Shop drawings detailing fabrication and installation of precast concrete units. Indicate member dimensions and cross-sections; locations, sizes, and types of reinforcement, including special reinforcement; estimated camber; and lifting devices necessary for handling and erection.

1. Include an erection plan indicating layout and dimensions, and identifying each precast concrete unit corresponding to sequence and procedure of installation. Indicate welded connections by AWS standard symbols. Detail loose, cast-in, and field hardware, inserts, connections, and joints, including accessories and construction at openings in precast units. Show all openings required for mechanical, plumbing, and other penetrations 12” and larger which are to be cast into precast members.
2. Indicate locations and details of anchorage devices that are to be embedded in other construction. Furnish templates, if required, for accurate placement.
3. Shop drawings shall be signed and sealed by the qualified professional engineer, registered in the State of Kentucky, responsible for their preparation.
4. To the extent structural precast unit design considerations are indicated as fabricator’s responsibility, include structural analysis data signed and sealed by the qualified professional engineer, registered in the State of Kentucky, responsible for their preparation. The calculations will be reviewed for design intent only. Engineering and detailing shall be solely the responsibility of the manufacturer and the professional engineer responsible for their preparation.
5. be solely the responsibility of the manufacturer and the professional engineer responsible for their preparation.

6. Computer generated electronic structural construction document files (ACAD) will be made available to the Contractor. The Contractor will be required to sign the Engineer's standard release of liability form prior to receiving the drawing files. Rules for use of said files shall be as defined in the CRSI "Code of Standard Practice" Sections 4.19 and 6.4.1.
7. Shop drawing resubmittals are reviewed for conformance with review marks only. Any changes or questions originating on a resubmittal shall be clearly clouded.

D. Design mixes for each concrete mix. Submit revised mix proportions when characteristics of materials, project conditions, weather, test results, or other circumstances warrant adjustments.

E. Material test reports from a qualified independent testing agency evidencing compliance with requirements of the following based on comprehensive testing of current materials:

1. Concrete materials.
2. Reinforcing materials.
3. Prestressing strands.
4. Admixtures.
5. Bearing pads.

F. Material certificates in lieu of agency test reports, when permitted by Architect, signed by fabricator certifying that each material item complies with requirements.

G. Dimensioned erection drawing showing steel headers for support of precast plank in floor plate and for support of precast plank over openings in bearing walls.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced Installer who has completed structural precast concrete 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: Firm experienced in producing structural precast concrete units 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 without delaying the Work.

C. ng the Work.

1. Fabricator must participate in the Precast/Prestressed Concrete Institute's (PCI) Plant Certification Program and be designated a PCI Certified Plant.

D. Professional Engineer Qualifications: A professional engineer who is legally authorized to practice in the State of Kentucky and who is experienced in providing engineering services of the kind indicated that have resulted in the installation and successful in-service performance of precast concrete units similar to this Project in material, design, and extent.

E. Testing Agency: Owner may engage an independent testing agency to perform shop inspections and tests and to provide test reports. Manufacturer shall provide testing agency with access to

places where structural precast concrete units are being fabricated so inspection and testing can be accomplished. Correction of deficiencies and additional testing to determine compliance of corrected work will be performed at Contractor's expense.

F. provide testing agency with access to places where structural precast concrete units are being fabricated so inspection and testing can be accomplished. Correction of deficiencies and additional testing to determine compliance of corrected work will be performed at Contractor's expense.

G. PCI Design Standard: Comply with recommendations of PCI MNL-120 "PCI Design Handbook – Precast and Prestressed Concrete" applicable to types of structural precast concrete units indicated.

H. PCI Quality-Control Standard: Comply with requirements of PCI MNL-116 "Manual for Quality Control Plants and Production of Precast and Prestressed Concrete Products," including manufacturing and testing procedures, quality-control recommendations, and camber and dimensional tolerances for types of units required.

I. ACI Publications: Comply with the following ACI publications applicable to types of structural precast concrete units indicated:

1. ACI 301 "Specifications for Structural Concrete for Buildings."
2. ACI 318 (ACI 318M) "Building Code Requirements for Reinforced Concrete."
3. ACI 315 "Manual of Standard Practice for Detailing Reinforced Concrete Structures."
4. ACI 525 "Minimum Requirements for Thin-Section Precast Concrete Construction."

J. Welding Standards: Comply with applicable provisions of the following American Welding Society publications:

1. AWS D1.1 "Structural Welding Code – Steel."
2. AWS D1.4 "Structural Welding Code – Reinforcing Steel."
3. AWS D12.1 "Recommended Practices for Welding Reinforcing Steel, Metal Inserts, and Connections in Reinforced Concrete Construction."

K. Calculated Fire-Test-Response Characteristics: When fire-resistance-rated assemblies are indicated, provide structural precast concrete units whose calculated fire resistance has been determined according to ASTM E 119 and PCI MNL-124 "Design for Fire Resistance of Precast Prestressed Concrete" and is acceptable to authorities having jurisdiction.

or

L. Fire-Test-Response Characteristics: Provide structural precast concrete units that comply with the following requirements:

1. Fire-response tests are performed by a qualified testing and inspecting agency. A qualified testing and inspecting agency includes UL or another agency that is acceptable to authorities having jurisdiction and performs testing and follow-up services.

2. Fire-resistance-rated assemblies indicated are identical in materials and construction to those tested for fire resistance per ASTM E 119.
3. Fire-resistance-rated assemblies are indicated by design designations listed in the UL "Fire Resistance Directory" or in the listings of another qualified testing and inspecting agency.

M. General Contractor and Precast Concrete Supplier shall coordinate and be responsible for installing all openings larger than 12" through precast members required for mechanical, plumbing, or other penetrations. Openings shown on structural drawings are for reference only and shall not be considered completely accurate in size, spacing, or quantity.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver precast concrete units to Project site in such quantities and at such times to ensure continuity of installation. Store units at Project site to prevent cracking, distorting, warping, staining, or other physical damage, and so that markings are visible.

B. Lift and support units only at designated lifting or supporting points as shown on final shop drawings.

C. Deliver anchorage items that are to be embedded in other construction before starting such work. Provide setting diagrams, templates, instructions, and directions, as required, for installation.

D. Provide temporary lateral support during erection to prevent bowing and warping. Blocking and supports shall be clean, non-staining, and shall not prevent uniform curing of exposed surfaces.

PART 2 – PRODUCTS

2.1 REINFORCING MATERIALS

A. Reinforcing Bars: ASTM A 615, Grade 60, deformed.

B. Steel-Welded Wire Fabric: ASTM A 1064, welded steel wire fabric in sheets.

C. Supports for Reinforcement: Bolsters, chairs, spacers and other devices for spacing, supporting and fastening reinforcing bars and welded wire fabric in place. Use supports complying with CRSI recommendations.

1. For exposed-to-view concrete surfaces, where legs of supports are in contact with forms, provide supports with legs that are protected with plastic (CRSI, Class 1) or stainless steel (CRSI, Class 2).

2.2 PRESTRESSING TENDONS

A. Prestressing Strand: ASTM A 416, Grade 250 or 270, uncoated, 7-wire, stress-relieved.

2.3 CONCRETE MATERIALS

A. Portland Cement: ASTM C 150, Type I or Type III.

1. Use only one brand and type of cement throughout Project, unless otherwise acceptable to Architect.

B. Fly Ash: ASTM C 618, Class C or F.

C. Silica Fume: ASTM C 1240, amorphous silica.

D. Normal-Weight Aggregates: ASTM C 33, Class 5S. Provide aggregates from a single source.

1. For exposed exterior surfaces, do not use fine or coarse aggregates that contain substances that cause spalling or surface discoloration due to oxidation.

E. Lightweight Aggregates: ASTM C 330.

F. Water: Potable.

G. Admixtures, General: Provide admixtures for concrete that contain not more than 0.05 percent chloride ions.

H. Air-Entraining Admixture: ASTM C 260, certified by manufacturer to be compatible with other required admixtures.

I. Water-Reducing Admixture: ASTM C 494, Type A.

J. High-Range, Water-Reducing Admixture: ASTM C 494, Type F or Type G.

K. Water-Reducing, Accelerating Admixture: ASTM C 494, Type E.

L. Water-Reducing, Retarding Admixture: ASTM C 494, Type D.

M. Corrosion Inhibitor: ASTM C494, Type C.

2.4 CONNECTION MATERIALS AND FINISHES

A. Steel Shapes and Plates: ASTM A 36.

B. Malleable Iron Castings: ASTM A 47.

C. Welded Headed Studs: AWS D1.1, Type B headed studs, cold-finished carbon-steel bars.

D. Deformed-Steel Wire Bar Anchors: ASTM A 496.

E. Welding Electrodes: Comply with AWS standards.

F. Accessories: Provide clips, hangers, shims, and other accessories required to install precast concrete units.

G. Shop-Primed Finish: Prepare surfaces of interior steel items, except those with galvanized finish or those surfaces to be embedded in concrete, according to requirements of SSPC-SP 3 and shop-apply primer according to SSPC-PA 1.

1. Primer: Fast-curing, lead- and chromate-free, VOC-conforming, universal modified-alkyd primer with good resistance to normal atmospheric corrosion, complying with performance requirements of FS TT-P-664.

2.5 BEARING PADS

A. Provide bearing pads for precast concrete units as follows:
1. High-Density Plastic: Multimonomer, nonleaching, plastic strip.

2.6 GROUT MATERIALS

A. Cement Grout: Portland cement, ASTM C 150, Type I, and clean, natural sand, ASTM C 404. Mix at ratio of 1 part cement to 2 ½ parts sand, by volume, with minimum water required for placement and hydration. Compressive strength of 3500 psi: 28 day strength or greater.

B. Nonmetallic, Nonshrink 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, with fluid consistency and a 30-minute working time.

C. consistency and a 30-minute working time.

2.7 CURING MATERIALS

A. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type I, Class B.

1. Provide material that has a maximum volatile organic compound (VOC) rating not to exceed those allowable by jurisdictional regulations.

2.8 CONCRETE MIXES

A. Prepare design mixes for each type and strength of concrete by either laboratory trial batch or field experience methods as specified in ACI 301. For the trial batch method, use an independent testing agency acceptable to Architect or qualified precast manufacturing plant personnel for preparing and reporting proposed mix designs. Trial batch and field experience tests shall have been performed within 12 months of submittal date.

1. Limit use of fly ash to less than or equal to 25 percent of cement content by weight.

B. Normal-Weight Concrete: Provide normal-weight concrete with the following properties:

1. Compressive Strength (28-Day): 5000 psi (34.5 MPa).
2. Maximum Water-Cementitious Materials Ratio at Point of Placement: 0.40.

C. Use air-entraining admixture in exterior exposed concrete unless otherwise indicated. Add air-entraining admixture at manufacturer's prescribed rate to result in concrete at point of placement having total air content with a tolerance of plus or minus 1-1/2 percent within the following limits:

1. Concrete structures and slabs exposed to freezing and thawing, deicer chemicals, or hydraulic pressure.

    a. 6.0 percent for 1-inch maximum aggregate.
    b. 6.0 percent for 3/4-inch maximum aggregate.
    c. 7.0 percent for 1/2-inch maximum aggregate.
    d. 7.5 percent for 3/8-inch maximum aggregate.

2. Other concrete not exposed to freezing, thawing, or hydraulic pressure, or to receive a surface hardener: 2 to 4 percent air.

D. Other Admixtures: Use water-reducing, high-range water-reducing, water-reducing and accelerating, or water-reducing and retarding admixtures, as required, according to manufacturer's directions.

E. Concrete-Mix Adjustments: Concrete-mix design adjustments may be requested by precaster when characteristics of materials, project conditions, weather, test results, or other circumstances warrant as accepted by Architect. Laboratory test data for revised mix design and strength results must be submitted to and accepted by Architect before using in the work.

F. pted by Architect before using in the work.

2.9 FABRICATION

A. Formwork: Accurately construct forms, mortar tight, of sufficient strength to withstand pressures due to concrete placing operations, temperature changes, and for pretensioning and detensioning operations. Maintain formwork to provide completed precast concrete units of shapes, lines, and dimensions indicated, within fabrication tolerances specified in PCI MNL-116.

1. Coat surfaces of forms with bond-breaking compound before reinforcement is placed. Provide commercial-formula, form-coating compounds that will not bond with, stain, or adversely affect concrete surfaces and that will not impair subsequent treatments of concrete surfaces requiring bond or adhesion. Apply in compliance with manufacturer's instructions.

2. not bond with, stain, or adversely affect concrete surfaces and that will not impair subsequent treatments of concrete surfaces requiring bond or adhesion. Apply in compliance with manufacturer's instructions.
3. Unless forms for precast, prestressed concrete units are stripped prior to detensioning, design forms so that stresses are not induced in precast units due to deformation of concrete under prestress or movement during detensioning.

B. Built-In Anchorages: Accurately position built-in anchorage devices and secure to formwork. Locate anchorages where they do not affect the position of the main reinforcement or placing of concrete. Do not relocate bearing plates in units, unless acceptable to Architect.

C. Cast-in openings larger than 12 inches in diameter or 12 inches square according to final shop drawings. Other smaller holes may be field cut by trades requiring them, as acceptable to Architect. Trades field cutting holes shall locate holes so as to not cut prestressing tendons.

D. Reinforcement: Comply with the recommendations of CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.

1. Clean reinforcement of loose rust and mill scale, earth, and other materials that reduce or destroy the bond with concrete.
2. Accurately position, support, and secure reinforcement against displacement by formwork, construction, or concrete placement operations. Locate and support reinforcement by metal chairs, runners, bolsters, spacers and hangers, as required.
3. Place reinforcement to obtain at least the minimum coverages for concrete protection. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position while placing concrete. Set wire ties so ends are directed into concrete, not toward exposed concrete surfaces.
4. rete surfaces.
5. Install welded wire fabric in lengths as long as practical. Lap adjoining pieces at least one full mesh and lace splices with wire.

E. Pretensioning: Pretension tendons for precast, prestressed concrete either by single-strand tensioning method or multiple-strand tensioning method. Comply with PCI MNL-116 requirements.

F. Concrete Mixing: Comply with requirements and with ASTM C 94. Following concrete batching, no additional water may be added.

G. Concrete Placement: Place concrete in a continuous operation to prevent seams or planes of weakness from forming in precast units. Comply with requirements of ACI 304R for measuring, mixing, transporting, and placing concrete.

1. Thoroughly consolidate placed concrete by internal and external vibration without dislocating or damaging reinforcement and built-in items. Use equipment and procedures complying with ACI 309R.
2. Comply with ACI 306R procedures for cold-weather concrete placement.
3. Comply with ACI 305R procedures for hot-weather concrete placement.

H. Identify pickup points of precast concrete units and orientation in structure with permanent markings, complying with markings indicated on final shop drawings. Imprint casting date on each precast unit on a surface that will not show in the finished structure.

I. Cure concrete according to the requirements of PCI MNL-116 by moisture retention without heat or by accelerated heat curing, using low-pressure live steam or radiant heat and moisture.

J. Delay detensioning prestressed concrete units until concrete has attained at least 70 percent of its compressive strength as established by test cylinders cured under the same conditions as the concrete.

1. If concrete has been heat cured, detension while concrete is still warm and moist to avoid dimensional changes that may cause cracking or undesirable stresses.
2. Detension pretensioned tendons either by gradually releasing tensioning jacks or by heat-cutting tendons, using a sequence and pattern to prevent shock or unbalanced loading.

K. Finish formed surfaces of precast concrete as indicated for each type of unit as follows:
1. Grade B Finish: Fill air pockets and holes greater than ¼ inch (6 mm) in diameter with sand-cement paste matching color of adjacent surfaces. Grind smooth form offsets or fins greater than 1/8 inch (3 mm).

L. Finish unformed surfaces by trowel, unless otherwise indicated. Consolidate concrete, bring to proper level with straightedge, float, and trowel to a smooth, uniform finish.

1. Apply scratch finish to precast concrete units that will receive concrete topping after installation. Following initial strike-off, transversely scarify surface to provide ridges approximately ¼ inch deep.
2. Apply a nonslip broom finish to exterior precast concrete subject to pedestrian traffic. Immediately after float finishing, slightly roughen concrete surface by brooming with fiber bristle broom perpendicular to main traffic route.
3. Where used as roof members, provide smooth, float top finish to precast units.

2.10 HOLLOW-CORE SLAB UNITS

A. Provide precast, prestressed concrete units with open, hollow cores running the full length of the slab units.

B. Provide solid, monolithic, precast concrete slab units where shown on drawings. Design and fabricate solid units to dimensions and details indicated as required for hollow-core slab units.

C. Furnish units free of voids or honeycombs.

D. Fabricator shall provide ¼” diameter holes through bottom of plank into each core at third points of span to allow rain water to escape through during construction, every member.

E. Reinforce units to resist transportation and erection stresses.

F. Include cast-in weld plates where required.

G. Coordinate with other trades for installation of cast-in items.

H. Provide headers of cast-in-place concrete or structural steel shapes for openings larger than one slab width according to hollow-core slab unit fabricator’s recommendations.

2.11 QUALITY CONTROL

A. The Owner may employ an independent testing agency to evaluate precast fabricator's quality control and testing methods.

1. Allow Owner's testing agency access to material storage areas, concrete production equipment, concrete placement, and curing facilities. Cooperate with Owner's testing agency and provide samples of materials and concrete mixes as may be requested for additional testing and evaluation.

B. Quality-Control Testing: Test and inspect precast concrete according to PCI MNL-116 requirements.

C. Strength of precast concrete units will be considered potentially deficient when precast concrete units fail to comply with requirements, including the following:

1. Fail to meet compressive-strength test requirements.
2. Reinforcement, and pretensioning and detensioning tendons of prestressed concrete do not conform to fabrication requirements.
3. Concrete curing and protection of precast units against extremes in temperature fail to meet requirements.
4. Precast units are damaged during handling and erecting.

D. Testing: When there is evidence that the strength of precast concrete units may be deficient or may not meet requirements, the Owner will employ an independent testing agency to obtain, prepare, and test cores drilled from hardened concrete to determine compressive strength according to ASTM C 42.

1. A minimum of 3 representative cores will be taken from precast concrete units of suspect strength, from locations directed by Architect.
2. Cores will be tested in an air-dry condition per ACI 301 when precast concrete units will be dry under service conditions.
3. Strength of concrete for each series of 3 cores will be considered satisfactory if the average compressive strength is at least 85 percent of the 28-day design compressive strength and no core compressive strength is less than 75 percent of the 28-day design compressive strength.
4. Test results will be made in writing on the same day that tests are made, with copies to Architect, Contractor, and precast fabricator. Test reports will include the Project identification name and number, date, name of precast concrete fabricator, name of concrete testing agency; identification letter, name, and type of precast concrete unit or units represented by core tests; design compressive strength, compressive strength at break and type of break, corrected for length-diameter ratio, and direction of applied load to core with respect to horizontal plane of concrete as placed.
5. crete fabricator, name of concrete testing agency; identification letter, name, and type of precast concrete unit or units represented by core tests; design compressive strength, compressive strength at break and type of break, corrected for length-diameter ratio, and direction of applied load to core with respect to horizontal plane of concrete as placed.
6. applied load to core with respect to horizontal plane of concrete as placed.

E. Patching: Where core test results are satisfactory and precast concrete units meet requirements, solidly fill core holes with patching mortar and finish to match adjacent concrete surfaces.

F. Dimensional Tolerances: Units having dimensions smaller or greater than required and not meeting tolerance limits may be subject to additional testing.

1. Precast units having dimensions greater than required will be rejected if the appearance or function of the structure is adversely affected or if larger dimensions interfere with other construction. Repair or remove and replace rejected units, as required, to meet construction conditions.

G. Defective Work: Precast concrete units that do not conform to requirements, including strength, manufacturing tolerances, and finishes, are unacceptable. Replace with precast concrete units that meet requirements.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions for compliance with requirements, including installation tolerances, true and level bearing surfaces, and other conditions affecting performance of precast concrete units. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 INSTALLATION - GENERAL

A. Members shall bear the minimum length called for on contract or shop drawings. If no bearing length is specified, 3 ½ inches shall be considered the minimum.

B. Set vertical units dry, without grout, attaining joint dimension with lead or plastic spacers. Grout pack base of unit.

C. Bearing Pads: Install bearing pads as precast concrete units are being erected. Set pads on true, level, and uniform bearing surfaces and maintain in correct position until precast units are placed. Concrete masonry units supporting precast concrete units shall be solid or grout filled to 8" minimum depth below bearing.

D. Welding: Perform welding in compliance with AWS D1.1 and AWS D1.4, with qualified welders.

1. All welding of precast members to adjacent structure (beams, embed angles, etc) shall be the responsibility of the Precast Concrete Installer, u.n.o. Provide steel shims and weld plates as required to bridge gaps due to tolerances and camber.
2. Protect precast concrete units and bearing pads from damage by field welding or cutting operations and provide noncombustible shields as required.
3. Repair damaged metal surfaces by cleaning and repriming damaged painted surfaces.

E. Fasteners: Do not use drilled or powder-actuated fasteners for attaching accessory items to precast, prestressed units, unless otherwise acceptable to Architect.

F. Erection Tolerances: Install precast units level, plumb, square, and true, without exceeding the recommended erection tolerances of PCI MNL-127 “Recommended Practice for Erection of Precast Concrete.”

G. Shore and brace precast concrete units to maintain location, stability, and alignment until permanent connections are installed.

H. Remove lifting hooks if necessary.

I. Provide sawcut and knock out access ports for reinforcing as shown on structural drawings.

J. Contractor shall coordinate all penetrations through and attachment to precast concrete elements with the precast manufacturer. Penetrations shall be located to not disturb or cut prestressing tendons. Attachment to the precast plank shall be located around tendon layout and shall incorporate fasteners designed for use in hollow concrete and that do not penetrate the concrete more than ¾”.

3.3 PLACING REINFORCEMENT

A. General: Comply with Concrete Reinforcing Steel Institute’s recommended practice for “Placing Reinforcing Bars,” for details and methods of reinforcement placement and supports and as specified.

B. Deliver reinforcement to job site bundled, tagged and marked. Use waterproof tags indicating bar size, length, and mark corresponding to placing drawings.

C. Clean reinforcement of loose rust and mill scale, earth, ice, and other materials that reduce or destroy bond with concrete.

D. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcing by metal chairs, runners, bolsters, spacers, and hangers, as approved by Architect.

E. When permitted, field bend bars cold, except during cold weather when moderate heating is necessary to avoid brittle failures.

F. Install all loose deformed bar straight and hooked dowels from precast hollow core plank into adjoining plank or wall along bearing ends and sides of panels.

3.4 GROUTING

A. Grouting Connections and Joints: After precast concrete units have been placed and secured, grout open spaces at keyways, connections recessed 1” or greater, and bearing joints in panels with cement grout.

1. Provide forms or other acceptable method to retain grout in place until hard enough to support itself. Pack spaces with stiff grout material, tamping until voids are completely filled. Place grout to finish smooth, plumb, and level with adjacent concrete surfaces. Keep grouted joints damp for not less than 24 hours after initial set. Promptly remove grout material from exposed surfaces before it hardens.
2. Level differential elevation of adjoining horizontal members with grout to maximum slope of 1:12.
3. Grout patch shape shall match projected adjacent surface profile.
4. Continue expansion joint through patches.

B. Grout between all hollow core plank to fully fill keyways.

C. Grout between all hollow core plank and support beams at plank bearing to fully fill void and brace beam flange. All grout within depth of precast is the responsibility of the precast installer.

D. Grout between all hollow core plank and adjoining walls at all hooked dowels. Grout continuously around entire perimeter of plank system to masonry face shell or ICF form. All grout within depth of precast is the responsibility of the precast installer.

E. Precast erector shall install drypack grout tight between bottom of precast elements and all parallel beams and structural bearing and shear walls. Grout shall fully fill the void out to the face of wall/extent of beam flange.

3.5 CLEANING

A. Clean exposed surfaces of precast concrete units after erection to remove weld marks, other markings, dirt, and stains.

1. Wash and rinse according to precast concrete fabricator's recommendations. Protect other work from staining or damage due to cleaning operations.
2. Do not use cleaning materials or processes that could change the appearance of exposed concrete finishes.

END OF SECTION 03 41 00

SECTION 04 20 00 – UNIT MASONRY ASSEMBLIES

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

B. Refer to the Drawings for locations of work to be performed.

1.02 SUMMARY

A. This Section includes unit masonry assemblies consisting of the following:

1. Concrete masonry units (CMUs).
2. Face brick.
3. Ground Face CMU (as indicated on Drawings)
3. Limestone (e.g., seat and wall caps).
4. Mortar and grout.
5. Reinforcing steel.
6. Masonry joint reinforcement.
7. Ties and anchors.
8. Embedded flashing.
9. Miscellaneous masonry accessories.
10. Cavity-wall insulation.

B. Requirements of Sheet S1.1, “Masonry Wall Construction” apply to work of this Section, except where different requirements are stated herein.

C. Related Sections include the following:

1. Division 07 Section "Bituminous Dampproofing" for dampproofing applied to the cavity face of backup wythes of CMU walls.
2. Division 07 Section "Sheet Metal Flashing and Trim" for exposed sheet metal flashing.
3. Division 07 Section "Joint Sealants" for sealing control and expansion joints in unit masonry.

D. Products installed, but not furnished, under this Section include the following:

1. Steel lintels and shelf angles for unit masonry, furnished under Division 05 Section "Metal Fabrications."
2. Manufactured reglets in masonry joints for metal flashing, furnished under Division 07 Section "Sheet Metal Flashing and Trim."

1.03 DEFINITIONS

A. Reinforced Masonry: Masonry containing reinforcing steel in grouted cells.

1.04 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: For the following:

1. Masonry Units: Show sizes, profiles, coursing, and locations of special shapes.
2. Limstone: Show sizes, profiles, and locations of each stone trim unit and seat caps required.

C. Samples: For each type and color of the following:

1. Face brick, straps of five or more standard (modular) bricks.
2. Colored mortar.

    a. Pigmented and colored-aggregate mortar. Make Samples using same sand and mortar ingredients to be used on Project**.** Label Samples to indicate types and amounts of pigments used.

3. Accessories embedded in masonry.
4. Limestone trim.

D. Material Certificates: Include statements of material properties indicating compliance with requirements including compliance with standards and type designations within standards. Provide for each type and size of the following:

1. Masonry units: Include material test reports substantiating compliance with requirements.
2. Cementitious materials. Include brand, type, and name of manufacturer.
3. Pre-blended, dry mortar mixes. Include description of type and proportions of ingredients.
4. Reinforcing bars.
5. Joint reinforcement.
6. Anchors, ties, and metal accessories.
7. Mix Designs: For each type of mortar and grout. Include description of type and proportions of ingredients.
8. 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 Tables 1 and 2 in ACI 530.1 / ASCE 6/TMS 602.

1.05 QUALITY ASSURANCE

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, through one source from a 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 a single manufacturer for each cementitious component and from one source or producer for each aggregate.

C. Fire-Resistance Ratings: Where indicated, provide materials and construction identical to those of assemblies with fire-resistance ratings determined per ASTM E 119 by a testing and inspecting agency, by equivalent concrete masonry thickness, or by other means, as acceptable to authorities having jurisdiction.

D. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution, as directed by the Architect.

1. Build mockups for typical exterior wall in sizes approximately 48-inches long by 48-inches high by full thickness, including face and backup wythes and accessories.

    a. Architect to provide drawing indicating mock-up configuration.
    b. Include a sealant-filled joint at least 16-inches long in each mockup.
    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, but not above window, with a 12-inch length of flashing left exposed to view (omit masonry above half of flashing).
    d. Include flashing, and weep holes in exterior masonry-veneer wall mockup.

2. Clean exposed faces of mockups with masonry cleaner as indicated.
3. Protect accepted mockups from the elements with weather-resistant membrane.
4. Approval of mockups is for color, texture, and blending of masonry units; relationship of mortar and sealant colors to masonry unit and stone colors; tooling of joints; and aesthetic qualities of workmanship.

    a. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless such deviations are specifically approved by the Architect in writing.

E. Pre-installation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Meetings."

1.06 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 pre-blended, dry mortar mix in moisture-resistant containers designed for lifting and emptying into dispensing silo. Store pre-blended, dry mortar mix in delivery containers on elevated platforms, under cover, and in a dry location or in a metal dispensing silo with weatherproof cover.

E. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

1.07 PROJECT CONDITIONS

A. Protection of Masonry exposed to weather: During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Weight sheeting and wrap around sides in a way that is sufficient to avoid exposure and keep wind from blowing covering off prior to restart of work. Cover partially completed masonry when construction is not in progress.

1. Extend cover a minimum of 24-inches down both sides and hold cover securely in place.
2. Where (1) wythe of multi-wythe 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, roof or concentrated loads until mortar and grout have reached its design strength. Coordinate with material testing consultant.

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 windows 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 ACI 530.1 / ASCE 6/TMS 602.

1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40-degrees F and above and will remain so until masonry has dried, but not less than 7-days after completing cleaning.

E. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in ACI 530.1 / ASCE 6/TMS 602.

PART 2 PRODUCTS

2.01 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 products specified.
2. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include manufacturers specified.

2.02 MASONRY UNITS, GENERAL

A. Defective Units: Referenced masonry unit standards may allow a certain percentage of units to exceed tolerances and to contain chips, cracks, or other defects exceeding limits stated in the standard. Do not uses units where such defects, including dimensions that vary from specified dimensions by more than stated tolerances, will be exposed in the completed Work or will impair the quality of completed masonry.

2.03 CONCRETE MASONRY UNITS (CMU)

A. Shapes: Provide shapes indicated and as follows:

1. Provide special shapes for lintels, corners, jambs, sashes, sills at openings, movement joints, headers, bonding, and other special conditions.
2. Provide bullnose units for outside corners.

B. Concrete Masonry Units: ASTM C 90.

1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 2000 psi.
2. Weight Classification: Lightweight, unless otherwise indicated.
3. Actual Size: Manufactured to dimensions 3/8 inch less than nominal dimensions.
4. Exposed Faces: Provide color and texture matching the range represented by Architect's sample.

    a. Size: 8-inches by 16-inches, unless otherwise noted. Refer to Wall Type Legend.

2.04 MASONRY LINTELS

A. Masonry Lintels: Prefabricated or built-in-place masonry lintels made from bond beam concrete masonry units with reinforcing bars placed as indicated and filled with coarse grout. Provide bullnose at all exposed outside corners. Cure precast lintels before handling and installing. Temporarily support built-in-place lintels until cured.

2.05 BRICK

A. General: Provide shapes indicated and as follows:

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. These shall be included in the allowance value.
2. Application: Use where brick is exposed, unless otherwise indicated. Refer to the Drawings for location of brick type.

B. Veneer Masonry: ASTM C 216, Grade SW, Type FBX.

1. Refer to “Masonry Type Legend” shown on Building Elevations (A2 Series) for masonry types and Basis-of-Design (B.O.D.) products.

C. Available Manufacturers:

1. Belden (B.O.D. product)
2. Bowerston (B.O.D. product)
3. General Shale
4. Glen-Gery
5. Endicott
6. Sioux City
7. Trenwyth Architectural Masonry (B.O.D. product)
8. Watsontown
9. Yankee Hill

2.06 STONE TRIM UNITS

A. Limestone: ASTM C 568, Classification II Medium.

1. Variety and Sources: Indiana oolitic limestone quarried in Lawrence, Monroe, or Owen Counties, Indiana.

    a. Grade and Color: Standard, according to grade and color classification established by ILI. Color to match existing limestone at each building for which stone trim is indicated.

B. Finish: Smooth.

C. Sizes / Shapes:

1. Profiles and sizes as shown on Drawings

    a. Seat and Wall Caps

2. Lengths:

    a. As indicated on Drawings.
    b. Sills: As indicated, based on width of masonry opening.
    c. Running stone trim, standard length: 3’-11 5/8” (equivalent of 6 lengths of brick and 6 head joints).

3. Corners, horizontal or vertical: Mitered. Lengths to be same either side of miter, coordinated to brick coursing.

D. Provide stone units accurately shaped, with exposed faces dressed true, and with beds and joints at right angles to faces.

1. For limestone, comply with recommendations in ILI's "Indiana Limestone Handbook."

2.07 MORTAR AND GROUT MATERIALS

A. Mortar For Concrete Masonry: Type S

1. Portland Cement: ASTM C 150, Type I or II, except Type III may be used for cold-weather construction.
2. Hydrated Lime: ASTM C 207, Type S.
3. Portland Cement-Lime Mix: Packaged blend of portland cement complying with ASTM C 150, Type I or Type III, and hydrated lime complying with ASTM C 270, Type S.

B. Colored Masonry Cement For Brick: ASTM C 91, Type N.

1. Pigments shall not exceed 10 percent of portland cement by weight.
2. Available Products:

    a. Essroc, Italcementi Group; Brixment Flamingo.
    b. Lafarge North America Inc.; U.S. Cement Color Masonry Cement.

c. Lehigh Cement Company; Lehigh Custom Color Masonry Cement.

3. Basis-Of-Design Product: Brixment Flamingo, R-20. Color to be determined during submittal process.

C. Pigmented Mortar: Use colored cement product or select and proportion pigments with other ingredients to produce color required. Do not add pigments to colored cement products.

1. Pigments shall not exceed 10 percent of portland cement by weight.

D. Aggregate for Mortar: ASTM C 144.

1. For mortar that is exposed to view, use washed aggregate consisting of natural sand.

E. Aggregate for Grout: ASTM C 404.

F. Water: Potable.

G. 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.

H. Pre-blended, Dry Mortar Mix: Furnish dry mortar ingredients in form of a pre-blended mix. Measure quantities by weight to ensure accurate proportions, and thoroughly blend ingredients before delivering to Project site.

I. Mortar for Unit Masonry: Comply with ASTM C 270, Proportion Specification. Provide the following types of mortar for applications stated unless another type is indicated.

1. For masonry below grade or in contact with earth, use Type S, (CMU).
2. For above-grade, non-load-bearing walls and parapet walls; and for other applications where another type is not indicated, use Type N, (BRICK).

J. Grout for Unit Masonry: Comply with ASTM C 476.

1. Compressive Strength of 2,500 psi
2. Use grout of type indicated or, if not otherwise indicated, of type (fine or course) that will comply with Table 1.15.1 in ACI 530.1 / ASCE 6/TMS 602 for dimensions of grout spaces and pour height.
3. Provide grout with a slump of 8 to 11-inches as measured according to ASTM C 143 / C 143M.

2.08 REINFORCEMENT

A. Uncoated Steel Reinforcing Bars: ASTM A 615, Grade 60 with supplementary requirements (SI).

B. Masonry Joint Reinforcement, General: ASTM A 951.

1. Interior Walls: Hot-dip galvanized, carbon steel.
2. Exterior Walls: Hot-dip galvanized, carbon steel.
3. Wire Size for Side Rods: W1.7 or 0.148-inch diameter.
4. Wire Size for Cross Rods: W1.7 or 0.148-inch diameter.
5. Spacing of Cross Rods, Tabs, and Cross Ties: Not more than 16-inches o.c.
6. Provide in lengths of not less than 10-feet, with prefabricated corner and tee units.

C. Masonry Joint Reinforcement for Single-Wythe Masonry: Truss type with single pair of side rods (Ladder type will not be accepted).

D. Masonry Joint Reinforcement for Multi-wythe Masonry:

1. Gasket Single Barrel Masonry Fastener with integral Thermal Break

a. Heckmann Thermal Pos-I-tie (Basis of Design) or equivalent by Durawall

1) Spaced 16” o.c. vertically and 32” o.c. horizontally.
2) Masonry Veneer Ties: Provide minimum 2-inches embedment in mortar.
3) Wire 3/16 inch x 3-1/2”
4) Material for Ties in Exterior Walls: Hot-dip galvanized.
5) Material for Ties Exposed to Air in Exterior Walls: Hot-dip galvanized.

2.09 TIES AND ANCHORS

A. Materials: Provide ties and anchors specified in subsequent paragraphs that are made from materials that comply with eight subparagraphs below, unless otherwise indicated.

1. Hot-Dip Galvanized, Carbon-Steel Wire: ASTM A 82; with ASTM A 153 / A 153M, Class B-2 coating.
2. Stainless Steel bars: ASTM A 276 or ASTM a 666, Type 304.

B. Adjustable Anchors for Connecting Masonry to Concrete Wall: Provide anchors that allow vertical or horizontal adjustment but resist tension and compression forces perpendicular to plane of wall.

1. Adjustable Reinforcement with 2X-Hook – Ladder Eye-Wire

a. Basis-Of-Design Product: Hohmann & Barnard – 270-2X Ladder Eye Wire

2) Flame resistance; UL 94 V-0 rating

C. Stone Anchors: Dowels, cramps, and other stone anchors from stainless steel, similar to Pos-I-Tie StoneAnchors.

2.10 EMBEDDED FLASHING MATERIALS

A. Thru-Wall Flashing: For flashing not exposed to the exterior:

1. Copper-Laminated Flashing: 5-oz. / sq. ft. copper sheet bonded with asphalt between 2 layers of glass-fiber cloth. Use only where flashing is fully concealed in masonry.

    a. Available Products:
        1) Advanced Building Products Inc.; Copper Fabric Flashing.
        2) AFCO Products Inc.; Copper Fabric.
        3) Hohmann & Barnard, Inc.; H & B C-Fab Flashing.
        4) Phoenix Building Products; Type FCC-Fabric Covered Copper.
        5) Polytite Manufacturing Corp.; Copper Fabric Flashing.
        6) Sandell Manufacturing Co., Inc.; Copper Fabric Flashing.
        7) York Manufacturing, Inc.; York Copper Fabric Flashing.

2. Flexible Flashing: Perma-Barrier, by W.R. Grace, to be installed at corners of openings, at top of thru-wall flashing over termination bar at ICF walls and other locations, where flexible flashing will provide a better installation.

    a. Termination Bar: Continuous flat metal bar, 1/8” thick by 1-inch wide, aluminum bar with pre-drilled holes at 8” o.c. Install bar with drive pins at masonry walls and screws at ICF walls.

3. Note: This section describes through-wall flashing. Alternate systems by listed manufacturers that do not require penetration of the continuous insulation (except for the anchoring) may be proposed for use, assuming documentation can be provided which indicates that they meet the performance goals of this specification.

B. Drip Plates: Stainless steel drip plate with a factory-formed hemmed edge for installation in a continuous bead of sealant; Type 304 stainless steel; width as required at each cavity condition; 26 ga material, minimum 10’ lengths.

1. Acceptable manufacturers:

    a. Hohmann & Barnard Inc
    b. Wire-Bond
    c. Riverside Sheet Metal
    d. Masonpro

2. Provide corners as required for continuous coverage without cut edges or sharp corners.

2.11 MISCELLANEOUS MASONRY ACCESSORIES

A. Weep/Vent Products: Use the following, unless otherwise indicated:

1. Vinyl Vent: One-piece, offset, T-shaped units made from flexible, injection-molded 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 approved by Architect to match that of mortar.

a. Available Products:

1) Hohmann & Barnard, Inc.; #343 Louvered Weep Hole.
2) Williams Products, Inc.; Williams-Goodco Brick Vent.
3) Wire-Bond; Louvered Weep holes.

B. Cavity Drainage Material: Free-draining mesh, made from polymer strands that will not degrade within the wall cavity.

1. Provide one of the following configurations:

a. Strips, full-depth of cavity and 10-inches wide, with dovetail shaped notches 7-inches deep that prevent mesh from being clogged with mortar droppings.
b. Strips, not less than 1-1/2-inches thick and 10-inches wide, with dimpled surface designed to catch mortar droppings and prevent weep holes from being clogged with mortar.

2. Available Products:

a. Advanced Building Products Inc.; Mortar Break or Mortar Break II.
b. Dayton Superior Corporation, Dur-O-Wal Division; Polytite MortarStop.
c. Mortar Net USA, Ltd.; Mortar Net.

2.12 CAVITY-WALL INSULATION

A. Closed Cell Spray Foam Insulation – See Building Insulation Section. Refer to Wall Types for Insulation locations and thicknesses.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work.

1. For the record, prepare a written report, endorsed by Installer, listing conditions detrimental to performance of work.

2. Verify that foundations are within tolerances specified.
3. Verify that reinforcing dowels are properly placed.

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.

3.02 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 the 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.
1. 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 per ASTM C 67. Allow units to absorb water so they are damp but not wet at time of laying.

G. Comply with construction tolerances in ACI 530.1 / ASCE 6/TMS 602 and with the following:

1. 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.
2. 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.
3. 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.
4. For exposed 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. Do not vary from bed-joint thickness of adjacent courses by more than 1/8-inch.

5. 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.
6. 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.
7. 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.

3.03 LAYING BRICK WALLS

A. Coursing: Lay brick plumb, level and true to line in **full** beds of mortar. Head joints shall be **filled solid** with mortar. Joints in brick work and between brick and other masonry or concrete shall be filled solid (head and bed joints) with mortar as work progresses. Exposed brick shall be laid in a running bond pattern unless shown otherwise indicated. Do not install any broken, chipped or cracked bricks.

B. Once laid, do not disturb face brick in any manner which would impair its mortar bed.

C. Cleaning: Clean face brick surfaces as work progresses, Final cleaning is specified hereinafter.

3.04 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 running bond; do not use units with less than nominal 4-inch horizontal face dimensions at corners or jambs.

1. Align ends of stone units with head joints in brick.

C. Lay concealed masonry with all units in a wythe in running bond. 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 racking 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.

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. Bed hollow metal frame anchors in mortar joints and fill head and jambs of frame solid with mortar.

G. Fill the first vertical cell of masonry units adjacent to framed openings full with specified grout fill.

H. When building in electric outlet boxes, pipe sleeves and other similar items, make cuts so face texture will not be damaged beyond face of the cover place or escutcheon; exposed patching will not be accepted.

I. Fill space between hollow metal frames and masonry solidly with mortar, unless otherwise indicated.

J. 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.

K. Fill cores in hollow concrete masonry units with grout 24-inches under bearing plates, beams, lintels, posts, and similar items, unless otherwise indicated.

L. At fire-rated partitions, treat joint between top of partition and underside of structure above to comply with requirements of "The Kentucky Building Code".

M. Tuckpoint joints of CMU walls to eliminate voids prior to applying the bituminous dampproofing.

3.05 MORTAR BEDDING AND JOINTING

A. Lay hollow concrete masonry units as follows:

1. With face shells fully bedded in mortar and with **full** head joints of depth equal to bed joints.
2. With webs fully bedded in mortar in all courses of piers, columns, and pilasters.
3. With webs fully bedded in mortar in grouted masonry, including starting course on footings. Fill / grout cores solid in starting course.

B. Make uniform, nominal 3/8” wide joints, unless otherwise shown. Tool joints smooth and dense with round, non-staining type jointed to provide slightly concave joints. Tool joints behind lockers, casework, markerboards, tackboards and other equipment.

C. Lay solid masonry units with **completely filled bed and head joints**; butter ends with sufficient mortar to fill head joints and shove into place. Do not deeply furrow bed joints or slush head joints.

D. Make joints in brickwork uniform and not more than 3/8” wide and as follows:

1. After becoming “thumb-print” hard, tool joints of exterior facing brick with jointed that is slightly larger than the width of the mortar joint. Close cracks and crevasses.
2. All joints above and below grade: tool concave.

E. Set stone trim units in full bed of mortar with full vertical joints. Fill dowel, anchor, and similar holes.

1. Clean soiled surfaces with fiber brush and soap powder and rinse thoroughly with clear water.
2. Wet joint surfaces thoroughly before applying mortar.

3.06 CAVITY WALLS

A. Bond wythes of cavity walls together using the following method:

1. Individual Metal Ties: Provide masonry veneer ties as specified, hooked to fastener in backup wythe; spaced typically at 32-inches o.c. horizontally and 16-inches o.c. vertically. Stagger ties in alternate courses. Provide additional ties within 12-inches of openings and space not more than 16-inches apart around perimeter of openings. At intersecting and abutting walls, provide ties at no more than 24-inches o.c. vertically.

2. Masonry Veneer Anchors: Comply with requirements for anchoring masonry veneers.

B. 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.

C. Coat cavity face of backup wythe to comply with Division 07 Section "Bituminous Dampproofing."

D. Installing Cavity-Wall Insulation: Place small dabs of adhesive, spaced approximately 12-inches o.c. both ways, on inside face of insulation boards, or attach with plastic fasteners designed for this purpose. Fit courses of insulation with edges butted tightly both ways. Press units firmly against inside wythe of masonry or other construction as shown.

1. Fill cracks and open gaps in insulation and **tape all joints.**

3.07 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. vertically.
2. Provide reinforcement not more than 8-inches above and below wall openings and extending 12-inches beyond openings.

a. Reinforcement above is 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.

3.08 ANCHORING MASONRY VENEERS

A. Anchor masonry veneers to concrete backup with masonry-veneer anchors to comply with the following requirements:

1. Fasten anchors to the insulated concrete form work ribs with two galvanized or stainless steel fasteners.
2. Locate anchor sections to allow maximum vertical differential movement of ties up and down.
3. Space anchors at 16-inches o.c. vertically and 32-inches o.c. horizontally with not less than (1) anchor for each 2.67 sq. ft. of wall area. Install additional anchors within 12-inches of openings and at intervals, not exceeding 16-inches, around perimeter.

3.09 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 as follows:

1. Install foam-plastic filler in head joints.

C. Form expansion joints in brick made from clay or shale as follows:

1. Form open joint full depth of brick wythe and of width indicated, but not less than 1/2-inch for installation of sealant and backer rod specified in Division 07 Section "Joint Sealants."

3.10 LINTELS

A. Install steel lintels where indicated.

B. Provide masonry lintels where shown and where openings of more than 8-inches for brick-size units and 16-inches for block-size units are shown without structural steel or other supporting lintels.

1. Lintels in bearing walls are shown on structural plans. Lintels in partition walls are not shown on plan and are specified by the Loose Lintel Schedule on sheet S1.1. All new openings in existing masonry walls shall be constructed using steel lintels.

C. Provide a minimum bearing of 8-inches at each jamb, unless otherwise indicated.

3.11 FLASHING, WEEP HOLES, CAVITY DRAINAGE, AND 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 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. Lap joints at least 6” and seal both horizontal and vertical surfaces of flashing. Before covering with mortar, seal penetrations in flashing with adhesive, sealant, or tape as recommended by flashing manufacturer.
2. At multi-wythe masonry walls, including cavity walls, extend flashing through outer Wythe to 1/4-inch beyond the exterior face, turned up a minimum of 8-inches, and 1-1/2-inches into the inner Wythe. Form 1/4-inch hook in edge of flashing embedded in inner wythe.
3. At masonry veneer with concrete back-up; extend flashing through veneer, across air space behind veneer, and up face of insulated concrete form work at least 8-inches; with upper edge secured by a galvanized termination bar with sealant along top of bar.
4. At lintels and shelf angles, extend flashing a minimum of 8-inches into masonry at each end. At heads and sills, extend flashing 8-inches at ends and turn up not less than 2-inches to form end dams.
5. Provide end dams at each end of stepped through wall flashings or at ends of a run of flashing.
6. Seal all laps and end dams with mastic for a waterproof installation.

C. Install reglets and nailers for flashing and other related construction where they are shown to be built into masonry.

D. Install weep holes in head joints in exterior wythes of first course of masonry immediately above embedded flashing and as follows:

E. Place cavity drainage material in cavities to comply with configuration requirements for cavity drainage material in Part 2 "Miscellaneous Masonry Accessories" Article.

F. Install vents in head joints in exterior wythes at 32-inches o.c. Use specified weep/vent products to form vents.

1. Close cavities off vertically and horizontally with blocking in manner indicated. Install through-wall flashing and weep holes above horizontal blocking.

3.12 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections indicated below and prepare test reports:

1. Allow inspectors access to scaffolding and work areas, as needed to perform inspections.
2. Place grout only after inspectors have verified compliance of grout spaces and grades, sizes, and locations of reinforcement.
3. Payment for these services will be made by the Owner.
4. Retesting of materials failing to comply with specified requirements shall be done at Contractor's expense.

B. Grout Test (Compressive Strength): For each mix provided, per ASTM C 1019.

3.13 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. Clean brick by bucket-and-brush hand-cleaning method described in BIA Technical Notes 20.
4. Clean concrete masonry by cleaning method indicated in NCMA TEK 8-2A applicable to type of stain on exposed surfaces. Do not use acid.
5. Clean and remove all stains and foreign substances from **all new brick**.
6. Clean stone trim to comply with stone supplier's written instructions.

E. Masonry Cleaning Materials see individual section for related cleaning instructions.

1. Commercial product manufactured for masonry cleaning.
2. “Sure Klean 600” by Prosoco, Inc. or “Thoro-Clean” by Standard Dry Wall Products, Inc.
3. Verify compatibility with selected masonry units.

3.14 SALVAGEABLE MATERIALS

A. Unless otherwise indicated, excess masonry materials are Contractor's property. At completion of unit masonry work, remove from Project site.

END OF SECTION 04 20 00

SECTION 05 10 00 – STRUCTURAL ANCHORS

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes post-installed metal anchors in concrete, masonry, and steel, as shown on drawings including schedules, notes, and details showing size and location of anchors, typical connections, and types of anchors required.

1. Adhesive anchors.
2. Wedge anchors.
3. Sleeve anchors.
4. Powder actuated fasteners.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 1 Section “Structural Special Inspection.”
2. Division 3 Section “Cast-in-Place Concrete.”
3. Division 4 Section “Unit Masonry.”
4. Division 5 Section “Structural Steel Framing.”
5. Division 5 Section “Cold-Formed Metal Framing – Structural.”
6. Division 6 Section “Rough Carpentry.”

1.3 DEFINITIONS

A. Threaded Rod: A rod that is continuously threaded for the full length of the rod unless noted otherwise.

1.4 ACTION SUBMITTALS

A. General: Furnish submittals in quantity, format, and other Conditions of the Contract and as specified in Division 1 of the Project Manual.

B. Product Data for each type of product specified. Include manufacturer’s specifications, load charts, and other data to show compliance with the specifications (including specified standards).

1.5 INFORMATIONAL SUBMITTALS

A. General: Furnish submittals in quantity, format, and other Conditions of the Contract and as specified in Division 1 of the Project Manual.

B. Installer Qualifications and Procedures: Submit a letter of procedure stating method of drilling, the product proposed for use, the complete installation procedure, manufacturer training date, and a list of the personnel to be trained on anchor installation.

C. ICC ES Evaluation Reports/Certificates.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: Anchors shall be installed by an installer with at least 1 year of experience performing installations similar in material, design, and extent to that indicated for this Project and with a record of successful in-service performance.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver anchors 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. Protect anchors and packaged materials from erosion and deterioration.
C. Keep anchors, rod materials, nuts and washers in original manufacturer's packaging with label intact until needed for use
D. Store all anchoring products in strict accordance with manufacturer's recommendations. For adhesive anchors, consider temperature, exposure to sunlight, and shelf life.

1.8 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 GENERAL

2.2 FASTENERS AND HARDWARE

A. Carbon-Steel Bolts and Threaded Fasteners: ASTM A 307, Grade A (ASTM F 568, Property Class 4.6), carbon-steel, hex-head bolts and threaded fasteners; carbon-steel nuts; and flat, unhardened steel washers.

1. Finish: Plain, noncoated.
2. Finish: Hot-dip zinc coating, ASTM A 153, Class C.
3. Finish: Mechanically deposited zinc coating, ASTM B 695, Class 50.

B. Carbon Steel Continuously Threaded Rod: ASTM A36 or ASTM A193 Grade B7.

C. Wedge Anchors: ASTM A510 or ASTM A108.

D. Stainless Steel Bolts, Hex Cap Screws, and Studs: ASTM F593.

E. Stainless Steel Nuts: ASTM F594.

2.3 ADHESIVE ANCHORS

A. Cartridge Injection Acrylic Adhesive Anchors: two-component material consisting of acrylic resin, hardener, cement and water, suitable for use on dry or damp surfaces. For use in concrete. Anchor to be approved for use with cracked concrete per ICC-ES AC308.

1. Available Products: Subject to compliance with requirements, products that may be incorporated in the Work include, but are not limited to, the following:

   a. HIT HY 200 V3 with HAS Super (ASTM A193 Gr B7) or HIT-Z (AISI 1038 Grade 75) threaded rods, Hilti.
   b. AC200+ (ICC-ES ESR 4027). DeWalt/Powers.

2. ASTM A563 heavy hex carbon-steel nuts; ASTM F436 hardened carbon-steel washers; and ASTM A36 plate washers.

B. Cartridge Injection Epoxy Adhesive Anchors: two-component epoxy adhesive, suitable for use on oversize, cored, and wet holes and in submerged applications. For use in concrete. Anchor to be approved for use with cracked concrete per AC308.

1. Available Products: Subject to compliance with requirements, products that may be incorporated in the Work include, but are not limited to, the following:

   a. A7+ System with A193 Gr B7 threaded rods, ITW Red Head.
   b. HIT RE500 V3 System with HAS Super threaded rods, Hilti.
   c. SET-3G Epoxy System with A193 Gr B7 threaded rods, Simpson/Strong-Tie
   d. PURE 110+ Epoxy Adhesive with A193 Gr B7 threaded rods, DeWalt / Powers.

2. ASTM A563 heavy hex carbon-steel nuts; ASTM F436 hardened carbon-steel washers; and ASTM A36 plate washers.

C. Cartridge Injection Acrylic Adhesive Anchors: two-component material consisting of acrylic resin, hardener, cement and water, suitable for use on dry or damp surfaces. For use in solid grouted concrete masonry.

1. Available Products: Subject to compliance with requirements, products that may be incorporated in the Work include, but are not limited to, the following:

   a. HIT HY 270 System with HAS-E (ISO 898 Class 5.8 Grade 58) threaded rods, Hilti.
   b. AT-XP System with A307 threaded rods, Simpson/Strong-Tie.
   c. A7+ with A307 threaded rods, Red Head.
   d. AC100+Gold with A307 threaded rod, DeWalt / Powers.

2. ASTM A563 heavy hex carbon-steel nuts; ASTM F436 hardened carbon-steel washers; and ASTM A36 plate washers.

D. Cartridge Injection Hybrid Adhesive Anchors: two-component material consisting of resin, hardener, cement and water, suitable for fastening into material containing voids and holes. For use in hollow concrete masonry, brick with holes, and multi-wythe brick construction.

1. Available Products: Subject to compliance with requirements, products that may be incorporated in the Work include, but are not limited to, the following:

a. HIT HY 270 System with HAS-E (ISO 898 Class 5.8 grade 58) threaded rods, Hilti.
b. AC100+ Gold Adhesive with A307 threaded rod, for use in hollow concrete masonry, DEWALT/ Powers.

2. ASTM A563 heavy hex carbon-steel nuts; ASTM F436 hardened carbon-steel washers; and ASTM A36 plate washers.

2.4 MECHANICAL ANCHORS

A. General: Anchor length shall be as necessary to provide the appropriate projection for the material that is being connected, the washer and full (100% of depth) engagement of the nut, and specified embedment. Embedment depth shall be respective to face of substrate (not attached material). See structural drawings for required minimum embedment of mechanical anchors; where no embedment is specified, provide anchors of sufficient length to result in manufacturer's maximum recommended effective embedment depth.

B. Basis of design: Structural anchors have been designed using Hilti products as basis of design. Where alternative anchors are substituted which are manufacturer rated as a weaker product for the given application, even when listed as an approved available product, contractor shall decrease member spacing (thereby increasing quantity of anchors) by a proportional amount as part of the base bid.

C. Wedge Anchors: Wedge type, torque-controlled, with impact section to prevent thread damage and wedge dimples to prevent spinning during installation, complete with required nuts and washers. Provide anchors with length identification markings conforming to ICC ES AC193. Type and size as indicated on Drawings. Suitable for fastening into cored, damp, or wet holes. For use in concrete. Anchor to be approved for use with cracked concrete per AC193.

1. Interior Use: Unless otherwise indicated on the Drawings, provide carbon steel anchors manufactured from materials conforming to ASTM A510 or ASTM A108 with zinc plating in accordance with ASTM B633, Type III Fe/Zn 5 (SC1).
2. Exterior Use (Including within masonry veneer cavity): Unless otherwise indicated on the drawings, provide stainless steel anchors. Stainless steel anchors shall be AISI Type 304 stainless steel provided with stainless steel nuts and washers of matching alloy group and minimum proof stress equal to or greater than the specified minimum full-size tensile strength of the externally threaded fastener. Stainless steel nuts shall conform to ASTM

F594 unless otherwise specified. Avoid installing stainless steel anchors in contact with galvanically dissimilar metals.

3. Available Products: Subject to compliance with requirements, products that may be incorporated in the Work include, but are not limited to, the following:

    a. Hilti Kwik Bolt KB1 (Carbon)
    b. Hilti Kwik Bolt TZ2 (304 Stainless Steel).
    c. DeWalt/ Powers Power-Stud+ SD2 (Carbon).
    d. DeWalt/ Powers Power-Stud+ SD4 (304 Stainless Steel).

D. Wedge Anchors: Wedge type, torque-controlled, with impact section to prevent thread damage and wedge dimples to prevent spinning during installation, complete with required nuts and washers. Provide anchors with length identification markings conforming to ICC ES AC193. Type and size as indicated on Drawings. Suitable for fastening into cored, damp, or wet holes. For use in grout filled concrete masonry.

1. Interior Use: Unless otherwise indicated on the Drawings, provide carbon steel anchors manufactured from materials conforming to ASTM A510 or ASTM A108 with zinc plating in accordance with ASTM B633, Type III Fe/Zn 5 (SC1).
2. Exterior Use (Including within masonry veneer cavity): Unless otherwise indicated on the drawings, provide stainless steel anchors. Stainless steel anchors shall be AISI Type 304 stainless steel provided with stainless steel nuts and washers of matching alloy group and minimum proof stress equal to or greater than the specified minimum full-size tensile strength of the externally threaded fastener. Stainless steel nuts shall conform to ASTM F594 unless otherwise specified. Avoid installing stainless steel anchors in contact with galvanically dissimilar metals.
3. Available Products: Subject to compliance with requirements, products that may be incorporated in the Work include, but are not limited to, the following:

    a. Hilti Kwik Bolt KB1 (carbon steel).
    b. Hilti Kwik Bolt TZ2 SS304 (stainless steel).
    c. DeWalt/ Powers Power-Stud+ SD1 (carbon steel).

E. Sleeve Anchors: Torque-controlled, exhibiting follow-up expansion under load, with provision for rotation prevention during installation. Type and size as indicated on Drawings. Suitable for fastening into material containing voids and holes, hollow concrete, hollow concrete masonry, and solid brick.

1. Interior Use: Unless otherwise indicated on the Drawings, provide carbon steel anchors manufactured from materials conforming to ISO 898 Part 1, with zinc plating equivalent to ASTM B633, Type III Fe/Zn 5 (5µm min.).
2. Exterior Use: As indicated on the Drawings, provide stainless steel anchors. Stainless steel anchors shall be manufactured from materials conforming to ISO 3506 Part 1 and having corrosion resistance equivalent to AISI Type 304 stainless steel. Stainless steel anchors shall be provided with stainless steel nuts and washers of matching alloy group and minimum proof stress equal to or greater than the specified minimum full-size tensile strength of the

externally threaded fastener. All nuts shall conform to ISO 3506 Part 2 unless otherwise specified. Avoid installing stainless steel anchors in contact with galvanically dissimilar metals.

3. onform to ISO 3506 Part 2 unless otherwise specified. Avoid installing stainless steel anchors in contact with galvanically dissimilar metals.
4. ISO 3506 Part 2 unless otherwise specified. Avoid installing stainless steel anchors in contact with galvanically dissimilar metals.
5. Available Products: Subject to compliance with requirements, products that may be incorporated in the Work include, but are not limited to, the following:

    a. Hilti HLC.
    b. DeWalt/ Powers Lok/Bolt.

2.5 POWDER ACTUATED FASTENERS

A. Drive Pins: Modified AISI 1060, 1062, or 1070 steel, hardness 49-61 Rockwell C, minimum tensile strength of 282 ksi, and minimum shear strength of 162 ksi; with zinc plating equivalent to ASTM B633, Type III Fe/Zn 5 (5µm min.) unless noted otherwise.

1. For fastening light gauge metal to concrete or concrete masonry: Minimum 0.157" shank diameter, 1 ¼" long, with knurled shank and premounted plastic & steel washer.

    a. Available Products: Subject to compliance with requirements, products that may be incorporated in the Work include, but are not limited to, the following:

        1) X-U 32 P8 by Hilti.
        2) No. 50208 by DeWalt/ Powers Fasteners.

2. For fastening light gauge metal to steel: Minimum 0.157" shank diameter, 3/4" long, with knurled shank and premounted plastic & steel washer.

    a. Available Products: Subject to compliance with requirements, products that may be incorporated in the Work include, but are not limited to, the following:

        1) X-U 19 P8 by Hilti.
        2) No. 50203 by DeWalt/ Powers Fasteners.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General

1. Drill holes with rotary impact hammer drills using carbide-tipped bits and core drills using diamond core bits. **Drill bits shall be of diameters as specified by the anchor manufacturer**. Unless otherwise shown on the Drawings, all holes shall be drilled perpendicular to the

concrete surface. Drill hole to the specified nominal embedment plus additional length as specified by the Anchor Manufacturer.

2. Cored Holes: Where anchors are to be installed in cored holes, use core bits with matched tolerances as specified by the manufacturer. Acrylic Adhesive Anchors shall not be installed in core drilled holes.
3. Embedded Items: Identify position of reinforcing steel and other embedded items prior to drilling holes for anchors. Exercise care in coring or drilling to avoid damaging existing reinforcing or embedded items. Notify the Engineer if reinforcing steel or other embedded items are encountered during drilling. Take precautions as necessary to avoid damaging prestressing tendons, electrical and telecommunications conduit, and gas lines.
4. ling. Take precautions as necessary to avoid damaging prestressing tendons, electrical and telecommunications conduit, and gas lines.
5. Base Material Strength: Unless otherwise specified, do not drill holes in concrete or masonry until concrete, mortar, or grout has achieved full design strength.
6. Observe manufacturer recommendations with respect to installation temperatures for cartridge injection adhesive anchors and capsule anchors.
7. Perform anchor installation in accordance with manufacturer instructions.
8. Contractor shall coordinate all attachment to precast concrete elements with the precast manufacturer. Penetrations shall be located to not disturb or cut prestressing tendons. Attachment to the bottom of precast plank shall be located around tendon layout and shall incorporate fasteners designed for use in hollow concrete and that do not penetrate the concrete more than ¾". Attachment to the top of precast plank shall be located around tendon layout and shall incorporate fasteners designed for use in hollow concrete.

B. Cartridge Injection Adhesive Anchors:

1. **Adhesive anchors shall be installed in concrete having a minimum age of 21 days at time of anchor installation.**
2. **Prepare all holes per manufacturer instructions** by cleaning to remove loose material and drilling dust prior to installation of adhesive. Systems specifically manufactured and tested to allow installation in unclean holes, such as the "Safe Set" system by Hilti, are permitted only after notification and approval by Engineer of Record.
3. Holes shall be dry or damp. Wet holes may be acceptable only after notification and approval by Engineer or Record and with use of adhesive suitable for wet conditions.
4. Follow manufacturer recommendations to ensure proper mixing of adhesive components.
5. Inject adhesive into holes proceeding from the bottom of the hole and progressing toward the surface in such a manner as to avoid introduction of air pockets in the adhesive.
6. Sufficient adhesive shall be injected in the hole to ensure that the annular gap is filled to the surface.
7. Remove excess adhesive from the surface.
8. Shim anchors with suitable device to center the anchor in the hole.
9. Do not disturb or load anchors before manufacturer specified cure time has elapsed.

C. Wedge Anchors, Heavy-Duty Sleeve Anchors, and Undercut Anchors:

1. **Prepare all holes per manufacturer instructions** by cleaning to remove loose material and drilling dust prior to installation of anchor.
2. Protect threads from damage during anchor installation.
3. Heavy-duty sleeve anchors shall be installed with sleeve fully engaged in part to be fastened.
4. Set anchors to manufacturer's recommended torque, using a torque wrench. Following attainment of 10% of the specified torque, 100% of the specified torque shall be reached within 7 or fewer complete turns of the nut. If the specified torque is not achieved within the required number of turns, the anchor shall be removed and replaced unless otherwise directed by the Engineer.

D. Concrete Screw Anchors:
1. **Prepare all holes per manufacturer instructions** by cleaning to remove loose material and drilling dust prior to installation of anchor.
2. Install anchor with powered impact wrench. The maximum torque rating of the impact wrench shall be in compliance with the anchor manufacturer instructions.
3. Install anchor with base of head flush to supported component. Do not over tighten anchor or strip embedment hole. Do not exceed the maximum installation torque per the anchor manufacturer instructions. Notify Engineer of Record and request repair instructions if anchor embedment hole is stripped.
4. Anchor may be loosened, one time only, by a maximum of one turn and retightened to facilitate fixture attachment or realignment. Complete removal and reinstallation of the anchor is not allowed.

E. Powder Actuated Fasteners: Perform anchor installation in accordance with manufacturer instructions. Adjust fastener shank diameter and length to achieve manufacturer's minimum recommended penetration of base material.

3.2 QUALITY CONTROL

A. General: The Owner will engage an independent testing and inspecting agency to perform inspections and tests and to prepare test reports. Testing agency will conduct and interpret tests and state in each report whether tested Work complies with or deviates from requirements. Failure to detect any defective materials shall not prevent later rejection when such defect is discovered, or obligate the Architect or Owner for final acceptance.

1. See Section 014110 – Structural Special Inspections and Contract Drawings for testing and inspection to be performed.
2. Provide access for testing agency to places where structural anchors are being installed so that required inspection and testing can be accomplished.
3. The General Contractor shall provide the testing agency a complete set of approved shop drawings.
4. Reports will be delivered to the Architect, Engineer, and the General Contractor within one week of inspection.
5. Deviations from requirements of the contract documents will be reported in writing to the General Contractor within 24 hours.

B. Correct deficiencies in or remove and replace anchors that inspections and test reports indicate do not comply with specified requirements.

END OF SECTION 05 10 00

SECTION 05 12 00 – STRUCTURAL STEEL FRAMING

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes fabrication and erection of structural steel work, as shown on drawings including schedules, notes, and details showing size and location of members, typical connections, and types of steel required.

1. Structural steel is that work defined in American Institute of Steel Construction (AISC) “Code of Standard Practice” and as otherwise shown on drawings.
2. Furnish bearing plates and anchors for steel joists and joist girders where required.
3. Furnish and install shelf and relieving angles.
4. Furnish loose lintels and loose beam bearing plates in structural and non-structural walls.
5. Furnish and install steel connections (of 1/8” and thicker material) between structural steel framing and/or steel bearing plates on bearing walls.
6. Grout below column bases.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 1 Section “Structural Special Inspection.”
2. Division 3 Section “Cast-in-Place Concrete.”
3. Division 4 Section “Unit Masonry.”
4. Division 5 Section “Structural Anchors.”
5. Division 5 Section “Architecturally Exposed Structural Steel Framing.”
6. Division 5 Section “Steel Joists.”
7. Division 9 Section “Painting.”

1.3 DEFINITIONS

A. Structural Steel: Elements of the structural frame indicated on Drawings and as described in AISC 303, "Code of Standard Practice for Steel Buildings and Bridges."

1.4 COORDINATION

A. 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.

B. s to ensure that shop primers and topcoats are compatible with one another.

C. Coordinate installation of anchorage items to be embedded in or attached to other construction without delaying the Work. Provide setting diagrams, sheet metal templates, instructions, and directions for installation.

1.5 PERFORMANCE REQUIREMENTS

A. Detail structural steel connections required by the Contract Documents to be selected or completed by the fabricator to withstand design loadings indicated.

1. Select and complete connections using typical details provided or, where no details are provided, design, detail and complete connections in accordance with AISC 360.
2. Load data are given at service-load level.

1.6 ACTION SUBMITTALS

A. General: Furnish submittals in quantity, format, and other Conditions of the Contract and as specified in Division 1 of the Project Manual.

B. Shop Drawings detailing fabrication and erection of structural steel components.

1. Submit a schedule of shop drawing submittal dates which allows the Architect reasonable time for review. Schedule shall list size and approximate number of sheets in each submittal. Provide a plan of the proposed quantity and sequences. Schedule and plan shall be submitted for comment prior to beginning shop drawing preparation.
2. Piecemarks in any given sequence shall be combined such that identical pieces are submitted for review as a single mark/detail. Submittals that submit identical pieces as multiple marks will be rejected unless fabricator compensates engineer for time and materials of shop drawing review.
3. le marks will be rejected unless fabricator compensates engineer for time and materials of shop drawing review.
4. Shop drawings that show the Architect's or Engineer's title block, logo and/or seal will be rejected and returned unchecked.
5. Computer generated electronic structural construction document files (ACAD) will be made available to the Contractor. The Contractor will be required to sign the Engineer's standard release of liability form prior to receiving the drawing files. Rules for use of said files shall be as defined in the AISC "Code of Standard Practice for Steel Buildings and Bridges," Section 4.3.
6. Provide setting drawings, templates, and directions for installation of anchor rods and other anchorages. Provide electronic (AutoCAD) drawing of anchor rods and other embedments to Contractor/Construction Manager for use in preparing a final survey of embedments.
7. oCAD) drawing of anchor rods and other embedments to Contractor/Construction Manager for use in preparing a final survey of embedments.
8. Provide erection details of all field connections.
9. Identify members and connections of the Seismic-Load-Resisting System.
10. Include details of cuts, connections, splices, camber, holes, and other pertinent data in accordance with AISC Specifications and the AISC "Detailing for Steel Construction," latest edition.

11. Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length, and type of each weld. Where CJP or PJP welds are to be used, show complete weld symbol with prequalified type and joint designation. Show backing bars that are to be removed and supplemental fillet welds where backing bars are to remain.
12. Indicate type, size, and length of bolts, distinguishing between shop and field bolts. Identify high-strength bolted slip-critical, direct-tension, tensioned shear/bearing, or blind expansion bolted connections.
13. Include erection plans and details. Note any cutting and/or welding required to be performed in the field.
14. Include ASTM material specifications and grade of steel.
15. Indicate surface preparation for primer/coating/fireproofing and shop primer/coating to be used.
16. Shop drawing resubmittals are reviewed for conformance with review marks only. Any changes or questions originating on a resubmittal shall be clearly clouded.

C. Shop Drawings detailing fabrication and placement of loose lintels. Loose lintels in non-bearing walls and over minor openings in structural walls are not shown on the structural plans but are to be included over all openings over 16" in width shown on architectural and mechanical drawings per the lintel schedule in the structural General Notes.

1. Include erection plans showing location and width of all openings.
2. Include details of cuts, connections, stud anchors, slip rods, holes, and other pertinent data in accordance with AISC Specifications and the AISC "Detailing for Steel Construction," latest edition.
3. Indicate welds by standard AWS symbols, and show size, length, and type of each weld.
4. Include ASTM material specifications and grade of steel.
5. Indicate surface preparation for primer/galvanizing and coating to be used.
6. Shop drawing resubmittals are reviewed for conformance with review marks only. Any changes or questions originating on a resubmittal shall be clearly clouded.

1.7 INFORMATIONAL SUBMITTALS

A. General: Furnish submittals in quantity, format, and other Conditions of the Contract and as specified in Division 1 of the Project Manual.

B. 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.

C. 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.
4. Twist-off tension control assembly.
5. Weld filler materials.

D. Present evidence that each welder has satisfactorily passed AWS qualification tests for welding processes involved and, if pertinent, has undergone re-certification. Provide continuity log for each welder, signed by the employer, showing that the welder has engaged in the necessary processes of welding during each 6-month period since the qualification. In lieu of qualification tests and continuity log, submit AWS CW number.

E. Welding Procedure Specifications (WPSs) and Procedure Qualification Records (PQRs): Provide according to AWS D1.1/D1.1M, "Structural Welding Code - Steel," for each welded joint whether prequalified or qualified by testing**,,**including the power source (constant current or constant voltage).

F. Fabricators who participate in the certified Quality Certification Program shall submit, at the completion of fabrication, a certificate of compliance stating that the work was performed in accordance with the approved construction documents.

1.8 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.

1. Installer must participate in the AISC Quality Certification Program and be designated an AISC-Certified *Certified Steel Erector (CSE)*.

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.

1. Fabricator must participate in the AISC Quality Certification Program and be designated an AISC-Certified *Standard for Steel Building Structures (STD)* Plant.

C. Comply with applicable provisions of the following specifications and documents:

1. AISC 360 “Specification for Structural Steel Buildings.”
2. AISC 303 “Code of Standard Practice for Steel Buildings and Bridges.”
3. AISC 341 “Seismic Provisions for Structural Steel Buildings.”
4. Research Council on Structural Connections’ (RCSC) “The Specification for Structural Joints Using High-Strength Bolts, 2009.”
5. American Welding Society’s (AWS) D1.1-2010 “Structural Welding Code – Steel.”
6. ASTM A 6 “Standard Specification for General Requirements for Rolled Structural Steel Bars, Plates, Shapes, and Sheet Piling.”
7. AGA – American Galvanizers Association publication “Recommended Details for Galvanized Structures”.
8. AISC – Steel Construction Manual, 14th Edition.
9. AWS – “Standard for AWS Certified Welders” AWS QC7-93.
10. SSPC – Steel Structures Painting Manual, Volume 1 and 2, latest edition.
11. SSPC Surface Preparation Specification, SP1 through SP15.

D. Welding Qualifications and Standards: Qualify procedures and personnel in accordance with applicable provisions of AWS D1.1 “Structural Welding Code – Steel” and AISC 360.

1. All shop and field welding shall be performed by personnel qualified by AWS procedure and who have engaged in the necessary processes of welding during each six-month period since the latest qualification.
2. Fabricator and erector shall institute a *Welder Identification System* wherein the welder who has welded a joint or member can be identified.

E. Preinstallation Conference: Conduct conference at Project site to comply with requirements of Division 1 Section “Project Meetings.”

1. The Contractor shall require reasonable representatives of every party who are concerned with the steel work to attend the Conference, including but not limited to, the following:

   a. Contractor’s Superintendent – Structural Steel Fabricator – Structural Steel Installer – Testing and Inspection Agency – Structural Engineer.

2. Minutes of the meeting shall be recorded, typed and printed by the Contractor and distributed by them to all parties concerned within five days of the meeting. One copy of the minutes shall also be transmitted to the following for information purposes: Owner’s Representative and Architect.

1.9 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, dunnage, or other supports and spacers. Protect steel members and packaged materials from corrosion and deterioration.

1. Do not store materials on structure in a manner that might cause distortion, damage, or overload to members or supporting structures. Repair or replace damaged materials or structures as directed.

C. Store fasteners in a protected place in sealed containers with manufacturer's labels intact.

1. Fasteners may be repackaged provided Owner's testing and inspecting agency observes repackaging and seals containers.
2. Clean and relubricate bolts and nuts that become dry or rusty before use.
3. Comply with manufacturers' written recommendations for cleaning and lubricating ASTM F 1852 fasteners and for retesting fasteners after lubrication.

1.10 SEQUENCING

A. Supply anchorage items to be embedded in or attached to other construction without delaying the Work.

PART 2 - PRODUCTS

2.1 STRUCTURAL STEEL MATERIALS

A. All structural steel shapes shall be new, unused and perfect stock, free from millscale, rust, flake, pitting, and imperfections, without bends, kinks, and distortions. Shop splicing of members will only be permitted if the member exceeds maximum mill length.

B. Wide Flange and Tee Shapes (Designated as W, WT): ASTM A992.

C. Channels and Angles: ASTM A572, Grade 50.

D. Plates and bars equal to or less than 4 inches thick: ASTM A572, Grade 50.

E. Cold-Formed Structural Steel Sections (Round, Rectangular, and Square Tubing): ASTM A500, Grade C.

F. Welding Electrodes: Comply with AWS requirements.

2.2 BOLTS, CONNECTORS, AND ANCHORS

A. General: For clarity in distinguishing between medium carbon steel (A325) bolts and alloy steel (A490) bolts, the structural drawings and this specification classify bolts using generic A325 and A490 designations. Contractor shall provide tension indicating device assemblies, as opposed to ordinary bolts, as required in the bolt specification below.

B. Medium Carbon Steel High-Strength Bolts, Nuts, and Washers: ASTM A325, Type 1, heavy hex steel structural bolts; ASTM A563, Grade C, heavy-hex carbon-steel nuts; and ASTM F436, Type 1, hardened carbon-steel washers, uncoated. Use ordinary bolts, washers, and nuts only where required for installation access, where bolts are called to be galvanized, and at contractor's option for snug-tight installation applications.

1. Finish: Plain, uncoated.
2. Twist-Off-Type Tension-Control Bolt-Nut-Washer Assemblies: ASTM F1852, Type 1, heavy-hex or round head assemblies consisting of steel structural bolts with splined ends, heavy-hex carbon-steel nuts, and hardened carbon-steel washers. Use of twist-off-type tension-control assembly is mandatory except where bolts are allowed by structural drawings to be installed snug-tight, where installation access prohibits use, and where bolts are called to be galvanized. Use of galvanized twist-off type assemblies is not permitted.
3. nsion-control assembly is mandatory except where bolts are allowed by structural drawings to be installed snug-tight, where installation access prohibits use, and where bolts are called to be galvanized. Use of galvanized twist-off type assemblies is not permitted.
4. ot permitted.

C. Alloy Steel High-Strength Bolts, Nuts, and Washers: ASTM A490, Type 1, heavy-hex steel structural bolts, ASTM A563, Grade DH, heavy-hex carbon-steel nuts, and ASTM F435, Type 1, hardened carbon-steel washers, uncoated.

D. Anchor Rods, Bolts, Nuts, and Washers: As follows:

1. Non-High Strength Rods:
   a. ASTM F1554 Grade 36 .
   b. Straight, Headed.
   c. Partially Threaded .
2. Nuts: ASTM A563 heavy-hex carbon-steel.
3. Plate Washers: ASTM A36 carbon steel.
4. Washers: ASTM F436, Type 1, hardened carbon steel.

2.3 PRIMER

A. Primer for uncoated steel: Fast-drying, low VOC, lead- and chromate-free, non-asphaltic, rust-inhibiting primer. Primer to be formulated for application over SSPC SP2 or SP3 prepared surfaces.

B. Primer for coated steel: Fast-drying, low VOC, high-build and high-solids, lead- and chromate-free, non-asphaltic, rust-inhibiting primer. Primer to be compatible with topcoat(s) including, but not limited to, intumescent coatings, alkyd, acrylic, and high-performance coatings such as epoxy and polyurethane. Primer to be formulated for application over SSPC SP6 prepared surfaces and selected by coating manufacturer for suitability and compatibility.

C. Epoxy Polyamide Primer: SSPC-Paint 22.

D. Zinc Rich Primer: SSPC–Paint 20 (79% minimum zinc dust in dried film).

1. Use inorganic Ethyl Silicate binder where structure will be exposed without additional protective topcoat or where structure requires significant welding during erection. Subject to compliance with requirements, products that may be incorporated in the work include, but are not limited to, the following:

   a. Carbozinc 11, Carboline Company, Inc.
   b. Tneme Zinc 90E-92, Tnemec Company, Inc.
   c. Zinc Clad II, Sherwin Williams Co.

2. Use primer with organic binder where structure will be topcoated with protective finish paint. Subject to compliance with requirements, products that may be incorporated in the work include, but are not limited to, the following:

   a. Carbozinc 621, Carboline Company, Inc.
   b. Corothane I Galvapac, Sherwin Williams Co.
   c. Tneme Zinc 90-97, Tnemec Company, Inc.

2.4 GALVANIZING MATERIALS

A. Galvanizing: The zinc used for the coating shall conform to the specifications for slab zinc (Spelter) ASTM designation: B6.

B. Galvanizing Repair Paint: High zinc dust content paint for regalvanizing welds and repair painting of galvanized steel, with dry film containing not less than 93 percent zinc dust by weight and complying with DOD-P-21035 A or SSPC-Paint 20, Type II.

2.5 FABRICATION

A. Fabricate and assemble structural steel in shop to greatest extent possible. Fabricate structural steel according to AISC 303, "Code of Standard Practice for Steel Buildings and Bridges," AISC 360, and other specifications referenced in this Section and in Shop Drawings.

1. Camber structural steel members where indicated.
2. Fabricate beams with rolling camber up.
3. Identify high-strength structural steel according to ASTM A6 and maintain markings until steel has been erected.
4. Mark and match-mark materials for field assembly.
5. Fabricate for delivery a sequence that will expedite erection and minimize field handling of structural steel.
6. Complete structural steel assemblies, including welding of units, before starting shop-priming operations.
7. Comply with fabrication tolerance limits of AISC's "Code of Standard Practice for Steel Buildings and Bridges" for structural steel.

B. Fabricate steel exposed to view 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.

C. Thermal Cutting: Perform thermal cutting by machine to greatest extent possible.

1. Plane thermally cut edges to be welded to comply with requirements in AWS D1.1.

D. Finishing: Accurately mill ends of columns and other members transmitting loads in bearing.

E. Mechanically roll sections to induce curvature where indicated. Fabricator shall increase thickness of curved tubes as part of base bid as required to prevent "oil canning" of the tube walls or "squashing" of the section for the specified radius.

F. Holes: Provide holes required for securing other work to structural steel framing, for attaching structural steel connections and embeds to other work, 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.
3. Provide erection holes, of minimum 3/16" diameter, in steel embed plates for temporary fastening of embeds to concrete formwork. Provide minimum 4 holes per piece. Coordinate hole size, spacing, and layout requirements with other trades contractors.
4. Provide vent and drain holes in closed sections subject to galvanizing or condensation due to exposure to thermal fluctuations.
5. Perimeter columns shall have holes through the column web or other devices attached to the columns at 42-45 inches above the finished floor and at the midpoint between the finished floor and the top cable to permit installation of perimeter safety cables.

G. Assemble and weld built-up sections by methods that will maintain true alignment of axes without warp.

H. Cleaning: Clean and prepare steel surfaces that are to remain unpainted according to SSPC-SP 1, "Solvent Cleaning or SSPC-SP 2, "Hand Tool Cleaning."

2.6 SHOP CONNECTIONS

A. Shop install and tighten high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A325 or A490 Bolts."

1. Bolts: ASTM A325 (ASTM A325M) high-strength bolts, unless otherwise indicated.
2. Connection Type: Unless snug tight connections are noted on the drawings as being permitted, all bolts shall be tightened to full pretensioning load. Bolts shall be pretensioned in a systematical progression from the most rigid point of the connections toward the free edges.

B. When two structural members on opposite sides of a column web, or a beam web over a column, share common connection holes do not use connections that require either member to be completely disconnected (nuts removed from bolts) for installation of the succeeding member.

C. Do not reuse bolts that have been tensioned.

D. All bolts of same ASTM type shall be of same diameter. In addition, bolts of different ASTM type shall be of different diameter unless otherwise approved by Structural Engineer.

E. Weld Connections: Comply with AWS D1.1 for procedures, appearance and quality of welds, and methods used in correcting welding work. Remove all cracks, pores, slag inclusions, incomplete fusions, and incomplete penetrations over ½" long in any weld and reweld.

1. Assemble and weld built-up sections by methods that will maintain true alignment of axes without warp.
2. Furnish all steel members in one piece without splicing, unless otherwise noted on project drawings or approved by Structural Engineer.

3. Design of Members and Connections: Typical AISC connections are to be used except where otherwise shown. Details shown are typical; similar details apply to similar conditions, unless otherwise indicated. Verify dimensions at site whenever possible without causing delay in the work. Promptly notify Architect whenever design of members and connections for any portion of structure are not clearly indicated.
4. cture are not clearly indicated.

F. Where Drawings indicate spliced and/or bent beams, provide AWS D1.1 pre-qualified full penetration welds to develop 100% of the beam's shear and moment capacity.

G. Where Drawings or Specifications indicate slip critical joints, media blast and then protect faying surfaces to be free of scale, coatings, and overspray within the bolt pattern and not less than 1 inch from the edges of holes.

H. Connections incorporating any of the following shall be marked with an identifying mark painted on the member.

1. Connections using bolts larger than ¾ inches.
2. Bearing connections with bolt threads excluded from shear plane.
3. Slip-critical connections.

2.7 SURFACE PREPARATION FOR COATINGS

A. Steel fabricator shall coordinate fireproofing and finishing requirements with architectural documents.

B. Surface Preparation: Clean surfaces to be painted. Remove dirt, loose rust, loose mill scale, and spatter, slag, or flux deposits. Wipe steel surfaces with solvent to remove rolling oils that impair primer bond. Prepare surfaces according to SSPC specifications as follows:

1. SSPC-SP 1 "Solvent Cleaning," all galvanized steel, unless noted otherwise.
2. SSPC-SP 2 "Hand Tool Cleaning," all steel except as otherwise specified.

2.8 SHOP PRIMING

A. General: Structural steel shall not be exposed to open atmospheric conditions between surface preparation and priming. Priming operation shall be performed in continuous operation with surface preparation.

1. Prime any blast-cleaned, bare steel within 8 hours of surface preparation or before flash rusting occurs.

B. Shop prime steel surfaces, except the following:

1. Surfaces embedded in concrete or mortar other than column bases and steel lintels. Extend priming of partially embedded members to a depth of 2 inches (50 mm).
2. Surfaces to be field welded.

3. Surfaces to be high-strength bolted with slip-critical connections.
4. Surfaces to receive sprayed fire-resistive materials (applied fireproofing).
5. Galvanized surfaces.

C. 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.

D. Epoxy Primer

1. Exposed interior structural steel for _____ shall be prime painted with the specified Epoxy Primer.
2. Prepare surfaces to be painted according to Steel Structures Painting Council Specification SSPC-SP 6, SSPC-SP 5 or SSPC-SP 8. The Pictorial Surface Preparation Standards for Painting Steel Surfaces, SSPC-VIS 1-89, shall be the acceptance criteria for the degree of preparation for cleaned surfaces.

E. Zinc Rich Primer

1. Exposed exterior structural steel for _____ shall be prime painted with the specified Zinc Rich Primer.
2. Prepare surfaces to be painted with inorganic binder primer according to Steel Structures Painting Council Specification SSPC-10 and surfaces to be painted with organic binder primer according to Steel Structures Painting Council Specification SSPC-SP 6. The Pictorial Surface Preparation Standards for Painting Steel Surfaces, SSPC-VIS 1-89, shall be the acceptance criteria for the degree of preparation for cleaned surfaces.
3. Contractor shall photograph blast cleaned structural steel members prior to priming and submit photographs to Engineer as confirmation that steel was properly cleaned.

F. Application

1. Steel to be concealed by other trades or which is exposed to view more than 20 feet above or lateral to a walking surface below may have primer applied by brushing, spraying, rolling, flow coating, dipping or other suitable means, at the election of the fabricator.
2. Steel to be exposed to view in the finished structure less than 20 feet above or to a walking surface shall have primer applied by spraying or smooth nap roller.

2.9 GALVANIZING

A. All welded assemblies to be galvanized shall be prepared according to Recommended Practice for Providing High Quality Zinc Coatings (Hot-Dip) on Assembled Products (ASTM A385).

B. Steel shall be hot-dip galvanized in accordance with ASTM A123 except that galvanized steel to be finish painted shall not be quenched (including by water, chromate, oil, or other deleterious substance). Coating weight shall conform with paragraph 5.1 of ASTM A123.

C. Hardware and threaded fasteners shall be galvanized in accordance with ASTM A153. Coating weight shall conform with Table 1 of ASTM A153.

D. Safeguard products against steel embrittlement according to ASTM A143.

E. Handle all articles to be galvanized in such a manner as to avoid any mechanical damage and to minimize distortion.

F. Surface finish shall be continuous, adherent, as smooth and evenly distributed as possible and free from any defect detrimental to the stated end use of the coated article.

G. Adhesion shall withstand normal handling consistent with the nature and thickness of the coating and normal use of the article.

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, Bearing, and Leveling 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. Column base plate anchor rods shall not be repaired, replaced, or field modified without the approval of the Structural Engineer. Prior to erection of a column the Contractor shall provide written notification to the Erector if there has been any repair, replacement or modification to its anchor rods.
2. Set base and bearing plates for structural members on wedges, shims, or setting nuts as required.
3. Pretension 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.
4. Weld plate washers all around to top of baseplate with minimum, unless otherwise noted, AISC permitted fillet weld size for thickness of parts joined at all braced frame and moment frame columns.
5. Promptly pack grout solidly between bearing surfaces and plates so no voids remain. Neatly finish exposed surfaces, protect installed materials, and allow to cure.

    a. Comply with manufacturer's instructions for proprietary grout materials.
    b. Grout shall be installed and cured before any elevated concrete slab supported on said columns are placed and prior to installing structural framing in excess of the third story above.

C. Maintain erection tolerances of structural steel within AISC 303 "Code of Standard Practice for Steel Buildings and Bridges."

D. Pour Stop with Relief Angle:

1. The horizontal misalignment of pour stop and relief angle assemblies shall not exceed 1/4 inch per 30 feet of length. Vertical misalignment of relief angle shall not exceed 1/4 inch per 30 feet of length. Straighten or reject members as required to meet specified tolerances.
2. Take precaution to avoid bending or twisting the relief bent plate during shipping and erection.
3. Detail and ship edge bent plate, brick relief bent plate/angle, fiber reinforced polymer plates, and associated bolts, washers, and headed studs as one piece over erectable length. Detailer shall coordinate fabrication lengths with erector prior to detailing.
4. Provide gap in relief bent plate / angle at locations of veneer expansion joints.
5. Miter relief bent plate / angle at corners and provide prequalified complete joint penetration weld at both legs.

E. Align and adjust various members that form part of complete frame or structure before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that will be in permanent contact with members. 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.

F. Splice members only where indicated.

G. Do not use thermal cutting during erection unless specifically approved by the Engineer.

H. Do not enlarge unfair holes in members by burning or by using drift pins. Ream holes that must be enlarged to admit bolts.

I. Provide all bracing, temporary bracing and accessories required for complete erection. Safety and adequacy of bracing and temporary bracing are the Installer's responsibility.

J. After erection, remove weld flux, rust, dirt or other foreign material from areas to receive touch-up paint. Repaint areas where protective coating has been damaged or is missing with shop primer paint.

3.4 FIELD CONNECTIONS

A. Install and tighten high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A325 or A490 Bolts."

1. Bolts: ASTM A325 (ASTM A325M) high-strength bolts, unless otherwise indicated.
2. Connection Type: Unless snug tight connections are noted on the Drawings as being permitted, all bolts shall be tightened to full pretensioning load.

B. Do not reuse ASTM A490 bolts, galvanized A325 bolts or bolts that have been tensioned.

C. Weld Connections: Comply with AWS D1.1 for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding. Remove all cracks, pores, slag inclusions, incomplete fusions, and incomplete penetrations over ½" long in any weld and reweld.

1. Comply with AISC 303 and AISC 360 for bearing, adequacy of temporary connections, alignment, and removal of paint on surfaces adjacent to field welds.
2. Remove backing bars or runoff tabs where indicated, back gouge, and grind steel smooth.
3. Assemble and weld built-up sections by methods that will maintain true alignment of axes without warp.
4. The General Contractor shall provide a full-time trained Fire-Watch Captain with appropriate fire suppression equipment during all times that welding activities occur and a minimum of 60 minutes thereafter. This person shall be in addition to the workmen.

D. Remove all erection clips, gussets, bolts, and angles where exposed in the finished structure and where they interfere with other construction. Grind welds smooth where exposed.

3.5 QUALITY CONTROL

A. General: The Owner will to prepare test reports. Testing agency will conduct and interpret tests and state in each report whether tested Work complies with or deviates from requirements. Failure to detect any defective materials shall not prevent later rejection when such defect is discovered, or obligate the Architect or Owner for final acceptance.

1. See Section 014110 – Structural Special Inspections and Contract Drawings for testing and inspection to be performed.
2. Provide access for testing agency to places where structural steel work is being installed so that required inspection and testing can be accomplished.
3. The General Contractor shall provide the testing agency a complete set of approved shop drawings.
4. Reports will be delivered to the Architect, Engineer, Steel Fabricator and the General Contractor within one week of inspection.
5. Deviations from requirements of the contract documents will be reported in writing to the General Contractor within 24 hours.

B. Correct deficiencies in or remove and replace structural steel that inspections and test reports indicate do not comply with specified requirements.

3.6 REPAIRS AND PROTECTION

A. Touchup Priming: Immediately after erection, clean field welds, bolted connections, abraded areas of shop primer, and exposed areas where primer is damaged or missing. Apply primer using same material as used for shop painting to comply with SSPC-PA 1 for touching up shop painted surfaces.

1. Clean and prepare surfaces by SSPC-SP 2 hand-tool cleaning or SSPC-SP 3 power-tool cleaning for standard primers and SSPC-SP6 Commercial Blast Cleaning for zinc-rich primers.
2. Apply by brush or spray to provide a minimum dry film thickness of 1.5 mils (0.038 mm).
3. Steel erector shall document with photographs and written correspondence to General Contractor/Construction Manager the condition of primer immediately following erection and Touchup Priming. All degradation of primed surfaces due to exposure, weather, or damage by other construction and trades shall be repaired by Painting Contractor through contract with the General Contractor/Construction Manager.

B. Coordination with Other Trades: Cleaning and primer touch up/repair that may be required as a result of, but not limited to, the following are not included in the scope of this specification section and are included to be included under Division 9 Section “Painting.”

C. ut not limited to, the following are not included in the scope of this specification section and are included to be included under Division 9 Section “Painting.”

1. Abrasions and rust from: bundling, banding, loading and unloading, chains, dunnage, cables and chains during erection, bridging, installation, and other jobsite handling.
2. Bolt heads and nuts.
3. Dirt.
4. Diesel smoke.
5. Road salt.
6. Weather conditions during storage and construction.

D. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and apply galvanizing repair paint according to ASTM A780. Minimum thickness requirements for the repair are those described in ASTM A123, Section 4.6.

E. Asphaltic Coating: After erection clean column base plates, anchor rod nuts, columns and other structural steel below grade up to finished floor. Clean bare steel surfaces to remove loose rust, loose mill scale, and spatter, slag, or flux deposits in accordance with SSPC-SP 2 “Hand Tool Cleaning.” Clean primed steel to be free of dirt and moisture. Apply coating by brush or spray to provide a minimum dry film thickness of 10 mils on rods, nuts, and structural steel up to bottom of slab on grade. Do not extend coating above grade.

F. nd Tool Cleaning.” Clean primed steel to be free of dirt and moisture. Apply coating by brush or spray to provide a minimum dry film thickness of 10 mils on rods, nuts, and structural steel up to bottom of slab on grade. Do not extend coating above grade.

G. t extend coating above grade.

3.7 CLEANING

A. All bare, primed, or galvanized steel to be left unpainted shall be thoroughly cleaned by solvent cleaning in accordance with latest edition of Steel Structures Painting Council Surface Preparation Specification No. 1 (SSPC-SP1). Hydrocarbon based solvents are prohibited.

END OF SECTION 05 12 00

SECTION 05 21 00 – STEEL JOIST FRAMING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. K-series open-web steel joists.
2. DLH-series deep-longspan steel joists.
3. Joist girders.
4. Joist accessories.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 1 Section “Structural Special Inspection.”
2. Division 3 Section “Cast-in-Place Concrete.”
3. Division 4 Section “Unit Masonry.”
4. Division 5 Section “Structural Steel Framing.”
5. Division 5 Section “Steel Decking.”
6. Division 9 Section “Painting.”

1.3 DEFINITIONS

A. Add-Load: A single vertical concentrated load that occurs at any one panel point along the joist chord.

B. Bend-Check Load: A vertical concentrated load used to design the joist chord for the additional bending stresses resulting from this load being applied at any location between the joist panel points. This load is already accounted for in the specified joist designation.

C. SJI: Steel Joist Institute overseeing manufacture of open web steel joists and girders.

D. Special Joists: Steel joists or joist girders requiring modification by manufacturer to support nonuniform, unequal, or special loading conditions that invalidate load tables in SJI's "Specifications."

1.4 PERFORMANCE REQUIREMENTS

A. Structural Performance: Engineer, fabricate, and erect joists and connections to withstand design loads within limits and under conditions required.

B. Deflection:

1. Standard Joists: Design standard joists to withstand SJI Standard Load Table design loads without deflections greater than the following:

   a. Live Load: Vertical deflection of 1/360 of the span.

2. Special Joists and Joist Girders: Design prescriptive joists to withstand loads as indicated without deflections greater than the following:

   a. Live Load: Vertical deflection of 1/360 of the span.
   b. Total Load: Vertical deflection of 1/240 of the span.

3. Cantilevered top chord extensions: Design loads for cantilevered ends shall be per SJI extension type where type is labeled on structural details or to match uniform load capacity of the joist where the extension is shown, but not labeled. Design cantilevered ends to withstand loads as indicated without deflections greater than the following:

   a. Live Load: Vertical deflection of 1/180 of the cantilever span.
   b. Total Load: Vertical deflection of 1/120 of the cantilever span.

C. Loading:

1. Load data are given at service-load level.
2. Joist sizes have been selected using uniform loading shear and moment envelopes which encapsulate the non-uniform design loading.
3. Unless stipulated otherwise on the drawings, concentrated loads from gravity forces are already accounted for in the joist designation.
4. All joists shall be designed for a bend check from incidental loads on bottom chords. Design for a bend-check on the top and bottom chords of 250 lbs applied concentrically to the bottom chord (between the double angles) and of 100 lbs applied eccentrically to the bottom angle (through the neutral axis of one of the double angles) applied anywhere along the bottom chord. The concentric and the eccentric loads will not occur simultaneously.
5. Wind net uplift on joists for the design of joist chords and bridging by the manufacturer shall be calculated by the joist manufacturer using the minimum dead load provided and either the component and cladding wind load and end zone widths provided in the General Notes or by calculating accurate loading and zone widths under the direction of a professional engineer engaged by the manufacturer. Under no circumstance shall wind end zone design width be less than 15 feet to allow for some future addition.

D. Engineering Responsibility: Engage a joist manufacturer who utilizes a qualified professional engineer to prepare design calculations, shop drawings, and other structural data for steel joists.

1.5 ACTION SUBMITTALS

A. General: Furnish submittals in quantity, format, and other Conditions of the Contract and as specified in Division 1 of the Project Manual.

B. Shop Drawings showing layout, mark, number, type, location, and spacings of joists. Include joining and anchorage details, bracing, bridging, accessories, splice and connection details, and attachments to other units of Work.

1. For joists indicated to comply with certain design loadings, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
2. Shop drawings which show the Architect's or Engineer's title block, logo and/or seal will be rejected and returned unchecked.
3. Computer generated electronic structural construction document files (ACAD) will be made available to the Contractor. The Contractor will be required to sign the Engineer's standard release of liability form prior to receiving the drawing files. Rules for use of said files shall be as defined in the AISC "Code of Standard Practice for Steel Buildings and Bridges," Section 4.3.
4. Shop drawing resubmittals are reviewed for conformance with review marks only. Any changes or questions originating on a resubmittal shall be clearly clouded.

1.6 INFORMATIONAL SUBMITTALS

A. General: Furnish submittals in quantity, format, and other Conditions of the Contract and as specified in Division 1 of the Project Manual.

B. 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.

C. Material certificates signed by joist manufacturer certifying that joists comply with SJI's "Specifications."

D. Mill certificates signed by manufacturers of bolts certifying that their products comply with specified requirements.

E. Welder certificates signed by Contractor certifying that welders comply with requirements specified under the "Quality Assurance" Article.

F. Research reports or evaluation reports of the model code organization acceptable to authorities having jurisdiction that evidence joists' compliance with the Kentucky Building Code.

G. Fabricators who participate in the certified Quality Certification Program shall submit, at the completion of fabrication, a certificate of compliance stating that the work was performed in accordance with the approved construction documents.

1.7 QUALITY ASSURANCE

A. Manufacturer Qualifications: Engage a firm experienced in manufacturing joists similar to those indicated for this Project and that have a record of successful in-service performance.

1. Manufacturer must be certified by SJI to manufacture joists conforming to SJI standard specifications and load tables.

B. Comply with applicable provisions of the following specifications and documents, except where noted otherwise on the structural drawings and specifications:

1. SJI Design Standard: Comply with recommendations of SJI's "Standard Specifications Load Tables and Weight Tables for Steel Joists and Joist Girders," applicable to types of joists indicated.
2. SJI Code of Standard Practice for Steel Joists and Joist Girders.

C. Welding Standards: Comply with applicable provisions of Steel Joist Institute Technical Digest 8 "Welding of Open-Web Steel Joists and Joist Girders" and applicable provisions of AWS D1.1 "Structural Welding Code – Steel" and AWS D1.3 "Structural Welding Code – Sheet Steel."

1. Certify that each welder has satisfactorily passed AWS qualification tests for welding processes involved and, if pertinent, has undergone recertification.

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 joists that are similar to those indicated for this Project in material, design, and extent.

E. t in material, design, and extent.

1.8 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 requirements of SJI's "Specifications" for chord and web section material.

B. Carbon-Steel Bolts and Threaded Fasteners: ASTM A 307, Grade A (ASTM F 568, Property Class 4.6), carbon-steel, hex-head bolts and threaded fasteners; carbon-steel nuts; and flat, unhardened steel washers.

1. Finish: Plain, noncoated.

C. Medium Carbon Steel High-Strength Bolts, Nuts, and Washers: ASTM A325, Type 1, heavy hex steel structural bolts; ASTM A563 heavy hex carbon-steel nuts; and ASTM F436 hardened carbon-steel washers, uncoated. Use ordinary bolts, washers, and nuts only where required for installation

access, where bolts are called to be galvanized, and at contractor's option for snug-tight installation applications.

1. Finish: Plain, uncoated.

D. Welding Electrodes: Comply with AWS standards.

2.2 PRIMERS

A. Primer: SSPC-Paint 15.

B. VOC compliance certificate signed by manufacturers certifying compliance of their products with regulations of authorities having jurisdiction over volatile organic compounds (VOCs).

2.3 STEEL JOISTS

A. Manufacture joists according to SJI's "Specifications," with steel angle top and bottom chord members, and as follows:

1. Joist Type: K-series steel joists.
2. Joist Type: DLH-series steel joists.
3. End Arrangement: Underslung.
4. End Arrangement: Underslung with bottom chord extensions.
5. Top Chord Arrangement: Parallel.

6. Top Chord Arrangement: Pitchedtwo ways, see plans.

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 where shown for securing other work to steel joists.

D. Extend top chords of joists with SJI Type S or R top chord extensions where indicated, complying with SJI's "Specifications" and load tables.

E. Camber steel joists according to SJI's "Specifications."

F. Equip bearing ends of joists with manufacturer's standard beveled ends or sloped shoes when joist slope exceeds ¼ inch in 12 inches (1:48). Equip bearing ends with deep shoes where non-standard seat depths are specified.

2.4 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.

B. Bridging: Fabricate bridging as indicated and according to SJI requirements.

1. Supply additional bridging to ensure stability of structure during construction period.

C. Supply ceiling extensions, either extended bottom chord elements or a separate extension unit of sufficient strength to support ceiling construction. Extend ends to within ½ inch (13 mm) of finished wall surface, unless otherwise indicated.

D. Supply miscellaneous accessories, including splice plates and bolts required by the joist manufacturer to complete the joist installation.

2.5 SHOP PAINTING

A. Surface Preparation: Clean and remove loose scale, heavy rust, and other foreign materials from fabricated joists and accessories to be primed by either 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 thickness of not less than 1 mil. Primer may be applied by standard dip coating and per SJI Code of Standard Practice may include drips, runs, and sags.

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 of joists. Do not proceed with installation until 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 recommendations, and the requirements of 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 bridging, connections, and anchors to ensure joists are stabilized during construction.

C. Field weld joists to supporting steel framework and steel bearing plates. Coordinate welding sequence and procedure with placing of joists.

1. 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 columns and framework, as required to meet OSHA requirements, using carbon-steel bolts at K-Series joists and high-strength structural bolts DLH-series joists.

1. Comply with the Research Council on Structural Connections' (RCSC) "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 where terminating at walls or beams.

3.3 QUALITY CONTROL

A. General: The Owner will engage an independent testing and inspecting agency to perform inspections and tests and to prepare test reports. Testing agency will conduct and interpret tests and state in each report whether tested Work complies with or deviates from requirements. Failure to detect any defective materials shall not prevent later rejection when such defect is discovered, or obligate the Architect or Owner for final acceptance.

1. See Section 014110 – Structural Special Inspections and Contract Drawings for testing and inspection to be performed.
2. Provide access for testing agency to places where structural steel joist work is being installed so that required inspection and testing can be accomplished.
3. The General Contractor shall provide the testing agency a complete set of approved shop drawings.
4. Reports will be delivered to the Architect, Engineer, Steel Fabricator and the General Contractor within one week of inspection.
5. Deviations from requirements of the contract documents will be reported in writing to the General Contractor within 24 hours.

B. Correct deficiencies in or remove and replace structural steel joists that inspections and test reports indicate do not comply with specified requirements.

3.4 REPAIRS AND PROTECTION

A. Repair damaged galvanized coatings on exposed surfaces with galvanized repair paint according to ASTM A 780 and the manufacturer's instructions.

B. Touch Up Painting: Following installation, promptly clean, prepare, and prime or reprime field connections, 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. Coordination with Other Trades: Cleaning and primer touch up/repair that may be required as a result of, but not limited to, the following are not included in the scope of this specification section and are included to be included under Division 9 Section “Painting.”

1. Abrasions and rust from: bundling, banding, loading and unloading, chains, dunnage, cables and chains during erection, bridging, installation, and other jobsite handling.
2. Dirt.
3. Diesel smoke.
4. Road salt.
5. Weather conditions during storage and construction.

D. Provide final protection and maintain conditions, in a manner acceptable to Manufacturer and Installer, that ensure that joists and accessories are without damage or deterioration at the time of Substantial Completion.

END OF SECTION 05 21 00

SECTION 05 31 00 – STEEL DECKING

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Steel roof deck.
2. Acoustical steel roof deck.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 1 Section “Structural Special Inspection.”
2. Division 3 Section “Cast-in-Place Concrete.”
3. Division 5 Section “Structural Steel Framing.”
4. Division 5 Section “Steel Joist Framing.”
5. Division 9 Section “Painting.”

1.3 ACTION SUBMITTALS

A. General: Furnish submittals in quantity, format, and other Conditions of the Contract and as specified in Division 1 of the Project Manual.

B. Product data including manufacturer’s specifications and installation instructions for each type of deck, accessory, and product specified.

C. Shop drawings showing layout and types of deck panels, anchorage details, reinforcing channels, pans, deck openings, special jointing, accessories, and attachments to other construction.

1. Shop drawings which show the Architect’s or Engineer’s title block, logo and/or seal will be rejected and returned unchecked.
2. Computer generated electronic structural construction document files (ACAD) will be made available to the Contractor. The Contractor will be required to sign the Engineer’s standard release of liability form prior to receiving the drawing files. Rules for use of said files shall be as defined in the AISC “Code of Standard Practice for Steel Buildings and Bridges,” Section 4.3.
3. Shop drawing resubmittals are reviewed for conformance with review marks only. Any changes or questions originating on a resubmittal shall be clearly clouded.

1.4 INFORMATIONAL SUBMITTALS

A. General: Furnish submittals in quantity, format, and other Conditions of the Contract and as specified in Division 1 of the Project Manual.

B. Product certificates signed by manufacturers of steel deck certifying that their products comply with specified requirements.

C. Welder certificates signed by Contractor certifying that welders comply with requirements specified under the “Quality Assurance” Article.

1.5 QUALITY ASSURANCE

A. Codes and Standards: Comply with provisions of the following codes and standards, except as otherwise indicated.

1. American Iron and Steel Institute (AISI), “Specification for the Design of Cold-Formed Steel Structural Members.”
2. American Welding Society (AWS), D1.3 “Structural Welding Code – Sheet Steel”.
3. Steel Deck Institute (SDI), “Design Manual for Composite Decks, Form Decks and Roof Decks.”

B. Installer Qualifications: Engage an experienced Installer who has completed steel deck similar in material, design, and extent to that indicated for this Project and with a record of successful in-service performance.

C. Welding Standards: Comply with applicable provisions of AWS D1.1 “Structural Welding Code – Steel” and AWS D1.3 “Structural Welding Code – Sheet Steel.”

1. Certify that each welder has satisfactorily passed AWS qualification tests for welding processes involved and, if pertinent, has undergone recertification.

1.6 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.

1.7 COORDINATION

A. Coordinate installation of sound-absorbing insulation strips in acoustic deck ribs with related units of Work specified in other Sections to ensure that the insulation is protected against damage from effects of the weather and other causes.

B. Coordinate installation of trench headers, preset inserts, and duct fittings in cellular metal floor deck with related units of Work specified in other Sections prior to casting concrete slab.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the Work include, but are not limited to, the following:

1. American Buildings Co.
2. Epic Metals Corp.
3. Marlyn Steel Products, Inc.
4. New Millennium Building Systems, LLC.
5. Robertson A United Dominion Co.
6. Roof Deck, Inc.
7. United Steel Deck, Inc.
8. Verco Manufacturing Co.
9. Vulcraft Div. Of Nucor Corp.

2.2 ROOF DECK

A. Steel Roof Deck: Fabricate panels without top-flange stiffening grooves conforming to SDI Publication No. 28 “Specifications and Commentary for Steel Roof Deck” and the following:
1. Galvanized and Shop-Primed Steel Sheet: ASTM A 446, Grade A, G 60 zinc coated according to ASTM A 653; cleaned, pretreated, and primed with manufacturer’s baked-on, lead- and chromate-free rust-inhibitive primer.
2. Deck Profile: Type NR, narrow rib.
3. Profile Depth: as indicated on drawings.
4. Design Uncoated-Steel Thickness: 0.0358 inch.
5. Span Condition: As indicated on drawings.
6. Side Joints: nested.

B. Acoustical Steel Roof Deck: Fabricate panels without top-flange stiffening grooves conforming to SDI Publication No. 28 “Specifications and Commentary for Steel Roof Deck” and the following:

1. Prime-Painted Steel Sheet: ASTM A 611, Grade as required to comply with SDI specifications; shop primed as follows:

   a. Shop Primer: Grey or white baked-on, lead- and chromate-free, rust-inhibitive primer, conforming to the performance requirements of FS TT-P-664.

2. Galvanized-Steel Sheet: ASTM A 446, Grade A, G 60 zinc coated according to ASTM A 653.
3. Galvanized-Steel Sheet: ASTM A 446, Grade A, G 90 zinc coated according to ASTM A 653.

4. Galvanized and Shop-Primed Steel Sheet: ASTM A 446, Grade A, G 60 zinc coated according to ASTM A 653; cleaned pretreated, and primed with manufacturer's baked-on, lead- and chromate free, rust-inhibitive primer.
5. Deck Profile: Type WR, wide rib.
6. Profile Depth: as indicated on drawings.
7. Design Uncoated-Steel Thickness: 0.0358 inch.
8. Span Condition: As indicated on drawings.
9. Side Joints: Interlocking seam.
10. Acoustical Perforations and Sound Insulation: Deck panels with manufacturer's standard perforated vertical webs and acoustical batts.
11. Noise Reduction: 0.95 NRC minimum.
12. Acoustical Perforations and Sound Insulation: Cellular deck panels with manufacturers' standard perforated flat-bottom plate welded to ribbed deck and acoustical batts.

    a. Acoustical Performance: NRC 0.80, tested according to ASTM C 423.
    b. Acoustical Performance: NRC 0.85, tested according to ASTM C 423.
    c. Acoustical Performance: NRC 0.90, tested according to ASTM C 423.

2.3 ACCESSORIES

A. General: Provide accessory materials for steel deck that comply with requirements indicated and recommendations of the steel deck manufacturer.

B. Mechanical Fasteners: Manufacturer's standard, corrosion-resistant, low-velocity, powder-actuated or pneumatically driven carbon steel fasteners; or self-drilling, self-threading screws.

C. Self Drilling Steel Screws: Manufacturer's standard hexagonal washer head, self-drilling, carbon steel screws. Screws shall be zinc electroplated to 5µm (minimum) thickness in accordance with ASTM B633 SC1 Type III. Select point type and size and thread length per manufacturer's recommendations to fully engage in the base material.

    1. Available Products: Subject to compliance with requirements, products that may be incorporated in the Work include, but are not limited to, the following:

        a. Hilti S-MD.

D. Powder or Pneumatic Fasteners: Modified AISI 1070 steel, minimum hardness 54 Rockwell C, minimum tensile strength of 285 ksi, and minimum shear strength of 175 ksi; with zinc plating equivalent to ASTM B633, Type III Fe/Zn 5 (5µm min.). Fasteners shall have knurled shanks, forged ballistic point, and minimum 12 mm steel washers for bar joists and 15 mm steel washers for structural steel.

    1. Available Products: Subject to compliance with requirements, products that may be incorporated in the Work include, but are not limited to, the following:

a. Bar Joist and Structural Steel with thickness of 1/8” up to and including 3/8”: Hilti X-HSN 24.
b. Structural Steel 1/4” or thicker: Hilti X-ENP-19 L15.

E. Sound-Absorbing Insulation: Manufacturer’s standard premolded roll or strip glass fiber or mineral fiber.

F. Miscellaneous Roof Deck Accessories: Steel sheet, 0.0359-inch-thick minimum ridge and valley plates, finish strips, and reinforcing channels, of same material as roof deck.

G. Pour Stops and Girder Fillers: Steel sheet, of same material as deck panels, and of thickness and profile as required per SDI Publication No. 28.

H. Column Closures, End Closures, Z-Closures, and Cover Plates: Steel sheet, of same material and thickness as deck panels, unless otherwise indicated.

I. Hanger Tabs: Manufacturer’s standard piercing steel sheet hanger attachment devices for floor deck panels.

J. Weld Washers: Manufacturer’s standard uncoated-steel sheet weld washers, shaped to fit deck rib, 0.0598 inch thick with 3/8-inch minimum diameter prepunched hole.

K. Recessed Sump Pans: Manufacturer’s standard size, single piece steel sheet 0.071-inch- thick minimum, of same material as deck panels, with 1-1/2-inch- minimum deep level recessed pans and 3-inch-wide flanges. Cut holes for drains in the field.

L. Flat Receiver Pan: Manufacturer’s standard size, single-piece steel sheet, 0.071-inch-thick minimum units, of same material as deck panels. Cut holes for drains in the field.

M. Steel Sheet Accessories: ASTM A 446, G 60 coating class, galvanized according to ASTM A 653.

N. Galvanizing Repair Paint: SSPC-Paint 20 or DOD-P-21035, with dry film containing a minimum of 94 percent zinc dust by weight. Subject to compliance with requirements, products that may be incorporated in the work include, but are not limited to, the following:

1. ZRC Galvilite, ZRC Worldwide.

O. Preset Inserts: Manufacturer’s standard, UL-labeled single-piece preset inserts, fabricated from either steel sheet galvanized according to ASTM A 653, G 60 coating class, or zinc sheet, with removable covers.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Examine supporting framing and field conditions for compliance with requirements for installation tolerances and other conditions affecting performance of steel deck.

3.2 PREPARATION

A. Do not place deck panels on concrete supporting structure until concrete has cured and is dry.

B. Locate decking bundles to prevent overloading of supporting members.

3.3 INSTALLATION, GENERAL

A. Install deck panels and accessories according to applicable specifications and commentary of SDI Publication No. 28, manufacturer's recommendations, and requirements of this Section.

B. Install temporary shoring before placing deck panels when required to meet deflection limitations.

C. Place deck panels on supporting framing and adjust to final position with ends accurately aligned and bearing on supporting framing before being permanently fastened. Do not stretch or contract side lap interlocks.

1. Align cellular deck panels for entire length of run of cells and align cells at ends of abutting panels.

D. Place deck panels flat and square and fasten to supporting framing without warp or deflection.

E. Cut and neatly fit deck panels and accessories around openings and other work projecting through or adjacent to the decking.

F. Provide additional reinforcement and closure pieces at openings as required for strength, continuity of decking, and support of other work.

G. Comply with AWS requirements and procedures for manual shielded metal arc welding, appearance and quality of welds, and methods used in correcting welding work. All welds sizes stipulated on drawings or specification shall be effective (not visible) diameter/length.

H. Do not use deck units for storage or working platforms.

I. Where options in fastening methods are given, fastening method of deck shall be compatible with supporting framing; including consideration for thickness of supporting steel.

3.4 ROOF DECK INSTALLATION

A. Specified roof deck fastening is unless noted otherwise in the Construction Drawings.

B. Fasten roof deck panels to steel supporting members as follows:

1. Fasten to structural steel supporting members with self-drilling No. 12- diameter or larger carbon steel screws or powder actuated fasteners at each support.
2. Fastener Spacing: Screw or pin deck units at ends and all intermediate supports. Space fasteners a maximum of 12 inches on center, with a minimum of four fasteners per unit at each support.

C. Side Lap Fastening: Fasten side laps between supports at intervals not exceeding 36 inches with self-drilling No. 10- diameter or larger carbon steel screws.

D. Perimeter Edge Fastening:

1. Fasten perimeter edges of deck to steel supporting members and angles with No. 12- diameter or larger carbon steel screws or powder actuated fasteners spaced a maximum of 12 inches on center.

E. End Bearing: Install deck ends over supporting framing with a minimum end bearing of 1-1/2 inches, with end joints as follows:

1. End Joints: Lapped 2 inches minimum.

F. Where layout of deck does not align bottom flute with edge angles / structure for complete perimeter fastening, provide continuous z-plate along deck edge and fasten to structure and deck in accordance with perimeter edge fastening requirements.

G. Roof Sump Pans and Sump Plates: Install over openings provided in roof decking, and screw flanges to top of deck. Space screws not more than 12 inches apart with at least one screw at each corner.

H. Miscellaneous Roof Deck Accessories: Install ridge and valley plates, finish strips, cover plates, end closures, and reinforcing channels according to deck manufacturer's recommendations. Screw to substrate to provide a complete deck installation.

I. Flexible Closure Strips: Install flexible closure strips over partitions, walls, and where indicated. Install with adhesive according to manufacturer's instructions to ensure complete closure.

J. Sound-Absorbing Insulation: Install premolded, roll or strip sound-absorbing insulation according to deck manufacturer's instructions.

3.5 QUALITY CONTROL

A. General: The Owner will engage an independent testing and inspecting agency to perform inspections and tests and to prepare test reports. Testing agency will conduct and interpret tests and state in each report whether tested Work complies with or deviates from requirements. Failure to detect any defective materials shall not prevent later rejection when such defect is discovered, or obligate the Architect or Owner for final acceptance.

1. See Section 014110 – Structural Special Inspections and Contract Drawings for testing and inspection to be performed.
2. Provide access for testing agency to places where steel decking work is being installed so that required inspection and testing can be accomplished.
3. The General Contractor shall provide the testing agency a complete set of approved shop drawings.
4. Reports will be delivered to the Architect, Engineer, Steel Fabricator and the General Contractor within one week of inspection.
5. Deviations from requirements of the contract documents will be reported in writing to the General Contractor within 24 hours.
6. Correct deficiencies in or remove and replace steel deck that inspections and test reports indicate do not comply with specified requirements.

3.6 REPAIRS AND PROTECTION

A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on both surfaces with galvanized repair paint according to ASTM A 780 and the manufacturer's instructions.

B. Touchup Painting: Wire brush, clean, and paint scarred areas, welds, and rust spots on both surfaces of installed deck panels.

1. Touch up painted surfaces with same type of shop paint used on adjacent surfaces.
2. Where shop-painted surfaces are exposed in-service, apply touchup paint to blend into adjacent surfaces.

END OF SECTION 05 31 00

SECTION 05 40 00 – COLD-FORMED METAL FRAMING – STRUCTURAL

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:
1. Exterior non-load-bearing curtain-wall framing.
2. Ceiling joist framing.

B. Related Sections include the following:

1. Division 1 Section “Structural Special Inspection.”
2. Division 6 Section “Rough Carpentry.”
3. Division 9 Section “Gypsum Board Assemblies.”

1.3 DEFINITIONS

A. Minimum Base Steel Thickness: Minimum base thickness of cold-formed framing delivered to the Project site shall be not less than 95 percent of the thickness used in the cold-formed framing design. Lesser thicknesses shall be permitted at bends due to cold forming.

B. Producer: Entity that produces steel sheet coil fabricated into cold-formed members.

1.4 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide cold-formed metal framing capable of withstanding design loads within limits and under conditions indicated.

1. Design Loads: As indicated.

2. Deflection Limits: Design framing systems to withstand design loads without deflections greater than the following:
a. Exterior Non-Load-Bearing Curtain-Wall Framing: Horizontal deflection of 1/360 of the wall height.
b. Ceiling Joist Framing: Vertical deflection of 1/360 of the span.

3. Design framing systems to provide for movement of framing members without damage or overstressing, sheathing failure, connection failure, undue strain on fasteners and anchors, or other detrimental effects when subject to a maximum ambient temperature change of 120 deg F**.**

4. Design framing system to maintain clearances at openings, to allow for construction tolerances, and to accommodate live load deflection of primary building structure as follows:

    a. Upward and downward movement of 1-1/2 inches.

B. Design exterior non-load-bearing curtain-wall framing to accommodate horizontal deflection without regard for contribution of sheathing materials.

1.5 ACTION SUBMITTALS

A. General: Furnish submittals in quantity, format, and other Conditions of the Contract and as specified in Division 1 of the Project Manual.

B. Product Data: For each type of cold-formed metal framing product and accessory indicated.

C. Shop Drawings: Show layout, spacings, sizes, thicknesses, and types of cold-formed metal framing; fabrication; and fastening and anchorage details, including mechanical fasteners. Show reinforcing channels, opening framing, supplemental framing, strapping, bracing, bridging, splices, accessories, connection details, and attachment to adjoining Work.

1. For cold-formed metal framing indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

2. esponsible for their preparation.
3. Shop drawings which show the Architect's or Engineer's title block, logo and/or seal will be rejected and returned unchecked.
4. Computer generated electronic structural construction document files (ACAD) will be made available to the Contractor. The Contractor will be required to sign the Engineer's standard release of liability form prior to receiving the drawing files. Rules for use of said files shall be as defined in the AISC "Code of Standard Practice for Steel Buildings and Bridges," Section 4.3.
5. Shop drawing resubmittals are reviewed for conformance with review marks only. Any changes or questions originating on a resubmittal shall be clearly clouded.

1.6 INFORMATIONAL SUBMITTALS

A. General: Furnish submittals in quantity, format, and other Conditions of the Contract and as specified in Division 1 of the Project Manual.

B. Product Test Reports: From a qualified testing agency indicating that each of the following complies with requirements, based on comprehensive testing of current products:

1. Expansion anchors.
2. Power-actuated anchors.
3. Mechanical fasteners.
4. Vertical deflection clips.

5. Miscellaneous structural clips and accessories.

C. Research/Evaluation Reports: Evidence of cold-formed metal framing's compliance with building code in effect for Project, from a model code organization acceptable to authorities having jurisdiction.

1.7 QUALITY ASSURANCE

A. Codes and Standards: Comply with provisions of the following codes, specifications, and standards, except where more stringent requirements are shown or specified. Each contractor having reference to AISI Documents shall maintain copies of same on project site.

1. AISI S202-11: Code of Standard Practice.
2. AISI S200-12: General Provisions.
3. AISI S201-12: Product Standard.
4. AISI S210-07(2012): Floor and Roof System Design.
5. AISI S211-07(2012): Wall Stud Design.
6. AISI S212-07(2012): Header Design.
7. AISI S213-07/S1-09 (2012): Lateral Design.

B. Manufacturer Qualifications: Member in good standing of the Steel Framing Industry Association (SFIA) or be a part of a similar organization that provides verifiable code compliance program.

C. Installer Qualifications: An experienced installer who has completed cold-formed metal framing 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.

D. Engineering Responsibility: Engage a qualified professional engineer to prepare design calculations, Shop Drawings, and other structural data.

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 cold-formed metal framing that are similar to those indicated for this Project in material, design, and extent.

F. ct in material, design, and extent.

G. Product Tests: Mill certificates signed by steel sheet producer or test reports from a qualified independent testing agency indicating steel sheet complies with requirements, including base steel thickness, yield strength, tensile strength, total elongation, chemical requirements, ductility, and galvanized-coating thickness.

H. Code-Compliance Certification of Studs and Tracks: Provide documentation that framing members are certified according to the product-certification program of the Steel Framing Industry Association (SFIA), or be a part of a similar organization that provides verifiable code compliance program.

I. Welding: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code-Steel," and AWS D1.3, "Structural Welding Code-Sheet Steel."

J. AISI Specifications: Comply with AISI's "Specification for the Design of Cold-Formed Steel Structural Members" for calculating structural characteristics of cold-formed metal framing.Co

1.8 DELIVERY, STORAGE, AND HANDLING

A. Protect cold-formed metal framing from corrosion, moisture staining, deformation, and other damage during delivery, storage, and handling as required in AISI's "Code of Standard Practice".

B. Store cold-formed metal framing, protect with a waterproof covering, and ventilate to avoid condensation.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering cold-formed metal framing that may be incorporated into the Work include, but are not limited to, the following:

1. ClarkDietrich Building Systems.
2. Consolidated Fabricators Corp.
3. J.N. Linrose
4. Scafco Corp.
5. Steel Construction Systems.
6. Steeler, Inc.
7. Super Stud Building Products, Inc.
8. United Metal Products, Inc.

2.2 MATERIALS

A. Framing Members, General: Comply with ASTM C 955 for conditions indicated.

B. Steel Sheet: ASTM A 1003/A 1003M, Structural Grade, Type H, metallic coated, of grade and coating designation as follows:

1. Grade: 33 for minimum base steel thickness of 0.0428 inch and less; 50, Class 1 or 2 for minimum base steel thickness of 0.0538 inch and greater, unless noted otherwise.
2. Coating: G60unless noted otherwise.

C. Steel Sheet for all studs, track, clips, plate, etc.: ASTM A 653/A 653M, structural steel, zinc coated, of grade and coating as follows:

1. Grade: As required by structural performance.

2. Grade: 33 for minimum base steel thickness of 0.0428 inch and less; 50 for minimum base steel thickness of 0.0538 inch and greater.
3. Coating: G60**.**

2.3 NON-LOAD-BEARING CURTAIN-WALL FRAMING

A. Steel Studs: Manufacturer's standard C-shaped steel studs, of web depths indicated, punched, with stiffened flanges, complying with ASTM C 955, and as follows:

1. Minimum Base-Steel Thickness:0.0428 inch**.**
2. Flange Width: 1-5/8 inches**.**

B. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with unstiffened flanges, complying with ASTM C 955, and as follows:

C. Minimum Base-Steel Thickness: 0.0329 inch Flange Width: 1-1/4 inches**.**

D. Single Slotted-Flange Deflection Track: Manufacturer's single, deep-leg, U-shaped steel track; unpunched, with unstiffened flanges containing vertical slots, of web depth to contain studs while allowing free vertical movement, with flanges and flange slots designed to support horizontal and lateral loads and transfer them to the primary structure

E. Single Deflection Track: Manufacturer's single, deep-leg, U-shaped steel track; unpunched, with unstiffened flanges, of web depth to contain studs while allowing free vertical movement, with flanges designed to support horizontal and lateral loads and transfer them to the primary structure, and as follows:

1. Minimum Base-Steel Thickness: 0.0428 inch
2. Flange Width: 2 inches, minimum.

2.4 CEILING JOIST FRAMING

A. Steel Ceiling Joists: Manufacturer's standard C-shaped steel sections, of web depths indicated, unpunched, with stiffened flanges, complying with ASTM C 955, and as follows:

1. Minimum Base-Steel Thickness: 0.0428 inch**.**
2. Flange Width: 1-5/8 inches, minimum.

2.5 FRAMING ACCESSORIES

A. Fabricate steel-framing accessories of the same material and finish used for framing members, with a minimum yield strength of 33,000 psi.

B. Provide accessories of manufacturer's standard thickness and configuration, unless otherwise indicated, as follows:

1. Supplementary framing.

2. Bracing, bridging, and solid blocking.
3. Web stiffeners.
4. End clips.
5. Foundation clips.
6. Anchor clips.
7. Gusset plates.
8. Stud kickers, knee braces, and girts.
9. Joist hangers and end closures.
10. Hole reinforcing plates.
11. Backer plates.

2.6 ANCHORS, CLIPS, AND FASTENERS

A. Steel Shapes and Clips: ASTM A 36/A 36M, zinc coated by hot-dip process according to ASTM A 123.

B. Expansion Anchors: Fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load equal to 5 times design load, as determined by testing per ASTM E 488 conducted by a qualified independent testing agency.

C. Power-Actuated Anchors: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load equal to 10 times design load, as determined by testing per ASTM E 1190 conducted by a qualified independent testing agency.

D. ualified independent testing agency.

E. Mechanical Fasteners: Corrosion-resistant-coated, self-drilling, self-threading steel drill screws.

1. Head Type: Low-profile head beneath sheathing, manufacturers' standard elsewhere.

F. Welding Electrodes: Comply with AWS standards.

2.7 MISCELLANEOUS MATERIALS

A. Galvanizing Repair Paint: SSPC-Paint 20.

2.8 FABRICATION

A. Fabricate cold-formed metal framing and accessories plumb, square, and true to line, and with connections securely fastened, according to manufacturer's written recommendations and requirements in this Section.

1. Fabricate framing assemblies using jigs or templates.
2. Cut framing members by sawing or shearing; do not torch cut.
3. Fasten cold-formed metal framing members by welding. Wire tying of framing members is not permitted. Comply with AWS D1.3 requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.

4. Fasten cold-formed metal framing members by welding or screw fastening, as standard with fabricator. Wire tying of framing members is not permitted.

    a. Comply with AWS D1.3 requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
    b. Locate mechanical fasteners and install according to Shop Drawings, with screw penetrating joined members by not less than three exposed screw threads.

5. Fasten other materials to cold-formed metal framing by welding, bolting, or screw fastening, according to Shop Drawings.

B. Reinforce, stiffen, and brace framing assemblies to withstand handling, delivery, and erection stresses. Lift fabricated assemblies to prevent damage or permanent distortion.

C. Fabrication Tolerances: Fabricate assemblies level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet and as follows:

1. Spacing: Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.
2. Squareness: Fabricate each cold-formed metal framing assembly to a maximum out-of-square tolerance of 1/8 inch.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Examine supporting substrates and abutting structural framing for compliance with requirements for installation tolerances and other conditions affecting performance. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

A. Cold-formed metal framing may be shop or field fabricated for installation, or it may be field assembled.

B. Install cold-formed metal framing according to ASTM C 1007, AISI S240 “North American Standard for Cold-Formed Steel Structural Framing”, and manufacturer’s written instructions, unless more stringent requirements are indicated.

C. Install shop- or field-fabricated, cold-formed framing and securely anchor to supporting structure.

1. Bolt or weld wall panels at horizontal and vertical junctures to produce flush, even, true-to-line joints with maximum variation in plane and true position between fabricated panels not exceeding 1/16 inch.

D. Install cold-formed metal framing and accessories plumb, square, and true to line, and with connections securely fastened, according to manufacturer's written recommendations and requirements in this Section.

1. Cut framing members by sawing or shearing, do not torch cut.
2. Fasten cold-formed metal framing members by welding or screw fastening, as standard with fabricator. Wire tying of framing members is not permitted.

a. Comply with AWS D1.3 requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
b. Locate mechanical fasteners and install according to Shop Drawings, with screw penetrating joined members by not less than three exposed screw threads.

E. Install framing members in one-piece lengths, unless splice connections are indicated for track or tension members.

F. Install temporary bracing and supports to secure framing and support loads comparable in intensity to those for which structure was designed. Maintain braces and supports in place, undisturbed, until entire integrated supporting structure has been completed and permanent connections to framing are secured.

G. Do not bridge building expansion and control joints with cold-formed metal framing. Independently frame both sides of joints.

H. Install insulation in built-up exterior framing members, such as headers, sills, boxed joists, and multiple studs at openings, that are inaccessible on completion of framing work.

I. Fasten hole reinforcing plate over web penetrations that exceed size of manufacturer's standard punched openings.

J. Erection Tolerances: Install cold-formed metal framing level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet and as follows:

1. Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.

K. Mechanical fasteners shall be spaced a minimum of 3 fastener diameters apart. Screw fasteners shall be installed such that a minimum of 3 screw threads are exposed.

L. Bearing surfaces shall be uniform.

M. Install continuous neoprene sealer gaskets at the underside of wall bottom track or rim track and at the top of foundation wall or slab at stud or joist locations.

3.3 NON-LOAD-BEARING CURTAIN-WALL INSTALLATION

A. Install continuous tracks sized to match studs. Align tracks accurately and securely anchor to supporting structure as indicated.

B. Fasten both flanges of studs to top and bottom track, unless otherwise indicated. Do not fasten studs to top deflection track. Space studs as follows:

1. Stud Spacing: 16 inches

C. Set studs plumb, except as needed for diagonal bracing or required for nonplumb walls or warped surfaces and similar requirements.

D. Isolate non-load-bearing steel framing from building structure to prevent transfer of vertical loads while providing lateral support.

1. Install slotted-deflection tracks and anchor to building structure.
2. Install single deep-leg deflection tracks and anchor to building structure.
3. Install double deep-leg deflection tracks and anchor outer track to building structure.
4. Connect vertical deflection clips to bypassing and infill studs and anchor to primary building structure.
5. Screws in vertical slots of deflection tracks or clips shall be positioned as necessary to permit the intended independent building structure movement.
6. Stud ends connecting to slotted-deflection tracks or within flange of single deflection tracks shall be held back from track web as required to permit the intended independent building structure movement while still maintaining the required horizontal support capacity, see details.

E. Install horizontal bridging in curtain-wall studs, spaced in rows indicated on Shop Drawings but not more than 48 inches apart. Fasten at each stud intersection.

1. Top Bridging for Single Deflection Track: Install row of horizontal bridging within 18 inches of single deflection track. Install a combination of flat, taut, steel sheet straps of width and thickness indicated and stud or stud-track solid blocking of width and thickness matching studs. Fasten flat straps to stud flanges and secure solid blocking to stud webs or flanges.

    a. Install solid blocking at every other stud.

2. Bridging: Cold-rolled steel channel, welded or mechanically fastened to webs of punched studs.
3. Bridging: Combination of flat, taut, steel sheet straps of width and thickness indicated and stud-track solid blocking of width and thickness to match studs. Fasten flat straps to stud flanges and secure solid blocking to stud webs or flanges.

F. Install miscellaneous framing and connections, including stud kickers, web stiffeners, clip angles, continuous angles, anchors, fasteners, and stud girts, to provide a complete and stable curtain-wall-framing system.

G. The maximum gap between bottom of non-loadbearing stud and track shall not exceed ¼”.

3.4 QUALITY CONTROL

A. General: The Owner will engage an independent testing and inspecting agency to perform inspections and tests and to prepare test reports. Testing agency will conduct and interpret tests and state in each report whether tested Work complies with or deviates from requirements. Failure to detect any defective materials shall not prevent later rejection when such defect is discovered, or obligate the Architect or Owner for final acceptance.

1. See Section 014110 – Structural Special Inspections and Contract Drawings for testing and inspection to be performed.
2. Provide access for testing agency to places where cold-formed metal framing work is being installed so that required inspection and testing can be accomplished.
3. The General Contractor shall provide the testing agency a complete set of approved shop drawings.
4. Reports will be delivered to the Architect, Engineer, Metal Framing Erector, and the General Contractor within one week of inspection.
5. Deviations from requirements of the contract documents will be reported in writing to the General Contractor within 24 hours.

B. Correct deficiencies in or remove and replace cold-formed metal framing that inspections and test reports indicate do not comply with specified requirements.

3.5 REPAIRS AND PROTECTION

A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on fabricated and installed cold-formed metal framing with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.

B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure cold-formed metal framing is without damage or deterioration at time of Substantial Completion.

END OF SECTION 05 40 00

SECTION 05 50 00 – METAL FABRICATIONS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This Section includes the following:

1. Steel framing and supports for mechanical and electrical equipment.
2. Steel framing and supports for applications where framing and supports are not specified in other Sections.
3. Loose bearing and leveling plates.
4. Steel weld-plates and angles for casting into concrete and masonry, not specified in other Sections.
5. Fasteners.
6. Metal bollards.
7. Roof, mechanical platform, elevator pit and other ladders.
   a. Steel or aluminum, as indicated in drawings.

B. Products furnished, but not installed, under this Section include the following:

1. Loose steel lintels.
2. Anchor bolts, steel pipe sleeves, loose bearing and leveling plates, and wedge-type inserts, indicated to be cast into concrete or built into unit masonry.

C. Related Sections include the following:

1. Division 03 Section "Cast-in-Place Concrete" for installing anchor bolts, steel pipe sleeves, wedge-type inserts and other items indicated to be cast into concrete.
2. Division 04 Section "Unit Masonry Assemblies" for installing loose lintels, anchor bolts, and other items indicated to be built into unit masonry.
3. Division 05 Section "Structural Steel Framing."
4. Division 05 Section "Metal Stairs and Railings."

1.03 PERFORMANCE REQUIREMENTS

A. Thermal Movements: Provide exterior metal fabrications 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 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.

B. Design ladders and attachments to resist 250-pound loads, located between two consecutive supports.

1. Rung load: 250 pounds, applied at center of rung.

1.04 SUBMITTALS

A. Product Data: For the following:

1. Nonslip aggregates and nonslip-aggregate surface finishes.
2. Paint products.
3. Grout.

B. Shop Drawings: Show fabrication and installation details for metal fabrications.

1. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items.
2. Provide templates for anchors and bolts specified for installation under other Sections.
3. For installed products indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

C. Welding certificates.

D. Qualification Data: For Professional Engineer.

1. Design ladders and structural supports under direct supervision of a professional engineer experienced in design of this work and licensed in the Commonwealth of Kentucky.

1.05 QUALITY ASSURANCE

A. Welding: Qualify procedures and personnel according to the following:

1. AWS D1.1, "Structural Welding Code-Steel."
2. AWS D1.3, "Structural Welding Code-Sheet Steel."

1.06 PROJECT CONDITIONS

A. Field Measurements: Verify actual locations of walls and other construction contiguous with metal fabrications 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 dimensions and proceed with fabricating metal fabrications without field

measurements. Coordinate wall and other contiguous construction to ensure that actual dimensions correspond to established dimensions.

2. Allow for trimming and fitting at site.

1.07 COORDINATION

A. Coordinate installation of anchorages for metal fabrications. 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. Coordinate installation of steel weld plates and angles for casting into concrete that are specified in this Section but required for work of another Section. Deliver such items to Project Site in time for installation.

PART 2 PRODUCTS

2.01 METALS, GENERAL

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.

2.02 FERROUS METALS

A. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.

B. Steel Tubing: ASTM A 500, cold-formed steel tubing.

C. Steel Pipe: ASTM A 53/A 53M, standard weight (Schedule 40), unless another weight is indicated or required by structural loads.

D. Slotted Channel Framing: Cold-formed metal channels with continuous slot complying with MFMA-3.

1. Size of Channels: As indicated.
2. Material: Steel complying with ASTM A 1008/A 1008M, commercial steel, Type B; minimum thickness; hot-dip galvanized after fabrication.

E. Cast Iron: ASTM A 48/A 48M, Class 30, unless another class is indicated or required by structural loads.

F. Stainless-Steel Sheet, Strip, Plate, and Flat Bars: ASTM A 666, Type 304.

G. Cold-Rolled Sheet and Strip: ASTM A 1008/A 1008M.

H. Hot-Rolled Sheet and Strip: ASTM A 1011/A 1011M.

2.03 FASTENERS

A. General: Unless otherwise indicated, provide Type 304 stainless steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B 633, Class Fe/Zn 5, at exterior walls. Provide stainless-steel fasteners for fastening aluminum. Select fasteners for type, grade, and class required.

B. Steel Bolts and Nuts: Regular hexagon-head bolts, ASTM A 307, Grade A; with hex nuts, ASTM A 563; and, where indicated, flat washers.

C. Stainless-Steel Bolts and Nuts: Regular hexagon-head annealed stainless-steel bolts, nuts and, where indicated, flat washers; ASTM F 593 (ASTM F 738M) for bolts and ASTM F 594 (ASTM F 836M) for nuts, Alloy Group 1 (A1).

D. Anchor Bolts: ASTM F 1554, Grade 36.

1. Provide hot-dip or mechanically deposited, zinc-coated anchor bolts where item being fastened is indicated to be galvanized.

E. Eyebolts: ASTM A 489.

F. Machine Screws: ASME B18.6.3 (ASME B18.6.7M).

G. Lag Bolts: ASME B18.2.1 (ASME B18.2.3.8M).

H. Plain Washers: Round, ASME B18.22.1 (ASME B18.22M).

I. Lock Washers: Helical, spring type, ASME B18.21.1 (ASME B18.21.2M).

J. Cast-in-Place Anchors in Concrete: Anchors capable of sustaining, without failure, a load equal to four times the load imposed, as determined by testing according to ASTM E 488, conducted by a qualified independent testing agency.

1. Threaded or wedge type; galvanized ferrous castings, either ASTM A 47/A 47M malleable iron or ASTM A 27/A 27M cast steel. Provide bolts, washers, and shims as needed, hot-dip galvanized per ASTM A 153/A 153M.

K. Expansion Anchors: Anchor bolt and sleeve assembly with capability to sustain, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E 488, conducted by a qualified independent testing agency.

1. Material for Anchors in Interior Locations: Carbon-steel components zinc-plated to comply with ASTM B 633, Class Fe/Zn 5.

2. Material for Anchors in Exterior Locations: Alloy Group 1 (A1) stainless steel bolts complying with ASTM F 593 (ASTM F 738M) and nuts complying with ASTM F 594 (ASTM F 836M).

2.04 MISCELLANEOUS MATERIALS

A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.

B. Shop Primers: Provide primers that comply with Division 09 Section “Painting”.

C. Galvanizing Repair Paint: Provide paint that complies with Division 09 Section “Painting” and ASTM A-780.

D. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.

E. Nonshrink, Nonmetallic Grout: Factory-packaged, non-staining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.

F. Concrete Materials and Properties: Comply with requirements in Division 03 Section "Cast-in-Place Concrete".

2.05 FABRICATION, GENERAL

A. Shop Assembly: Preassemble items in the 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 a 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 true to line and level 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 and contour of welded surface matches that of adjacent surface.

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.

G. Fabricate seams and other connections that will be exposed to weather in a 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.

1. 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 a minimum 6-inch embedment and 2-inch hook, not less than 8-inches from ends and corners of units and 24-inches o.c., unless otherwise indicated.

2.06 MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Provide steel framing and supports not specified in other Sections as needed to complete the 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 retained by framing and supports. Cut, drill, and tap units to receive hardware, hangers, and similar items.

1. Fabricate units from slotted channel framing where indicated.
2. Furnish inserts if units are installed after concrete is placed.

C. Galvanize all miscellaneous framing and supports exposed to the exterior and where otherwise indicated.

D. Prime non-galvanized miscellaneous framing and supports with specified primer.

2.07 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. Weld adjoining members together to form a single unit where indicated.

B. Size loose lintels to provide bearing length at each side of openings equal to 1/12 of clear span but not less than 8-inches, unless otherwise indicated.

C. Galvanize loose steel lintels located in exterior wall.

2.08 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.

B. Galvanize plates after fabrication.

2.09 STEEL WELD PLATES AND ANGLES

A. Provide steel weld plates and angles not specified in other Sections for items supported from/by concrete construction as needed to complete the Work. Provide each unit with not less than two integrally welded steel strap anchors for embedding in concrete.

2.10 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.

1. Provide with integrally welded steel strap anchors for embedding in concrete or masonry construction.

C. Galvanize exterior miscellaneous steel trim.

D. Prime interior miscellaneous steel trim, where indicated with specified primer.

2.11 LADDERS

A. Vertical steel ladders:

1. Side Rails: Steel sections, 3/8” x 2” with 24” clear spacing between rails.
2. Rungs: 1” diameter solid rod spaced 12” o.c., with slip resistant finish on top surface.
3. Walk Through: Extend side rails minimum 42” above top level with top and intermediate rail extending horizontally 27” over upper traffic surface.
4. Mounting: Steel mounting brackets for bolted attachment to wall.
5. Clearance to Centerline of Rungs: Minimum 7” clearance from wall.

2.12 METAL BOLLARDS

A. Fabricate metal bollards from Schedule 40 steel pipe (galvanized and painted).

B. Where sleeves are required, fabricate sleeves for bollard anchorage from steel pipe 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.

2.13 FINISHES, GENERAL

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Finish metal fabrications after assembly.

2.14 STEEL AND IRON FINISHES

A. Galvanizing: Hot-dip galvanize items as indicated to comply with applicable standard listed below:

1. ASTM A 123/A 123M, for galvanizing steel and iron products.
2. ASTM A 153/A 153M, for galvanizing steel and iron hardware.

B. Preparation for Shop Priming: Prepare uncoated ferrous-metal surfaces to comply with minimum requirements indicated below for SSPC surface preparation specifications and environmental exposure conditions of installed metal fabrications:

1. Exteriors (SSPC Zone 1B) and Items Indicated to Receive Specified Metal Primer: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
2. Interiors (SSPC Zone 1A): SSPC-SP 3, "Power Tool Cleaning."

C. Shop Priming: Apply shop primer to uncoated surfaces of metal fabrications, except those with galvanized finishes and those to be embedded in concrete, sprayed-on fireproofing, 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.

1. Paint corners, crevices, bolts, welds, and sharp edges.

PART 3 EXECUTION

3.01 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. At exposed connections, 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. Provide threaded fasteners for use with concrete and masonry inserts, toggle bolts, through bolts, lag bolts, wood screws, and other connectors.

E. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.

3.02 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. Support steel girders on solid grouted masonry, concrete, or steel pipe columns. Secure girders with anchor bolts embedded in grouted masonry or concrete or with bolts through top plates of pipe columns.

   1. Where grout space under bearing plates is indicated for girders supported on concrete or masonry, install as specified in "Installing Bearing and Leveling Plates" Article 3.03.

C. Install pipe columns on concrete footings with grouted baseplates. Position and grout column baseplates as specified in "Installing Bearing and Leveling Plates" Article 3.03.

3.03 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 grout.

1. Use nonshrink grout, either metallic or nonmetallic, in concealed locations where not exposed to moisture; use nonshrink, nonmetallic grout in exposed locations, unless otherwise indicated.
2. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

3.04 INSTALLING METAL BOLLARDS

A. Anchor bollards in concrete with pipe sleeves (of required) preset and anchored into concrete. 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, rounding top surface to shed water. Provide smooth surface.

3.05 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.

1. Apply by brush or spray to provide a minimum 2.0-mil dry film thickness.

B. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Division 09 Section “Painting”.

C. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

END OF SECTION 05 50 00

SECTION 05 51 00 – METAL STAIRS AND RAILINGS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

B. Refer to the Drawings for locations of work to be performed.

1.02 SUMMARY

A. Section includes:

1. Steel stair frame of structural sections, with closed risers and concrete pan treads.
2. Stair and ramp handrails and guardrails.
   a. Pickets as infill.
3. Steel tube railings and fittings.

B. Related Sections

1. Division 09 Section "Exterior Painting" and "Interior Painting".

1.03 DESIGN REQUIREMENTS

A. Design and fabricate stair assembly to support a uniform live load of 100 lb / sq ft and a concentrated load of 300 lb/sq ft with deflection of stringer or landing framing not to exceed 1/240 of span. Test in accordance with ASTM E-935.

1. Design and fabricate stair treads to support a 300-pound concentrated load at any location.

B. Design and fabricate handrail, and attachments to resist forces as required by Kentucky Building Code and ANSI A117.1. Apply loads non-simultaneously to produce maximum stresses.

1. Top Rail Concentrated Load: 200 pounds applied at any point in any direction.
2. Top Rail Uniform Load: 50-plf applied in any direction.
3. Baluster Concentrated Load: 50-pounds applied to one square foot area.

1.04 SUBMITTALS

A. Shop Drawings:

1. Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories.

2. Indicate welded connections using standard AWS A2.4 welding symbols. Indicate net weld lengths.

B. Design Data: Submit design calculations signed and sealed by Professional Engineer.

1.05 QUALIFICATIONS

A. Prepare Shop Drawings under direct supervision of a Professional Engineer experienced in design of this work and licensed at the place where the Project is located

B. Welders: AWS qualified within the previous 12 months.

1.06 FIELD MEASUREMENTS

A. Verify field measurements prior to fabrication.

PART 2 PRODUCTS

2.01 STAIR MATERIALS

A. Steel Sections: ASTM A-36/A-36M.

B. Handrail and Railing Tubing: ASTM A-513, Type 5, minimum 50 ksi yield strength.

C. Plates: ASTM A-283/A-283M.

D. Sheet Steel: ASTM A-653/A-653M, galvanized with coating class.

E. Handrail Brackets: Malleable iron.

F. Splice Connectors: Steel welding collars.

G. Bolts, Nuts, and Washers: ASTM A-307, Grade A ASTM A-325, plain finish.

H. Exposed Mechanical Fastenings: Flush countersunk screws or bolts; consistent with design of stair structure.

I. Welding Materials: AWS D1.1 or AWS D1.3; type required for materials being welded.

J. Shop Primer SSPC 15, Type 1, red oxide.

K. Touch-Up Primer: To match shop primer.

L. Fabrication:

1. Fit and shop assemble components in largest practical sections, for delivery to site.

2. Fabricate components with joints tightly fitted and secured.
3. Continuously seal joined pieces by intermittent welds and plastic filler.
4. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.
5. Exposed Mechanical Fastenings: Flush countersunk screws or bolts; unobtrusively located; consistent with design of component, except where specifically noted otherwise.
6. Supply components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.
7. Accurately form components required for anchorage of stairs and landings and railings to each other and to building structure.

2.03 FABRICATION - STAIRS

A. Fabricate stairs and landings with closed risers and pan treads for concrete fill.

B. Form treads and risers to conform to the drawings and details.

C. Secure treads to stringers with clip angles; welded / bolted in place.

D. Form stringers with rolled steel channel sections or steel tubes, as indicated by Drawings.

2.04 STEEL RAILING SYSTEM COMPONENTS

A. Steel Materials:

1. Rolled Sections: ASTM A-36/A-36M.
2. Tubing: ASTM A-513, Type 5, minimum 50 ksi yield strength.
3. Plates: ASTM A-283/A-283M.
4. Bolts, Nuts, and Washers: ASTM A-325, hot-dip galvanized to ASTM A-153f or galvanized components.
5. Welding Materials: AWS D1.1; type required for materials being welded.

B. Rails and Posts: 1-1/2 inch outside diameter steel tubing; welded joints.

C. Pickets: Where shown, provide square pickets, welded construction. If not shown closer on Drawings, space pickets to produce maximum 4 inch clear opening.

D. Fittings: Elbows, T-shapes, wall brackets, escutcheons; machined steel.

E. Mounting: Steel pipe sleeves welded to edge angle.

F. Fasteners: Provide concealed fasteners, unless unavoidable or standard for railings indicated.

1. Steel Railings: Plated steel fasteners complying with ASTM B 633, Class Fe/Zn 25 for electrodeposited zinc coating.

G. Exposed Fasteners: Flush countersunk screws or bolts; consistent with design of railing.

H. Splice Connectors: Steel welding collars.

I. Fabrication:

1. Fit and shop assemble components in largest practical sizes for delivery to site.
2. Fabricate components with joints tightly fitted and secured. Provide spigots and sleeves to accommodate site assembly and installation.
3. Exposed Mechanical Fastenings: Flush countersunk screws or bolts; unobtrusively located; consistent with design of component, except where specifically noted otherwise.
4. Supply components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.
5. Interior Components: Continuously seal joined pieces by continuous welds.
6. 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.
7. Close exposed ends of railing members' welded closure, welds ground smooth.
8. Grind exposed joints flush and **smooth** with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.
9. Accurately form components to suit ramps, stairs, and landings, to each other and to building structure.
10. 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.
11. Provide steel tabs welded to rail frame for mechanical fastening of wire mesh at infill areas. Mesh to be mounted to tabs with clips or clamps such that sharp edges of fastener are covered and fastener cannot be tampered with.
12. Accommodate for expansion and contraction of members and building movement without damage to connections or members.
13. Form handrails from 1-1/2 inch diameter steel pipe or tube, welded construction. Return ends of rails to wall. Secure handrails to walls with brackets.

2.05 SHOP FINISHING

A. Clean surfaces of rust, scale, grease, and foreign matter prior to finishing.

B. Steel and Iron, to receive the following:

1. Galvanize Railings for exterior exposure: Hot-dip galvanize exterior railings, after fabrication, to comply with ASTM A 123/A 123M. Provide hot-dip galvanized fittings, brackets, fasteners, sleeves, and other ferrous components.
2. Interior railing scheduled for painting are not required to be galvanized.
3. Shop-Prime galvanized and non-galvanized railings.

    a. After galvanizing, clean railings, treat with metallic-phosphate process, and apply primer to comply with SSPC-PA 1.

4. Stripe paint corners, crevices, bolts, welds, and sharp edges.

C. Do not prime surfaces in direct contact with concrete or where field welding is required.

D. Prime paint items with two coats.

E. Galvanizing:

1. ASTM A-123/A-123M; hot dip galvanize after fabrication.
2. Galvanizing Touch-Up Paint: SSPC Paint 20 Type I Inorganic zinc rich.

F. Component Finishes:

1. Interior Locations: Shop prime two coats. Free of drips and runs.
2. Touch-Up Primer: To match shop primer.

G. Prepare surfaces for shop painting in accordance with SSPC SP 2.

H. Shop Primer SSPC 15, Type 1, red oxide.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field conditions are acceptable and are ready to receive work.

B. Verify solid grouted masonry is installed and correctly located to receive wall mounted handrails.

3.02 PREPARATION

A. Clean and strip primed steel items to bare metal where site welding is required.

B. Supply items required to be cast into concrete and or embedded in masonry with setting templates.

3.03 INSTALLATION

A. Install components plumb and level, accurately fitted, free from distortion or defects.

B. Provide anchors, plates, angles, hangers, and struts required for connecting stairs to structure.

C. Allow for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.

D. Field weld components indicated on shop drawings. Perform field welding in accordance with AWS D1.1.

E. Field weld anchors as indicated on approved shop drawings. Touch-up welds with primer.

F. Field bolt and weld to match shop bolting and welding. Conceal bolts and screws whenever possible. Where not concealed, use flush countersunk fastenings.

G. Mechanically fasten joints butted tight, flush, and hairline. Grind welds smooth and flush.

H. Obtain approval prior to site cutting or creating adjustments not scheduled.

I. After erection, prime welds, abrasions, and surfaces not shop primed galvanized, except surfaces to be in contact with concrete.

J. After erection, touch up welds, abrasions, and damaged finishes with prime paint.

K. Anchor railings to structure with anchors, plates, and angles.

L. General: Perform cutting, drilling, and fitting required for installing railings. Set railings accurately in location, alignment, and elevation.

1. Set posts plumb within a tolerance of 1/16 inch in 3 feet 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.

M. Exterior rails to be mechanically anchored at anchor plates, not set in sleeves.

N. Set railing in sleeves at interior where indicated. Grind welds smooth. Anchor posts in concrete by inserting into formed holes and grouting annular space.

O. Install mesh or pickets as indicated in drawings, either perpendicular to ground or perpendicular to rails.

P. Conceal bolts and screws wherever possible.

1. Where not concealed, use flush countersunk fastenings.

Q. Assemble with spigots and sleeves to accommodate tight joints and secure installation.

R. Adjusting and Cleaning:

1. Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material as used for shop painting.
2. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

S. Finish paint steel components as specified in Division 09 Section “Painting”. All Exterior Pipe and Tube Railing assemblies, including gates and ferrous fittings, to be painted.

3.04 ERECTION TOLERANCES

A. Maximum Variation from Plumb: 1/4-inch per story, non-cumulative.

B. Maximum Offset from True Alignment: 1/4-inch.

C. Maximum Out-of-Position: 1/4-inch.

3.05 PROTECTION

A. Protect stairs, railings, and handrails from damage from construction traffic and operations.

B. 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.

C. Restore finishes damaged during installation and construction period so no evidence remains of correction work. Return items that cannot be refinished in the field to the shop; make required alterations and refinish entire unit or provide new units.

END OF SECTION 05 51 00

SECTION 06 10 00 – ROUGH CARPENTRY

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This Section includes the following:

1. Wood blocking and nailers.
2. Wood nailers and cant strips associated with roofing assemblies.
3. Plywood backing panels.
4. Plywood
5. Preservative treatment, borate type.

1.03 DEFINITIONS

A. Dimension Lumber: Lumber that is cut to certain pre-determined sizes, that is sawn, planed, and smooth, ready for building applications.

B. Lumber grading agencies, and the abbreviations used to reference them, include the following:

1. NeLMA: Northeastern Lumber Manufacturers' Association.
2. NLGA: National Lumber Grades Authority.
3. SPIB: The Southern Pine Inspection Bureau.
4. WWPA: Western Wood Products Association.

1.04 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.

a. Manufacturer's Certificate: Certify that Products conform to specified requirements.

2. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.
3. Include copies of warranties from chemical treatment manufacturers for each type of treatment.

B. Research/Evaluation Reports: For the following, showing compliance with building code in effect for Project:

1. Wood-preservative-treated wood.
2. Power-driven fasteners.
3. Expansion anchors.
4. Metal framing anchors.

1.05 QUALITY ASSURANCE

A. Source Limitations for Engineered Wood Products: Obtain each type of engineered wood product through one source from a single manufacturer.

B. Source Quality: Obtain each type of treated wood from a single manufacturer.

1. Surface Burning Characteristics: ASTM E84.

a. Flame Spread Index: 25, maximum.
b. Smoke Developed Index: 450, maximum.

2. Moisture Content after Treatment:

a. Lumber: Maximum 19-percent.
b. Structural Panels: Maximum 15-percent.

C. Apply label from agency approved by authority having jurisdiction to identify each fire-retardant treated material. Include the following identification:

1. Inspection agency.
2. Standard to which the material was treated.
3. Treating facility.
4. Treatment material and retention.
5. End use for which the product is suitable.
6. Kiln dried after treatment.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Stack lumber flat with spacers between each bundle to provide air circulation. Provide for air circulation around stacks and under coverings.

PART 2 PRODUCTS

2.01 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. For exposed lumber indicated to receive a stained or natural finish, omit grade stamp and provide certificates of grade compliance issued by grading agency.
3. Where nominal sizes are indicated, provide actual sizes required by DOC PS 20 for moisture content specified. Where actual sizes are indicated, they are minimum dressed sizes for dry lumber.
4. Provide dressed lumber, S4S, unless otherwise indicated.

2.02 WOOD-PRESERVATIVE-TREATED LUMBER

A. Preservative Treatment by Pressure Process: AWPA U1, using 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 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.
3. Within 18-inches of grade.

E. Note that, since 2004-2005, treated wood materials cannot be installed in direct contact with some metals without danger of corrosion.

1. Fasteners shall be hot-dipped galvanized or stainless steel. Follow wood and metal suppliers' recommendations in selection of fasteners.
2. Follow wood and metal suppliers' recommendations to isolate treated lumber from metal materials (flashings, fittings, etc.) where necessary.

2.03 MISCELLANEOUS LUMBER

A. General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:

1. Blocking (interior blocking to be fire treated).
2. Nailers.
3. Furring.

4. Hanging strips.

B. For items of dimension lumber size, provide Construction or No. 2 grade lumber with 19-percent maximum moisture content of any species.

C. For concealed boards, provide lumber with 19-percent maximum moisture content and any of the following species and grades:

1. Mixed southern pine, No. 2 grade; SPIB.
2. Eastern softwoods, No. 2 Common grade; NeLMA.
3. Northern species, No. 2 Common grade; NLGA.
4. Western woods, Standard or No. 2 Common grade; WCLIB or WWPA.

D. For blocking not used for attachment of other construction, Utility, Stud, or No. 2 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, nailers, and furring used for attachment of other construction, select and cut lumber to eliminate knots and other defects that will interfere with attachment of other work.

2.04 PLYWOOD BACKING PANELS

A. Telephone and Electrical Equipment Backing Panels: DOC PS 1, Exposure 1, C-D Plugged, in thickness indicated or, if not indicated, not less than 3/4-inch nominal thickness. Paint panel according to Division 09 Section "Interior Painting" **before installing equipment**.
B. Backing Panels to be Fire Treated.

2.05 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this Article for material and manufacture.

1. Where rough carpentry is exposed to weather, in ground contact, in pressure-preservative treated, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A-153 / A-153M, or stainless-steel fasteners.

B. Nails, Brads, and Staples: ASTM F 1667.

C. Power-Driven Fasteners: NES NER-272.

D. Wood Screws: ASME B18.6.1.

E. Screws for Fastening wood blocking or nailers to Metal Roof Deck: Steel drill screws, in type and length recommended by screw manufacturer for thickness of material to be attached, with organic-polymer or other corrosion-protective coating having a salt-spray resistance of more than 800 hours according to ASTM B 117. Countersink fastener flush with surface of furring.

F. Lag Bolts: ASME B18.2.1 (ASME B18.2.3.8M).

G. Bolts: Steel bolts complying with ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6); with ASTM A 563 (ASTM A 563M) hex nuts and, where indicated, flat washers.

H. Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to 6 times the load imposed when installed in unit masonry assemblies and equal to 4 times the load imposed when installed in concrete as determined by testing per ASTM E 488 conducted by a qualified independent testing and inspecting agency.

1. Material: Stainless steel with bolts and nuts complying with ASTM F 593 and ASTM F 594, Alloy Group 1 or 2 (ASTM F 738M and ASTM F 836M, Grade A1 or A4).

2.06 PLYWOOD

A. Trademark: Identify each plywood panel with appropriate APA trademark.

B. Concealed Performance-Rated Plywood: Where plywood panels will be used for concealed types of applications, provide APA performance-rated panels complying with requirements indicated for grade designation, span rating, exposure durability classification, edge detail (where applicable) and thickness.

1. Wall and Roof Exterior Sheathing: APA Rated Sheathing

a. Exposure durability classification: Exterior
b. Span rating: As required to suit structure/support spacing indicated.
c. Basis of Design: 3/4” CDX, unless noted otherwise.

2. Fire-treatment as indicated in Drawings and General Notes.

2.07 MISCELLANEOUS MATERIALS

A. Sill-Sealer Gaskets: Mineral fiber or other non-glass-fiber insulation, fabricated in strip form, for use as a sill sealer; 1-inch nominal thickness, compressible to 1/32-inch; selected from manufacturer's standard widths to suit width of sill members indicated.

PART 3 EXECUTION

3.01 INSTALLATION, GENERAL

A. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit rough carpentry to other construction; scribe and cope as needed for accurate fit. Locate nailers, blocking, grounds, furring, and similar supports to comply with requirements for attaching other construction.

B. Framing Standard: Comply with AF&PA's "Details for Conventional Wood Frame Construction," unless otherwise indicated.

C. Do not splice structural members between supports, unless otherwise indicated.

D. Provide blocking and framing as indicated and as required to support facing materials, fixtures, specialty items, and trim.

E. Sort and select lumber so that natural characteristics will not interfere with installation or with fastening other materials to lumber. Do not use materials with defects that interfere with the function of member or pieces that are too small to use with minimum number of joints or optimum joint arrangement.

F. Comply with AWPA M4 for applying field treatment to cut surfaces of preservative-treated lumber.

G. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:

1. NES NER-272 for power-driven fasteners.
2. Table 2304.9.1, "Fastening Schedule," in Kentucky Building Code.

H. Use common wire nails, unless otherwise indicated (as in case of treated lumber applications). 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; do not countersink nail heads, unless otherwise indicated.

3.02 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.

3.03 FIELD TREATMENT

A. Treat cuts and bored holes in pressure treated lumber and plywood with field treatment materials in accordance with wood treatment manufacturer’s instructions.

3.04 PROTECTION

A. Protect rough carpentry from weather. If, despite protection, rough carpentry becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

END OF SECTION 06 10 00

SECTION 07 11 13 – BITUMINOUS DAMPPROOFING

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

B. Refer to the Drawings for locations of work to be performed.

1.02 SUMMARY

A. This Section includes the following:

1. Cold-applied, emulsified-asphalt dampproofing on exterior CMU construction.
2. To be installed at outside face of all exterior CMU walls.

1.03 SUBMITTALS

A. Product Data: For each type of product indicated. Include recommendations for method of application, primer, number of coats and coverage or thickness.

B. Material Certificates: For each product, signed by manufacturers.

1.04 QUALITY ASSURANCE

A. Manufacturer: Obtain primary dampproofing materials of each type required from single manufacturer with not less than (3) years of successful experience in supplying principal materials for dampproofing work. Provide secondary materials recommended by manufacturer of primary materials.

B. Installer: A firm which has specialized in the installation of types of dampproofing required for project, for not less than (3) years and is acceptable to manufacturer of primary materials.

1. As applicable, assign work closely associated with dampproofing including (but not limited to) dampproofing accessories, flashings in connection with waterproofing, expansion joints in membrane, insulation (except cementitous cast-in-place type) and protection course on membrane, to installer of dampproofing, for individual responsibility.

1.05 PROJECT CONDITIONS

A. Substrate: Proceed with work of this section only after substrate conditions and penetrating work has been completed.

B. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit dampproofing to be performed according to manufacturers' written instructions.

C. Ventilation: Provide adequate ventilation during application of dampproofing in enclosed spaces. Maintain ventilation until dampproofing has cured.

PART 2 PRODUCTS

2.01 COLD-APPLIED, EMULSIFIED-ASPHALT DAMPPROOFING

A. Basis of Design Product: BASF (Sonneborn), Hydrocide 600 & 700B.

B. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include the following:

1. ChemMasters Corp.
2. Degussa Building Systems.
3. Karnak Corporation.
4. Koppers Inc.
5. Meadows, W. R., Inc.
6. Flintkote Division / Genstar Corporation

C. Cold-Applied, Emulsified-Asphalt Dampproofing; provide one of the following:

1. Fibered Brush and Spray Coats: ASTM D 1227, Type II, Class 1.
2. Brush and Spray Coats: ASTM D 1227, Type III, Class 1.

D. VOC Content: 0.25 lb / gal. or less.

2.02 MISCELLANEOUS MATERIALS

A. Emulsified-Asphalt Primer: ASTM D 1227, Type III, Class 1, except diluted with water as recommended by manufacturer.

B. Asphalt-Coated Glass Fabric: ASTM D 1668, Type I.

C. Patching Compound: Manufacturer's fibered mastic of type recommended by dampproofing manufacturer.

PART 3 EXECUTION

3.01 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.

3.02 PREPARATION

A. Protection of Other Work: 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 material manufacturer.

C. Apply patching compound for filling and patching tie holes, honeycombs, reveals, and other imperfections.

D. Fill voids, seal joints and apply bond breakers as recommended by materials manufacturer, with particular attention at construction joints.

E. Prime Substrate as recommended by materials manufacturer.

3.03 APPLICATION, GENERAL

A. General: 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 additional coats if recommended by manufacturer or if required to achieve coverage indicated or if rained on before cure.
2. Allow each coat of dampproofing to cure 24-hours before applying subsequent coats.
3. Allow 48-hours drying time.
4. Permit membrane to cure under conditions which will not contaminate or deteriorate fluid applied waterproofing material. Block off traffic and protect membrane from physical damage.

B. Mix separately packaged components in accordance with manufacturer’s instructions.

C. Apply uniform coating of dampproofing to substrate and adjoining surfaces indicated to receive membrane.

1. Apply coating either by hand or by machine spray, complying with manufacturer’s recommendations regarding horizontal and vertical surfaces.
2. On exterior face of inner wythe of cavity walls behind rigid insulation: Apply primer and (1) brush or spray coat at not less than 1 gal. / 50 sq. ft.

a. Provide continuous plane of protection on exterior face of inner wythe of exterior masonry cavity walls.

b. Lap dampproofing at least 1/4 inch onto flashing, masonry reinforcement, veneer ties, and other items that penetrate inner wythe.
c. Extend dampproofing over outer face of structural members and concrete slabs that interrupt inner wythe, and lap dampproofing at least 1/4-inch onto shelf angles supporting veneer.

3.04 CLEANING

A. Remove dampproofing materials from surfaces not intended to receive dampproofing.

END OF SECTION 07 11 13

SECTION 07 17 00 – SELF-ADHERING SHEET WATERPROOFING

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SECTION INCLUDES

A. Surface preparation.
B. Application of rolled, self-adhering waterproofing membrane system.
C. Installation of a combination sodium bentonite/hydrophilic bentonite waterstop.

1.03 RELATED SECTIONS

A. Division 03 Section “Cast-in-Place Concrete”.
B. Division 07 Section “Building Insulation”.
C. Division 07 Section “Sheet Metal Flashing and Trim”.
D. Division 07 Section “Joint Sealants”.
E. Division 33 Section “Storm Drainage and Piping”.

1.04 REFERENCES

A. ASTM D146 - Standard Test Methods for Sampling and Testing Bitumen-Saturated Felts and Fabrics Used in Roofing and Waterproofing.
B. ASTM D412 - Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers-Tension.
C. ASTM D570 - Standard Test Method for Water Absorption of Plastics.
D. ASTM D903 - Standard Test Method for Peel or Stripping Strength of Adhesive Bonds.
E. ASTM D1876 – Standard Test Method for Peel Resistance of Adhesives. (T-Peel Test).
F. ASTM D1970 - Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection.
G. ASTM E96 (Method B) - Standard Test Methods for Water Vapor Transmission of Materials.
H. ASTM E154 - Standard Test Methods for Water Vapor Retarders Used in Contact with Earth Under Concrete Slabs, on Walls, or as Ground Cover.

1.05 SUBMITTALS

A. Comply with Division 01 Section “Shop Drawings, Product Data, and Samples”.
B. Submit manufacturer's product data and application instructions.

1.06 QUALITY ASSURANCE

A. Contractor will provide the proper equipment, manpower, and supervision at the jobsite to install the waterstop in compliance with the project plans and specifications.

B. Installation must be carried out by an experienced contractor with an adequate number of skilled personnel, experienced in the application of waterproofing and bentonite waterstop materials according to manufacturer's current written installation instructions.
C. Sodium bentonite/hydrophilic waterstop is not designed to be installed into expansion joints.
D. Sodium bentonite/hydrophilic waterstop is designed to seal structural concrete joints with a minimum 3,000 psi (20.7 MPa) compressive concrete strength.
E. Maintain a record of the batch numbers of all materials supplied for this project.

1.07 PREINSTALLATION CONFERENCE

A. Convene a pre-installation conference prior to commencing work of this section, in accordance with Division 01 Section "Quality Control", meeting with manufacturer's technical representative, General Contractor, site contractor, Architect, and Special Inspector to review the installation procedures.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly identifying product name and manufacturer.
B. Store materials in a clean dry area in accordance with manufacturer's instructions.
C. Store adhesives and primers at temperatures of 40°F (5°C) and above to facilitate handling.
D. Store membrane cartons on pallets.
E. Do not store at temperatures above 90°F (32°C) for extended periods.
F. Keep away from sparks and flames.
G. Completely cover when stored outside. Protect from rain.
H. Protect materials during handling and application to prevent damage or contamination.
I. Avoid use of products which contain tars, solvents, pitches, polysulfide polymers, or PVC materials that may come into contact with waterproofing membrane system.

1.09 ENVIRONMENTAL REQUIREMENTS

A. Product not intended for uses subject to abuse or permanent exposure to the elements.
B. Protect rolls from direct sunlight until ready for use
C. Do not apply membrane when air or surface temperatures are below 40°F (4°C).
D. Do not apply to frozen concrete.

1.10 WARRANTY

A. Sheet Membrane Waterproofing: Provide written 5 year material warranty issued by the membrane manufacturer upon completion of the work.

PART 2 PRODUCTS

2.01 MANUFACTURER

A. Basis of Design: W.R. MEADOWS, Inc (Mel-Rol)
   1. Could include Mel-Rol LT or Mel-Rol XLT. Select product based on air and surface temperatures during time of application.
B. Acceptable Manufacturers:
   1. Carlisle (860)
   2. Grace (Bituthene 3000)

2.02 MATERIALS

A. Rolled, Self-Adhering Waterproofing Membrane: Polymeric waterproofing membrane protected by release paper on cross-laminated polyethylene carrier film with exposed polymeric membrane strips on both sides protected by pull-off release strips.
   1. Performance Based Specification: Waterproofing membrane shall have the following characteristics:
      a. Compliance: AREMA Specification Chapter 29 - Waterproofing.
      b. Thickness:
         1) Carrier Film: 4 mils.
         2) Polymeric Membrane: 56 mils.
      c. Tensile Strength, ASTM D412, Die C:
         1) Carrier Film: 5,900 psi (40.71 MPa) minimum.
         2) Polymeric Membrane: 460 psi (3.23 MPa) minimum.
      d. Elongation, ASTM D412, Die C: Polymeric Membrane: 971 % minimum.
      e. Peel Adhesion, ASTM D903: 11.8 lbf/in. (2068 N/m).
      f. Lap Adhesion, ASTM D1876: 8.62 lbf/in. (1508 N/m)
      g. Water Vapor Permeability, ASTM E96, Method B: 0.036 perms.
      h. Water Absorption, ASTM D570: 0.1 percent, 72 hours maximum.
      i. Resistance to Hydrostatic Head: Equivalent to 230.9 feet (70.3 m) of water.
      j. Puncture Resistance, ASTM E154: 48.2 lbf (214.6 N).
      k. Exposure to Fungi, Soil Test: Pass, 16 weeks.
      l. Color:
         1) Carrier Film: White.
         2) Polymeric Membrane: Black.

2.03 ACCESSORIES

A. The following are aligned with the Basis of Design and shall be used as part of an integrated, coordinated system protected by the required warranty. Similar/equivalent products by other listed manufacturers shall be provided, similarly making up an integrated, warranteed system.
B. Surface Conditioner:
   1. Temperatures Above 40°F (4°C): Mel-Prime Water Base Primer.
   2. Temperatures Above 0°F (-18°C): Mel-Prime VOC Compliant Solvent Base Primer or Standard Solvent Base Primer.

C. Waterstop: a rolled type material consisting of a combination of sodium bentonite and hydrophilic rubber for use in concrete construction joints and around waterproofing membrane penetrations: Waterstop EC Plus
   1. Water-Based Adhesive: Adhesive containing 15 - 20% emulsified bentonite. To be used when above the water table and temperatures are above 40° F (4°C). CLAY-TITE ADHESIVE by W. R. MEADOWS.
   2. Bentonite Mastic: Pliable yet expandable mastic containing bentonite. To be used below the water table or when temperatures are going to be below 40° F (4° C). CLAY-TITE MASTIC by W. R. MEADOWS.

D. Flashing and Fillets: MEL-ROL LIQUID MEMBRANE.
E. Pointing Mastic: POINTING MASTIC.
F. Termination Bar: TERMINATION BAR.
G. Corner Tape: DETAIL STRIP.
H. Waterproofing Protection Course: PROTECTION COURSE
I. Rolled Matrix Drainage System: MEL-DRAIN Rolled Matrix Drainage System.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine surfaces to receive self-adhering membrane. Notify Architect if surfaces are not acceptable. Do not begin surface preparation or application until unacceptable conditions have been corrected.

3.02 SURFACE PREPARATION

A. Protect adjacent surfaces not designated to receive waterproofing.
B. Clean and prepare surfaces to receive waterproofing in accordance with manufacturer's instructions.
C. Do not apply waterproofing to surfaces unacceptable to manufacturer.
D. Concrete surfaces must be clean, smooth, and free of standing water.
E. Patch all holes and voids and smooth out any surface misalignments.
F. Apply surface conditioner to surfaces that will be covered within one working day according to manufacturer’s recommended coverage rates.
G. Install corner tape on all inside and outside corners, including the footing.
H. Apply a 9” (229 mm) strip of self-adhering membrane over construction, control, and expansion joints and over cracks greater than 1/16” (1.59 mm) wide.
I. Seal all terminations with pointing mastic.

3.03 APPLICATION

A. Vertical Application
   1. Apply waterproofing membrane system in accordance with manufacturer's instructions.
   2. Ensure accessory materials are compatible with membrane and approved by membrane manufacturer.

3. Remove release paper on edge and position the membrane.
4. Pull balance of release paper off, running the roll vertically over the top of the corner tape at the footing.
5. Immediately hand-rub the membrane firmly to the surface, removing any bubbles or wrinkles, then pressure roll the complete surface to assure positive adhesion.
6. Overlap all seams and stagger end laps at least 2 ½" (63.5 mm).
7. Seal all terminations with pointing mastic.
8. Inspect membrane before covering and repair as necessary. Cover tears and inadequate overlaps with membrane. Seal edges of patches with pointing mastic.

3.04 INSTALLATION OF WATERSTOP IN CONSTRUCTION JOINTS

A. Install waterstop in all applicable vertical and horizontal construction joints and around any applicable waterproofing membrane penetrations.
B. Apply a continuous bead of bentonite mastic in all areas to receive bentonite waterstop.
C. Remove thin release paper to expose adhesive on the bentonite waterstop.
D. Install bentonite waterstop a minimum of 2" (50 mm) from face of wall and firmly press into place allowing the mastic to fully coat the bottom of the waterstop.
E. Install standard masonry nails at 12" (300 mm) o.c., if required, for additional fastening.
F. Tightly butt ends of the waterstop together for subsequent applications.
G. Remove thick release paper on top prior to concrete placement.

3.05 INSTALLATION AROUND PENETRATIONS

A. Fill voids with concrete grout or bentonite mastic and trowel around penetration, ensuring all areas are completely filled.
B. Cut strips of the bentonite waterproofing membrane 6" (150 mm) wide and cut flanges across this strip to aid in wrapping the strip around the penetration.
C. Install this strip according to manufacturer's installation instructions and fasten into place.
D. Apply a continuous bead of bentonite mastic in all areas to receive bentonite waterstop.
E. Remove release paper to expose adhesive on the bentonite waterstop.
F. Install bentonite waterstop around the penetration, firmly pressing into the bentonite mastic, allowing the mastic to fully coat the bottom of the waterstop.
G. Remove thick release paper on top prior to concrete placement.

3.06 PROTECTION

A. Protect membrane on vertical and horizontal applications with immediate application of waterproofing protection course, rolled matrix drainage board.
B. Backfill immediately using care to avoid damaging waterproofing membrane system.

END OF SECTION 07 17 00

SECTION 07 20 00 – BUILDING INSULATION

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 DESCRIPTION OF WORK

A. Extent of building insulation work is shown of the Drawings and indicated by the provisions of this Section.

B. Applications of building insulation specified in this Section include the following:

1. Foundation perimeter insulation (supporting backfill)
2. Polyisocyanurate rigid insulation board.
3. Closed-cell spray foam polyurethane.
4. Mineral wool sound barrier around openings thru walls.
5. Mineral wool fire barrier at top of fire-rated walls.

C. Insulation for masonry cavity walls is specified under Division 04 Section “Unit Masonry Assemblies”.

D. Roofing insulation for both the Standing Seam Metal Roof system and the Modified Bitumen Roof system is specified under Division 07 Section “Roof Insulation”.

E. Sound attenuation, blankets shall be specified under Division 09 Section “Gypsum Board Assemblies”.

F. Low expansion spray foam around windows and doors is specified in their respective Specification Sections.

1.03 QUALITY ASSURANCE

A. Thermal Conductivity: Thickness indicated are for thermal conductivity (k-value at 75-degrees F) specified for each material. Provide adjusted thickness as directed for equivalent use of material having a different thermal conductivity. Where insulation is identified by “R” value, provide thickness required to achieve indicated value.

B. Fire and Insurance Ratings: Comply with fire-resistance flammability and insurance ratings indicated and comply with regulations as interpreted by governing authorities.

1.04 SUBMITTALS

A. Product Data: Submit manufacturer's product specifications and installation instructions for each type of insulating and vapor barrier material required.

B. Product test reports: For foam insulation, from tests performed by a qualified agency.

C. Evaluation reports: For foam insulation, from ICC-ES.

1.05 PRODUCT HANDLING

A. General Protection: Protect insulations for physical damage and from becoming wet, soiled, or covered with ice or snow.

B. Protection for Plastic Insulation:

1. Do not expose to sunlight, except to extent necessary for period of installation and concealment.
2. Protect against ignition at all times. Do not deliver plastic insulating materials to Project Site ahead of installation time. Complete installation and concealment of insulation materials as rapidly as possible in each area of the Work.
3. Cover stored insulation on pallets with canvas tarps.

C. Storage of Rigid Insulation Board:
1. Insulation stored on job must be raised above ground level on wood pallets and covered with waterproof tarpaulins protected against blowing off.

PART 2 PRODUCTS

2.01 MATERIALS

A. Extruded Polystyrene Board Insulation (Perimeter Insulation):

1. Manufacturer: Subject to compliance with requirements, provide products of one of the following:
   a. Carlisle Spray Foam Insulation.
   b. The Dow Chemical Company
   c. Owens Corning
   d. Pactiv Building Products Division

2. Rigid, closed-cell, extruded, polystyrene insulation board with integral high-density skin.
   a. Comply with ASTM C-578, Type IV
   b. min. 20 psi compressive strength
   c. k-value of 0.20
   d. .3% maximum water absorption
   e. 1.1 perm-inch max. water vapor transmission
   f. Manufacturer's standard length and widths

g. Provide minimum thickness of 2” unless otherwise indicated.

B. Closed-cell spray foam polyurethane:

1. Manufacturer: Subject to compliance with requirements, provide products of one of the following:

   a. The Dow Chemical Company
   b. BASF
   c. Johns Manville

2. Two-Component, spray-applied polyurethane foam with zero-ozone depleting potential that meets the following:

   a. Core Density, ASTM D1622: min. 2.5 pcf
   b. Compressive Strength, ASTM D1621: min. 25 psf
   c. Tensile Strength, ASTM D1623: min. 60 psf
   d. Closed-cell content, ASTM D6226: >95
   e. Thermal Resistance, ASTM C518: min. 6.4 / inch
   f. Water Vapor Permeability, ASTM E96: min. 2.2 perm-inch
   g. Surface Burning Characteristics, ASTM E84: Class A
   h. Provide a minimum thickness as indicated on Drawings.

C. Rigid Insulation Board:

1. Polyisocyanurate rigid, closed cell, foam insulation.: ASTM C591-15, of type and density indicated below, Class 1 flame spread and smoke development requirements per ASTM E84, respectively:

   a. Available Manufacturers:
      1. Dow Chemical Company.
      2. Owens Corning.
      3. Dyplast.

   b. R-Value: R-5 to R-6 per inch thickness.

D. Spray foam insulation for filling small voids / holes:

1. Manufacturers:
   a. Handi-Form Spray Foam as manufactured by Fomo Products.
   b. Great Stuff Pro by Dow Chemical or equivalent by Hilti
   c. Froth Pak Foam Insulation by Dow Chemical or equivalent by Hilti

2. Flame Spread: 25 max per ASTM E84
3. Smoke Development: 350 max per ASTM E84

E. Miscellaneous Materials:

1. Mineral wool sound / fire barrier (at top of fire-rated walls)
   a) Equal to Thermafiber SAFB, Standard Fiber.
2. Adhesive for Bonding Insulation: Type recommended by insulation manufacturer and complying with fire-resistance requirements.
3. Mechanical Anchors: Type and size shown or, if not shown, as recommended by insulation manufacturer for type of application and condition of substrate.
4. Provide UL rated sealant system over insulation at top of fire-rated walls.

PART 3 EXECUTION

3.01 INSPECTION AND PREPARATION

A. Installer must examine substrates and conditions under which insulation work is to be performed and must notify Contractor in writing of unsatisfactory conditions. Do not proceed with insulation work until unsatisfactory conditions have been corrected in a manner acceptable to the Installer.

1. Review placement area for foam insulation to determine that final location will not be within 3” of any heat source where the temperature will exceed 200 deg F per ASTM C 411, but not less than requirements of authorities having jurisdiction.

B. Clean substrates of substances that are harmful to insulation, including removing projections capable of puncturing insulation or vapor retarders, or that interfere with insulation attachment.

3.02 INSTALLATION

A. General:

1. Comply with manufacturer’s instruction for particular conditions of installation in each case. If printed instructions are not available or do not apply to the Project conditions, consult with manufacturer’s technical representative for specific recommendations before proceeding with work.
2. Extend insulation to the full thickness shown over entire area to be insulated. Cut and fit tightly around obstructions and fill all voids with insulation. Remove projections which interfere with placement.
3. Apply a single layer of insulation of required thickness, unless otherwise shown or required to make up total thickness.

B. Perimeter and Under-Slab Insulation:

1. On vertical surfaces, set units in adhesive applied in accordance with manufacturer’s instructions. Use type adhesive recommended by manufacturer of insulation.

C. General Building Insulation:

1. Apply insulation units to substrate by method indicated, complying with manufacturer's recommendations. If no specific method is indicated, bond units to substrate with adhesive or use mechanical anchorage to provide permanent placement and support of units.
2. Seal joints between closed-cell non-breathing insulation units by applying mastic or sealant to edges of each unit to form a tight seal as units are shoved into place. Fill voids in completed installation with mastic or sealant.

D. Spray Foam, Closed Cell:

1. Comply with insulation manufacturer's written instructions.
2. Site mix liquid components according to manufacturer's direction.
3. Apply insulation to produce the minimum thickness required. Where notes indicate filling stud cavity, fill minimum 3 ½" of 3 5/8" stud cavity or 5 ½" of 6" stud cavity. Where note indicates filling a void, fill complete. The intention is to extend insulation thickness indicated to envelop entire area to be insulated.
   a. Fit tightly around obstructions and fill voids.
   b. Remove projections that interfere with placement.
4. Water piping coordination: If water piping is located within insulated exterior walls, coordinate location of piping to ensure that it is placed on warm side of insulation and insulation encapsulates piping.
5. Miscellaneous voids: Apply insulation in miscellaneous voids and cavity spaces where required to prevent gaps in insulation.

E. Spray Foam Insulation for small voids:

1. Filling of small voids and holes around structural bearing areas.

3.03 PROTECTION

A. General: Protect installed insulation from harmful weather exposures and from possible physical abuses, where possible by non-delayed installation of concealing work or, where that is not possible, by temporary covering or enclosure. Installed shall advise Contractor of exposure hazards, including possible sources of deterioration and fire hazards.

END OF SECTION 07 20 00

SECTION 07 22 00 – ROOF INSULATION

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 WORK INCLUDED

A. Furnish labor and materials to complete roof insulation work indicated, as specified herein, or both.

B. Roof insulation is part of the warranty in Division 07 Sections “Modified Bituminous Membrane Roofing” and “Standing Seam Metal Roof Panels”.

1.03 SHOP DRAWINGS

A. Product Data: Provide manufacturer’s specification data sheets for each product in accordance with Division 01 Section “Submittal” procedures.

B. Provide approval letters from insulation manufacturer for use of their insulation within this particular roofing system type.

C. Provide a sample of each insulation type.

D. Shop Drawings

1. Submit manufacturer’s shop drawings indicating complete installation details of tapered insulation system, including identification of each insulation block, sequence of installation, layout, drain locations, roof slopes, thicknesses, crickets, and saddles.
2. Shop drawing shall include: Outline of roof, location of drains, complete board layout of tapered insulation components, thickness and the average “R” value for the completed insulation system.

E. Certification

1. Submit roof manufacturer’s certification that insulation fasteners furnished are acceptable to roof manufacturer.
2. Submit roof manufacturer’s certification that insulation furnished is acceptable to roofing manufacturer as a component of roofing system and is eligible for roof manufacturer’s system warranty.

1.04 REQUIREMENTS

A. Fire Classification, ASTM E-108.

B. Pre-installation meeting: Refer to Division 07 Roofing Specification Sections for Pre-Installation meeting requirements.

C. Apply only as much roof insulation in one day as can be covered by completed roofing system the same day.

D. Insulation must be kept dry at all times, in storage and during application on roof. In addition to manufacturer's shipping bags, contractor must completely tarp.

E. Temporary water cut-offs installed at completion of each day's work must be removed upon resumption of work.

F. Insulation must meet Kentucky Building Code, current edition. Minimum LTTR R25.0.

1.05 MATERIAL STORAGE

A. Deliver products to site with seals and labels intact, in manufacturer’s original containers, dry and undamaged.

B. Store all insulation materials in a manner to protect them from the wind, sun and moisture damage prior to and during installation. Any insulation that has been exposed to any moisture shall be removed from the project site.

C. Insulation stored on job must be raised above deck or ground level on wood pallets and covered with waterproof tarpaulins. Any warped, broken, or wet insulation boards shall be removed from the site.

PART 2 PRODUCTS

2.01 INSULATION MATERIALS

A. Thermal Insulation Properties and Approved Insulation Boards.

1. Rigid Polyisocyanurate Roof Insulation; ASTM C1289:

    a. Qualities: Rigid, closed cell polyisocyanurate foam core bonded to heavy duty glass fiber mat facers.
    b. R-Value: 25 minimum.
    c. Two layers of 2.5” thick rigid board insulation.
    d. Compliances: UL, WH or FM listed under Roofing Systems
    Federal Specification HH-I-1972, Class 1.

2. Tapered Polyisocyanurate Roof Insulation; ASTM C1289:

    a. Qualities: Factory Tapered, closed cell polyisocyanurate foam core bonded to heavy duty glass fiber mat facers.

b. Thickness: Minimum 1 inch
c. Tapered Slope: 1/4- inch

1) 1/4- inch per foot where located at structurally flat roof decks to provide positive drainage.

a) Saddles and crickets to be a minimum of twice the slope of the overall slope of any given roof section and installed to provide positive drainage per drawings and as needed on any/all membrane roof areas.

d. Compliances: UL, WH or FM listed under Roofing Systems Federal Specification HH-I-1972, Class 1

3. Dens-Deck Prime Roof Board

a. Qualities: Nonstructural glass mat faced, noncombustible, water-resistant treated gypsum core panel.
b. Board Size: Four feet by four feet (4'x4').
c. Thickness: One half (1/2) inch.
d. R-Value: 0.56
e. Compliances: UL, WH or FM listed under Roofing Systems.
f. Acceptable manufacturers: Providers of similar products recommended by roof system manufacturer, provided the requirements herein are met.
g. Locations: Modified Bituminous Roofing System only.

2.02 RELATED MATERIALS

A. Self Adhering Air and Vapor Barrier. (Located at all acoustic metal decking locations only).

B. Wood Insulation and Membrane Nailer Stops: Pressure treated wood as specified in Division 06 Section "Rough Carpentry".

C. Fiber Cant and Tapered Edge Strips: Performed rigid insulation units of sizes/shapes indicated, matching insulation board or of perlite or organic fiberboard, as per the approved manufacturer.

D. Roof Board Joint Tape: Six (6) inches wide glass fiber mat with adhesive compatible with insulation board facers.

E. Roof Deck Insulation Adhesive: - Dual-component, high rise foam adhesive as recommended by insulation manufacturer and approved by FM indicated ratings.

1. Tensile Strength (ASTM D412)……250 psi
2. Density (ASTM D1875)……..8.5 lbs./gal.
3. Viscosity (ASTM D2556)……22,000 to 60,000 cP.
4. Peel Strength (ASTM D903)…..17 lb/in.

5. Flexibility (ASTM D816)……Pass @ -70°F

E. Fasteners: Corrosion resistant screw fastener as recommended by roof membrane manufacturer.

1. Factory Mutual Tested and Approved with three (3) inches coated disc for I-90 rating, length required to penetrate metal deck one inch.

PART 3 EXECUTION

3.01 INSPECTION OF SURFACES

A. Roofing contractor shall be responsible for preparing an adequate substrate to receive insulation.

1. Verify that work which penetrates roof deck has been completed.
2. Verify that wood nailers are properly and securely installed.
3. Examine surfaces for defects, rough spots, ridges, depressions, foreign material, moisture, and unevenness.
4. Do not proceed until defects are corrected.
5. Do not apply insulation until substrate is sufficiently dry.
6. Broom clean substrate immediately prior to application.
7. Use additional insulation to fill depressions and low spots that would otherwise cause ponding water.
8. Verify that temporary roof has been completed.

3.02 INSTALLATION

A. Self Adhering Air & Vapor Barrier.

1. Install directly to the DTA ACOUSTIC METAL DECKING ARES ONLY, prior to installing the insulation layers.

B. Attachment with Mechanical Fasteners

1. Approved insulation board shall be fully attached to the deck with an approved mechanical fastening system. As a minimum, the amount of fasteners shall be in accordance with manufacturer's recommendation for FM I-90 system. Otherwise, a minimum of one fastener per two square feet shall be installed.
2. Filler pieces of insulation require at least two fasteners per piece if size of insulation is less than four square feet.
3. Spacing pattern of fasteners shall be as per manufacturer's recommendations to meet the FM requirements. Placement of any fastener from edge of insulation board shall be a minimum of three inches, and a maximum of six (6) inches.
4. Minimum penetration into deck shall be as recommended by the fastener manufacturer. There is a one (1) inch minimum for metal, wood and structural concrete decks where not specified by the manufacturer.
5. Tape joints of insulation as per manufacturer's requirements.

6. **Fasteners located at acoustical metal decking: The Contractor shall install all mechanical fasteners in these locations in a manner so that all fasteners are installed and penetrate into the high ribs of the DTA decking in order for them to be concealed between the ribs and not visible from the interior.**

C. Attachment of Cover Board with Insulation Adhesive Approved by Factory Mutual (FM).

1. Ensure all surfaces are clean, dry, free of dirt, debris, oils, loose ore embedded gravel, unadhered coatings, deteriorated membrane and other contaminants that may inhibit adhesion.
2. Apply insulation adhesive directly to the substrate using a ribbon pattern provided by the primary roofing manufacturer in order to provide the required wind uplift resistance as specified in Division 07 Section “Modified Bitumen Roofing System”.
3. Immediately place cover boards into wet adhesive. Do not slide boards into place. Do not allow the adhesive to skin over before installing insulation boards.
4. Briefly step each board into place to ensure contact with the adhesive. Substrates with irregular surfaces may prevent the insulation board from making positive contact with the adhesive. Relief cuts or temporary weights may be required to ensure proper contact.
5. All boards shall be cut and fitted where the roof deck intersects a vertical surface. The boards shall be cut to fit a minimum of one quarter (1/4) inch away from the vertical surface.
6. Tape joints of insulation as per manufacturer’s requirements.

D. Install insulation as per standard specifications of manufacturer, details indicated, methods specified, as may be required by field conditions or manufacturer's system warranty as specified in Division 07 Sections “Standing Seam Metal Roof Panels” and “Modified Bituminous Membrane Roofing”.

E. If more than one layer is required, stagger layers minimum of 12” in each direction; set parallel, break joints. Bring insulation units into moderate contact with one another without forcing; cut to fit neatly around roof projections.

F. Wood insulation stops: Treated wood of same thickness as insulation; mechanically fastened around projections and extensions through deck. Stops: 6" wide or 1" wider than flanges being nailed to them.

G. All voids/gaps in rigid insulation shall be filled with same material prior to covering.

H. Tapered Insulation.

1. Install tapered insulation around roof drains and scuppers to ensure positive drainage.
2. Install tapered insulation as per standard specification of material manufacturer.
3. Roofing contractor shall verify dimensions, drain heights and drain locations in field prior to installation of tapered roof insulation system.
4. Starting at low points lay tapered roof insulation in uniform patterns installed with mechanical fasteners. Insulation shall be firmly adhered/fastened to deck and/or between layers.
5. Fill insulation of rigid insulation shall be utilized in 1" increments as necessary to achieve specified thickness and required "R" value.
6. Locate valleys by snapping chalk lines. Adjacent valleys should form 90 degree right angles. Lacing

of tapered panels at valleys, in lieu of mitering, is unacceptable.

7. Install crickets at all roof penetrations to assure drainage and as required in accordance with Standard Cricket Detail.
8. Finished tapered insulation installation shall pitch in even planes to gutters or roof drains.
9: Minimum 4'x4' tapered sumps are to be installed at each primary roof drain, the thickness of either on layer of 2.2" rigid insulation or using tapered wood fiberboard insulation edge (1.5"x0"x24").

3.03 CLEANING

A. Remove debris and cartons from roof deck. Leave insulation clean and dry, ready to receive roofing membrane.

3.04 CONSTRUCTION WASTE MANAGEMENT

A. Remove and properly dispose of waste products generated during installation. Comply with requirements of authorities having jurisdiction.

END OF SECTION 07 22 00

SECTION 07 41 13 - STANDING-SEAM METAL ROOF PANELS

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. Pre-formed standing-seam metal roof panel system.
2. Gutters.
3. Downspouts.
4. Snow retention system.

B. Related Sections:

1. Division 05 Section “Steel Decking”.
2. Division 06 Section “Rough Carpentry” for wood nailers, blocking, and fascia boards.
3. Division 07 Section “Roof Insulation” for insulation and attachment methods.
4. Division 07 Section “Modified Bituminous Membrane Roofing”.
5. Division 07 Section “Sheet Metal Flashing and Trim” for weather protection for base flashings.
6. Division 07 Section “Roof Accessories” for counter flashing gravel stops, and fascia.
7. Division 08 Section “Insulated Translucent Wall System”.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Meet with Owner, Architect, Owner's insurer if applicable, metal panel Installer, metal panel manufacturer's representative, structural-support Installer, and installers whose work interfaces with or affects metal panels, including installers of roof accessories and roof-mounted equipment.
2. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
3. Review methods and procedures related to metal panel installation, including manufacturer's written instructions.
4. Examine support conditions for compliance with requirements, including alignment between and attachment to structural members.
5. Review structural loading limitations of deck during and after roofing.
6. Review flashings, special details, drainage, penetrations, equipment curbs, and condition of other construction that affect metal panels.
7. Review governing regulations and requirements for insurance, certificates, and tests and inspections if applicable.

8. Review temporary protection requirements for metal panel systems during and after installation.
9. Review procedures for repair of metal panels damaged after installation.
10. Document proceedings, including corrective measures and actions required, and furnish copy of record to each participant.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include manufacturer's detailed material and system description, sealant and closure installation instructions, engineering performance data and finish specifications. Indicate fastener types and spacing; and required fastener pullout values .

B. Shop Drawings:

1. Show roofing system with flashings and accessories in plan, sections and details. Include metal thickness' and finishes, panel lengths, joining details, anchorage details, flashings, insulation and special fabrication provisions for termination and penetrations; thermal expansion provisions and special supports.
2. Indicate relationships with adjacent and interfacing work. Indicate fastener types and spacing; and provide fastener pullout values.
3. Shop drawings must be specific to this project and completed by the metal panel manufacturer's engineering department. Any and/or all changes recommended by the successful bidder must be approved by the manufacturer in writing prior to submittal.

C. Samples: Provide full scale samples of the following materials and system components. Samples shall be of identical material type, thickness, panel width, and material grade/ alloy/temper as the system specified for this project. Except for item 2, samples may be of any of the manufacturer's standard colors.

1. Submit a twelve (12) inch long by actual width sample of panel showing seam profile and stiffening mesas across the flat pan of the panel. Also include separate snap-on cap with factory applied hot melt sealant beads.
2. Provide a three by five (3 x 5) inch sample of the color selected for this project. The sample shall be the actual specified coating system on a metal substrate.
3. Provide samples of actual system components, including: each type of anchor/clip required, head closure assembly, roll goods, bearing plates and/or framing.

1.5 INFORMATIONAL SUBMITTALS

A. Design Loads: Submit copy of manufacturer's minimum design load calculations according to ASCE 7-05, Method 2 for Components and Cladding, prepared by an engineer employed by the system manufacturer as a full-time staff engineer. In no case shall the design loads be taken to be less than those detailed in Performance Requirements article of this specification are.
B. Product Test Reports: Design Test Reports: Provide certified test reports from an independent

testing laboratory that bear the seal of a registered professional engineer to show compliance with the performance criteria specified in Performance Requirements article. Each of the following test reports must be submitted:

1. ASTM E1 592-95: Test results must clearly demonstrate compliance with the following requirements:

    a. The ultimate test failure load shall be reduced by the safety factor specified in Performance Requirements article to determine the allowable working load for the panel system.
    b. The proposed system has been tested to insure that the allowable working load of the panel system meets or exceeds the specified negative wind uplift pressures listed in Performance Requirements article of this specification for all roof zones.
    c. The test results are applicable for the panel material, grade, thickness, width, and profile specified. Results are not applicable for systems that are thinner, wider, lower grade, or different material/profile than the system which was tested.
    d. The results must clearly show that the allowable clip spacing meets or exceeds the requirements specified in Metal Panel and Flashing Installation article 3.3 C for all roof areas. Clip spacing shall not be increased for any roof zone from that which is specified.

2. ASTM E283-93 and E331-86: Test results must clearly demonstrate compliance with the performance requirements specified in Performance Requirements article.
3. ASTM E1646-95 and E1680-95: Test results must clearly demonstrate compliance with the performance requirements specified in Performance Requirements article. Results are not applicable for systems that are thinner, wider, lower grade, or different material/profile than the system which was tested. The differential test pressures must be equal to those specified in Performance Requirements article.
4. UL 790: The proposed roof panel shall be listed as a non-combustible roof covering material and be approved for use in a UL classification assembly.
5. UL 263: The panel system shall clearly be shown as approved for use in an UL Construction Assembly, which conforms to the construction of this project.

C. Qualification Data: For Installer.

D. Field quality-control reports.

E. Sample Warranties: For special warranties.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For metal panels to include in maintenance manuals.

1.7 DISCLOSURE OF MATERIALS/ALTERNATE MANUFACTURERS

A. Disclosure of Materials/Alternate Manufacturers: The materials described herein are the Basis of Design and the type of materials to be used on this project. When a particular make or trade name is specified, it shall be indicative of the minimum standard required. This specification is based on

the performance characteristics of the system identified in section 2.1.

1. If a bidder wants to bid a material by a manufacturer not listed in passage 2.1, 3., the bidding Contractor must submit the alternate material/manufacturer to the Architect for approval and include all items in section 1.5 B.
2. The bidder must disclose in his/her bid package the manufacturer that is intended to be used on the Project if other than a listed manufacturer.
3. If no manufacturer is listed in the bidder's bid, the bidder's bid is accepted with the assumption that the Basis of Design manufacturer will be provided and the bidder shall use the Basis of Design manufacturer.
4. Bidder will not be allowed to change materials after the bid opening date.
5. Failure of a panel system to meet all requirements of this specification will result in forfeiture of the bid award.

B. Alternate (Non-listed) Manufacturers: Alternate Manufacturers are subject to meeting all Design Performance and Warranty requirements. If the bidder wishes to propose an alternate manufacturer and/or material other than that specified, the following manufacturer criteria must be submitted by the bidding contractor to the Architect for approval. Alternate systems will not be considered for approval unless it is submitted by the bidding Contractor, and each of these items has been submitted for review to the Architect and/or Engineer:

1. Submit each item listed in section 1.4 (A through E) for evaluation of the proposed system. Shop drawings for a similar project may be submitted in lieu of shop drawings for this project.
2. Tests shall have been made for identical systems within the ranges of specified performance criteria.
3. Empirical calculations for roof performance shall only be acceptable for positive loads.
4. A list of at least five (5) jobs where the proposed alternate material was used under similar conditions in this region. Each job must be at least five (5) years old, and each must be available for inspection by the Architect and/or Engineer.
5. The standing seam roof panels must be physically manufactured and guaranteed by the material supplier.
6. All products must be in accordance with the Health, Safety and Environmental Control (H, S & E) Regulations, e.g., No asbestos materials, no harmful solvent release materials, etc.
7. In making a request for submission, Bidder/Contractor represents:

    a. Bidder/Contractor has personally investigated the proposed product or method, and determined that it is equal or superior in all respects to that specified.
    b. Bidder/Contractor will provide the same guarantee for substitution as for the product and method specified.
    c. Bidder/Contractor will coordinate installation of accepted substitution in work, making such changes as may be required for work to be completed in all respects.
    d. Bidder/Contractor waives all claims for additional cost related to substitution, which consequently become apparent.
    e. Cost data is complete and includes all related cost under his/her contract or other contracts, which may be affected by the substitution.
    f. Bidder/Contractor will reimburse the Owner for all redesign cost by the Architect for

accommodation of the substitute.

8. Manufacturer's Certificate: Manufacturer must not have been in Chapter 11 bankruptcy during the last five (5) years.
9. A written statement from the manufacturer stating that they will provide the building Owner with site inspections a minimum of three (3) times per week by an experienced, full time employee of the company.
10. A copy of manufacturer's 30-year watertight warranty. Warranty must be a single- source manufacturer's waterproofing warranty and must include coverage for all trim, flashing, and penetrations associated with this standing seam roof system. Warranty must be from the same manufacturer as the modified bituminous membrane roof system, and pre- manufactured metal coping cap system.
11. Submit a certified copy of the roofing manufacturer's ISO 9001:2008 compliance certificate.
12. Proof that the manufacturer has been in business for a minimum number of years equal to the warranty period required for this project.

C. The Architect and/or Engineer reserves the right to be the final authority on the acceptance or rejection of any or all bids, proposed alternate roofing systems or materials that has met ALL specified requirement criteria.

D. Alternate material submissions shall be sent only by the bidding contractor to the Architect. Only substitutes approved in writing by the Architect and/or will be considered.

E. NOTE: Failure to submit substitution package, or any portion thereof requested, may result in disqualification and consideration for that particular contractor's request for manufacturer substitution.

F. Site Formed Panels: All metal panels must be factory premanufactured and engineered for this project. No panels shall be formed on site unless they are longer than 80 lineal feet. Site formed panels must be fabricated by the manufacturer’s equipment and personnel NOT by the installer or contractor.

1.8 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

1. Engage an experienced metal roofing contractor (erector) to install standing seam system who has a minimum of five (5) years of experience specializing in the installation of structural standing seam metal roof systems.
2. Contractor must be certified by manufacturer specified as supplier of structural standing seam system and obtain written certification from manufacturer that installer is approved for installation of specified system. If requested, contractor must supply Owner with a copy of this certification.
3. Successful contractor is required to maintain a full-time supervisor/foreman who is on the job-site at all times during installation of new roof system. Foreman must have a minimum of five

(5) years of experience with the installation of system similar to that specified.

4. Successful contractor must obtain all components of roof system from a single manufacturer, including any roll good materials if required. Any secondary products that are required which cannot be supplied by the specified manufacturer must be recommended and approved in writing by primary manufacturer prior to bidding.
5. If required, fabricator/installer shall submit work experience and evidence of adequate financial responsibility. The Owner's representative reserves the right to inspect fabrication facilities in determining qualifications.
6. The installer must have at least 3 previous projects where the specified standing seam system was installed that are at least 10 years old with the Basis of Design Manufacturer, with a minimum roof size of 10,000 square feet in roof area each.

B. 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 roof area and eave, including fascia, and soffit as shown on Drawings; approximately 12 feet square by full thickness, including attachments and 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. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Manufacturer's Responsibility:

1. Protect components during fabrication and packing from mechanical abuse, stains, discoloration, and corrosion.
2. Provide protective interleaving between contact areas of exposed surfaces to prevent abrasion during shipment, storage, and handling.

B. Installer's Responsibility

1. Store materials off ground providing for drainage; under cover providing for air circulation; and protected from wind movement, foreign material contamination, mechanical damage, cement, lime or other corrosive substances.
2. Stack pre-finished materials to prevent twisting, bending, abrasion and denting and elevate one end to facilitate moisture run-off.
3. Handle materials to prevent damage to surfaces, edges and ends of panels and sheet metal items. Damaged material shall be rejected and removed from the sit e.
4. Unload wall panels using a boom or crane, supporting the panels in at least two (2) locations during lifting.
5. Protect panels from wind-related damages.
6. Protect moisture-sensitive materials from the weather.
7. Inspect materials upon delivery. Reject and remove physically damaged or marred material from project site.

1.10 FIELD CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit assembly of metal panels to be performed according to manufacturers' written instructions and warranty requirements.

B. Determine that work of other trades will not hamper or conflict with necessary fabrication and storage requirements for pre-formed metal roofing system.

C. Protection:

1. Provide protection or avoid traffic on completed roof surfaces.
2. Do not overload roof with stored materials.
3. Support no roof-mounted equipment directly on roofing system.

D. Ascertain that work of other trades which penetrates the roof or is to be made watertight by the roof is in place and approved prior to installation of roofing.

1.11 COORDINATION

A. Coordinate sizes and locations of roof curbs, equipment supports, and roof penetrations with actual equipment provided.

B. Coordinate metal panel installation with rain drainage work, flashing, trim, construction of soffits, and other adjoining work to provide a leakproof, secure, and noncorrosive installation.

1.12 WARRANTY

A. Special Warranty (Manufacturer) - Base Bid: Manufacturer's standard form in which manufacturer agrees to repair or replace standing-seam metal roof panel assemblies that fail to remain weathertight, including leaks, within specified warranty period.

1. Owner shall receive ONE (1) warranty from manufacturer of roof panels covering all of the following criteria.

a. Manufacturer's 30-year No Dollar Limit (NDL) watertight warranty, including coverage for all trim, flashings, and penetrations associated with the standing seam roof area.
b. 30 year coverage on finish including checking, crazing, peeling, chalking, fading and/or adhesion.
c. At the request of the Owner, the Manufacturer will provide an annual inspection. The request for annual inspections shall be applicable for the life of the warranty at no additional cost to the Owner.

2. Warranty Period: 30 years from date of Substantial Completion.

B. Special Warranty (Installer) - Base Bid: Submit roofing Installer's Warranty, on warranty form at end of this Section, signed by Installer, covering Work of this Section, including all components of roofing system such as roofing membrane, base flashing, roof insulation, fasteners, cover boards, substrate boards, vapor retarders, roof pavers and walkway products, for the following warranty period.

1. Manufacturer of roofing system shall be responsible for installer warranty. If Installer is no longer in business at the time of necessary warranty work, covered under either Manufacturer's or Installer's warranties, Manufacturer shall cover Installer's warranty, providing any materials and/or labor necessary to honor the terms of that Warranty

2. Warranty Period: Three years from date of Substantial Completion.

C. Special Warranty on Panel Finishes - Base Bid: Manufacturer's standard form in which 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 D2244.
b. Chalking in excess of a No. 8 rating when tested according to ASTM D4214.
c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.

2. Finish Warranty Period: 30 years from date of Substantial Completion.

D. Combined Edge to Edge Warranty – Base Bid: The warranty for both the metal and modified bituminous roof sections shall come from the same one manufacturer. The warranty must be a weather-tight warranty and including all areas of Mod. Bit. Roofing, Sheet Metal Copings and Edge systems, Standing Seam Metal Roof Panels (both sloped and vertical wall applications). The manufacturer cannot private label their roofing material metal or modified bituminous. There cannot be two separate warranties for the metal roof section and the modified bituminous roof section.

1.13 MANUFACTURER'S INSPECTIONS

A. When the project is in progress, the roofing system manufacturer will provide the following:

B. Keep the Architect and/or Engineer informed as to the progress and quality of the work as observed.

C. Provide job site inspections a minimum of three (3) days a week with weekly photographic and written reports to the Architect.
D. Report to the Architect and/or Engineer in writing any failure or refusal of the Contractor to correct unacceptable practices called to the Contractor's attention.

E. Confirm after completion that manufacturer has observed no applications procedures in conflict with the specifications other than those that may have been previously reported and corrected.

PART 2 PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Thermal Expansion and Contraction:

1. Completed metal roofing and flashing system shall be capable of withstanding expansion and contraction of components caused by changes in temperature without buckling, producing excess stress on structure, anchors, or fasteners, or reducing performance ability.
2. The design temperature differential shall be not less than 200 degrees F.
3. Interface between panel and clip shall provide for unlimited thermal movement in each direction along the longitudinal direction.
4. Location of metal roofing rigid connector shall be at roof ridge unless otherwise approved by the Manufacturer. Metal ridge connector may require design as per job conditions by specified manufacturer.

B. Uniform Wind Uplift Load Capacity:

1. Roof system to be installed over the rigid insulation system and high temperature metal roofing underlayment with the panel systems appropriate one piece clips, fastened in to the structural decking with the appropriate mechanical fasteners to achieve the specified uplift resistance.

2. Installed roof system shall withstand negative (uplift) design wind loading pressures complying with the following criteria. Anchor clips shall be installed exactly as spacing given in Metal Panel and Flashing Installation article 3.3 C.

   a. Design Code: ASCE 7-10, Method 2 for Components and Cladding.
   b. Safety Factor: 1.67 after any load reduction or material stress increase.
   c. Category Ill Building with an Importance Factor of 1.
   d. Wind Speed: 120 mph.
   e. Ultimate Pullout Value: 623 pounds per each of the two fasteners holding the panel anchor to the metal decking.
   f. Exposure Category: C
   g. Design Roof Height: 40 feet
   h. Minimum Building Width: 150 feet
   i. Roof pitch: 1: 12

Roof Area	Design Uplift Pressure:
Zone 1- Mid Roof	28.8 psf
Zone 2 - Eaves, Ridge	33.5 psf
Zone 3 – Corners	53.7 psf
Zone 4 – Vertical	22.6 psf
Zone 5 – Vertical Corner	27.9 psf

3. Capacity shall be determined using pleated airbag method in accordance with ASTM E 1592, testing of sheet metal roof panels. Allowable safe working loads shall be determined by dividing the ultimate test load by the safety factor specified above. In order to comply with the building code, panel system must be tested to withstand these listed pressures at clip spacings no closer than those listed in Metal Panel and Flashing Installation article 3.3 C.

C. Uniform Positive Load Capacity:

1. The installed roof system shall be capable of resisting the following positive uniform roof loads: Roof Live Load of 35 psf; Ground Snow Load of 35 psf; Balanced Uniform Roof Snow Load of 26.7 psf; Maximum Unbalanced Surcharged Load of 10.7 psf, and an Unbalanced Width of 24.6 feet.
2. Capacity to resist positive loads shall be determined by empirical calculations in accordance with AISI. Calculation shall be sealed by a registered professional engineer.
3. Installed roof system shall carry positive uniform design loads with a maximum system deflection of L/180 as measured at the rib (web) of the panel.

D. Underwriters' Laboratories, Inc., (UL) fire resistance P ratings for roof assemblies: If applicable, panel system shall be approved for use in an appropriate Construction Assembly, as defined by UL 263.

E. Underwriters' Laboratories, Inc., (UL) fire rating per UL 790.

F. ASTM E283: Static pressure air infiltration (doors, windows, curtain walls):

Pressure	Leakage Rate
1.57 psf	0.0007 cfm/sq. ft.
6.24 psf	0.0002 cfm/sq. ft.
20.0 psf	0.0036 cfm/sq. ft.

G. ASTM E331: Static pressure water infiltration (doors, windows, curtain walls):

Pressure	Result
5 GAL/HR per sq. ft. and Static Pressure of 20.0 psf for 15 minutes	No Leakage

H. ASTM E1 680: Static pressure air infiltration (roof panels):

Pressure	Leakage Rate
1.57 psf	0.0012 cfm/sq. ft.
6.24 psf	0.0001 cfm/sq. ft.
20.0 psf	0.0011 cfm/sq. ft.

I. ASTM E1 646: Static pressure water infiltration (roof panels):

Pressure	Result
5 GAL/HR per sq. ft. and Static Pressure of 20.0 psf for 15 minutes	No Leakage

J. Water penetration (dynamic pressure): No water penetration, other than condensation, when exposed to dynamic rain and 70 mph wind velocities for not less than five minutes duration, when tested in accord with principles of AAMA 501.1.

K. Capacities for gauge, span or loading other than those tested may be determined by interpolation of test results within the range of test data. Extrapolation for conditions outside test range are not acceptable.

2.2 STANDING-SEAM METAL ROOF PANELS

A. Whenever a particular make of material, trade name and/or manufacturer's name is specified herein, it shall be regarded as being indicative of the minimum standard of quality required. A bidder who proposes to quote on the basis of an alternate material and/or system will only be considered if the proposed alternate is submitted and approved as being equivalent or superior in quality to the specified system in accordance with Disclosure of Materials/Alternate Manufacturers article. Additionally, all manufacturer and contractor/fabricator guidelines, performance criteria and warranty criteria must be met as specified in Part 1

B. Product names for the metal roof panel system and waterproofing materials used in this section shall be based on performance characteristics of the metal System manufactured by The Garland Company, and shall form the Basis of Design. Any proposed system must meet or exceed the following listed characteristics. Additionally, all performance requirements listed in "Design and Performance Criteria" article and "Warranty" criteria article must be met and submitted as well as all items listed in the "Disclosure of Materials/Alternate Manufacturers" article.

2.3 MANUFACTURERS

A. Basis-of-Design Product:

1. The Garland Company Inc.

   Subject to compliance with requirements, provide Garland Company, Inc. (The); standing seam metal roof system or a comparable product.

2.4 SHEET METAL MATERIALS

A. Galvanized steel 24 gauge, G90, smooth as per ASTM A 653.

B. Flashing and flat stock material: Fabricate in profiles indicated on Drawings of same material, thickness, and finish as roof system, unless indicated otherwise.

C. Coated Finish:

1. Exposed surfaces for coated panels:
   a. Two coat coil applied, baked-on full-strength (70% resin) fluorocarbon coating system (polyvinylidene fluoride, PVF2), applied by manufacturer's approved applicator.
   b. Unexposed surfaces for coated panels shall be baked-on polyester coating with .20 to .30 dry film thickness (TDF).

2. Color choices to be selected by architect from Manufacturer's Standard Selections.

D. Gutters, downspouts, leaders and gutter bracket covers shall be fabricated as specified in 0.040" aluminum with a two-coat fluoropolymer finish to match the roof panel

2.5 STANDING SEAM METAL ROOF PANEL SYSTEM

A. Provide the same panel profile from a single manufacturer for ALL standing seam roof areas.

B. Configuration: Provide standing seam panels incorporating mechanically interlocked, concealed anchor clips allowing unlimited thermal movement, and of configuration which will prevent entrance or passage of water.

1. Panel/Cap configuration must have a total of four (4) layers of steel surrounding anchor clip for prevention of water infiltration and increased system strength designed to limit potential for panel blow-off.
2. Profile of panel shall have mesa's every two (2) inches on center continuous throughout panel which are a minimum of one point five (1.5) inches wide. These will absorb thermal stresses, reduce oil canning, and increase load carrying capacity.
3. Exposed fasteners, screws and/or roof mastic are unacceptable and will be rejected. System configuration only allows for exposed fasteners at trim details (as per manufacturer's guidelines).
4. Panels must be fabricated and furnished in continuous lengths from eave to eave with no joint s/ splices/ overlaps.
5. Panels lengths which exceed maximum shipping lengths shall be field rolled on equipment owned by the panel manufacturer. Contractor rolling equipment is NOT allowed. Equipment shall have at least 12 rolling stations and provide a product identical to factory manufactured product. The equipment shall be operated by a trained full time experienced technician.
6. Seam caps shall be manufactured in the factory and shall be installed with NO end laps. Seam sealant must be factory applied.

C. Seam must be two and three-eights (2-3/8) inches minimum height for added upward pressures and aesthetic appeal. Seam shall have continuous anchor reveals to allow anchor clips to resist positive and negative loading and allow unlimited expansion and contraction of panels due to thermal changes. Integral (not mechanically sealed) seams are NOT acceptable.

D. Concealed Standard Anchor Clips: Clips must be sixteen (16) gauge galvanized steel, ONE (1) piece clip with projecting legs for additional panel alignment and provision for unlimited thermal movement in each direction along the longitudinal dimension.

1. Two -piece (2) clips are NOT acceptable.
2. Sealant applied in panel cap must be isolated from clip to insure that no sealant damage occurs from the movement of the panel during expansion and contraction.
3. Clip must maintain a clearance of a minimum of three eights (3/8) inches between panel and substrate for proper ventilation to help prevent condensation on underside of panel and eliminate the contact of panel fastener head to panel.

E. Seam cap: Snap-on cap shall be a minimum of 1" wide "T" shaped of continuous length up to forty-five (45) feet according to job conditions and field seamed by means of manufacturer's standard seaming machine.

1. Cap shall be designed to receive two (2) beads of continuous hot applied gasketing sealant which will be applied independent of anchor clip to allow unlimited thermal movement of panel without damage to cap sealant.
2. Sealant shall be a SIS (Styrene-lsoprene-Styrene) block copolymer type thermoplastic rubber adhesive, non-fatigue water barrier.

F. Standing Seam Panel Width: 18"

G. Stiffening ribs: Located in flat of panel to minimize oil canning and telegraphing of structural members.

H. Replace-ability: Panels shall be of a symmetrical design with snap on cap configuration such that individual panels may be removable for replacement without removing adjacent panels.

I. Panel ends shall be panned at ridge or where applicable per the manufacturer's approved shop drawings.

J. Panel length: Full length without joints/ splices/ laps.

2.6 MISCELLANEOUS MATERIALS

A. Accessories:

1. Gable anchor clips: Standing Seam style, 16 gauge galvanized steel.
2. Concealed I-SPAN Anchors: I-SPAN Anchors are extruded aluminum, alloy 6005-T5, with projecting legs for additional panel alignment and provision for unlimited thermal movement in each direction along the longitudinal dimension. Provide anchors of continuous lengths with a 0.062 inch minimum thickness.
3. Fasteners:

a. Concealed fasteners: Corrosion resistant steel fasteners (zinc plated, stainless steel or equal) designed to meet structural loading requirements and in accordance with recommendations from the manufacturer of the metal roof decking and wood blocking. Provide #14-13 DPI as the minimum fastener size.

b. Exposed fasteners: Series 410 stainless steel fasteners or one-eighth (1/8) inch diameter stainless steel waterproof rivets. All exposed fasteners shall be factory painted to match the color of the standing seam panels.

4. Closures: Factory precut closed cell foam meeting ASTM D1056 or ASTM D3575, enclosed in metal channel matching panels when used at ridge, rake, and jamb.
5. Framing Components:

   a. Hat Sections / Z Furrings: Galvanized steel furring hat sections, 22 gauge minimum. For vertical application of roof panels. Refer to Wall Section drawings.

6. Provide all miscellaneous accessories for complete installation.

B. Sealant:

1. Acceptable product:

   a. Concealed Application: Basis of design manufacturer Butyl Sealant or approved equal.
   b. Exposed Application: Basis of design manufacturer Tripolymer Sealant or approved equal.

2. Colors: As selected by Architect from sealant manufacturer's standard selection.

C. Prefabricated Shims:

1. Install prefabricated high-density polyethylene plastic shims under the roof panel clip and over the bearing plates to maintain a level/plumb plane to prevent buckling of the roof panel.

D. Snow Retention System:

1. Shall be S-5! Snow Retention System as supplied by the standing seam panel manufacturer designed for the appropriate local code ground snow load of 35 psf resulting in the required balanced and unbalanced snow loads, specified roof slopes, radius and lengths, and an 18 inch wide panel. One (1) row of the S-5 ! Color Guard snow retention system will be required on both eave ends of all roof sections. An S-5! Clip shall be installed at each panel seam, and one (1) Snow Clips between each panel.
2. Color shall match standing seam roof panel color.

E. Gutters and Downspouts:

1. Gutters: Formed from 0.040" aluminum with a two-coat fluoropolymer paint finish to match the roof panel. Match profile described in drawings, providing complete with end pieces, outlet tubes, and other special pieces as required. Fabricate in minimum 10-foot long sections, of size and metal thickness according to SMACNA's "Architectural Sheet Metal Manual." Furnish gutter supports spaced per SMACNA's recommendation based on gauge and stretch-out, fabricated from same metal as gutters. Provide wire ball strainers of compatible metal at outlets. Finish gutters to match standing seam metal roof panels.
2. Gutter Brackets: External gutter bracket supports shall be 2-inch wide x ¼-inch thick formed

aluminum, and shall be spaced at no greater than 30" on center. Stagger external gutter bracket supports with internal gutter st raps. External supports shall be post- painted with a matching full-strength 70 percent PVDF finish, or covered with an aluminum cover matching the roof panel material, and warranted by the panel manufacturer for same term as specified for material finishes.

3. Gutter Straps: Internal gutter straps shall be 1-inch wide x 1/8-inch thick formed aluminum, and shall be spaced at no greater than 30" on center. Stagger internal gutter straps with gutter external bracket supports.
4. Downspouts: Formed from same material as roof panels. Fabricate in 10-foot long sections, complete with formed elbows and offsets, of size and metal thickness according to SMACNA's "Architectural Sheet Metal Manual". Finish downspouts to match gutters.
5. Downspout Brackets: Where detailed, surface mounted downspout protection guards shall be fabricated from ¼-inch thick formed aluminum, and shall be post-painted with a matching full-strength 70 percent PVDF finish and warranted by the panel manufacturer for same term as specified for material finishes.

2.7 FABRICATION

A. Shop fabricate metal roofing and flashing components to the maximum extent possible, forming metal work with clear, sharp, straight, and uniform bends and rises. Hem exposed edges of flashings.

B. Form flashing components from full single width sheet in minimum ten (10'-0") foot lengths. Provide mitered corners, joined using closed end pop rivets and joint sealant.

C. Fabricate roofing and related sheet metal work in accord with approved shop drawings and applicable standards.

2.8 FINISHES

A. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

B. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in same piece are unacceptable. Variations in appearance of other 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 PREPARATION

A. Inspection: Examine the alignment and placement of the building structure and substrate. Correct any objectionable warp, waves or buckles in the substrate before proceeding with installation of the pre-formed metal roofing. The installed roof panels will follow the contour of the structure and may appear irregular if not corrected.

B. Establish straight side and crosswise benchmarks.

C. Use proper size and length fastener for strength requirements. Approximately five- sixteenths (5/16) inch is allowable for maximum fastener head size beneath the panel.

D. Rectangular shaped roofs shall be checked for square and straightness. Gable ends may require setting a true line for the gable clips and setting with string line.

E. Measure the roof lengthwise to confirm panel lengths, overhangs, coverage of flashings at eaves and ridges and verify clearances for thermal movement.

F. Pre-roofing Conference:

1. Prior to beginning metal roofing work, a pre-roofing conference shall be held to review work to be accomplished.
2. Architect, Engineer, Owner, contractor, metal roofing subcontractor, metal roofing system manufacturer's representative and all other subcontractors who have equipment penetrating roof or whose work involves access to roof shall be present.

3.2 METAL FABRICATION AND EQUIPMENT

A. Mechanical panel fabrication for field panels shall be operated by a trained full time experienced technician.

B. Mechanical equipment shall have a least twelve (12) rolling stations and provide a product identical to factory manufactured product.

3.3 METAL PANEL AND FLASHING INSTALLATION

A. Details on the project documents are provided for bidding purposes. All details will be shown on manufacturer's shop drawings to successful bidder. Comply with all details and install roof panels, roofing materials and flashings in accordance with approved shop drawings and manufacturer's product data, within specified erection tolerances.

B. Prepare roof for the installation of standing seam panels, including:

1. Install the specified and approved underlayment as required in this specification over the installed insulation system. The specified underlayment shall be applied over the entire roof area.

C. Directly over the installed metal hat channels (completed roof substrate), install one (1) piece panel anchor clips. All anchor clips will be set on sixteen gauge galvanized pre-punched bearing plates to distribute the loads on the insulation board, and fastened with two (2) approved fasteners into the metal roof deck based on the following fastener spacing pattern. As required, install prefabricated high density polyethylene plastic shims to maintain a level/plumb surface/plane for the standing seam panel to prevent buckling.

Clip Spacing/Wind Uplift Zones:

* Clip spacing shall be mapped into Zones per manufacturers shop drawings that are required by the installer.
* This clip spacing must be followed to ensure integrity of the completed installation. These have been determined based on the uplift calculations for the specified roof and the test results of ASTM E-1592.

D. Installation of Roof Panels: Roof panels can be installed by starting from either end and working towards the opposite end. Due to the symmetrical design of the specified panel system, it is also acceptable to start from the middle of the roof and work toward each end.

1. Stainless steel pop rivets shall be secured through the anchor reveal of the panel leg and extend into the arms of the panel clip located on either side of the curved apex of the roof. The panel is then anchored at both sides of each of the clip. Three (3) rivets per panel are required and shall be installed.

    a. Be sure to capture all drilling debris during this operation with a rag or cloth placed on the panels at the drilling operation.
    b. Panels are not securely attached to the roof until fixed to the anchor clip. To avoid damage and injury, all panels shall be fixed to the anchor clip immediately as they are installed.

2. The seam caps are shipped with two (2) beads of factory applied hot melt sealant located inside the caps. To install the caps, hook one side of the cap over the panel edge and rotate over the opposite panel leg. For ease of installation, start at one end of the panel and work toward the opposite end.
3. A hand crimping tool is used to crimp the cap around the top of two adjacent panels
4. Caps shall then be permanently seamed with manufacturer's mechanical seamer.
5. At the end of each day's work, seam caps shall be mechanically seamed or hand crimped (crimp 4 inches every 8 feet) to reduce the possibility of wind damage prior to completion of the project.
6. Un-installed panels which are temporarily stored on the ground or roof shall be secured in place at the end of each day's work to prevent possible damage or injury.

E. Isolate dissimilar metals and masonry or concrete from metals with bituminous coating. Use gasketed fasteners where required to prevent corrosive action between fastener, substrate, and panels.

F. Limit exposed fasteners to extent indicated on shop drawings.

G. Anchorage shall allow for temperature expansion/contraction movement without stress or elongation of panels, clips, or anchors. Attach clips to structural substrate using fasteners of size and spacing as determined by manufacturer's design analysis to resist specified uplift and thermal movement forces.

H. Seal laps and joints in accordance with roofing system manufacturer's product data.

I. Coordinate flashing and sheet metal work to provide weathertight conditions at roof terminations. Fabricate and install in accordance with standards of SMACNA Manual.

J. Provide for temperature expansion/contraction movement of panels at roof penetrations and roof mounted equipment in accordance with system manufacturer's product data and design calculations.

K. Installed system shall be true to line and plane and free of dents, and physical defects. In light gauge panels with wide flat surfaces, some oil canning may be present. Oil canning does not affect the finish or structural integrity of the panel and is therefore not cause for rejection.

L. Maximum variation from true planes or lines shall be one-fourth (1/4) inch in twenty (20) feet and three -eighth (3/8) inch in forty (40) feet or more.

M. Form joints in linear sheet metal to allow for one-fourth (1/4) inch minimum expansion at twenty (20) feet on center maximum and eight (8) feet from corners.

N. At joints in linear sheet metal items, set sheet metal items in two (2), one-fourth (1/4) inch beads of butyl sealant. Extend sealant over all metal surfaces. Mate components for positive seal. Allow no sealant to migrate onto exposed surfaces.

O. Remove damaged work and replace with new, undamaged components.

P. Touch up exposed fasteners using paint furnished by roofing panel manufacturer and matching exposed panel surface finish.

Q. Clean exposed surfaces of roofing and accessories after completion of installation. Leave in clean condition at date of substantial completion. Touch up minor abrasions and scratches in finish.

R. Snow Retention System:

1. At every location called out by the architectural drawings install one (1) row of the S-5! Color Guard Snow retention system as supplied by the standing seam panel manufacturer in accordance with the manufacturer's recommendations. S-5 ! Clamps are require at EACH panel seam, and the S-5 ! Clamp set screws shall be tightened to a tension of 115 in-lbs per each screw. Additionally, a S-5! Snow Clip is required in each panel.

3.4 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect metal roof panel installation, including accessories. Report results in writing. Inspections required 3 days per week.

B. Remove and replace applications of metal roof panels where tests and inspections indicate that they do not comply with specified requirements.

C. Additional tests and inspections, at Contractor's expense, are performed to determine compliance

of replaced or additional work with specified requirements.

D. Prepare test and inspection reports.

3.5 CLEANING AND PROTECTION

A. Remove temporary protective coverings and strippable films, if any, as metal panels are installed, unless otherwise indicated in manufacturer's written installation instructions. On completion of metal panel installation, clean finished surfaces as recommended by metal panel manufacturer. Maintain in a clean condition during construction.

B. Replace metal panels that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 07 41 13

ROOFING INSTALLER'S GUARANTEE FORM
(Standing Seam Metal Roof Panel System)

WHEREAS_____

OF_____

Herein called the "Roofing Installer," has performed roofing and associated work ("work") on the following project:

Owner:	Bullitt County Public Schools
Address:	1040 Highway 44 East, Shepherdsville KY 40165
Building Name/Type:	Phase III Athletics – Bullitt Central Physical Science Center
Address:	
Type of Work:	
Acceptance Date:	
Guarantee Period:	
Expiration Date:	

A. AND WHEREAS Roofing Installer has contracted (either directly with Owner or indirectly as a subcontractor) to guarantee the complete roof system, including metal flashings and skirt flashing, metal joint caps and cap flashings, metal counterflashings and receivers, gutters and downspouts, roof insulation, wood nailers and blocking, cant strips, base sheet, base plys, cap and base sheets, mechanical fasteners and termination bars – all the aforementioned said work against leaks and faulty or defective materials and workmanship for designated Guarantee Period.

B. NOW THEREFORE Roofing Installer hereby guarantees, subject to terms and conditions herein set forth, that during Guarantee 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.

C. This Guarantee is made subject to the following terms and conditions:
   1. Specifically excluded from this Guarantee are damages to work and other parts of the building, and to building contents, caused by:
      a. Lightning
      b. Peak gust wind speed exceeding 120 mph
      c. Fire
      d. Failure of roofing system substrate, including cracking, settlement, excessive deflection, deterioration, and decomposition by causes other than roof system leaks

e. Faulty construction or materials of parapet walls, copings, chimneys, vents, equipment supports, and other edge conditions and penetrations of the work
f. Vapor condensation on bottom of roofing
g. Activity on roofing by others, including other 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, Guarantee shall be null and void until such damage has been repaired by Roofing Installer and until cost and expense thereof has been paid by Owner or by another responsible party so designated.
3. The Roofing Installer is responsible for damage to work covered by this Guarantee and is further liable for consequential damages to building or building contents resulting from leaks or faults or defects of work for a period of Three Years form date of Substantial Completion of the Work.
4. During Guarantee 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 Guarantee shall become null and void on date of said alterations, but only to the extent said alterations affect work covered by this Guarantee. If Owner engages Roofing Installer to perform said alterations, Guarantee 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 Guarantee.
5. During Guarantee 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 Guarantee shall become null and void on date of said change, but only to the extent said change affects work covered by this Guarantee.
6. The Owner shall promptly notify Roofing Installer of observed, know, or suspected leaks, defect or deterioration and shall afford reasonable opportunity for Roofing Installer to inspect work and to examine evidence of such leaks, defect or deterioration.
7. This Guarantee is recognized to be the only guarantee 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 Guarantee 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.

IN WITNESS THEREOF
This instrument has been duly executed this day of , 20 .

Authorized Signature_____

Printed Name_____

Title_____

END OF INSTALLER'S GUARANTEE

SECTION 07 42 13 – METAL SOFFIT PANELS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 DESCRIPTION OF WORK

A. Extent of prefabricated soffit panels is indicated on the Drawings and indicated by provisions of this Section.

B. The following types of work are specified in this Section:

1. Preformed steel soffit systems and accessories

C. Sheet metal and flashings not part of soffit systems are included in other Division 07 Sections.

1.03 QUALITY ASSURANCE

A. Industry Standards: Provide products which comply with applicable requirements of "Architectural Sheet Metal Manual" by SMACNA, Fifth Edition, except as otherwise indicated.

B. Submit manufacturer's written warranty to cover finish on steel. Failure of material includes but is not limited to, fading, chalking or peeling. Length of time for warranty is 20 years from the Date of Substantial Completion. Painted Metal Finish Warranty Period: Twenty (20) Years from date of Substantial Completion

1.04 MANUFACTURER'S INSPECTIONS

A. When the project is in progress, the system manufacturer will provide the following:

1. Keep the Architect and/or Engineer informed as to the progress and quality of the work as observed.

2. Provide job site inspections a minimum of three (3) days a week with reports to the Architect.

3. Report to the Architect and/or Engineer in writing any failure or refusal of the Contractor to correct unacceptable practices called to the Contractor's attention.

   Confirm after completion that manufacturer has observed no applications procedures in conflict with the specifications other than those that may have been previously reported and corrected.

1.05 SUBMITTALS

A. Product Data: Submit manufacturer's technical product data, installation instruction and general recommendations for each product required. Include data substantiating that materials and performance comply with requirements.

B. Shop Drawings: Submit shop drawings indicating layout, joining, profiles, accessories, anchorages, flashing connections and relationship to supporting structure and to adjoining wall construction.

C. Samples:

1. For initial selection of colors, submit manufacturer's color chart consisting of small sections of the same metal to be used in the Work which have been finished to indicate the full range and quality of standard colors or color ranges and of standard textures available.

1.06 JOB CONDITIONS

A. Coordinate work of this Section with adjoining work for proper sequencing of each installation to ensure best possible weather resistance and protection of materials and finishes against damage.

PART 2 PRODUCTS

2.01 MATERIALS

A. Zinc-Coated Steel Sheet: ASTM A 526, with G90 zinc coating.

B. Miscellaneous Materials:
1. Concealed Fasteners: Same metal as item fastened or other non-corrosive metal recommended by manufacturer.
2. Mastic Sealant: Polyisobutylene; non-hardening, non-skinning, non-drying, non-migrating sealant.
3. Adhesives: Type recommended by manufacturer for substrate and project conditions and formulated to withstand min. 60 PSF uplift force.

2.02 FABRICATION, GENERAL

A. Provide soffit panels which are designed and fabricated to fit applications indicated and to perform optimally with respect to weather resistance, water tightness, durability, strength and uniform appearance.

B. Expansion Provisions: Fabricate soffits to allow controlled expansion in running lengths not only for movement of metal components in relationship to one another but also to adjoining dissimilar materials, including flashing and roofing membrane materials, in a manner which is sufficient to prevent water leakage, deformation or damage.

2.03 SOFFIT PANEL SYSTEMS

A. Manufacturer: Subject to compliance with requirements, provide products of one of the following:

1. The Garland Company
2. Metal Sales
3. Dimensional Metals
4. Tremco
5. Metal Panel Systems

B. Metal Panels: The metal panels shall be fabricated from 24-gauge G90 galvanized steel, conforming to ASTM A 446, Grade A and ASTM A 525.

1. Flush panel with concealed fasteners.
2. Perforated panels with concealed fasteners (as described on the Drawings).
3. 12-inch wide panel.
4. Full length panels shall be utilized without end laps.

C. Concealed Clips: Soffit system shall be fastened to framing members with 16-gauge, G90 galvanized steel, A 446, Grade D, concealed fastening clips. The clips shall provide for unlimited, unimpeded panel movement confirmed by testing from an independent testing laboratory.

D. Flashing and Trim: All flashings and trim shall be of the same material, finish and color as the panels, unless otherwise indicated. Construct with 24-gauge materials.

E. Accessories:

1. Fasteners: Screws shall be stainless steel, No.14 diameter, self-tapping type.

2.04 METAL FINISHES

A. General: Apply coatings either before or after forming and fabricating panels, as required by coating process and as required for maximum coating performance capability. Protect coating promptly after application and cure, by application of strippable film or removable adhesive cover and retain until installation has been completed.

1. Color: Light Bronze (by Basis of Design) – metallic paint

B. Flouropolymer Coating: Full-strength, 70% “Kynar 500” coating, baked-on for 15-minutes at 450-degrees F in a dry film thickness of 1.0-mil, 30% reflective gloss (ASTM D 523), over min. 0.2-mil baked-on modified epoxy primer.

1. Durability: Provide coating which has been field tested under normal range of weathering conditions for a minimum of 20 years with significant peel, blister, flake, chip, crack or check

in finish and without chalking in excess of 8 (ASTM D 659), and without fading in excess of 5-NBS units.

C. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

D. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

E. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

F. Provide reverse side coating on interior side of metal soffit panel consisting of primer and washcoat. Washcoat to consist of PVDF coating, 0.5 mil total dry film thickness.

PART 3 EXECUTION

3.01 INSTALLATION

A. General: Comply with manufacturer's written installation instruction and recommendations. Coordinate with installation if sub framing and other substrates to receive work of this Section, with flashing, and wall construction; as required to ensure that each element of the work performs properly, and that combined elements are waterproof and weather tight. Anchor products included in this Section securely to structural substrates, adequate to withstand lateral and thermal stresses as well as inward and outward loading pressures.

B. Isolation: Where metal surfaces of units are installed in contact with dissimilar metal or corrosive substrates, including wood, apply bituminous coating on concealed metal surfaces, or provide other permanent separation as recommended by manufacturer.

3.02 CLEANING AND PROTECTION

A. Clean exposed metal surfaces in accordance with manufacturer's instructions. Touch-up damaged metal coatings will not be allowed and scratched/damaged sheets will require replacement with exact color replacement.

B. Protections: Provide protective measures as required to ensure that work of this Section will be without damage or deterioration at time of Substantial Completion.

END OF SECTION 07 42 13

SECTION 07 52 50 - MODIFIED BITUMINOUS MEMBRANE ROOFING

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SECTION INCLUDES

A. Cold Applied 2-Ply Membrane Roofing

1. Roofing Accessories – including retrofit roof drains and self-adhering vapor retarder sheet

B. Related Sections:

1. Division 05 Section “Steel Decking”.
2. Division 06 Section “Rough Carpentry” for wood nailers and cant strips.
3. Division 07 Section “Roof Insulation” for insulation and fastening.
4. Division 07 Section “Sheet Metal Flashing and Trim” for weather protection for base flashings.
5. Division 07 Section “Roof Accessories” for counter flashing gravel stops, and fascia.
6. Division 08 Section “Insulated Translucent Wall System”.

1.03 REFERENCES

A. ASTM D 4 - Standard Specification for Asphalt Primer Used in Roofing, Dampproofing, and Waterproofing.

B. ASTM D 312 - Standard Specification for Asphalt used in Roofing.

C. ASTM D 451- Standard Test Method for Sieve Analysis of Granular Mineral Surfacing for Asphalt Roofing Products.

D. ASTM D 1970- Specification for Sheet Materials, Self-Adhering Polymer Modified Bituminous, Used as Steep Roofing Underlayment for Ice Dam Protection.

E. ASTM D 1079 - Standard Terminology Relating to Roofing, Waterproofing and Bituminous Materials.

F. ASTM D 1227 - Standard Specification for Emulsified Asphalt Used as a Protective Coating for Roofing.

G. ASTM D 1863 - Standard Specification for Mineral Aggregate Used as a Protective Coating for Roofing.

H. ASTM D 2178 - Standard Specification for Asphalt Glass Felt Used in Roofing and Waterproofing.

I. ASTM D 2822 - Standard Specification for Asphalt Roof Cement.

J. ASTM D 2824- Standard Specification for Aluminum-Pigmented Asphalt Roof Coating.

K. ASTM D 4601-Standard Specification for Asphalt Coated Glass Fiber Base Sheet Used in Roofing.

L. ASTM D 5147 - Standard Test Method for Sampling and Testing Modified Bituminous Sheet Materials.

M. ASTM D 6162 - Standard Specification for Styrene Butadiene Styrene (SBS) Modified Bituminous Sheet Materials Using a Combination of Polyester and Glass Fiber Reinforcements.

N. ASTM D 6163 - Standard Specification for Styrene Butadiene Styrene (SBS) Modified Bituminous Sheet Materials Using Glass Fiber Reinforcements.

O. ASTM D 6164 - Standard Specification for Styrene Butadiene Styrene (SBS) Modified Bituminous Sheet Materials Using Polyester Reinforcements.

P. ASTM D 6754- Standard Specification for Ketone Ethylene Ester (KEE) Sheet Roofing.

Q. ASTM D 6757 - Standard Specification for Underlayment Felt Containing Inorganic Fibers Used in Steep-Slope Roofing.

R. ASTM E 108 - Standard Test Methods for Fire Test of Roof Coverings

S. Factory Mutual Research (FM): Roof Assembly Classifications.

T. National Roofing Contractors Association (NRCA): Roofing and Waterproofing Manual.

U. Sheet Metal and Air Conditioning Contractors National Association, Inc. (SMACNA) - Architectural Sheet Metal Manual.

V. Underwriters Laboratories, Inc. (UL): Fire Hazard Classifications.

W. Warnock Hersey (WH): Fire Hazard Classifications.

X. ANSI-SPRI ES-1 Wind Design Standard for Edge Systems used with Low Slope Roofing Systems.

Y. ASCE 7, Minimum Design Loads for Buildings and Other Structures

Z. UL- Fire Resistance Directory.

AA. FM Approvals - Roof Coverings and/or RoofNav assembly database.

1.04 DESIGN/ PERFORMANCE REQUIREMENTS

A. Perform work in accordance with all federal, state, and local codes.

B. Design Requirements:

1. Uniform Wind Uplift Load Capacity

a. Installed roof system shall withstand negative (uplift) design wind loading pressures complying with the following criteria. Anchor clips shall be installed exactly as spacing given in article 3.3, C.

1) Design Code: ASCE 7-16, Method 2 for Components and Cladding.
2) Edge zone width: 24’
3) Fastener Safety Factor: 3 after any load reduction or material stress increase.
4) Importance Category: IV.
5) Importance Factor of: 1
6) Wind Speed: 120 mph
7) Ultimate Pullout Value: 501 pounds per each of the two fasteners holding the panel anchor to the metal roof deck.
8) Exposure Category: C.
9) Design Roof Height: 40 feet.
10) Minimum Building Width: 400 feet.
11) Roof Pitch: .25:12.
12) Roof Area Design Uplift Pressure:

Zone 1	41.3 psf
Zone 2 – Eaves, ridges, hip	52.3 psf
Zone 3 – Corners	68.8 psf

2. Live Load: Do not to exceed building design criteria.
3. Dead Load:

a. Installation of new roofing materials shall not exceed the deadload capacity of the existing roof structure.

1.05 SUBMITTALS

A. Submit under provisions of Division 01 Section “Submittals”.

B. Product Data: Manufacturer's data sheets on each product to be used, including:

1. Preparation instructions and recommendations.
2. Storage and handling requirements and recommendations.
3. Installation instructions.

C. Shop Drawings: Submit shop drawings including installation details of roofing, flashing, fastening, insulation, and vapor barrier, including notation of roof slopes and fastening patterns of insulation and base modified bitumen membrane, prior to job start.

D. Design Pressure Calculations: Submit design pressure calculations for the roof area in accordance with ASCE 7 and local Building Code requirements. Include a roof system attachment analysis report, certifying the system's compliance with applicable wind load requirements before Work begins.

E. Verification Samples: For each modified bituminous membrane ply product specified, two samples, minimum size 6-inches square, representing actual product, color, and patterns.

F. Manufacturer's Certificates: Provide to certify products meet or exceed specified requirements.

G. Test Reports: Submit test reports, prepared by an independent testing agency, for all modified bituminous sheet roofing, indicating compliance with ASTM D5147. Testing must be performed at 77 deg. F. Tests at O deg. F will not be considered.

H. Closeout Submittals: Provide manufacturer's maintenance instructions that include recommendations for periodic inspection and maintenance of all completed roofing work. Provide product warranty executed by the manufacturer. Assist Owner in preparation and submittal of roof installation acceptance certification as may be necessary in connection with fire and extended coverage insurance on roofing and associated work. Provide a manufacturer's example of an inspection report that includes photographic evidence of rejection, corrective action, and acceptance of roofing installation. Provide a signed letter of the manufacturer stating that they will inspect the job at least three days a week during installation for the duration of the project.

1.06 QUALITY ASSURANCE

A. Perform Work in accordance with NRCA Roofing and Waterproofing Manual.

B. Manufacturer Qualifications: Company specializing in manufacturing products specified with documented ISO 9001 certification and minimum of twelve years of documented experience and must not have been in Chapter 11 bankruptcy during the last 20 years.

C. 3 days per week inspection reports to owner from full time material manufacturer's employee. The reports will include pictures of the day's progress made by the contractor and a detailed written report as to the work performed that day.

D. Installer Qualifications: Company specializing in performing Work of this section with minimum 10 years documented experience and a certified Pre-Approved Manufacturer contractor for a minimum of 10 years. They shall not have filed for Bankruptcy in the last 10 years.

E. The manufacturer must have current ISO 9001:2000 certification for the manufacturing of the products to be utilized on this project.

F. Installer's Field Supervision: Maintain a full-time Supervisor/Foreman on job site during all phases of

roofing work while roofing work is in progress.

G. Roofing manufacturer's inspector must have a minimum of 2 years' experience with said roofing manufacturer and be an employee of the manufacturer warranting the roof system. A signed affidavit should be submitted as to the hire date of said employee of roofing manufacturer.

H. Product Certification: Provide manufacturer's certification that materials are manufactured in the United States and conform to requirements specified herein, are chemically and physically compatible with each other, and are suitable for inclusion within the total roof system specified herein.

I. Source Limitations: Obtain all components of roof system from a single manufacturer. Secondary products that are required shall be recommended and approved in writing by the roofing system Manufacturer. Upon request of the Architect or Owner, submit Manufacturer's written approval of secondary components in list form, signed by an authorized agent of the Manufacturer.

1.07 PRE-INSTALLATION MEETINGS

A. Convene minimum two weeks prior to commencing Work of this section.

B. Review installation procedures and coordination required with related Work.

1. Installation of roofing system shall not begin until all outstanding issues are resolved to the satisfaction of the Architect.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store products in manufacturer's unopened packaging with labels intact until ready for installation.

B. Store all roofing materials in a dry place, on pallets or raised platforms, out of direct exposure to the elements until time of application. Store materials at least 4-inches above ground level and covered with "breathable" tarpaulins.

C. Stored in accordance with the instructions of the manufacturer prior to their application or installation. Store roll goods on end on a clean flat surface. No wet or damaged materials will be used in the application.

D. Store at room temperature wherever possible, until immediately prior to installing the roll. During winter, store materials in a heated location with a 50-degree F minimum temperature, removed only as needed for immediate use. Keep materials away from open flame or welding sparks.

E. Avoid stockpiling of materials on roofs without first obtaining acceptance from the Architect/Engineer.

F. Adhesive storage shall be between the range of above 40-degree F and below 80-degree F. Area of

storage shall be constructed for flammable storage.

1.09 COORDINATION

A. Coordinate Work with installing associated metal flashings as work of this section proceeds.

1.10 PROJECT CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside the manufacturer’s absolute limits.

1.11 WARRANTY

A. Upon completion of the work, provide the Manufacturer's written and signed **30 year Edge-To-Edge No Dollar Limit System Warranty**, warranting that, if a leak develops in the roof during the term of this warranty, due either to defective material or defective workmanship by the installer, the manufacturer shall provide the Owner, at the Manufacturer's expense, with the labor and material necessary to return the defective area to a watertight condition **including Same Manufacturer's Metal Edge components and Metal Roof Panels.**

1. Warranty Period:

a. 30 years from date of acceptance.

B. Installer is to guarantee all work against defects in materials and workmanship for a period indicated following final acceptance of the Work.

1. Warranty Period:

a. 3 years from date of acceptance.

C. The warranty for both the metal and modified bituminous roof sections shall come from the same one manufacturer. The manufacturer cannot private label their roofing material metal or modified bituminous. There cannot be two separate warranties for the metal roof section and the modified bituminous roof section.

D. The material manufacturer will provide an annual inspection for the duration of the warranty at the request of the owner at no additional charge.

E. The warranty shall cover all roof-related components installed under this specification and shall not be limited to only those materials supplied by the material supplier issuing the warranty.

F. Specifically - The warranty submitted by the manufacturer of record will cover:

1. All labor.

2. Materials by the manufacturer of record.
3. Materials by others.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Basis of Design Manufacturer: **The Garland Company, Inc.**

B. Alternate bid Manufacturers:

1. Ecology Roofing Systems
2. SR Products (Simon Roofing Products)
3. Tremco.

C. Requests for substitutions will be considered in accordance with provisions of Division 01 Section "Substitutions".

D. The Products specified are intended and the Standard of Quality for the products required for this project. If other products are proposed the bidder must disclose in the bid the manufacturer and the products that they intend to use on the Project. If no manufacturer and products are listed, the bid may be accepted only with the use of products specified.

1. Bidder will not be allowed to change materials after the bid opening date.
2. If alternate products are included in the bid, the products must be equal to or exceed the products specified. Supporting technical data shall be submitted to the Architect/ Owner for approval prior to acceptance.
3. In making a request for substitution, the Bidder/Roofing Contractor represents that it has:

    a. Personally investigated the proposed product or method, and determined that it is equal or superior in all respects to that specified.
    b. Will provide the same guarantee for substitution as for the product and method specified.
    c. Will coordinate installation of accepted substitution in work, making such changes as may be required for work to be completed in all respects.
    d. Will waive all claims for additional cost related to substitution, which consequently become apparent.
    e. Cost data is complete and includes all related cost under his/her contract or other contracts, which may be affected by the substitution.
    f. Will reimburse the Owner for all redesign cost by the Architect for accommodation of the substitution.

4. Architect/ Owner reserves the right to be the final authority on the acceptance or rejection of any or all bids, proposed alternate roofing systems or materials that has met ALL specified requirement criteria.
5. Failure to submit substitution package, or any portion thereof requested, will result in immediate disqualification and consideration for that particular contractors request for

manufacturer substitution.

2.02 ROOFING SHEET METALS

A. Base Bid

1. Base (Ply) Sheet: One ply bonded to the prepared substrate with lnterply Adhesive:

    a. 80 mil SBS (Styrene-Butadiene-Styrene) rubber modified roofing membrane reinforced with a fiberglass scrim, performance requirements according to ASTM D 5147.

2. Modified Cap (Ply) Sheet: One ply bonded to the prepared substrate with interplay adhesive:

    a. 160 mil SBS and SIS (Styrene-Butadiene-Styrene and Styrene-lsoprene- Styrene) rubber modified membrane incorporating post-consumer recycled rubber, fire retardant additives and reinforced with a fiberglass and polyester composite scrim. Surfaced with the highly reflective Sunburst white mineral. ASTM D 6162, Type lll Grade G

3. lnterply Adhesive: (1 and 2)

    a. Polymer modified cold process asphalt roofing bitumen V.O.C. compliant ASTM D 3019.

4. Flashing Base Ply: One ply bonded to the prepared substrate with lnterply Adhesive:

    a. 80 mil SBS (Styrene-Butadiene-Styrene) rubber modified roofing membrane reinforced with a fiberglass scrim, performance requirements according to ASTM D 5147.

5. Flashing Cap (Ply) Sheet: One ply bonded to the prepared substrate with InterplyAdhesive:

    a. 160 mil SBS and SIS (Styrene-Butadiene-Styrene and Styrene-lsoprene- Styrene) rubber modified membrane incorporating post-consumer recycled rubber, fire retardant additives and reinforced with a fiberglass and polyester composite scrim. Surfaced with the highly reflective Sunburst white mineral. ASTM D 6162, Type lll Grade G

6. Flashing Ply Adhesive:

    a. Brush grade flashing adhesive

PART 3 EXECUTION

3.01 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

B. Inspect and approve the deck condition, slopes and fastener backing if applicable, parapet walls, expansion joints, roof drains, stack vents, vent outlets, nailers and surfaces and elements.

C. Verify that work penetrating the roof deck, or which may otherwise affect the roofing, has been properly completed.

D. If substrate preparation and other conditions are the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.02 PREPARATION

A. General: Clean surfaces thoroughly prior to installation.

1. Remove all present roofing and insulation materials down to the metal decking in an appropriate manner / method and dispose of in manners that are approved by all local codes and governances.
2. Only remove roof areas daily that can be covered the same day with new roofing materials to provide a water tight roofing assembly at all times.
3. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
4. Fill substrate surface voids that are greater than 1/4-inch wide with an acceptable fill material.
5. Roof surface to receive roofing system shall be smooth, clean, free from loose gravel, dirt, and debris, dry and structurally sound.
6. Wherever necessary, all surfaces to receive roofing materials shall be power broom and vacuumed to remove debris and loose matter prior to starting work.
7. Do not apply roofing during inclement weather. Do not apply roofing membrane to damp, frozen, dirty, or dusty surfaces.
8. Fasteners and plates for fastening components mechanically to the substrate shall provide a minimum pull-out capacity of 300 lbs. (136 k) per fastener. Base or ply sheets attached with cap nails require a minimum pullout capacity of 40 lb. per nail.
9. Prime decks where required, in accordance with requirements and recommendations of the primer and deck manufacturer.

3.03 INSTALLATION - GENERAL

A. Install modified bitumen membranes and flashings in accordance with manufacturer's instructions and with the recommendations provided by the National Roofing Contractors Association's Roofing & Waterproofing Manual, the Asphalt Roofing Manufacturers Association, and applicable codes.

B. General: Avoid installation of modified bitumen membranes at temperatures lower than 40-45 degrees F. When work at such temperatures unavoidable use the following precautions:

1. Take extra care during cold weather installation and when ambient temperatures are affected by wind or humidity, to ensure adequate bonding is achieved between the surfaces to be joined. Use extra care at material seam welds and where adhesion of the applied product to the appropriately prepared substrate as the substrate can be affected by such temperature constraints as well.
2. Unrolling of cold materials, under low ambient conditions must be avoided to prevent the

likelihood of unnecessary stress cracking. Rolls must be at least 40 degrees F at the time of application. If the membrane roll becomes stiff or difficult to install, it must be replaced with roll from a heated storage area.

C. Commence installation of the roofing system at the lowest point of the roof (or roof area), working up the slope toward the highest point. Lap sheets shingle fashion so as to constantly shed water

D. All slopes greater than 2:12 require back-nailing to prevent slippage of the ply sheets. Use ring or spiral-shank 1-inch cap nails, or screws and plates at a rate of 1 fastener per ply (including the membrane) at each insulation stop. Place insulation stops at 16 ft o.c. for slopes less than 3:12 and 4 feet o.c. for slopes greater than 3:12. On non- insulated systems, nail each ply directly into the deck at the rate specified above. When slope exceeds 2:12, install all plies parallel to the slope (strapping) to facilitate backnailing. Install 4 additional fasteners at the upper edge of the membrane when strapping the plies.

3.04 INSTALLATION COLD APPLIED ROOF SYSTEM

A. Modified Cap Ply(s): Cut cap ply sheets into 18-foot lengths and allow plies to relax before installing. Install in interplay adhesive applied at the rate required by the manufacturer. Shingle sheets uniformly over the prepared substrate to achieve the number of plys specified. Shingle in proper direction to shed water on each large area of roofing.

1. Lap ply sheet ends 8-inches. Stagger end laps 12-inches minimum.
2. Solidly bond to the base layers with specified cold adhesive at the rate of 2 to 2- 1/2 gallons per 100 square feet.
3. Roll must push a puddle of adhesive in front of it with adhesive slightly visible at all side laps. Care should be taken to eliminate air entrapment under the membrane.
4. Install subsequent rolls of modified across the roof as above with a minimum of 4-inch side laps and 8-inch staggered end laps. Lay modified membrane in the same direction as the underlayers but the laps shall not coincide with the laps of the base layers.
5. Allow cold adhesive to set for 5 to 10 minutes before installing the top layer of modified membrane.
6. Extend membrane 2-inches beyond top edge of all cants in full mappings of the cold adhesive as shown on the Drawings.
7. **The cap sheet shall be treated as a finished surface. The cleanliness and appearance of the finished surface shall be uniform in appearance, free of excessive mineral loss, free of asphaltic adhesives with no UV protection other than the bleed out of any heat welded membrane laps, etc. Care should be taken and any necessary protection methods performed to achieve an acceptable finished surface while the installation of the roof system and associated sheet metal components are being installed that may require traffic over the roof system. The installer is responsible for notifying the general contractor of any required protection methods that may be required to protect any finished roof or sheet metal surface while other related trades are performed over the roof surface. Any finished roof surface that is deemed unacceptable in appearance may be subject to further work to remedy a poor aesthetic appearance and/or UV resistance of the modified bitumen and/or sheet metal components.**

B. Fibrous Cant Strips: Provide non-combustible perlite or glass fiber cant strips at all wall/curb detail treatments where angle changes are greater than 45 degrees. Cant may be set in approved cold adhesives, hot asphalt or mechanically attached with approved plates and fasteners.

C. Wood Blocking, Nailers and Cant Strips: Provide wood blocking, nailers and cant strips per requirements of Division 06 Section “Rough Carpentry”.

1. Provide nailers at all roof perimeters and penetrations for fastening membrane flashings and sheet metal components.
2. Wood nailers should match the height of any insulation, providing a smooth and even transition between flashing and insulation areas.
3. Nailer lengths should be spaced with a minimum 1/8-inch gap for expansion and contraction between each length or change of direction.
4. Nailers and flashings should be fastened in accordance with Factory Mutual "Loss Prevention Data Sheet 1- 49, Perimeter Flashing" and be designed to be capable of resisting a minimum force of 200 lbs/lineal foot in any direction.

D. Metal Work: Provide metal flashings, counter flashings, parapet coping caps and thru- wall flashings as specified in Division 07 Section “Sheet Metal Flashing and Trim”. Install in accordance with the SMACNA "Architectural Sheet Metal Manual" or the NRCA Roofing Waterproofing manual.

E. Termination Bar: Provide a metal termination bar or approved top edge securement at the terminus of all flashing sheets at walls and curbs. Fasten the bar a minimum of 8-inches o.c. to achieve constant compression. Provide suitable, sealant at the top edge if required.

F. Flashing Base Ply: Install flashing sheets by the same application method used for the base ply.

1. Seal curb, wall, and parapet flashings with an application of mastic and mesh on a daily basis. Do not permit conditions to exist that will allow moisture to enter behind, around or under the roof or flashing membrane.
2. Prepare all walls, penetrations, expansion joints and where shown on the Drawings to be flashed with required primer at the rate of 100 square feet per gallon. Allow primer to dry tack free.
3. Adhere to the underlying base ply with specified flashing ply adhesive unless otherwise specified. Nail off at a minimum of 8-inches o.c. from the finished roof at all vertical surfaces.
4. Solidly adhere the entire flashing ply to the substrate. Secure the tops of all flashings that are not run up and over curb through termination bar fastened at 6-inches o.c. and sealed at top.
5. Seal all vertical laps of flashing ply with a three-course application of trowel-grade mastic and fiberglass mesh.
6. Coordinate counter flashing, cap flashings, expansion joints and similar work with modified bitumen roofing work as specified.
7. Coordinate roof accessories, miscellaneous sheet metal accessory items, including piping vents and other devices with the roofing system work.
8. Secure the top edge of the flashing sheet using a termination bar only when the wall surface above is waterproofed or nailed 4-inches on center and covered with an acceptable counter

flashing.

G. Flashing Cap Ply: Install flashing cap sheets by the same application method used for the base ply.

1. Seal curb, wall, and parapet flashings with an application of mastic and mesh on a daily basis. Do not permit conditions to exist that will allow moisture to enter behind, around or under the roof or flashing membrane.
2. Prepare all walls, penetrations, expansion joints and where shown on the Drawings to be flashed with required primer at the rate of 100 square feet per gallon. Allow primer to dry tack free.
3. Adhere to the underlying base flashing ply with specified flashing ply adhesive unless otherwise specified. Nail off at a minimum of 8-inches o.c. from the finished roof at all vertical surfaces.
4. Coordinate counter flashing, cap flashings, expansion joints and similar work with modified bitumen roofing work as specified.
5. Coordinate roof accessories, miscellaneous sheet metal accessory items with the roofing system work.
6. All stripping shall be installed prior to flashing cap sheet installation.
7. Heat and scrape granules when welding or adhering at cut areas and seams to granular surfaces at all flashings.
8. Secure the top edge of the flashing sheet using a termination bar only when the wall surface above is waterproofed or nailed 4-inches on center and covered with an acceptable counter flashing.

H. Roof Walkways: Provide walkways in areas indicated on the Drawings.

3.05 INSTALLATION EDGE TREATMENT AND ROOF PENETRATION FLASHING

A. Scupper Through Wall:

1. Inspect the nailer to assure proper attachment and configuration.
2. Run one ply over nailer, into scupper hole and up flashing as in typical wall flashing detail. Assure coverage of all wood nailers.
3. Install a scupper box in a 1/4-inch bed of mastic. Assure all box seams are soldered and have a minimum 4-inch flange. Make sure all corners are closed and soldered. Prime scupper at a rate of 100 square feet per gallon and allow to dry.
4. Fasten flange of scupper box every 3-inches o.c. staggered.
5. Strip in flange of scupper box with base flashing ply covering entire area with 6-inch overlap on to the field of the roof and wall flashing.
6. Install a second ply of modified flashing ply in bitumen over the base flashing ply, 9-inches on to the field of the roof. Apply a three-course application of mastic and mesh at all seams.

B. Scupper Through Wall (Overflow):

1. Inspect the nailer to assure proper attachment and configuration.
2. Run one ply over nailer up the overflow, into the scupper hole and up flashing as in typical wall flashing detail. Assure coverage of all wood nailers.

3. Install scupper box in a 1/4-inch bed of mastic. Assure all box seams are soldered and have a minimum 4-inch flange. Make sure all corners are closed and soldered. Prime scupper at a rate of 100 square feet per gallon and allow to dry.
4. Fasten flange of scupper box every 3-inches o.c. staggered.
5. Strip in flange scupper box with base flashing ply covering entire area with 6-inch overlap on to the field of the roof and wall flashing.
6. Install a second ply of modified flashing ply in bitumen over the base flashing ply, 9-inches on to the field of the roof. Apply a three-course application of mastic and mesh at all seams.

C. Expansion Joint:

1. Minimum curb height is 8-inches above finished roof height. Chamfer top of curb. Prime vertical curb at a rate of 100 square feet per gallon and allow to dry.
2. Mechanically attach wood cant to expansion joint nailers. Run all field plies over cant a minimum of 2-inches.
3. Install compressible insulation in neoprene cradle.
4. Install base flashing ply covering curb set in bitumen with 6-inches on to field of the roof.
5. Install a second ply of modified flashing ply in bitumen over the base flashing ply, 9-inches on to the field of the roof. Attach top of membrane to top of curb and nail at 8-inches o.c. Apply a three-course application of mastic and mesh at all vertical seams and allow to cure and aluminize.
6. Install pre-manufactured expansion joint cover. Fasten sides at 12-inches o.c. with fasteners and neoprene washers. Furnish all joint cover laps with butyl tape between metal covers.

D. Area Divider:

1. Minimum curb height is 8-inches above finished roof height. Prime vertical curb at a rate of 100 square feet per gallon and allow to dry.
2. Set cant in bitumen. Run all field plies over cant a minimum of 2-inches.
3. Install base flashing ply covering curb set in bitumen with 6-inches on to field of the roof.
4. Install a second ply of modified flashing ply in bitumen over the base flashing ply, 9-inches on to the field of the roof. Attach top of membrane to top of curb and nail at 8-inches o.c. Apply a three-course application of mastic and mesh at all vertical seams and allow to cure and aluminize.
5. Install pre-manufactured cover. Fasten sides at 24-inches o.c. with fasteners and neoprene washers through slotted holes. Furnish all joint cover laps with butyl tape between metal covers.

E. Equipment Support:

1. Minimum curb height is 8-inches above finished roof height. Prime vertical at a rate of 100 square feet per gallon and allow to dry.
2. Set cant in bitumen. Run all field plies over cant a minimum of 2-inches.
3. Install base flashing ply covering curb set in bitumen with 6-inches on to field of the roof.
4. Install a second ply of modified flashing ply in bitumen over the base flashing ply, 9-inches on to the field of the roof. Attach top of membrane to top of curb and nail at 8-inches o.c. Apply a three-course application of mastic and mesh at all vertical seams and allow to cure and

aluminize.

5. Install pre-manufactured cover. Fasten sides at 24-inches o.c. with fasteners and neoprene washers. Furnish all joint cover laps with butyl tape between metal covers.
6. Set equipment on neoprene pad and fasten as required by equipment manufacturer.

F. Curb Detail/Air Handling Station:

1. Minimum curb height is 8-inches above finished roof height. Prime vertical at a rate of 100 square feet per gallon and allow to dry.
2. Set cant in bitumen. Run all field plies over cant a minimum of 2-inches.
3. Install base flashing ply covering curb set in bitumen with 6-inches on to field of the roof.
4. Install a second ply of modified flashing ply in bitumen over the base flashing ply, 9-inches on to the field of the roof. Apply a three-course application of mastic and mesh at all vertical seams and allow to cure and aluminize.
5. Install pre-manufactured counterflashing with fasteners and neoprene washers or per manufacturer's recommendations.
6. Set equipment on neoprene pad and fasten as required by equipment manufacturer.

G. Exhaust Fan:

1. Minimum curb height is 8-inches above finished roof height. Prime vertical at a rate of 100 square feet per gallon and allow to dry.
2. Set cant in bitumen. Run all plies over cant a minimum of 2-inches.
3. Install base flashing ply covering curb with 6-inches on to field of the roof.
4. Install a second ply of modified flashing ply installed over the base flashing ply, 9-inches on to field of the roof. Attach top of membrane to top of wood curb and nail at 8-inches o.c. Apply a three-course application of mastic and mesh at all vertical seams and allow to cure and aluminize.
5. Install metal exhaust fan over the wood nailers and flashing to act as counterflashing. Fasten per manufacturer's recommendation.

H. Roof Drain:

1. Plug drain to prevent debris from entering plumbing.
2. Taper insulation to drain minimum of 24-inches from center of drain.
3. Install retrofit roof drains at all existing roof drains (not new construction area).
4. Run roof system plies over drain. Cut out plies inside drain bowl.
5. Set lead/copper flashing (30-inch square minimum) in 1/4-inch bed of mastic. Run lead/copper into drain a minimum of 2-inches. Prime lead/copper at a rate of 100 square feet per gallon and allow to dry.
6. Install base flashing ply (40-inch square minimum) in bitumen.
7. Install modified membrane (48-inch square minimum) in bitumen.
8. Install clamping ring and assure that all plies are under the clamping ring.
9. Remove drain plug and install strainer.

I. Plumbing Stack:

1. Minimum stack height is 12-inches.
2. Run roof system over the entire surface of the roof. Seal the base of the stack with elastomeric sealant.
3. Prime flange of new sleeve. Install properly sized sleeves set in 1/4-inch bed of roof cement.
4. Install base flashing ply in bitumen.
5. Install membrane in bitumen.
6. Caulk the intersection of the membrane with elastomeric sealant.
7. Turn sleeve a minimum of 1-inch down inside of stack.

J. Pitch Pocket:

1. Run all plies up to the penetration.
2. Place the pitch pocket over the penetration and prime all flanges.
3. Strip in flange of pitch pocket with one ply of base flashing ply. Extend 6-inches onto field of roof.
4. Install second layer of modified membrane extending 9-inches onto field of the roof.
5. Fill pitch pocket half full with non-shrink grout. Let this cure and top off with pourable sealant.
6. Caulk joint between roof system and pitch pocket with roof cement.

K. Liquid Flashing:

1. Mask target area on roof membrane with tape.
2. Clean all non-porous areas with isopropyl alcohol.
3. Apply 32 wet mil base coat of liquid flashing over masked area.
4. Embed polyester reinforcement fabric into the base coat of the liquid flashing.
5. Apply 48-64 wet mil topcoat of the liquid flashing material over the fabric extending 2-inches past the scrim in all directions.
6. Apply minerals immediately or allow the liquid flashing material to cure 15-30 days and then install reflective coating.

3.06 VAPOR RETARDER

A. Install the self-adhering sheet vapor barrier directly to all acoustic metal deck areas per plans prior to mechanically fastening subsequent layers of roof insulation and membrane installation.

B. The vapor barrier should be install to the surface of the adjacent wall substrates up high enough to make contact with the finished roof flashings in order to create a full envelope seal around the roof insulation layers.

C. New Metal decking does. It need to be primed so long as it is free of dirt and debris.

D. Wall substrates require priming prior to the installation of the self-adhering sheet vapor barrier.

3.08 CLEANING

A. Clean-up and remove daily from the site all wrappings, empty containers, paper, loose particles, and other debris resulting from these operations.

B. Remove asphalt markings from finished surfaces.

C. Repair or replace defaced or disfigured finishes caused by Work of this section.

3.09 PROTECTION

A. Provide traffic ways, erect barriers, fences, guards, rails, enclosures, chutes, and the like to protect personnel, roofs and structures, vehicles and utilities.

B. Protect exposed surfaces of finished walls with tarps to prevent damage.

C. Plywood for traffic ways required for material movement over existing roofs shall be not less than 5/8-inch thick.

D. In addition to the plywood listed above, an underlayment of minimum 1/2-inch recover board is required on new roofing.

E. Special permission shall be obtained from the Manufacturer before any traffic shall be permitted over new roofing.

3.10 FIELD QUALITY CONTROL

A. Field observations shall be performed **a minimum of 3 times per week** by a Sales Representative employed full-time by the manufacturer and whose primary job description is to assist, inspect and approve membrane installations for the manufacturer.

1. Warranty shall be issued upon manufacturer's acceptance of the installation.

B. Provide observation reports from the Sales Representative indicating procedures followed, weather conditions and any discrepancies found during inspection at least once a week to the architect

1. Provide a final report from the Sales Representative, certifying that the roofing system has been satisfactorily installed according to the project specifications, approved details, and good general roofing practice.

3.11 SCHEDULES

A. Base (Ply) Sheet:

1. (80 mil): 80 mil SBS (Styrene-Butadiene-Styrene) rubber modified roofing base sheet reinforced with a dual fiberglass reinforced scrim, performance requirements according to ASTM D 5147.

Finished membrane meets and/or exceeds ASTM D 6163, TYPE III

a. Tensile Strength, ASTM D 5147

1) 2 in/min. @ 73.4 +/- 3.6 deg. F MD 225 lbf/in XD 225 lbf/in
2) 50 mm/min. @ 23 +/- 2 deg. C MD 39.0 kN/m XD 39 kN/m

b. Tear Strength, ASTM D 5147

1) 2 in/min. @ 73.4 +/- 3.6 deg. F MD 300 lbf XD 300 lbf
2) 50 mm/min. @ 23 +/- 2 deg. C MD 1335 N XD 1335 N

c. Elongation at Maximum Tensile, ASTM D 5147

1) 2 in/min. @ 73.4 +/- 3.6 deg. F MD 7% XD 7%
2) 50 mm/min. @ 23 +/- 2 deg. C MD 7% XD 7%

d. Low Temperature Flexibility, ASTM D 5147, Passes -30 deg. F

B. Thermoplastic/Modified Cap (Ply) Sheet:

1. 160 mil SBS and SIS (Styrene-Butadiene-Styrene and Styrene-lsoprene-Styrene) rubber modified membrane incorporating post-consumer recycled rubber, fire retardant additives and reinforced with a fiberglass and polyester composite scrim. Surfaced with the highly reflective Sunburst white mineral. ASTM D 6162, Type Ill Grade G

a. Tensile Strength, ASTM D 5147

1) 2 in/min. @ 73.4 +/- 3.6 deg. F MD 700 lbf/in XO 750 lbf/in
2) 50 mm/min. @ 23 +/- 2 deg. C MD 122.5 kN/m XO 131.25 kN/m

b. Tear Strength, ASTM D 5147

1) 2 in/min. @ 73.4 +/- 3.6 deg. F MD 1300 lbf XO 1400 lbf
2) 50 mm/min. @ 23 +/- 2 deg. C MD 5783 N XO 6227 N

c. Elongation at Maximum Tensile, ASTM D 5147

1) 2 in/min. @ 73.4 +/- 3.6 deg. F MD 6.0% XO 6.0%
2) 50 mm/min. @ 23 +/- 2 deg. C MD 6.0% XO 6.0%

d. Low Temperature Flexibility, ASTM D 5147, Passes -30 deg. F
e. Reflectivity, ASTM C 1549: 73%

C. lnterply Adhesive:

1. Polymer modified cold process asphalt roofing bitumen V.O.C. compliant ASTM D 3019.

Performance Requirements:

a. Non-Volatile Content ASTM D 4479 70%
b. Density ASTM D1475 8.9 lbs./gal.
c. Viscosity Stormer ASTM D562 400-500 grams
d. Flash Point ASTM D 93 100 deg. F min.
e. Slope: up to 3:12

D. Flashing Base Ply:

1. 80 mil SBS (Styrene-Butadiene-Styrene) rubber modified roofing base sheet reinforced with a dual fiberglass reinforced scrim, performance requirements according to ASTM D 5147. Finished membrane meets and/or exceeds ASTM D 6163, TYPE III

a. Tensile Strength, ASTM D 5147

1) 2 in/min. @ 73.4 +/- 3.6 deg. F MD 225 lbf/in XD 225 lbf/in
2) 50 mm/min. @ 23 +/- 2 deg. C MD 39.0 kN/m XD 39 kN/m

b. Tear Strength, ASTM D 5147

1) 2 in/min. @ 73.4 +/- 3.6 deg. F MD 300 lbf XD 300 lbf
2) 50 mm/min. @ 23 +/- 2 deg. C MD 1335 N XD 1335 N

c. Elongation at Maximum Tensile, ASTM D 5147

1) 2 in/min. @ 73.4 +/- 3.6 deg. F MD 7% XD 7%
2) 50 mm/min. @ 23 +/- 2 deg. C MD 7% XD 7%

d. Low Temperature Flexibility, ASTM D 5147, Passes -30 deg. F

E. Flashing Ply Adhesive:

1. Brush grade flashing adhesive.

a. Non-Volatile Content ASTM D 4479 70 min.
b. Density ASTM D 1475 8.6 lbs./gal.
c. Flash Point ASTM D 93 100 deg. F

F. Flashing Cap (Ply) Sheet:

1. 160 mil SBS and SIS (Styrene-Butadiene-Styrene and Styrene- lsoprene-Styrene) rubber modified membrane incorporating post-consumer recycled rubber, fire retardant additives and reinforced with a fiberglass and polyester composite scrim. Surfaced with the highly reflective Sunburst white mineral. ASTM D 6162, Type Ill Grade G

a. Tensile Strength, ASTM D 5147

1) 2 in/min. @ 73.4 +/- 3.6 deg. F MD 700 lbf/in XD 750 lbf/in
2) 50 mm/min. @ 23 +/- 2 deg. C MD 122.5 kN/m XD 131.25 kN/m

b. Tear Strength, ASTM D 5147

1) 2 in/min. @ 73.4 +/- 3.6 deg. F MD 1300 lbf XD 1400 lbf
2) 50 mm/min. @ 23 +/- 2 deg. C MD 5783 N XD 6227 N

c. Elongation at Maximum Tensile, ASTM D 5147

1) 2 in/min. @ 73.4 +/- 3.6 deg. F MD 6.0% XD 6.0%
2) 50 mm/min. @ 23 +/- 2 deg. C MD 6.0% XD 6.0%

d. Low Temperature Flexibility, ASTM D 5147, Passes -30 deg. F
e. Reflectivity, ASTM C 1549: 73%

G. Self-adhering Air & Vapor Barrier (Ply) Sheet:

1. 45 mil SBS (Styrene-Butadiene-Styrene) rubber modified membrane intended to be an air barrier / vapor retarder with a surfacing consisting of a woven polypropylene film that provides uv resistance that allows the membrane to temporarily be exposed to the elements.

a. Tensile Strength, ASTM D 5147

1) 2 in/min. @ 73.4 +/- 3.6 deg. F MD 125 lbf/in XD 90 lbf/in
2) 50 mm/min. @ 23 +/- 2 deg. C MD 21.89 kN/m XD 15.76 kN/m

b. Tear Strength, ASTM D 5147

1) 2 in/min. @ 73.4 +/- 3.6 deg. F MD 175 lbf XD 120 lbf
2) 50 mm/min. @ 23 +/- 2 deg. C MD 778 N XD 534 N

c. Low Temperature Flexibility, ASTM D 5147, Passes -25 deg. F
d. Static Pressure Resistance, ASTM D 5602

1) Pass, 42 lbs. (187 N)

e. Lap Adhesion, ASTM D 1876

1) 20 pli.

f. Peel Resistance on Steel, ASTM D 903

1) 10 lbs./in.

g. Water Vapor Permeance, perm (ng/Pa.s.m2), ASTM E 96, Method B)

1) 0

h. Air Permeability L/s*m2, ASTM E 2178
1) <0.025 L/s*m2

END OF SECTION 07 52 50

ROOFING INSTALLER'S GUARANTEE FORM
(Modified Bituminous Membrane Roofing System)

WHEREAS_____

OF_____

Herein called the "Roofing Installer," has performed roofing and associated work ("work") on the following project:

Owner:	Bullitt County Public Schools
Address:	1040 Highway 44 East, Shepherdsville KY 40165
Building Name/Type:	Phase III Athletics – Bullitt Central Physical Science Center
Address:	
Type of Work:	
Acceptance Date:	
Guarantee Period:	
Expiration Date:	

A. AND WHEREAS Roofing Installer has contracted (either directly with Owner or indirectly as a subcontractor) to guarantee the complete roof system, including metal flashings and skirt flashing, metal joint caps and cap flashings, metal counterflashings and receivers, gutters and downspouts, roof insulation, wood nailers and blocking, cant strips, base sheet, base plys, cap and base sheets, mechanical fasteners and termination bars – all the aforementioned said work against leaks and faulty or defective materials and workmanship for designated Guarantee Period.

B. NOW THEREFORE Roofing Installer hereby guarantees, subject to terms and conditions herein set forth, that during Guarantee 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.

C. This Guarantee is made subject to the following terms and conditions:
   1. Specifically excluded from this Guarantee are damages to work and other parts of the building, and to building contents, caused by:
      a. Lightning
      b. Peak gust wind speed exceeding 120 mph
      c. Fire
      d. Failure of roofing system substrate, including cracking, settlement, excessive deflection, deterioration, and decomposition by causes other than roof system leaks

e. Faulty construction or materials of parapet walls, copings, chimneys, vents, equipment supports, and other edge conditions and penetrations of the work
f. Vapor condensation on bottom of roofing
g. Activity on roofing by others, including other 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, Guarantee shall be null and void until such damage has been repaired by Roofing Installer and until cost and expense thereof has been paid by Owner or by another responsible party so designated.
3. The Roofing Installer is responsible for damage to work covered by this Guarantee and is further liable for consequential damages to building or building contents resulting from leaks or faults or defects of work for a period of Three Years form date of Substantial Completion of the Work.
4. During Guarantee 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 Guarantee shall become null and void on date of said alterations, but only to the extent said alterations affect work covered by this Guarantee. If Owner engages Roofing Installer to perform said alterations, Guarantee 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 Guarantee.
5. During Guarantee 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 Guarantee shall become null and void on date of said change, but only to the extent said change affects work covered by this Guarantee.
6. The Owner shall promptly notify Roofing Installer of observed, know, or suspected leaks, defect or deterioration and shall afford reasonable opportunity for Roofing Installer to inspect work and to examine evidence of such leaks, defect or deterioration.
7. This Guarantee is recognized to be the only guarantee 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 Guarantee 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.

IN WITNESS THEREOF
This instrument has been duly executed this day of , 20 .

Authorized Signature_____

Printed Name_____

Title_____

END OF INSTALLER'S GUARANTEE

SECTION 07 61 13 – METAL WALL PANELS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section Includes: Metal lap-seam wall panels with concealed fasteners, including trim and accessories.

B. Related Sections:

1. Division 07 Section "Sheet Metal Flashing and Trim" for sheet metal copings, flashings, reglets and roof drainage items.
2. Division 07 Section "Joint Sealants" for field-applied joint sealants.

1.03 REFERENCES

A. AAMA 501.1 - Test Method for Water Penetration of Windows, Curtain Walls, and Doors Using Dynamic Pressure.

B. AAMA 620 - Voluntary Specification for High Performance Organic Coatings on Coil Coated Architectural Aluminum Substrates.

C. AAMA 621 - Voluntary Specification for High Performance Organic Coatings on Coil Coated Architectural Hot Dipped Galvanized (HDG) and Zinc-Aluminum Coated Steel Substrates.

D. General: Standards listed by reference form a part of this specification section. Standards listed are identified by issuing authority, abbreviation, designation number, title, or other designation. Standards subsequently referenced in this Section are referred to by issuing authority abbreviation and standard designation.

E. ASTM International:

1. ASTM E 84 – Standard Test Method for Surface Burning Characteristics of Building Materials.
2. ASTM B 209 - Specification for Aluminum and Aluminum Alloy Sheet and Plate.
3. ASTM E 283 – Standard Test Method for Determining rate of Air Leakage Through Exterior Windows, Curtain Walls and Doors Under Specified Pressure Differences Across Specimen.
4. ASTM E 330 – Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference.
5. ASTM E 331 – Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference.
6. ASTM A 653 – Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-

Coated (Galvannealed) by the Hot-Dip Process.

7. ASTM A 666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless-Steel Sheet, Strip, Plate, and Flat Bar.
8. ASTM A 755/A 755M - Specification for Steel Sheet, Metallic Coated by the Hot-Dip Process and Prepainted by the Coil-Coating Process for Exterior Exposed Building Products.
9. ASTM A 792/A 792 M - Standard Specification for Steel Sheet, 55 % Aluminum-Zinc Alloy-Coated by the Hot-Dip Process.
10. ASTM C 920 - Specification for Elastomeric Joint Sealants.
11. ASTM A 1011 – Standard Specification for Steel, Sheet, and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength.
12. ASTM E 1592 – Standard Test Method for Structural Performance of Sheet Metal Roof and Siding Systems by Uniform Static Air Pressure Difference.
13. ASTM D 2244 – Standard Practice for Calculation of Color Tolerances and Color Differences from Instrumentally Measured Color Coordinates.
14. ASTM D 4214 – Standard Test Methods for Evaluating the Degree of Chalking of Exterior Paint Films.

F. Underwriters Laboratories (UL):

1. UL 263 - Fire Tests of Building Construction and Materials.

G. Sheet Metal and Air Conditioning Contractors' National Association (SMACNA): "Architectural Sheet Metal Manual."

1.04 PERFORMANCE REQUIREMENTS

A. General: Provide metal wall panel assemblies meeting performance requirements as determined by application of specified tests by a qualified testing agency on manufacturer's standard assemblies.

B. Air Infiltration: When installed over Insulated Composite Backup Panels or Metal Liner Panels, maximum 0.06 cfm/sq. ft. (0.3 L/s per sq. m) per ASTM E 283 at a static-air-pressure difference of 1.57 lb./sq. ft., using minimum 10-by-10-foot test panel that includes side joints.

C. Water Penetration, Static Pressure: When installed over Insulated Composite Backup Panels or Metal Liner Panels, no uncontrolled water penetration per ASTM E 331 at a minimum static differential pressure of 6.24 lb./sq. ft., using minimum 10-by-10-foot test panel that includes side joints.

D. Structural Performance: Provide metal wall panel assemblies capable of withstanding the effects of indicated loads and stresses within limits and under conditions indicated for disengagement, per ASTM E 72.

1. Wind Loads: Determine loads based on uniform pressure, importance factor, exposure category, and basic wind speed indicated on drawings.

2. Limits of Deflection: Metal wall panel assembly shall withstand scheduled wind pressure with the following allowable deflection:

    a. Maximum allowable deflection limited to L/180 deflection of panel perimeter normal to plane of wall with no evidence of failure.

3. Secondary Metal Framing: Design secondary metal framing for metal wall panel assembly according to AISI's "Standard for Cold-Formed Steel Framing - General Provisions."
4. Side Joint Disengagement: Panels must be designed and tested under Negative load per ASTM E 72.

E. Thermal Movements: Allow for thermal movements from variations in both ambient and internal temperatures. Accommodate movement of support structure caused by thermal expansion and contraction.

F. Wall systems that incorporate foam plastic insulation must be tested by the foam plastic supplier in accordance with NFPA-285.

1.05 QUALITY ASSURANCE

A. Manufacturer/Source: Provide metal wall panel and panel accessories from a single manufacturer.

B. Manufacturer Qualifications: Approved manufacturer listed in this Section with minimum 10 years' experience in manufacture of similar products in successful use in similar applications.

1. Approval of Comparable Products: Submit the following in accordance with project substitution requirements, within time allowed for substitution review:

    a. Product data, including certified independent test data indicating compliance with requirements.
    b. Sample submittal from similar project.
    c. Project references: Minimum of 5 installations not less than 5 years old, with Owner and Architect contact information.
    d. Sample warranty.

2. Substitutions following award of contract are not allowed except as stipulated in Division 01 General Requirements.
3. Approved manufacturers must meet separate requirements of Submittals Article.

C. Wall Systems Installer Qualifications: Experienced Installer with minimum of 5 years' experience with successfully completed projects of a similar nature and scope.

1.06 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Conduct preinstallation meeting at site attended by Owner, Architect, manufacturer's representative, and other trade contractors.

1. Coordinate building framing in relation to metal wall panel assembly.
2. Coordinate installation of building air and water barrier behind metal wall panel assembly.
3. Coordinate window, door and louver, and other openings and penetrations of metal wall panel assembly.

1.07 ACTION SUBMITTALS

A. Product Data: Manufacturer's data sheets, for specified products.

1. Include data indicating compliance with performance requirements, including load span tables tested for side joint disengagement under negative loads per ASTM E 72.

B. Shop Drawings: Provide shop drawings prepared by manufacturer or manufacturer's authorized Installer. Include full elevations showing openings and penetrations. Include details of each condition of installation and attachment. Provide details at a minimum scale 1-1/2-inch per foot (1:8) of all required trim and extrusions needed for a complete installation.

1. Indicate points of supporting structure that must coordinate with metal wall panel assembly installation.

C. Samples for Initial Selection: For each product specified. Provide representative color charts of manufacturer's full range of colors.

D. Samples for Verification: Provide 12-inch section of panel(s) showing finishes. Provide 12-inch-long pieces of trim pieces and other exposed components.

1.08 INFORMATIONAL SUBMITTALS

A. Product Test Reports: Indicating compliance of products with requirements, from a qualified independent testing agency.
Buy American Act Certification: Submit documentation certifying that products comply with provisions of the Buy American Act 41 U.S.C 10a – 10d.

B. Qualification Information: For Installer firm.

C. Manufacturer's warranty: Submit sample warranty.

1.09 CLOSEOUT SUBMITTALS

A. Maintenance data.

1.10 DELIVERY, STORAGE AND HANDLING

A. General: Comply with manufacturer's current printed product storage recommendations.

B. Delivery: Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.

C. Storage: Store materials above ground, under waterproof covering, protected from exposure to harmful weather conditions and at temperature and humidity conditions recommended by manufacturer. Provide proper ventilation of metal panel system to prevent condensation build-up between each panel and trim or flashing component. Tilt stack to drain in wet conditions. Remove strippable plastic film before storage under high-heat conditions. Store products in manufacturer's unopened packaging until just prior to installation.

D. Handling: Exercise caution in unloading and handling metal panel system to prevent bending, warping, twisting and surface damage.

1.11 WARRANTY

A. Special Manufacturer's Warranty: On manufacturer's standard form, in which manufacturer agrees to repair or replace components of metal wall panel assemblies that fail in materials and workmanship within **two** years from Date of Substantial Completion.

PART 2 PRODUCTS

2.01 METAL WALL PANELS

A. Basis of Design Product: Subject to compliance with requirements provide Metal Sales Manufacturing Corporation; Concealed Fastened Wall Panel.

1. **Metal Panel 1**

    a. Style: EM1 Series, EM1-1653
    b. Size: Box Rib profile with 1" rib height
    c. Panel Coverage: 16"
    d. Color: Refer to Metal Panel / Siding Type Legends on A2 Series Drawings.

B. Comparable manufacturers.

1. Centria
2. Metl-Span
3. Monarch Metal, Inc.

C. Submit substitution request in accordance with Division 01 Section "Substitutions".

2.02 PANEL MATERIALS

A. Metallic-Coated Steel Face Sheet: Coil-coated, ASTM A 755/A 755M.

1. Zinc-Coated (Galvanized) Steel Sheet: ASTM A 653/A 653M, G90 (Class Z275), structural steel quality.
2. Face Sheet: Minimum 0.030 inch/22 gage nominal uncoated thickness.
3. Surface: Smooth.

B. Attachment: Concealed clip fastened panel.

C. Application: Designed for application over open framing or solid substrate.

D. Fire Resistance Rating: Comply with UL 263 Fire Resistance Ratings.

E. Moisture Barrier required for building envelope applications.

2.03 FIELD-INSTALLED THERMAL INSULATION

A. General: Refer to and coordinate with requirements in Division 07 Section “Building Installation”.

B. Refer to Wall and Partition Types in the Drawings.

2.04 METAL WALL PANEL ACCESSORIES

A. Metal Wall Panel Accessories, General: Provide complete metal wall panel assembly incorporating trim, copings, fasciae, parapet caps, soffits, sills, inside and outside corners, and miscellaneous flashings. Provide manufacturer's factory-formed shims, flashings, gaskets, & lap strips for a complete installation. Fabricate accessories in accordance with SMACNA Manual.

B. Formed Flashing and Trim: Match material, thickness, and color of metal wall panels.

C. Sealants: Type recommended by metal wall panel manufacturer for application, meeting requirements of Division 07 Section "Joint Sealants."

D. Flashing Tape: 4-inch wide self-adhering butyl flashing tape.

E. Fasteners: Self-tapping screws and other acceptable fasteners recommended by panel manufacturer. Where exposed fasteners cannot be avoided, supply stainless steel fasteners with heads matching color of metal wall panels by means factory-applied coating.

2.05 SECONDARY METAL SUBGIRT FRAMING

A. Miscellaneous Framing Components, General: Cold-formed metallic-coated steel sheet, ASTM A 653/A 653M, G90 (Z180).

1. Hat Channels: 0.06 inch/16 ga. (1.52 mm) minimum – nominal thickness.
2. Sill Channels: 0.06 inch/16 ga. (1.52 mm) minimum – nominal thickness.

2.06 SOURCE QUALITY CONTROL

A. Source: Obtain metal wall panels, trim and other accessories from a single manufacturer.

B. Quality Control: Obtain metal wall panels, trim and other accessories from a manufacturer capable of providing on-site technical support and installation assistance.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine metal wall panel substrate with Installer present. Inspect for erection tolerances and other conditions that would adversely affect installation of metal wall panels.

B. Wall Substrate: Confirm that wall substrate is within tolerances acceptable to metal wall panel system manufacturer.

1. Maximum deviations acceptable:

a. 1/4-inch in 20 feet vertically or horizontally from face plane of framing.
b. 1/2-inch across building elevation.
c. 1/8-inch in 5 feet.

C. Framing: Inspect framing that will support metal wall panels to determine if support components are installed as indicated on approved shop drawings. Confirm presence of acceptable framing members at recommended spacing to match installation requirements of metal wall panels.

D. Openings: Verify that window, door, louver, and other penetrations match layout on shop drawings.

E. Air/Moisture Barriers: Confirm that work has been completed, inspected, and tested as required.

F. Advise G.C., in writing, of out-of-tolerance work and other deficient conditions prior to proceeding with metal wall panel system installation.

G. Correct out of tolerance work and other deficient conditions prior to proceeding with panel installation.

3.02 SECONDARY FRAMING INSTALLATION

A. Secondary Metal Subgirt Framing: Install secondary metal framing components to tolerances indicated, as shown on approved shop drawings. Install secondary metal framing and other metal panel supports per ASTM C 1007 and metal wall panel manufacturer's recommendations.

3.03 METAL WALL PANEL INSTALLATION

A. General: Install metal wall panels in accordance with approved shop drawings and manufacturer's recommendations. Install metal wall panels in orientation, sizes, and locations indicated. Anchor metal wall panels and other components securely in place. Provide for thermal and structural movement.

B. Attach panels to metal framing using recommended clips, screws, fasteners, sealants, and adhesives indicated on approved shop drawings.

1. Fasteners for Steel Wall Panels: Stainless-steel for exterior locations and locations exposed to moisture; carbon steel for interior use only.
2. Fasten metal wall panels to supports with fasteners and spacing recommended by manufacturer.
3. Provide weatherproof escutcheons for pipe and conduit penetrating exterior walls.
4. Dissimilar Materials: Where elements of metal wall panel system will come into contact with dissimilar materials, treat faces and edges in contact with dissimilar materials as recommended by manufacturer.

C. Joint Sealers: Install joint sealants where indicated on approved shop drawings.

3.04 ACCESSORY INSTALLATION

A. General: Install metal wall panel accessories with positive anchorage to building and provide for thermal expansion. Coordinate installation with flashings and other components.

1. Install related flashings and sheet metal trim per requirements of Division 07 Section "Sheet Metal Flashing and Trim."
2. Install components required for a complete metal wall panel assembly, including trim, copings, corners, lap strips, flashings, sealants, fillers, closure strips, and similar items.
3. Comply with performance requirements and manufacturer's written installation instructions.
4. Provide concealed fasteners except where noted on approved shop drawings.
5. Set units true to line and level as indicated.

3.05 CLEANING AND PROTECTION

A. Remove temporary protective films. Clean finished surfaces as recommended by metal wall panel manufacturer. Clear weep holes and drainage channels of obstructions, dirt, and sealant. Maintain a clean condition during construction.

B. Replace damaged panels and accessories that cannot be repaired by finish touch-up or minor repair.

END OF SECTION 07 61 13

SECTION 07 62 00 – SHEET METAL FLASHING AND TRIM

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

B. Refer to the Drawings for locations of work to be performed.

1.02 SUMMARY

A. This Section includes the following sheet metal flashing and trim:

1. Formed roof drainage system: gutters, downspouts, scuppers and conductor heads.
2. Formed low-slope roof flashings and trim.
3. Formed roof expansion assemblies.
4. Formed wall flashing and trim, not including storefront system flashing or aluminum window flashing.

B. Related Sections include the following:

1. Division 04 Section "Unit Masonry Assemblies" for installing through-wall flashing, reglets, and other sheet metal flashing and trim.
2. Division 06 Section "Rough Carpentry" for wood nailers and blocking.
3. Division 07 Section "Modified Bituminous Membrane Roofing" for installing sheet metal flashing and trim integral with roofing membrane.
4. Division 07 Section "Joint Sealants" for field-applied sheet metal flashing and trim sealants.
5. Division 08 Section "Aluminum Windows" for flashing of window systems.

1.03 PERFORMANCE REQUIREMENTS

A. General: Install sheet metal flashing and trim to withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failing, rattling, leaking, and fastener disengagement.

B. Fabricate and install roof edge flashing capable of resisting the forces according to requirements of “The Kentucky Building Code”:

C. Thermal Movements: Provide sheet metal flashing and trim that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, hole elongation, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Provide clips that resist rotation and avoid shear stress as a result of sheet metal and trim thermal movements. Base

design 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.

D. Water Infiltration: Provide sheet metal flashing and trim that does not allow water infiltration to building interior.

1.04 SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Shop Drawings: Show layouts of sheet metal flashing and trim, including plans and elevations. Distinguish between shop- and field-assembled work. Include the following:

1. Material, thickness, weight, and finish for each item and location in Project.
2. Details for forming sheet metal flashing and trim, including profiles, shapes, seams, and dimensions.
3. Details for fastening, joining, supporting, and anchoring sheet metal flashing and trim; including fasteners, clips, cleats, and attachments to adjoining work.
4. Details of expansion-joint covers, including showing direction of expansion and contraction.

C. Samples for Initial Selection: For each type of sheet metal flashing and trim indicated with factory-applied color finishes.

1. Include similar Samples of trim and accessories involving color selection.

D. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below:

1. Sheet Metal Flashing: 12-inches long. Include fasteners, cleats, closures, and other attachments.
2. Trim: 12-inches long. Include fasteners and other exposed accessories.
3. Accessories: Full-size Sample.

1.05 QUALITY ASSURANCE

A. Sheet Metal Flashing and Trim Standard: Comply with SMACNA's "Architectural Sheet Metal Manual, Latest Edition." Conform to dimensions, minimum thickness or gauge requirements, and profiles shown unless more stringent requirements are indicated.

B. Pre-installation Conference: Conduct conference at Project site to comply with requirements in Division 01 Sections.

1. Meet with Owner, Architect, Owner's insurer if applicable, Installer, and installers whose work interfaces with or affects sheet metal flashing and trim including installers of roofing materials, roof accessories, and roof-mounted equipment.
2. Review methods and procedures related to sheet metal flashing and trim.
3. Examine substrate conditions for compliance with requirements, including flatness and attachment to structural members.
4. Document proceedings, including corrective measures and actions required, and furnish copy of record to each participant.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver sheet metal flashing materials and fabrications undamaged. Protect sheet metal flashing and trim materials and fabrications during transportation and handling.

B. Unload, store, and install sheet metal flashing materials and fabrications in a manner to prevent bending, warping, twisting, and surface damage.

C. Stack materials on platforms or pallets, covered with suitable weathertight and ventilated covering. Do not store sheet metal flashing and trim materials in contact with other materials that might cause staining, denting, or other surface damage.

1.07 COORDINATION

A. Coordinate installation of sheet metal flashing and trim with interfacing and adjoining construction to provide a leak-proof, secure, and noncorrosive installation.

1.08 WARRANTY

A. Special Warranties: Contractor will repair or replace sheet metal flashing that fails in materials or workmanship within the specified warranty period. Warranty is in conjunction with the pre-finished metal roofing and modified bituminous roofing (NDL) warranty.

1. Warranty Period: Three (3) Years from date of Substantial Completion. Failures include, but are not limited to, the following:

    a. Failure to meet performance requirements.
    b. Structural failures including excessive deflection or water leakage.
    c. Deterioration of metals and other materials beyond normal weathering.

2. Painted Metal Finish Warranty Period: Twenty (20) Years from date of Substantial Completion. Failures include the following:
    a. Peeling, checking, cracking, or crazing beyond that which is normal during forming.
    b. Chalking in excess of numerical rating 8 as tested per ASTM D-4214-89 (Method D-659).
    c. Fading in excess of 5 delta units (Hunter Color Difference), per ASTM D-2244-85, after removal of dirt and chalk.

PART 2 PRODUCTS

2.01 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 products specified.
2. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include the manufacturers specified.

2.02 SHEET METALS

A. Galvanized sheet metal: Standard galvanized steel sheet, meeting requirements of ASTM A-653 / A-653M and ASTM A-924 / A-924M, as applicable, with minimum zinc coating of 1.25 ounces per square foot and 0.2 percent copper bearing, and mill phosphatized for maximum paint adherence. Where sheet metal gauge is not indicated, provide 22-gauge. Factory finish as indicated:

1. Sheet metal flashing and trim material shall be provided by the same manufacturer as the pre-finished metal roofing and pre-finished metal siding.

B. Provide Stainless steel for through-wall Scuppers

C. Lead Sheet: ASTM B-749, Type L51121, copper-bearing lead sheet.

2.03 MISCELLANEOUS MATERIALS

A. General: Provide materials and types of fasteners, welding rods, protective coatings, separators, sealants, and other miscellaneous items as required for complete sheet metal flashing and trim installation.

B. Fasteners and Accessories: Furnish anchors and fasteners, washers, straps, and accessories required for a complete and finished installation. Fasteners and accessories shall conform with the following requirements:

1. Nails shall be stainless steel, hard copper, bronze, or brass. Where sheet metal is built-in over roofing materials or other sheet metal, use nails or screws with 1 inch matching nonferrous washers. Screws shall be standard stainless steel, brass, or bronze wood screws, as required. Sheet metal screws shall be self-drilling, self-tapping stainless steel or tempered non-corrodible steel of proper size and length to suit conditions.
2. Screw head shall be furnished with neoprene, or EPDM, washers and painted to match material being fastened.

3. Straps: Straps and miscellaneous fastenings, where required shall be stainless steel, half-hard copper, or half-hard 70-30 brass of size indicated or required. Where not indicated, provide straps of 1/16 inch thick by 1-inch-wide size.

C. Solder for Lead: ASTM B-32, Grade Sn50, 50 percent tin and 50 percent lead.

D. 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.

E. Butyl Sealant: ASTM C-1311, single-component, solvent-release butyl rubber sealant, polyisobutylene plasticized, heavy bodied for hooked-type expansion joints with limited movement.

F. Isolating Material / Bituminous Coating: Cold-applied asphalt mastic, SSPC-Paint 12, compounded for 15-mil dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.

G. EPDM - 60-mil.

2.04 MANUFACTURED SHEET METAL FLASHING AND TRIM

A. Flashing and Trim: All flashing shall be of the same material, finish and color as the pre-finished roof and / or siding panels, unless otherwise indicated. Construct with 22-gauge material.

B. Reglets: Units of type, material, and profile indicated, formed to provide secure interlocking of separate reglet and counterflashing pieces, and compatible with flashing indicated.

1. Available Manufacturers:

    a. Cheney Flashing Company, Inc.
    b. Fry Reglet Corporation.
    c. Heckmann Building Products Inc.
    d. Hickman, W. P. Company.
    e. Keystone Flashing Company, Inc.
    f. Sandell Manufacturing Company, Inc.

2. Material: Galvanized steel, 26-gauge thick.
3. Masonry Type: Provide with offset top flange for embedment in masonry mortar joint.
4. Counterflashing Wind-Restraint Clips: Provide clips to be installed before counterflashing to prevent wind uplift of counterflashing lower edge.

2.05 FABRICATION, GENERAL

A. General: Custom fabricate sheet metal flashing and trim to comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and

other characteristics of item indicated. Shop-fabricate items where practicable. Obtain field measurements for accurate fit before shop fabrication.

B. 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.

C. Fabricate sheet metal flashing and trim without excessive oil canning, buckling, and tool marks and true to line and levels indicated, with exposed edges folded back to form hems.

D. Sealed Joints: Form non-expansion but movable joints in metal to accommodate elastomeric sealant to comply with SMACNA recommendations.

E. 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 butyl sealant concealed within joints.

F. Conceal fasteners and expansion provisions where possible on exposed-to-view sheet metal flashing and trim, unless otherwise indicated.

G. 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" for application but not less than thickness of metal being secured.

2.06 ROOF DRAINAGE SHEET METAL FABRICATIONS

A. Conductor Head and Scupper: Fabricate to cross-section indicated, complete with outlet tubes, and other accessories as required.

1. Conductor Head and Scupper: Fabricate from the following material:

a. Pre-finished Galvanized Steel: 22-gauge.
b. Stainless Steel: 0.031-inches for through wall scupper.

B. Downspouts: Fabricate rectangular downspouts complete with mitered elbows. Fabricate watertight. Furnish with metal brackets, 2” wide x 1/16” thick pre-finished galvanized steel.

1. Fabricate gutters and downspouts from 22-gauge pre-finished metal.
2. Provide shop-fabricated round-to-rectangular transition for neatly resolved interface with downspout boots provided. Field cuts and fitting will not be accepted.

C. Downspout boots: Cast iron, with light gray rust inhibitive primer, prepared for final paint.
1. Acceptable Manufacturers include JR Hoe and Zurn.
2. Extend above grade a consistent height (with top bells aligned), minimum / approximately 2’ above finished grade.

3. Top bell dimensions to be coordinated to downspout sizes indicated, to provide tight fit with minimal space around exterior face of downspout.

    a. Gap to be filled with sealant or grout after completion of work.

4. Provide necessary mounting hardware from same manufacturer.

2.07 LOW-SLOPE ROOF SHEET METAL FABRICATIONS

A. Pre-finished Metal Wall Caps: Fabricate in minimum 8-foot long, but not exceeding 10-foot long, sections. Miter corners and seal watertight.

1. Joint Style: Drive slide, including mitered corners.
2. Fabricate metal wall caps from the following material:

    a. Pre-finished Galvanized Steel: 22-gauge.

B. Roof Expansion Assemblies: Fabricate in minimum 8-foot long, but not exceeding 10-foot long, sections. Miter corners and seal watertight.

1. Joint Style: Drive slide joints and standing seam mitered corners.
2. Fabricate roof expansion assemblies from the following material:

    a. Pre-finished Galvanized Steel: 22-gauge.

C. Counterflashing: Fabricate from the following material:

1. Prefinished Galvanized Steel: 22-gauge.

D. Flashing Receivers: Fabricate from the following material:

1. Prefinished Galvanized Steel: 22-gauge.

E. Roof-Penetration Flashing: Fabricate from the following material:

1. Lead: 4.0 lb/sq. ft., hard tempered.

2.09 FINISHES

A. General: Apply coatings either before or after forming and fabricating panels, as required by coating process and as required for maximum coating performance capability. Protect coating promptly after application and cure, by application of strippable film or removable adhesive cover and retain until installation has been completed.

1. Color and finish shall be selected by the Architect.

B. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

C. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

D. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

F. Provide reverse side coating on interior side of sheet metal consisting of primer and washcoat. Washcoat to consist of PVDF coating, 0.5 mil total dry film thickness.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, to verify actual locations, dimensions and other conditions affecting performance of work.

1. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.
2. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION, GENERAL

A. General: Anchor sheet metal flashing, trim and other components of the Work securely in place, with provisions for thermal and structural movement. Use fasteners, sealants, protective coatings, separators, and other miscellaneous items as required to complete sheet metal flashing and trim system.

B. Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with bituminous coating or by other permanent separation as recommended by fabricator or manufacturers of dissimilar metals.

1. Coat side of sheet metal flashing and trim with bituminous coating where flashing and trim will contact wood, other ferrous metal, pressure-treated lumber, or cementitious construction.

C. Install exposed sheet metal flashing and trim, without excessive oil canning, buckling, and tool marks.

D. Install sheet metal flashing and trim true to line and levels indicated with miters and joints accurately fitted. Provide uniform, neat waterproof seams with minimum exposure of

elastomeric or butyl sealant. Corners shall be reinforced and edges of sheet metal shall be hemmed.

E. 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. Continuous cleats shall be anchored with fasteners at 6" o.c.

F. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Where lapped or bayonet-type expansion provisions cannot be used or would not be sufficiently watertight, form expansion joints of intermeshing hooked flanges, not less than 1-inch deep, filled with butyl sealant concealed within joints.

G. Fasteners: Use fasteners of sizes that will penetrate substrate not less than 1-1/4-inches for nails and not less than 3/4-inch for wood screws.

1. Provide neoprene washers wherever required fasteners penetrate sheet metal. Exposed fasteners will not be permitted for any portion of this work unless specifically shown in the details.

H. Seal joints with butyl sealant as required for watertight construction.

1. Where sealant-filled joints are used, embed hooked flanges of joint members not less than 1-inch into sealant. Form joints to completely conceal sealant. (Beads of sealant which will be concealed in the finished work shall be continuous, with no voids of material.) When ambient temperature at time of installation is moderate, between 40- and 70-degrees F, set joint members for 50 percent movement either way. Adjust setting proportionately for installation at higher ambient temperatures. Do not install sealant-type joints at temperatures below 40-degrees F.
2. Prepare joints and apply sealants to comply with requirements in Division 07 Section "Joint Sealants."
3. Seal seams, joints, and/or laps at all flashings watertight. **Dam ends of flashings at openings or off-set conditions.**

3.03 ROOF DRAINAGE SYSTEM INSTALLATION

A. General: Install sheet metal roof drainage items to produce complete roof drainage system according to SMACNA recommendations and as indicated. Coordinate installation of roof perimeter flashing with installation of roof drainage system.

B. Downspouts: Join sections with 1-1/2-inch telescoping joints, sealed as not to leak. Provide wall brackets designed to hold downspouts securely 1-inch away from walls; locate brackets at top and bottom and at approximately 60-inches o.c. in between. Connect downspouts to underground drainage system indicated.

C. Scuppers shall be stainless steel with welded corners and joints.

D. Downspout boots: After installation of downspouts, gap between outside of downspout and boot to be filled with sealant or grout.

3.04 ROOF FLASHING INSTALLATION

A. General: Install sheet metal roof flashing and trim to comply with performance requirements and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, set units true to line, and level as indicated. Install work with laps, joints, and seams that will be permanently watertight.

B. Pipe, vent thru-roof: Construct pitch pans of stainless steel to flash penetrations through roof, where indicated or necessary. Pan to be 2” greater in length and width than object it is flashing. Flange to extend minimum 4” onto roof. Set in trowel coating of plastic cement over plies of built-up roofing. Nail 3” o.c. at 3/4" from edge of flange. Provide cover flange with one ply of felt stripping set in cement, extending 8”, and one ply, mopped, extending 12” on deck beyond edge of flange. Sides shall extend up from roof minimum of 4”. Joints to be seamed and sealed. Pitch pan to be filled by Roofer. Construct counterflashing cap or bonnet of metal with draw band and caulking over pitch pocket wherever possible.

C. Pipe Counterflashing: Install counterflashing umbrella with close-fitting collar with top edge flared for elastomeric sealant, extending a minimum of 4-inches over base flashing. Install stainless steel draw band and tighten.

D. 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 a minimum of 4-inches and bed with butyl sealant.

1. Secure in a waterproof manner by means of snap-in installation and sealant or lead wedges and sealant.

E. Roof-Penetration Flashing: Coordinate installation of roof-penetration flashing with installation of roofing and other items penetrating roof. Install flashing as follows:

1. Flashing shall be accurately formed to conform with roofing contours and configurations and as required to assure a watertight installation. Flashing shall be built in as roofing work progresses.
2. Turn lead flashing down inside vent piping, being careful not to block vent piping with flashing.
3. Seal with elastomeric sealant and clamp flashing to pipes penetrating roof except for lead flashing on vent piping.
4. Provide sheet metal umbrella above pitch-pan on pipe / conduit.

3.05 WALL FLASHING INSTALLATION

A. General: Install sheet metal wall flashing to intercept and exclude penetrating moisture according to SMACNA recommendations and as indicated. Coordinate installation of wall flashing with installation of wall-opening components such as windows, doors, and louvers.

B. Through-Wall Flashing: Installation of formed through-wall flashing is specified in Division 04 Section "Unit Masonry Assemblies."

C. Pre-finished Metal Wall Cap: Install wall cap with continuous cleat on exposed face and neoprene washer and fastener at 24” o.c. on roof side.

3.06 CLEANING AND PROTECTION

A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.

B. Clean all flashing and remove sealants. To prevent rust staining on finished surfaces, immediately remove fillings caused by drilling or cutting.

C. Remove temporary protective coverings and strippable films as sheet metal flashing and trim are installed. On completion of installation, clean finished surfaces, including removing unused fasteners, metal filings, pop rivet stems, and pieces of flashing. Maintain in a clean condition during construction.

D. Replace sheet metal flashing and trim that have been damaged or that have deteriorated shall be replaced. Spray paint finish touch-up is NOT acceptable.

END OF SECTION 07 62 00

SECTION 07 72 00 - ROOF ACCESSORIES

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. Roof hatches.
2. Preformed flashings.

B. Related Sections include the following:

1. Division 05 Section "Metal Fabrications" for metal vertical ladders for access to roof hatches.
2. Division 06 Section "Rough Carpentry" for wood nailers.
3. Division 07 Section "Sheet Metal Flashing and Trim" for shop- and field-fabricated metal flashing and counterflashing, and miscellaneous sheet metal trim and accessories.

1.3 SUBMITTALS

A. Product Data: For each type of roof accessory indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Shop Drawings: Show fabrication and installation details for roof accessories. Show layouts of roof accessories including plans and elevations. Indicate dimensions, weights, loadings, required clearances, method of field assembly, and components. Include plans, elevations, sections, details, and attachments to other work. Coordinate with other roof-mounted items including mechanical and electrical equipment, ductwork, piping, and conduit.

C. Samples: For each type of exposed factory-applied finish required and for each type of roof accessory indicated, prepared on Samples of size to adequately show color.

D. Warranty: Special warranty specified in this Section.

1.4 QUALITY ASSURANCE

A. Sheet Metal Standard: Comply with SMACNA's "Architectural Sheet Metal Manual" details for fabrication of units, including flanges and cap flashing to coordinate with type of roofing indicated.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Pack, handle, and ship roof accessories properly labeled in heavy-duty packaging to prevent damage.

1.6 PROJECT CONDITIONS

A. Field Measurements: Verify required openings for each type of roof accessory by field measurements before fabrication and indicate measurements on Shop Drawings.

1.7 COORDINATION

A. Coordinate layout and installation of roof accessories with roofing membrane and/or standing seam roofing and base flashing and interfacing and adjoining construction to provide a leak-proof, weathertight, secure, and non-corrosive installation.

1.8 WARRANTY

A. Manufacturer's standard warranty: Materials shall be free of defects in material and workmanship for a period of five years from the date of purchase. Should a part fail to function in normal use within this period, manufacturer shall furnish a new part at no charge.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers listed in other Part 2 articles.

2.2 METAL MATERIALS

A. Galvanized Steel Sheet: ASTM A 653/A 653M, G90 coated.

B. Aluminum-Zinc Alloy-Coated Steel Sheet: ASTM A 792/A 792M, AZ50 coated.

C. Aluminum Sheet: ASTM B 209, alloy and temper recommended by manufacturer for type of use and mill finish.

D. Aluminum Extrusions and Tubes: ASTM B 221, alloy and temper recommended by manufacturer for type of use, mill finished.

E. Steel Shapes: ASTM A 36/A 36M, hot-dip galvanized to comply with ASTM A 123/A 123M, unless otherwise indicated.

2.3 MISCELLANEOUS MATERIALS

A. Cellulosic-Fiber Board Insulation: ASTM C 208, Type II, Grade 1, 1 inch thick.

B. Glass-Fiber Board Insulation: ASTM C 726, 1 inch thick.

C. Fasteners: Same metal as metals being fastened, or nonmagnetic stainless steel or other non-corrosive metal as recommended by roof accessory manufacturer. Match finish of exposed fasteners with finish of material being fastened. Provide non-removable fastener heads to exterior exposed fasteners.

2.4 ROOF HATCHES

A. Available Manufacturers:

1. Babcock-Davis; a Cierra Products Inc. Company.
2. Bilco Company (The).
3. Bristolite Skylights.
4. Custom Curb, Inc.
5. Dur-Red Products.
6. Hi Pro International, Inc.
7. J. L. Industries, Inc.
8. Metallic Products Corporation.
9. Milcor Inc.; a Gibraltar Company.
10. Nystrom, Inc.
11. O'Keeffe's Inc.
12. Precision Ladders, LLC.
13. Roof Products & Systems Corporation.
14. ThyCurb; Div of Thybar Corporation.
15. Wasco Products, Inc.
16. Western Canwell.

B. Basis-of-Design Product: Bilco, Type S-50TB.
1. Thermally broken cover and curb
2. R-value R-18, using polyisocyanurate insulation
3. EPDM gasketing for weather and wind resistance
4. 11ga aluminum construction, cover, and frame

C. Size: 3'-0" long x 2'6" wide x 12” height. (Hinges on ‘width’ dimension.)

D. Performance characteristics:

1. Cover shall be reinforced to support a minimum live load of 40 psf with a maximum deflection of 1/150th of the span or 20 psf wind uplift.
2. Operation of the cover shall be smooth and easy with controlled operation throughout the entire arc of opening and closing.
3. Operation of the cover shall not be affected by temperature.
4. Entire hatch shall be weathertight with fully welded corner joints on cover and curb.

E. Cover: 11-gauge aluminum with a 5” beaded flange with formed reinforcing members. Cover shall have a heavy extruded EPDM rubber gasket that is bonded to the cover interior to assure a continuous seal when compressed to the top surface of the curb.

F. Curb: 12” in height and of 11-gauge aluminum, formed with a 5-1/2” flange with 7/16” holes provided for securing to the roof deck. The curb shall be equipped with an integral metal capflashing of the same gauge and material as the curb, fully welded at the corners, incorporating flashing system and stamped tabs, 6” on center, to be bent inward to hold single ply roofing membrane securely in place.

G. Curb insulation: 3” polyisocyanurate

H. Lifting mechanisms: Compression spring operators enclosed in telescopic tubes to provide, smooth, easy, and controlled cover operation throughout the entire arc of opening and closing. The upper tube shall be the outer tube to prevent accumulation of moisture, grit, and debris inside the lower tube assembly. The lower tube shall interlock with a flanged support shoe welded to the curb assembly.

I. Hardware:

1. Heavy pintle hinges.
2. Cover shall be equipped with a spring latch with interior and exterior turn handles.
3. Interior and exterior padlock hasps.
4. Latch strike bolted to the curb assembly.
5. Cover, automatically locking in the open position with a rigid hold open arm equipped with a 1” diameter vinyl grip handle to permit easy release for closing.
6. Compression spring tubes of an anti-corrosive composite material; other hardware to be zinc plated and chromate sealed. Springs to have an electrocoated acrylic finish for corrosion resistance.
7. Cover hardware to be bolted into heavy gauge channel reinforcing welded to the underside of the cover and concealed within the insulation space.

J. Factory finish to be mill finish aluminum.

2.5 PREFORMED FLASHINGS

A. Exhaust Vent Flashings: Double-wall metal flashing sleeve, urethane insulation filled, with integral deck flange, 12 inches high, with removable metal hood and slotted or perforated metal collar, and as follows:

1. Available Manufacturers:

    a. Thaler Metal Industries Ltd.

2. Metal: Aluminum sheet, 0.064-inch thick, mill finished.
3. Diameter: As indicated.

B. Vent Stack Flashing: Metal flashing sleeve, with integral deck flange, uninsulated, and as follows:

1. Available Manufacturers:

    a. Thaler Metal Industries Ltd.

2. Metal: Aluminum sheet, 0.064-inch thick, mill finished.

3. Height: 12 inches.
4. Diameter: As indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, to verify actual locations, dimensions, and other conditions affecting performance of work.

1. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored and is ready to receive roof accessories.
2. Verify dimensions of roof openings for roof accessories.
3. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Install roof accessories according to manufacturer's written instructions. Anchor roof accessories securely in place and capable of resisting forces specified. Use fasteners, separators, sealants, and other miscellaneous items as required for completing roof accessory installation. Install roof accessories to resist exposure to weather without failing, rattling, leaking, and fastener disengagement.

B. Install roof accessories to fit substrates and to result in watertight performance.

C. Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with bituminous coating or by other permanent separation as recommended by manufacturer.

1. Coat concealed side of uncoated aluminum roof accessories with bituminous coating where in contact with wood, ferrous metal, or cementitious construction.
2. Underlayment: Where installing exposed-to-view components of roof accessories directly on cementitious or wood substrates, install a course of felt underlayment and cover with a slip-sheet, or install a course of polyethylene underlayment.
3. Bed flanges in thick coat of asphalt roofing cement where required by roof accessory manufacturers for waterproof performance.

D. Install roof accessories level, plumb, true to line and elevation, and without warping, jogs in alignment, excessive oil canning, buckling, or tool marks.

E. Roof Hatch Installation:

1. Check roof hatch for proper operation. Adjust operating mechanism as required. Clean and lubricate joints and hardware.
2. Attach safety railing system (if required) to roof hatch curb.
3. Attach ladder safety post according to manufacturer's written instructions.

F. Preformed Flashing Installation:

1. Secure to roof membrane according to roofing manufacturer's written instructions.

3.3 CLEANING

A. Clean exposed surfaces according to manufacturer's written instructions.

END OF SECTION 07 72 00

SECTION 07 92 00 – JOINT SEALANTS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

B. Refer to the Drawings for locations of work to be performed.

1.02 SUMMARY

A. 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 non-traffic surfaces.
2. Exterior joints in horizontal traffic surfaces, including joints between slabs and building walls.
3. Interior joints in vertical surfaces and horizontal non-traffic surfaces.
4. Interior joints in horizontal traffic surfaces.
5. Perimeter insulation at window and door openings.

B. See Division 07 Section “Metal Wall Panels” for sealant to be used in conjunction with metal siding.

C. See Division 08 Section "Glazing" for glazing sealants.

1.03 WORK INCLUDED

A. Furnish labor and materials to complete caulking work indicated, as specified herein, or both, including but not limited to:

1. Clean out and caulk exterior and interior joints around door frames, entrances, louvers, windows, and other wall openings with urethane base caulking.
2. Clean out and caulk control and expansion joints in masonry with urethane base caulking.
3. Caulk cabinets at top and bottom of splash, all joints at walls, other cabinets, and beneath inset sinks with silicone caulk.
4. Caulk edges of gypsum board where it meets dissimilar material with urethane base caulking.
5. Caulk joints between dissimilar materials.

1.04 PERFORMANCE REQUIREMENTS

A. Provide elastomeric joint sealants that establish and maintain watertight and airtight continuous joint seals without staining or deteriorating joint substrates.

B. Provide joint sealants for interior applications that establish and maintain airtight and water-resistant continuous joint seals without staining or deteriorating joint substrates.

C. Install sealants when temperature is within the range recommended by the manufacturer. Do not proceed with sealants in unfavorable weather conditions.

1.05 SUBMITTALS

A. Product Data: For each joint sealant product indicated.

B. Samples: For each type and color of joint sealant required.

1. Color: As selected by Architect from manufacturer's full range.
2. Install 12-inch-long sample of selected colors for approval prior to proceeding with caulking work.

C. Preconstruction field test reports.

D. Compatibility and adhesion test reports.

E. Product certificates and test reports.

1.06 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 manufacturer's standard test method to determine whether priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of joint sealants to joint substrates.

B. Preconstruction Field-Adhesion Testing: Before installing elastomeric sealants, field test their adhesion to Project joint substrates according to the method in ASTM C 1193 that is appropriate for the types of Project joints.

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.
2. Install 12" long sample (min. of 3-colors) of selected colors for approval prior to proceeding with caulking work.

D. Single Source: Joint sealants within each type to be one product from a single manufacturer.

1.07 DELIVERY AND STORAGE

A. Deliver, store, and handle materials to prevent inclusion of foreign materials, damage of materials by water and breakage. Deliver and store packaged materials in original packages until ready for use. Do not use packages or materials showing evidence of water or other damage.

1.08 GUARANTEE

A. Guarantee that specified work will be free from defects of materials, workmanship for one year from date of Substantial Completion.

B. Repair and replace such defective work and other work thereby damaged, which becomes defective during guaranteed term, without extra cost to the Owner.

C. The following types of failures are considered defective work: leakage, hardening, cracking, crumbling, melting, shrinking, or running of caulking; or staining of adjacent work joint sealant.

PART 2 PRODUCTS

2.01 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. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range.

C. Acrylic caulking materials are not acceptable.

2.02 MATERIALS

A. Bond Breaker Tape:

1. 3M’s 470 or 481 tape, as applicable.

B. Joint Sealant Backing:

1. General:

a. Backer Rod: Resilient closed cell polyethylene foam backer rod designed for use with cold applied joint sealants.
b. Provide sealant backings of material and type that are non-staining; 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.

2. Available Products:

    a. BASF MasterSeal: Backer Rod
    b. Dow Chemical Company: Ethafoam
    c. Tremco

3. Cylindrical Sealant Backings: ASTM C 1330, Type C (closed-cell material with a surface skin), O (open-cell material), B (bi-cellular material with a surface skin), or any of the preceding types, 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.
4. 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.

C. Urethane Base Caulking (typical at interior and exterior joints):

1. One-component urethane non-sag grade sealant, including perimeter of gypsum board / hard surfaced ceilings.
2. Available Products:

    a. BASF MasterSeal: NP-1
    b. Sika Corporation: Sikaflex 1A
    c. Tremco, Inc.

3. Type: S (single component)
4. Grade: NS (nonsag)
5. Class: 25
6. Use Related to Exposure: NT (non-traffic)
7. Uses Related to Joint Substrates: M, A, and, as applicable to joint substrates indicated, O.

D. Silicone Base Caulking (typical at perimeter of countertops):

1. Available Products:

    a. Pecora 860 Clear Architectural Silicone Sealant, or equal manufactured by:

        1) General Electric
        2) Dow Corning

3. Type: S (single component)
4. Grade: NS (nonsag)
5. Class: 25
6. Use Related to Exposure: NT (non-traffic)
7. Uses Related to Joint Substrates: M, G, A, and, as applicable to joint substrates indicated, O.

E. Primers: As required and recommended by sealant manufacturer.

F. Sand: To match mortar for joints in brick work.

2.04 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: Non-staining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

D. Masonry Sand for control joints in brick masonry.

PART 3 EXECUTION

3.01 PREPARATION

A. Preparation of surfaces, joint packing and application shall be by workers trained in preparation and application of materials proposed for use.

B. Examine joints and areas to be sealed. Do not proceed until unsatisfactory conditions are corrected. Masonry, mortar joints and concrete shall be dry and fully cured in areas to be sealed.

C. Surfaces to be sealed shall be clean, dry and dust free. Surface and air temperature shall be greater than 30-degrees F and less than-100 degrees F.

D. Pack deep joints with back-up material specified. Shallow joints shall use non-bonding tape at bottom of joint. Joint shall be approximately 1/2 depth to width when ready for caulking. Generally, minimum depth shall be 1/4” and maximum depth 1/2”, unless otherwise indicated.

E. 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.

a. 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.

2. Remove laitance and form-release agents from concrete.

    a. 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.

F. 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.

G. 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.

3.02 APPLICATION

A. Prime surfaces and install materials in strict accordance with manufacturer’s written directions. Backer rods shall be compression fit.
B. Compound shall not adhere to back of joints.

C. Gun sealant from bottom of joint to prevent air bubbles from forming below surface.

3.03 INSTALLATION

A. Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.

B. Acoustical Sealant Application Standard: Comply with recommendations in ASTM C 919 for use of joint sealants in acoustical applications as applicable to materials, applications, and conditions indicated.

C. Install sealant backings of type indicated 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 bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.

E. 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.

F. **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.

G. 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.

3.04 JOINTS

A. Neatly point finish of caulking joints on flush surfaces with tool; remove excess material. Leave joints uniform and slightly concave.

B. Neatly point finish of caulking joints in internal corners with coving tool; remove excess material.

C. Install insulating foam at full perimeter of all window and door openings in the exterior envelope, including entrances, clerestories, and translucent panel installations.

D. Caulking where exposed: Free of wrinkles and uniformly smooth. Make caulk joints watertight.

E. While still sticky, apply sand to exterior control joints to match mortar joints in brick work.

3.05 CLEANING

A. Immediately clean adjacent materials which have been soiled; leave work in neat, clean condition.

END OF SECTION 07 92 00

SECTION 07 95 00 – FIRE AND SMOKE SEALANTS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

B. Refer to the Drawings for locations of work to be performed.

1.02 DESCRIPTION OF WORK

A. In general, this Section covers fire and smoke sealants as indicated. Refer to this Section for fire and smoke sealants not provided by Mechanical and Electrical Contractors (see also Divisions 20, 21, 22, 23, 26, 27 and 28), under their scope of work and other devices for penetrations thru smoke or rated walls.

B. All joints and penetrations in rated walls shall be sealed so that the fire protection rating will be maintained.

1.03 SUBMITTALS

A. Product Data: Submit manufacturer's product specifications, including handling, installation, curing instructions and fire performance tested data sheets.

1.04 JOB CONDITIONS

A. Weather Conditions: Do not proceed with installation of liquid sealants under unfavorable weather conditions. Install elastomeric sealants when temperature is within the range recommended by manufacturer for installation.

PART 2 PRODUCTS

2.01 FIRE-RESISTANT JOINT SEALERS

A. General: Provide manufacturer's standard sealant and accessory materials with fire-resistance rating indicated which are identical to those of assemblies whose fire endurance has been determined by testing per ASTM E 814 by Underwriters Laboratory, Inc. or other testing and inspecting agency acceptable to authorities having jurisdiction.

B. Sealant: One-part sealant as follows:

1. One-Part-Fire-Stopping Sealant: One-part sealant formulated for use as part of a through-penetration fire-stop system for sealing openings and penetration through walls and floors.

C. Products: Subject to compliance with requirements, provide one of the following:

1. Isolatek, International: Cafco TFS Caulk
2. General Electric Silicone: Pensil Fire Stop Systems
3. Tremco: Fyre-Shield

D. Mineral fiber board, mineral fiber matting and mineral fiber putty:

1. Forming and damming materials used to contain the liquid sealant mixture prior to and during foam-filling penetrations. Fire tested and functionally approved forming materials may be left in place to become an integrally part of the foamed penetration seal.

E. Plywood sheet, particle board or other combustible forming materials:

1. Forming and damming materials used for containment during foaming only must be removed from the final completed penetration seal system.

PART 3 EXECUTION

3.01 MANUFACTURER'S INSTRUCTIONS

A. Comply with manufacturer's printed instruction except where more stringent requirements are shown or specified, and except where manufacturer's technical representative directs otherwise.

3.02 PREPARATION

A. Clean surfaces immediately before installation of sealant compound. Remove dirt, insecure coatings, moisture and other substances which could interfere with bond or sealant of compound. Roughen vitreous and glazed joint surfaces as recommended by sealant manufacturer.

3.03 INSTALLATION

A. Install fire-resistant sealant in openings where indicated and at thicknesses indicated. Dam bottom of vertical openings and one side of horizontal openings with temporary containment forms or, where required to achieve fire-resistance ratings, provide permanent mineral composition board forms. **On horizontal penetrations, provide partial face containment forms where required for sealant placement.** Allow installed sealant to cure 24 hours; remove temporary forms; trim ragged edged with sharp knife; inspect and fill voids with additional filler to form uniform thickness of sealant.

B. Spillage: Do not allow sealants to overflow or spill onto adjoining surfaces or to migrate into voids of adjoining surfaces. Clean adjoining surface by whatever means necessary to eliminate evidence of spillage.

C. Recess exposed edges of gaskets and exposed joint sealant slightly behind adjoining surfaces, unless otherwise shown, so that compressed units will not protrude from joints.

3.04 CURE AND PROTECTION

A. Cure sealants in compliance with manufacturer's instructions and recommendations. Advise the Contractor of procedures required for cure and protection of sealants during construction period, so they will be without deterioration or damage at time of Substantial Completion.

END OF SECTION 07 95 00

SECTION 08 11 00 – STEEL DOORS AND FRAMES

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section Includes:

1. Standard hollow metal doors, frames, and view windows.
2. Metal Lite Kits for hollow metal doors.
3. Thermally broken steel frames.

B. Related Sections

1. Division 04 Section "Unit Masonry Assemblies" for embedding anchors for hollow metal work into masonry construction.
2. Division 08 Section "Door Hardware" for door hardware for hollow metal doors.
3. Division 08 Section "Glazing" for glazing for hollow metal doors and hollow metal windows.
4. Division 09 Sections "Interior Painting" and “Exterior Painting” for field painting hollow metal doors, frames, and windows.

1.03 DEFINITIONS

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A. Minimum Thickness: Minimum thickness of base metal without coatings.

B. Standard Hollow Metal Work: Hollow metal work fabricated according to ANSI/SDI A250.8.

1.04 SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, core descriptions, fire-resistance rating and finishes.

B. Shop Drawings: Include the following:
1. Elevations of each door design.
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. Fire ratings for fire doors.

B. Samples for Verification:

1. For the following items, prepared on Samples about 12 by 12-inches to demonstrate compliance with requirements for quality of materials and construction:

a. Doors: Show vertical-edge, top, and bottom construction; core construction; and hinge and other applied hardware reinforcement. Include separate section showing glazing if applicable.
b. Frames: Show profile, corner joint, floor and wall anchors, and silencers. Include separate section showing fixed hollow metal panels and glazing if applicable.

C. Other Action Submittals:

1. 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.

D. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for each type of hollow metal door and frame assembly.

1.05 QUALITY ASSURANCE

A. Source Limitations: Obtain hollow metal work from single source from single manufacturer.

B. Provide doors and frames complying with Steel Door Institute “Recommended Specifications: Standard Steel Doors and Frames” (SDI-100) and as herein specified.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver hollow metal work palletized, wrapped, or crated to provide protection during transit and Project-site storage. Do not use non-vented plastic.
1. Provide additional protection to prevent damage to finish of 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 under cover at Project Site. Place in stacks of five units maximum in a vertical position with heads up, spaced by blocking, on minimum 4-inch high wood blocking. Do not store in a manner that traps excess humidity.
1. Provide minimum 1/4-inch space between each stacked door to permit air circulation.

1.07 PROJECT CONDITIONS

A. Field Measurements: Verify actual dimensions of openings by field measurements before fabrication.

1.08 COORDINATION

A. Coordinate installation of anchorages 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.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following:

1. Amweld Building Products, LLC.
2. Ceco Door Products; an Assa Abloy Group company.
3. Curries Company; an Assa Abloy Group company.
4. Fleming Door Products Ltd.; an Assa Abloy Group company.
5. Metal Products, Inc.
6. Steelcraft; an Ingersoll-Rand company.
7. Republic.
8. De La Fontaine

2.02 MATERIALS

A. Cold-Rolled Steel Sheet: ASTM A-1008 / A-1008M, Commercial Steel (CS), Type B; suitable for exposed applications.

B. Hot-Rolled Steel Sheet: ASTM A-1011 / A-1011M, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.

C. Galvanized Steel Sheets: Zinc coated carbon steel sheets of commercial quality, complying with ASTM A-526, with ASTM A-525, G 60 zinc coating, mill phosphatized.

D. Frame Anchors: ASTM A-591 / A-591M, Commercial Steel (CS), 40Z (12G) coating designation; mill phosphatized.

1. For anchors built into exterior walls, steel sheet complying with ASTM A-1008 / A-1008M (cold-rolled) or ASTM A-1011 / A-1011M (hot-rolled), and hot-dip galvanized according to ASTM A-153 / A-153M, Class B.

E. Inserts, Bolts, and Fasteners: Hot-dip galvanized according to ASTM A-153 / A-153M.

F. Glazing: Comply with requirements in Division 08 Section "Glazing."

G. Bituminous Coating: Cold-applied asphalt mastic, SSPC-Paint 12, compounded for 15-mil dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.
H. Finish Hardware Preparation:

1. Prepare doors and frames to receive mortised and concealed finish hardware in accordance with final Builders Hardware Schedule and templates provided by hardware supplier. Comply with applicable requirements of ANSI A 115 series specification for door and frame preparation for hardware.
2. Reinforce doors and frames to receive surface-applied hardware. Drilling and tapping for surface-applied finish hardware may be done at Project Site.
3. Locate finish hardware as shown on final shop drawings or, if not shown, in accordance with "Recommended Locations for Builder's Hardware," published by Door and Hardware Institute.
4. All interior and exterior door frames shall be prepared to receive butts, closers and locksets.
5. **Doors and frames shall be prepared to receive all electrified hardware as specified.**

2.03 STANDARD HOLLOW METAL DOORS

A. General: Provide doors of design indicated, not less than thickness indicated; fabricated with smooth surfaces, without visible joints or seams on exposed faces unless otherwise indicated. Comply with ANSI / SDI A250.8.

1. Tolerances: Comply with SDI 100, "Manufacturing Tolerances for Standard Steel Doors and Frames."
2. Design: Flush panel, with openings as indicated on the Drawings.
3. Vertical Edges for Single-Acting Doors: Beveled edge, seamless and fully welded.

    a. Beveled Edge: 1/8-inch in 2-inches.

4. Top and Bottom Edges: Closed with flush or inverted 0.042-inch thick, end closures or channels of same material as face sheets.

5. Exterior Doors: SDI-100, Level 4, maximum duty, Model 2, minimum **14-gauge**, vertical steel stiffeners. Form panels and doors from galvanized sheet steel. Close top and bottom edges of exterior doors as an integral part of door construction; top closures to be metal. Doors to have continuous welded seamless vertical edges, dressed smooth.

    a. Exterior Core Construction: Manufacturer's standard fiberglass core with stiffeners.
    b. Thermal-Rated (Insulated) Exterior Doors: Where indicated, provide doors fabricated with thermal-resistance value (R-value) of not less than 4.0 degrees F x h x sq. ft. / Btu when tested according to ASTM C-1363.

6. Interior Doors: SDI-100, Level 3, extra heavy duty, Model 1, minimum **16-gauge** faces. Doors to have continuous welded seamless vertical edges, dressed smooth.

a. Interior Core Construction: Manufacturer's honeycomb core.

7. Rated Doors: Comply with UL labeling requirements.
8. Coordinate undercut at each door with floor finish and threshold conditions. Undercut may vary depending on location and conditions. Exterior doors shall contact threshold seal to prevent air infiltration.

B. Hardware Reinforcement: Fabricate according to ANSI / SDI A250.6 with reinforcing plates from same material as door face sheets.

C. Fabricate concealed stiffeners and hardware reinforcement from either cold- or hot-rolled steel sheet.

2.04 STANDARD HOLLOW METAL FRAMES

A. General: Comply with ANSI / SDI A250.8 and with details indicated for type and profile.

C. Exterior Frames: Fabricated from hot-dip galvanized steel sheet.

1. Fabricate frames with mitered, continuously welded corners.
2. Fabricate frames as full profile welded unless otherwise indicated.
3. Frames for Level 3 Steel Doors: **14-gauge** thick steel sheet.

D. Interior Frames: Fabricated from cold-rolled steel sheet.

1. Fabricate frames with mitered or coped corners.
2. Fabricate frames as face welded unless otherwise indicated.
3. Frames for Level 2 Steel Doors: **16-gauge** thick steel sheet.
4. Frames for Wood Doors: 16-gauge thick steel sheet.
5. Frames for View Windows: 16-gauge thick steel sheet.

D. Hardware Reinforcement: Fabricate according to ANSI / SDI A250.6 with reinforcement plates from same material as frames.

E. Pre-drill glass stops to correspond with the appropriate glass thickness. Install glass stops on the secure side of the frame.

2.05 THERMALLY BROKEN METAL FRAMES

A. General: Comply with ANSI / SDI A250.8 and with details indicated for type and profile.

C. Exterior Frames: Fabricated from hot-dip galvanized steel sheet.

1. Fabricate frames with mitered, continuously welded corners.
2. Fabricate frames as full profile welded.
3. Thermal Break: Factory-installed 1/16” thick hermal barrier integrated into frame.

a. Basis of Design: Ceco/Assa Abloy Mercury TQB/TRB

4. Frames for Level 3 Steel Doors: **14-gauge** thick steel sheet.

C. Hardware Reinforcement: Fabricate according to ANSI / SDI A250.6 with reinforcement plates from same material as frames.

D. Pre-drill glass stops to correspond with the appropriate glass thickness. Install glass stops on the secure side of the frame.

2.06 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, not less than 0.042-inch thick, and as follows:

1. Monolithic Concrete Slabs: Clip-type anchors, with two holes to receive fasteners.

2.07 STOPS AND MOLDINGS

A. Moldings for Glazed Lites in Doors: Minimum 16-gauge thick, fabricated from same material as door face sheet in which they are installed.

B. Fixed Frame Moldings: Formed integral with hollow metal frames, a minimum of 5/8-inch high unless otherwise indicated.

C. Loose Stops for Glazed Lites in Frames: Minimum 16-gauge thick, fabricated from same material as frames in which they are installed.

D. Metal Lite Openings: Install metal frames with through-bolted sex bolts. Face sheet of door may not be used as a window / glass stop. The head of the fastener shall be on the secure side of the door.

2.08 ACCESSORIES

A. Grout Guards: Formed from same material as frames, not less than 26-gauge thick.

2.09 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 thickness of metal. 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. Tolerances: Fabricate hollow metal work to tolerances indicated in SDI 100.

C. Hollow Metal Doors:

1. Exterior Doors: Provide weep-hole openings in bottom of exterior doors to permit moisture to escape. Seal joints in top edges of doors against water penetration.
2. Glazed Lites: Factory cut openings in doors.

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. Welded Frames: Weld joints as noted in paragraph 2.04; grind, fill, dress, and make smooth, flush, and invisible.
2. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.
3. Grout Guards: Weld guards to frame at back of hardware mortises in frames to be grouted.
4. Floor Anchors: Weld anchors to bottom of jambs and mullions with at least four spot welds per anchor.
5. Jamb Anchors: Provide number and spacing of anchors as follows:

    a. Masonry 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:

        1) Three anchors per jamb from 60 to 90-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:

        1) Four anchors per jamb from 60 to 90-inches high.

6. Door Silencers: Except on weather-stripped doors, 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, edge channels, and hardware reinforcement 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 the Door Hardware Schedule and templates furnished as specified in Division 08 Section "Door Hardware."

1. Locate hardware as indicated, or if not indicated, according to ANSI / SDI A250.8.
2. Reinforce doors and frames to receive non-templated, mortised and surface-mounted door hardware.
3. Comply with applicable requirements in ANSI / SDI A250.6 and ANSI / DHI A115 Series specifications for preparation of hollow metal work for hardware.
4. Coordinate locations of conduit and wiring boxes for electrical connections with Division 26 Sections.

G. Stops and Moldings: Provide stops and moldings around glazed lites where indicated. Form corners of stops and moldings with butted or mitered hairline joints.

1. Single Glazed Lites: Provide fixed stops and moldings welded on secure side of hollow metal work.
2. Provide fixed frame moldings on outside of exterior and on secure side of interior doors and frames.
3. Provide loose stops and moldings on inside of hollow metal work.
4. Coordinate rabbet width between fixed and removable stops with type of glazing and type of installation indicated.

2.10 STEEL FINISHES

A. Prime Finish: Apply manufacturer's standard primer immediately after cleaning and pretreating.

1. Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with ANSI/SDI A250.10 acceptance criteria; recommended by primer manufacturer for substrate; compatible with substrate and field-applied coatings despite prolonged exposure.

PART 3 EXECUTION

3.01 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.

B. Examine roughing-in for embedded and built-in anchors to verify actual locations before frame installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 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. Prior to installation, adjust and securely brace welded hollow metal frames for squareness, alignment, twist, and plumbness to the following tolerances:

1. Squareness: Plus or minus 1/16-inch, measured at door rabbet on a line 90-degrees from jamb perpendicular to frame head.
2. Alignment: Plus or minus 1/16-inch, measured at jambs on a horizontal line parallel to plane of wall.
3. Twist: Plus or minus 1/16-inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
4. Plumbness: Plus or minus 1/16-inch, measured at jambs on a perpendicular line from head to floor.

C. Drill and tap doors and frames to receive non-templated, mortised, and surface-mounted door hardware.

3.03 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. Placing Frames:

1. Comply with provisions of SDI-105 “Recommended Erection Instructions For Steel Frames”, unless otherwise indicated.
2. Except for frames located at in-place concrete or masonry and at drywall installations, place frames prior to construction of enclosing walls and ceilings. Set frames accurately in position, plumbed, aligned and braced securely until permanent anchors are set. After wall construction is completed, remove temporary braces and spreaders, leaving surfaces smooth and undamaged.
3. In masonry construction, locate (3) wall anchors per jamb at hinge and strike levels. Building-in of anchors and grouting of frames is specified in Division 04 Sections.
4. At in-place concrete or masonry construction, set frames and secure to adjacent construction with machine screws and masonry anchorage devices. Grout all frames solid.

C. Hollow Metal Frames: Install hollow metal frames of size and profile indicated. Comply with ANSI / SDI A250.11.

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 frames with removable glazing stops located on secure side of opening.
c. Install door silencers in frames before grouting.
d. Remove temporary braces necessary for installation only after frames have been properly set and secured.
e. Check plumbness, squareness, and twist of frames as walls are constructed. Shim as necessary to comply with installation tolerances.
f. Field apply bituminous coating to backs of frames that are filled with grout containing anti-freezing agents.

2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and secure with post-installed expansion anchors.

a. Floor anchors may be set with powder-actuated fasteners instead of post-installed expansion anchors if so indicated and approved on Shop Drawings.

3. Metal-Stud Partitions: Solidly pack mineral-fiber insulation behind 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.

D. Hollow Metal Doors: Fit hollow metal doors accurately in frames, within clearances specified below. Shim as necessary.

1. Non-Fire-Rated Standard Steel Doors:

a. Jambs and Head: 1/8-inch plus or minus 1/16-inch.
b. Between Edges of Pairs of Doors: 1/8-inch plus or minus 1/16-inch.
c. Between Bottom of Door and Top of Threshold: Maximum 3/8-inch.
d. Between Bottom of Door and Top of Finish Floor (No Threshold): Maximum 3/4-inch.

2. Fire-Rated Doors: Install doors with clearances according to NFPA 80.

E. Glazing: Comply with installation requirements in Division 08 Section "Glazing" and with hollow metal manufacturer's written instructions.

1. Secure stops with countersunk flat- or oval-head machine screws spaced uniformly not more than 9-inches o.c. and not more than 2-inches o.c. from each corner.

3.04 ADJUSTING AND CLEANING

A. Final Adjustments: Check and readjust operating finish 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. Galvanized Surfaces: Clean abraded areas and repair with galvanizing repair paint according to manufacturer's written instructions.

END OF SECTION 08 11 00

SECTION 08 33 13 – COILING DOORS

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. Overhead coiling doors.
   2. Accessories.

1.3 DESIGN REQUIREMENT

A. Manual Operation: Design door assembly to operate for not less than 20,000 cycles.

1.4 SUBMITTALS

A. Shop Drawings: Indicate pertinent dimensioning, anchorage methods, hardware locations, and installation details.

B. Product Data: Technical data, component connections, and details.

C. Samples: Submit two curtain slats, 12 inches in length, illustrating shape and finish.

D. Manufacturer's Installation Instructions: Submit special installation instructions.

E. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: Submit lubrication requirements and frequency, and periodic adjustments required.

PART 2 PRODUCTS

2.1 COILING DOORS

A. Manufacturers:
   1. Overhead Door Corp (B.O.D. product)
   2. Clopay Building Products
   3. Cornell Iron Works (B.O.D. product)
   4. McKeon Rolling Steel Door Co., Inc.

5. Wayne Dalton Corp
6. Windsor Door

B. Basis-of-Design (B.O.D.) products:

1. Overhead Rolling Doors - Insulated:
   a. Basis-of-Design: Overhead Door, Rolling Steel Service Door, Stormtite, Model 627
   b. Power-coated finish, Architect to select for manufacturer's full range of colors.
   c. Motorized – coordinate with Electrical Drawings.

2. Overhead, Counter, Rolling Door:
   a. Basis-of-Design: Cornell, Rolling Counter Door.
   b. Stainless-steel finish.
   c. Manual Operation.

C. Manual push up units to have overhead balance device, requiring 25 lb nominal force to operate.

D. Sizes as indicated on Door Schedule. Coordinate with actual opening size constructed (field measure).

2.2 MATERIALS

A. Stainless Steel Sheet: ASTM A480/A480M or ASTM A666; Type 304 or 316, rollable temper

2.3 COMPONENTS

A. Curtain: Conform to the following scheduled:
   1. Material: 22-gauge stainless steel.
   2. Profile: Flat, 2-1/2 inches x 3/4 inch deep.
   3. End locks: Nylon, attached to every other slat to act as wearing surface and prevent lateral movement.
   4. Curtain Bottom: Stainless steel, fitted with angles, channels, or tubes to provide reinforcement and positive contact with floor in closed position.

B. Guides: Minimum 3/16 inch; three piece formed stainless steel, bolted together to form guide channel and mounting surface with flared guide runners full height to prevent metal-to-metal contact and curtain stops.

C. Roller Shaft Counterbalance: Steel pipe and helical steel spring system, capable of producing torque sufficient to ensure smooth operation of curtain from any position and capable of holding position at mid-travel; with adjustable spring tension.

D. Hood Enclosure: Minimum 24-gauge steel; internally reinforced to maintain rigidity and shape.

E. Head Plate: Rectangular steel plate, with precision sealed ball bearings supporting drive side axle.

F. Barrel Assembly: Steel pipe sized for maximum deflection under loading of 0.03 inch per foot of span, with threaded rings or lugs welded to barrel assembly for curtain attachment.

G. Springs: Curtain weight counterbalanced by oil-tempered, helically wound torsion springs, grease packed and mounted on steel torsion shaft, designed for minimum 20,000 cycles.

E. Hardware:
   1. Locks: Locking: Interior mounted plated steel slide bolt lock(s) with padlock provisions.

2.3 SHOP FINISHING

A. Steel Components: Stainless steel (304).

B. Hood Enclosure: Stainless steel (304).

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify opening sizes, tolerances and conditions are acceptable.

3.2 INSTALLATION

A. Use anchorage devices to securely fasten assembly to wall construction without distortion or stress.

B. Securely and rigidly brace components suspended from structure.

C. Fit and align assembly including hardware; level and plumb, to provide smooth operation.

D. Coordinate installation of sealants and backing materials at frame perimeter as specified in Division 07 Section “Joint Sealants”.

E. Install perimeter trim and closures.

3.3 ERECTION TOLERANCES

A. Maintain dimensional tolerances and alignment with adjacent Work.

B. Maximum Variation from Plumb: 1/16 inch.

C. Maximum Variation from Level: 1/16 inch.

3.4 ADJUSTING

A. Adjust doors, hardware, and operating assemblies for smooth operation.

3.5 CLEANING

A. Clean door and components.

B. Remove labels and visible markings.

END OF SECTION 08 33 13

SECTION 08 44 13 – GLAZED ALUMINUM CURTAIN WALLS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section includes:

1. Aluminum tube framing system with vision glass.
2. Perimeter sealant.

B. Related Sections:

1. Division 07 Section “Building Insulation” for foam to fill small voids.
2. Division 08 Section “Glazing” for curtain wall glazing.
3. Division 08 Section “Aluminum-Framed Entrances and Storefronts” for complementary system.

1.03 SYSTEM DESCRIPTION

A. Curtain Wall System: Tubular aluminum sections with self-supporting framing, factory prefinished, insulated vision glass, related flashings, anchorage, and attachment devices.

1.04 PERFORMANCE REQUIREMENTS

A. Structural Performance:

1. Design pressure as calculated in accordance with applicable code and ASCE 7 for curtain wall sizes and configurations indicated on Drawings.
2. Withstand maximum positive and negative wind pressures acting normal to plane of wall, including building corners determined from design criteria indicated on Drawings.
3. Member Deflection: Maximum 1/175 of span measured at design pressure.

B. Air Infiltration: Maximum 0.06 cfm/sf of curtain wall area.

1. Test Method: ASTM E283.
2. Test Pressure Differential: 6.24 psf.

C. Water Leakage: None, with 12 psf minimum test pressure difference.

1. Test Method: ASTM E331.

C. System Assembly: Accommodate without damage to system, components or deterioration of seals, movement within system, movement between system and perimeter framing components, dynamic loading and release of loads, deflection of structural support framing, and tolerance of supporting components.

E. Condensation Resistance Factor: When tested in accordance with AAMA 1503.

1. Frame: Not less than 73.

F. Expansion / Contraction: System to provide for expansion and contraction within system components caused by a cycling temperature range of 170-degrees F over a 12-hour period without causing detrimental effect to system components.

G. System Internal Drainage: Drain water entering joints, condensation occurring in glazing channels, or migrating moisture occurring within system, to the exterior by a weep drainage network.

H. Not Permitted: Vibration harmonics, wind whistles, noises caused by thermal movement, thermal movement transmitted to other building elements, loosening, weakening, or fracturing of attachments or components of system.

1.05 SUBMITTALS

A. Product Data: Provide component dimensions, describe components within assembly, anchorage and fasteners, glass and infill, internal drainage details and water flow drainage diagrams.

1. Finish: Finish options to include manufacturer's full range of anodized finishes for selection. Dark Bronze (tentative selection).

B. Design Data: Provide framing member structural and physical characteristics, calculations, and dimensional limitations.

C. Shop Drawings: Indicate system dimensions, framed opening requirements and tolerances, anticipated deflection under load, affected related Work, weep drainage network, expansion and contraction joint location and details, and field welding required.

1. Include shop and field sealants by manufacture and product name, and locate on drawings. Show sealant joint sizes, including tolerances and maximum/minimum joint sizes required.

D. Samples: Submit (2) frame samples indicating pre-finished aluminum surface, illustrating edge and corner construction details.

E. Test Reports: Submit substantiating engineering data, test results of previous tests by independent laboratory which purport to meet performance criteria, and other supportive data.

F. Manufacturer's Certificate: Certify installer is approved by manufacturer.

G. Manufacturer's Field Services Report:

1. Submit report of observations.
2. Certify installation is complete in accordance with manufacturer's instructions.
3. Indicate supplementary instructions provided for Project specific conditions.

H. Professional Seal: Provide seal and signature on shop drawings and manual and computer calculations of Professional Engineer responsible for submittal.

1.06 QUALITY ASSURANCE

A. Perform Work in accordance with AAMA - Metal Curtain Wall, Window, Store Front and Entrance - Guide Specifications Manual. AAMA - Aluminum Curtain Wall Design Guide Manual.

B. Surface Burning Characteristics:

1. Foam Insulation: Maximum 75/450 flame spread/smoke developed index when tested in accordance with ASTM E84.

C. Apply label from agency approved by authority having jurisdiction to identify each foam plastic insulation board.

D. Source Limitations for Glazed Aluminum Curtain Walls: Obtain from single source from single manufacturer.

1.07 QUALIFICATIONS

A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum five years documented experience.

B. Installer Qualifications: Company specializing in performing the work of this section with minimum five years documented experience and approved by manufacturer.

C. Design structural support framing components under direct supervision of a Professional Structural Engineer experienced in design of this Work and licensed where the project is located.

1.08 DELIVERY, STORAGE, AND PROTECTION

A. Handle Work of this Section in accordance with AAMA - Curtain Wall Manual #10.

B. Protect prefinished aluminum surfaces with protective wrapping. Do not use adhesive papers or sprayed coatings which bond when exposed to sunlight or weather. Puncture wrappings at ends for ventilation.

1.09 ENVIRONMENTAL REQUIREMENTS

A. Do not install sealants when ambient temperature is less than 40-degrees F during and 48-hours after installation.

1.10 COORDINATION

A. Coordinate the Work with installation of Work affecting or adjacent to curtain wall materials including firestopping, vapor retarder placement, custom doors, exterior wall panels, roofing, flashing, skylights, joint sealants, and other finishes and building components.

1.11 WARRANTY

A. System Warranty: Include coverage for complete system for failure to meet specified requirements and failure of operational parts to function normally.

1. Provide five year manufacturer's labor and material warranty.

B. Glass Warranty: As specified in Division 08 Section “Glazing”.

C. Finish Warranty:

1. Anodized Finish: Provide five-year manufacturer's warranty.

PART 2 PRODUCTS

2.01 CURTAIN WALL SYSTEM

A. Manufacturers:

1. Kawneer Co., Inc., Series 1600 – Basis-of-Design
2. Tubelite, Series 400.
3. Oldcastle Building Envelope.
4. EFCO Corp.; Series 5500.
5. United States Aluminum; Series 3250.
6. Trulite; Series SB750

B. Product Description: Glazed aluminum curtain wall, thermally broken with interior tubular section insulated from exterior glass retaining member; matching stops and glass retaining member of sufficient size and strength to provide bite on glass; drainage holes, deflector plates and internal flashings, sub-sill flashing, to accommodate internal weep drainage system; internal mullion baffles to eliminate "stack effect" air movement within internal spaces.

1. Reinforced Mullion: Extruded aluminum cladding with internal reinforcement of aluminum structural section.

2.02 STANDARD STICK TYPE CURTAIN WALL

A. Mullion Profile:

1. 2-1/2 inches nominal face dimension
2. 6 inches depth
3. Cap Type: 1-inch depth from face of cap to face of glass.
4. Thermally broken with interior tubular section insulated from exterior pressure plate; matching stops and pressure plate of sufficient size and strength to provide bite on glass and infill panels; drainage holes, deflector plates and internal flashings to accommodate internal weep drainage system; internal mullion baffles to eliminate "stack effect" air movement within internal spaces.

B. Reinforced Mullion: Profile to match mullion profile with internal reinforcement of shaped steel structural section.

C. Trim: Pre-finished aluminum sheet trim, closures, and sills to match curtain wall framing, bent to profiles indicated and required for complete sealed system.

D. Receptors: Provide manufacturer’s standard pre-finished jamb receptors where indicated fabricated from same material as framing, sized for curtain wall depth, anticipated movement. Include standard friction inserts and seals.

2.03 COMPONENTS

A. Extruded Aluminum: ASTM B221 ASTM B221M; 6063 alloy, T5 temper typical, 6061 alloy, T6 temper for extruded structural members.

B. Glass: Specified in Division 08 Section “Glazing”.

C. Glazing Materials: Curtain wall manufacturer’s standard types to suit application to achieve weather, moisture, and air infiltration requirements.

D. Sealant and Backing Materials: Provide sealants and backing materials complying with requirements specified in Division 07 Section “Joint Sealants” of types described below.

1. Perimeter Sealants: Urethane, non-sag grade.
2. Sealant Used Within System (Not Used for Glazing): Manufacturer’s standard types for specific applications.

E. Flashings: Minimum 0.032-inch thick aluminum, to match curtain wall mullion sections where exposed.

1. Secure flashings with concealed fastening method.

F. Firestopping: Specified in Division 07 Section “Fire and Smoke Sealants”.

G. Fasteners: Stainless steel.

H. Concrete or Masonry Inserts: Cast iron, malleable iron, or ASTM A123 hot-dip galvanized steel inserts.

2.04 ALUMINUM SUB-SILL

A. <u>Provide extruded, one-piece sub-sill with end dams at all windows / louvers. Sub-sills shall be set in a bed of sealant.</u>

2.05 FABRICATION

A. Fabricate system components with minimum clearances and shim spacing around perimeter of assembly, yet enabling installation and dynamic movement of perimeter seal.

B. Accurately fit and secure joints and corners. Make joints flush, hairline, and weatherproof.

C. Prepare components to receive anchor devices. Fabricate anchors.

D. Arrange fasteners and attachments to ensure concealment from view.

E. Reinforce framing members for external imposed loads.

2.06 SHOP FINISHING

A. Anodized Aluminum Surfaces: AA-M12C22A41 non-specular as fabricated mechanical finish, medium matte chemical finish, and Architectural Class I 0.7 mils (0.018 mm) anodized coating.

1. Conform to AAMA 611.
2. Finish options to include manufacturer's full range of anodized finishes for selection. Dark Bronze (tentative selection).

B. Apply bituminous paint to concealed metal surfaces in contact with cementitious or dissimilar materials.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify dimensions, tolerances, and method of attachment with other work.

3.02 INSTALLATION

A. Install curtain wall system in accordance with manufacturer instructions.

B. Attach to structure to permit sufficient adjustment to accommodate construction tolerances and other irregularities.

C. Provide alignment attachments and shims to permanently fasten system to building structure.

D. Align assembly plumb and level, free of warp or twist. Maintain assembly dimensional tolerances and align with adjacent work.

E. Provide thermal isolation where components penetrate or disrupt building insulation.

F. Install sill flashings: Turn up ends and edges; seal to adjacent Work to form water tight dam.

G. Coordinate installation of fire stop at each floor slab edge.

H. Pack fibrous insulation in shim spaces at perimeter of assembly to maintain continuity of thermal barrier. Use foam insulation at perimeter of opening to assure gaps and voids are filled at full perimeter of curtain wall installation.

I. Install glass in accordance with Division 08 Section “Glazing”.

J. Install perimeter sealant in accordance with Division 07 Section “Joint Sealants”.

3.03 ERECTION TOLERANCES

A. Maximum Variation from Plumb: 0.06-inches every 3-feet non-cumulative or 0.125-inches per 25-feet, whichever is less.

B. Maximum Misalignment of Two Adjoining Members Abutting in Plane: 1/32 inch.

C. Sealant Space between Curtain Wall Mullions and Adjacent Construction: Maximum of 3/4-inch and minimum of 1/4 inch.

3.04 FIELD QUALITY CONTROL

A. Testing: At the Owner’s option, Owner shall retain a qualified independent testing agency to perform field tests. The Architect shall select curtain wall units to be tested as soon as a representative portion of the project has been installed, glazed, perimeter caulked and cured. Conduct tests for air infiltration and water penetration with manufacturer's representative present. Tests not meeting specified performance requirements and units having deficiencies shall be corrected as part of the contract amount. Testing Standard shall be per AAMA 503 and the following:

1. Air Infiltration Tests: Conduct tests in accordance with ASTM E 783. Allowable air infiltration shall not exceed 1.5 times the amount indicated in the performance requirements or 0.09 cfm/ft 2, whichever is greater.

2. Water Infiltration Tests: Conduct tests in accordance with ASTM E 1105. No uncontrolled water leakage is permitted when tested at a static test pressure of two-thirds the specified water penetration pressure but not less than 6.24 psf.

3.05 CLEANING

A. Remove protective material from prefinished aluminum surfaces.

B. Wash down surfaces with a solution of mild detergent in warm water, applied with soft, clean wiping cloths. Take care to remove dirt from corners. Wipe surfaces clean.

C. Remove excess sealant by moderate use of mineral spirits or other solvent acceptable to sealant manufacturer.

3.06 PROTECTION OF INSTALLED CONSTRUCTION

A. Protect finished Work from damage.

END OF SECTION 08 44 13

SECTION 08 51 13 – ALUMINUM WINDOWS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

B. Refer to the Drawings for locations of work to be performed.

1.02 SUMMARY

A. This Section includes the following:

1. Fixed / operable aluminum-framed windows.
2. Integral horizontal mini blinds (where indicated on Drawings).

B. Related Sections include the following:

1. Division 08 Section "Glazing" for aluminum window glazing.
2. Division 08 Section “Aluminum Framed Entrances and Storefronts” for Work between this section and Storefront section to be coordinated for similar finished results.
3. Division 07 Section "Sheet Metal Flashing and Trim" for specifications covering aluminum window flashing installed under this Section.

1.03 DEFINITIONS

A. Performance class designations according to AAMA / WDMA / CS 101 / I.S.2 / A440. North American Fenestration Standard (NAFS):

1. HC: Heavy Commercial.

B. Performance grade number according to AAMA / WDMA / CS 101 / I.S.2 / A440:

1. Design pressure number in pounds force per square foot used to determine the structural test pressure and water test pressure.

C. Structural Test Pressure: For uniform load structural test, is equivalent to 150 percent of the design pressure.

D. Minimum Test Size: Smallest size permitted for performance class (gateway test size). Products must be tested at minimum test size or at a size larger than minimum test size to comply with requirements for performance class.

1.04 PERFORMANCE REQUIREMENTS

A. General: Provide aluminum windows capable of complying with performance requirements indicated, based on testing manufacturer's windows that are representative of those specified, and that are of minimum test size indicated below:

1. Size required by AAMA / WDMA / CS 101 / I.S.2 / A440 for type and classification of window units.
2. Size indicated on Drawings.

B. Structural Performance: Provide aluminum windows capable of withstanding the effects of the following loads, based on testing units representative of those indicated for Project that pass AAMA / WDMA / CS 101 / I.S.2 / A440, Uniform Load Structural Test:

1. Design Wind Loads: Determine design wind loads applicable to Project from basic wind speed indicated in miles per hour (meters per second) at 33-feet above grade, Importance Factor, and Exposure Category indicated on Drawings; according to ASCE 7, Section 6.5, "Method 2-Analytical Procedure" and “The Kentucky Building Code”; based on mean roof heights above grade.

C. Air Infiltration: The test specimen shall be tested in accordance with ASTM E283 at a minimum vent size of 48-inches x 32-inches. Air infiltration rate shall not exceed 0.10 cfm / sf at a static air pressure differential of 6.24 psf.

D. Water Resistance: The test specimen shall be tested in accordance with ASTM E547 and ASTM E331 at a minimum vent size of 48-inches x 32-inches. There shall be no leakage as defined in the test method at a static air pressure differential of 12 psf.

E. Uniform Load Deflection: With vents closed and locked, a minimum static air pressure difference of 30.09 psf shall be applied in the positive and negative direction in accordance with ASTM E330. The unit shall be evaluated after each load.

F. Uniform Load Structural Test: A minimum static air pressure difference of 45.14 psf shall be applied in the positive and negative direction in accordance with ASTM E330. The unit shall be evaluated after each load.

G. Component Testing: Window components shall be tested in accordance with procedures described in AAMA 101 / I.S.2-97.

H. Thermal Transmittance Test (U-Value): When tested in accordance with AAMA 1503, the conductive thermal transmittance (U-Value) shall not be more than:

1. Project-Out: U-Value not more than .45 BTU / hr /sf / degrees F.

I. Condensation Resistance Test: When tested in accordance with AAMA 1503, the condensation resistance factor (CRF) shall not be less than:

1. Project-Out: CRF not less than 58 (frame).

J. Forced Entry Resistance: All windows shall conform to AAMA 1302.5, performance level 10.

K. Thermal Barrier Tests: Thermal break shall be designed in accordance with AAMA TIR-A8 and tested in accordance with AAMA 505.

L. 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.

1.05 SUBMITTALS

A. Product Data: Include construction details, material descriptions, and fabrication methods, dimensions of individual components and profiles, hardware, finishes, and operating instructions for each type of aluminum window indicated.
1. Description of blind assembly and operation.

B. Shop Drawings: Include plans, elevations, sections, details, hardware, attachments to other work, operational clearances, installation details, and the following:

1. Joinery details.
2. Drainage details.
3. Weather-stripping details.
4. Glazing details.
5. Installation data / requirements.
6. For installed products indicated to comply with design loads, include structural analysis data prepared by or under the supervision of a qualified professional engineer detailing fabrication and assembly of aluminum windows and used to determine the following:

a. Structural test pressures and design pressures from wind loads indicated.
b. Deflection limitations of glass framing systems.
c. Size, location and spacing of perimeter fasteners.

C. Product Schedule: For aluminum windows. Use same designations indicated on Drawings.

D. Qualification Data: For Installer, manufacturer and testing agency.

E. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency for each type, class, grade, and size of aluminum window. Test results based on use of downsized test units will not be accepted.

F. Maintenance Data: For operable window sash, operating hardware, weather stripping, and finishes to be included in maintenance manuals.

G. Warranty: Special warranty specified in this Section.

1.06 QUALITY ASSURANCE

A. Installer Qualifications: An installer acceptable to aluminum window manufacturer for installation of units required for this Project.

B. Manufacturer Qualifications: A 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.

C. Source Limitations: Obtain aluminum windows through one source from a single manufacturer.

D. Product Options: Drawings indicate size, profiles, and dimensional requirements of aluminum windows and are based on the specific system indicated.

1. Do not modify intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If modifications are proposed, submit comprehensive explanatory data to Architect for review.

E. Fenestration Standard: Comply with AAMA / WDMA / CS 101 / I.S.2 / A440, "North American Fenestration Standard / Specification for Windows, Skylights and Glass Doors," for definitions and minimum standards of performance, materials, components, accessories, and fabrication. Comply with more stringent requirements if indicated.

1. Provide AAMA-certified aluminum windows with an attached label.

F. Glazing Publications: Comply with published recommendations of glass manufacturers and with GANA's "Glazing Manual" unless more stringent requirements are indicated.

G. Pre-installation Conference: Conduct conference at Project site to review methods and procedures related to aluminum windows including, but not limited to, the following:

1. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
2. Review, discuss, and coordinate the interrelationship of aluminum windows with other exterior wall components. Include provisions for structural anchorage, glazing, flashing, weeping, sealants, and protection of finishes.
3. Review and discuss the sequence of work required to construct a watertight and weathertight exterior building envelope.

H. Inspect and discuss the condition of substrate and other preparatory work performed by other trades.

1.07 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 proceed with fabricating aluminum windows without field measurements. Coordinate wall construction to ensure that actual opening dimensions correspond to established dimensions.

1.08 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace aluminum windows that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Failure to meet performance requirements.
b. Structural failures including excessive deflection, water leakage, air infiltration, or condensation.
c. Faulty operation of movable sash and hardware.
d. Deterioration of metals, other materials, flashing, and metal finishes beyond normal weathering.
e. Failure of insulating glass.
f. Failure in operation of blinds.

2. Warranty Period: Ten (10) 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 fail within specified warranty period. Warranty does not include normal weathering.

1. Warranty Period: 10 years from Date of Substantial Completion.

C. Installation Warranty by Installer: Two (2) Years from Date of Substantial Completion.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products for Fixed and Project-Out windows that may be incorporated into the Work include the following:

1. EFCO Corporation (Series 450X, Basis of Design).

2. Kawneer Company, Inc. / Traco
3. Manko
4. Peerless Products, Inc.
5. Winco
6. DeSCo Architectural (i86+)

2.02 MATERIALS

A. Aluminum Extrusions: Extruded aluminum shall be 6063-T5 or T6 alloy and tempered, but not less than 22,000-psi ultimate tensile strength, not less than 16,000-psi minimum yield strength, and not less than 0.125-inch thickness at any location for the main frame and sash members.

1. Finish: To be selected from manufacturer's full range of anodized finishes for selection. Dark Bronze (tentative selection).
2. Depth of frame and vent shall not be less than 4-1/2".

B. Fasteners:

1. Rivets: aluminum or nonmagnetic stainless steel.
2. Screws for installation: nonmagnetic stainless steel.
3. Frame components shall be mechanically fastened.
4. Reinforcement: Where fasteners screw anchor into aluminum less than 0.125-inch thick, reinforce interior with aluminum or nonmagnetic stainless steel to receive screw threads, or provide standard, noncorrosive, pressed-in, splined grommet nuts.
5. Exposed Fasteners: Unless unavoidable for applying hardware, do not use exposed fasteners.

C. Anchors, Clips, and Accessories: Nonmagnetic stainless steel with sufficient strength to withstand design pressure indicated.

D. Reinforcing Members: Aluminum, nonmagnetic stainless steel, or nickel/chrome-plated steel complying with ASTM B 456 for Type SC 3 severe service conditions, or zinc-coated steel or iron complying with ASTM B 633 for SC 3 severe service conditions; provide sufficient strength to withstand design pressure indicated.

E. Compression-Type Weather Stripping: Provide compressible weather stripping designed for permanently resilient sealing under bumper or wiper action and for complete concealment when aluminum window is closed.
1. Weather-Stripping Material: Manufacturer's standard system and materials complying with AAMA / WDMA / CS 101 / I.S.2 / A440.

F. Replaceable Weather Seals: Comply with AAMA 701 / 702.

G. Glazing Gaskets: Standard glazing gasket shall be a dry glazed elastomer in accordance with ASTM C509-91 and/or expanded cellular glazing tapes conforming to AAMA 810 specification.

H. Ventilator:

1. All vent extrusions shall be tubular.
2. Each corner shall be mitered, reinforced with an extruded corner key, hydraulically crimped and “cold welded” with epoxy adhesive.
3. Each vent shall utilize (2) rows of weather stripping installed in specifically designed dovetail grooves in the extrusion. The exterior gasket will be omitted at the vent bottom rail for project-out vents, allowing pressure to equalize the void between the vents and frame.
4. The vent shall present a flush appearance with the exterior and interior of the main frame when in the closed position.

I. Integral horizontal mini blinds:

1. All aluminum windows (fixed and operable) are to include horizontal mini blinds.
2. Glazing shall be 1” thick insulated unit, as described in Division 08 Section “Glazing”.
3. 1” aluminum blind (color to be selected by Architect) shall be installed to the interior side of the insulated units and a removable framed clear glass panel shall be installed to the interior side of the blind. Provide neoprene (exterior) and EPDM (interior) glazing gaskets for the insulated unit. Provide aluminum glazing beads for the interior glazing panel.

    a. All tilting of blinds shall be performed without opening the interior panel.
    b. Blind operation shall be via operator mechanism affixed permanently to installation.

J. Sliding Pass-Thru Window Assembly (as indicated on Drawings):

1. Basis-of-Design: CRL Horizontal Sliding Barbara Model Pass-Thru Assembly with D7 Header).
2. Glazing shall be 1/4” thick insulated unit, as described in Division 08 Section “Glazing”.

K. Low expansion spray foam insulation for filling perimeter of window frames:

1. Great Stuff Window & Door by Dow Chemical or approved equal.
2. Low-pressure foam designed not to bow bend window and door frames.

2.03 ALUMINUM SUB-SILL

A. <u>Provide extruded, one-piece sub-sill with end dams at all windows / louvers. Sub-sills shall be set in a bed of sealant.</u>

2.04 GLAZING

A. Glass and Glazing Materials: Refer to Division 08 Section "Glazing" for glass units and glazing requirements applicable to glazed aluminum window units.
B. Integral blinds as part of glazing assembly. See passage 2.02, I, above.

2.05 HARDWARE

A. General: Provide manufacturer's standard hardware fabricated from aluminum, stainless steel, carbon steel complying with AAMA 907, or other corrosion-resistant material compatible with aluminum; designed to smoothly operate, tightly close, and securely lock aluminum windows, and sized to accommodate sash or ventilator weight and dimensions. Do not use aluminum in frictional contact with other metals. Where exposed, provide solid bronze or nonmagnetic stainless steel.

1. Locking mechanism and handles for manual operation shall be cam type and manufactured from a white bronze alloy with a US25D brushed finish, (2) per sash.
2. Operating hardware shall be Anderberg 4-bar friction stainless steel hinges with adjustable friction slide shoe, (2) per vent.

B. Locks and Latches: Designed to allow unobstructed movement of the sash across adjacent sash in direction indicated and operated from the inside only.

C. Limit Devices: Provide limit devices designed to restrict sash or ventilator opening.

2.06 FABRICATION

A. Fabricate aluminum windows in sizes indicated. Include a complete system for assembling components and anchoring windows.

B. Fabricate aluminum windows that are re-glazable without dismantling sash or ventilator framing.

C. Thermally Improved Construction: Fabricate aluminum windows 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. Thermal barrier de-bridge space shall be not less than 1/4”.

1. Mechanical fasteners, welded components, and hardware items shall not bridge thermal barriers. Thermal barriers shall align at all frame and vent corners.
2. Provide thermal-break construction that has been in use for not less than three years and has been tested to demonstrate resistance to thermal conductance and condensation and to show adequate strength and security of glass retention.
3. Provide thermal barriers tested according to AAMA 505; determine the allowable design shear flow per the appendix in AAMA 505.
4. Provide hardware with low conductivity or nonmetallic material for hardware bridging thermal breaks at frame or vent sash.

D. Weather Stripping: Provide full-perimeter weather stripping for each operable sash and ventilator. Weather stripping shall be Santoprene or equal.

E. Weep Holes: Provide weep holes and internal passages to conduct infiltrating water to exterior.

F. Glazing Stops: Provide snap-on glazing stops coordinated with Division 08 Section "Glazing" and glazing system indicated. Provide glazing stops to match sash and ventilator frames.

2.07 FINISHES, GENERAL

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: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.08 ALUMINUM FINISHES

A. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.

B. Anodized Finish:

1. Finish all exposed areas of aluminum windows and components with electrolytically deposited color in accordance with Aluminum Association Designation AA-M10-C22.
2. Preliminary selection / tentative: Dark bronze.

PART 3 EXECUTION

3.01 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 work. Verify opening dimensions, levelness of sill plate, and operational clearances. Examine wall flashings, vapor retarders, water and weather barriers, and other built-in components to ensure a coordinated, weathertight window installation.

1. Metal Surfaces: Dry; clean; free of grease, oil, dirt, rust, corrosion, and welding slag; without sharp edges or offsets at joints.
2. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. Comply with Drawings, Shop Drawings, and manufacturer's written instructions for installing windows, hardware, accessories, and other components.

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.

C. Install windows and components to drain condensation, water penetrating joints, and moisture migrating within windows to the exterior.

D. Separate aluminum and other corrodible surfaces from sources of corrosion or electrolytic action at points of contact with other materials.

E. Adequately anchor to maintain permanent position when subjected to normal movement and loading. Shop drawings to indicate location and size of fasteners to meet wind load requirements.

F. Install **low expansion** spray foam insulation between window frame (head and jambs) and rough opening material.

3.03 FIELD QUALITY CONTROL

A. Remove and replace noncomplying aluminum windows and retest as specified above.

B. Testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirement, if not in compliance with these Specifications.

3.04 ADJUSTING, CLEANING, AND PROTECTION

A. Adjust operating sashes and ventilators, screens, hardware, and accessories for a tight fit at contact points and weather stripping for smooth operation and weathertight closure. Lubricate hardware and moving parts.

B. Clean aluminum surfaces, including glass, immediately after installing windows. Avoid damaging protective coatings and finishes. Remove excess sealants, glazing materials, dirt, and other substances.

C. Protect window surfaces from contact with contaminating substances resulting from construction operations. In addition, monitor window surfaces adjacent to and below exterior concrete and masonry surfaces during construction for presence of dirt, scum, alkaline deposits, stains, or other contaminants. If contaminating substances do contact window surfaces, remove contaminants immediately according to manufacturer's written recommendations.

1. Use extra care in protecting windows during masonry brick cleaning so as to not damage the aluminum finish.

D. Replace any glass that has been broken, or insulated glass that has lost its seal, prior to Substantial Completion.

E. After Substantial Completion, replace glass in accordance with Division 08 Section “Glazing”, paragraph 1.06, Warranty.

END OF SECTION 08 51 13

SECTION 08 71 00 – DOOR HARDWARE

Part 1 GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Commercial door hardware for the following new and existing swinging doors:
   a. Aluminum.
   b. Hollow metal.
   c. Flush wood.
   d. Existing.
2. Key cylinders for doors specified in other Sections.
3. **Electrified access control door hardware. See Door Hardware Schedule and Door-Set Numbering Index (this Section) for hardware sets prefixed with "E" for required electrical work and materials. See electrical specifications for additional electrical work and materials required.**
4. **Low-energy ADA automatic door operators requiring electrical work and materials, and installation by AAADM certified installer.**

B. Codes and References: Comply with the version year adopted by the Authority Having Jurisdiction.

1. ANSI A117.1 - Accessible and Usable Buildings and Facilities.
2. ICC/IBC - International Building Code.
3. NFPA 70 - National Electrical Code.
4. NFPA 80 - Fire Doors and Windows.
5. NFPA 101 - Life Safety Code.
6. NFPA 105 - Installation of Smoke Door Assemblies.
7. KENTUCKY BUILDING CODE.

C. Products furnished, but not installed, under this Section include the following. Coordinating, purchasing, delivering, and scheduling remain requirements of this Section.

1. Permanent key cylinder cores to be installed by Owner.

1.2 ALTERNATE PRICING

A. Provide alternate pricing to include the Owner's preferred hardware manufacturers and series as indicated below:
1. Key Cylinders: Schlage Primus, factory keyed as directed by Owner for compatibility with District key system.
2. Schlage L series mortise locksets with model 17 levers.
3. Exit Devices: Von Duprin 99 series.
4. Closers: LCN 4040XP series.

1.3 SUBMITTALS

A. Number of Submittals: All items listed in this section are to be included in one submittal prepared by one Supplier.

B. Product Data: Include construction and installation details, material descriptions, dimensions of individual components and profiles, and finishes.

C. Qualification Data:

1. Finish Hardware Installers
   a. Finish hardware, including electrified hardware, for wood, hollow metal, and aluminum doors to be installed by personnel trained and certified by the manufacturer of the product furnished.

   b. Provide manufacturer's certificates for installer as part of Contractor's bid information. Failure to supply certificates may result in rejection of bid.
2. Hardware Supplier
   a. Established contract hardware firm which maintains and operates an office, display, and stock in project area and which is a factory authorized distributor of the lock being furnished.
   b. Hardware scheduled and furnished by or under direct supervision an Architectural Hardware Consultant.
   c. All schedules submitted to the Architect for approval and job use must carry the signature and certified seal of this Architectural Hardware Consultant.
3. Architectural Hardware Consultant
   a. Currently certified by the Door and Hardware Institute.
   b. Full-time employee of the Hardware Supplier or an individual having no contractual ties to any supplier/manufacturer entity.
   c. Available at reasonable times to Architect, Owner, and Contractor during course of work.
4. Automatic Door Operator Supplier
   a. Established automatic operator distribution and installation firm which maintains and operates an office, display, and stock in project area and which is a factory authorized distributor of the automatic operator being furnished.
   b. Currently certified by AAADM to install both high and low energy automatic door operators.
   c. All schedules submitted to the Architect for approval and job use must include copies of the distributors factory authorization to distribute and install their operators and AAADM certification to install both high and low energy automatic door operators.

D. Maintenance Data: For each type of door hardware. Include final hardware schedule, product datasheets, keying schedule, riser diagrams, and point-to-point wiring diagrams in 3-ring binder, labeled on spine with project name and "Door Hardware".

E. Warranty: Special warranty specified in this Section.

F. Other Action Submittals:

1. Door Hardware Sets: Prepared by or under the supervision of a DHI certified Architectural Hardware Consultant, detailing fabrication and assembly of door hardware, as well as procedures and diagrams. Coordinate the final door hardware sets with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.

   a. Format: Comply with scheduling sequence and vertical format in DHI's "Sequence and Format for the Hardware Schedule"; other formats will be rejected without review. Double space entries, and number and date each page.
   b. Numerical Sequence of Sets and Headings: Submittal headings shall be in exact order as hardware sets in specification: one heading only per set. Submittal set numbers shall relate to specification set numbers, ie. if three headings are required for Set 12 due to door width differences, then the heading numbers should be 12.1, 12.2, and 12.3 or employing similar linking logic.
   c. Door Numbers: Identical to those used in the contract documents.
   d. Number of Copies: (5).
   e. Content: Include the following information:

      1) Identification number, location, hand, fire rating, and material of each door and frame.
      2) Type, style, function, size, quantity, and finish of each door hardware item.
      3) Complete designations of every item required for each door or opening including name and manufacturer.
      4) Degree of opening for closer and overhead stop and holder installation.
      5) Keying information.
      6) Fastenings and other pertinent information.
      7) Location of each door hardware set, cross-referenced to Drawings, both on floor plans and in door and frame schedule.
      8) Explanation of abbreviations, symbols, and codes contained in schedule.
      9) Mounting locations for door hardware.
      10) Notes included with specification hardware sets <u>transcribed verbatim</u> into submittal hardware sets.
      11) Door and frame sizes and materials.
      12) Description of each electrified door hardware function, including location, sequence of operation, and interface with other building control systems.
         a) 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.
      13) List of related door devices specified in other Sections for each door and frame.

   f. Submittal Sequence: Submit the final door hardware sets at earliest possible date, particularly where approval of the door hardware sets must precede fabrication of other work that is critical in Project construction schedule. Include Product Data, Samples, Shop Drawings of other work affected by door hardware, and other information essential to the coordinated review of the door hardware sets.

2. Keying Schedule: Prepared by or under the supervision of Architectural Hardware Consultant, detailing Owner's final keying instructions for locks. Include schematic keying diagram and index each key set to unique door designations.

1.4 QUALITY ASSURANCE

A. Furnish proper hardware types and quantities for proper door function, hardware mounting and clearances, aesthetics, and to meet applicable codes. Bring discrepancies to the attention of the Architect a minimum of (10) days prior to bid date so that an addendum may be issued and costs included in the bid. No additional compensation will be allowed after bidding for hardware changes required for proper function, hardware mounting or clearances, aesthetics or to meet codes. The specification is not a detail from which products should be ordered; detailing the project is the responsibility of the Contract Hardware Supplier.

B. 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.

C. Source Limitations: **All items listed in hardware sets are to be furnished by one supplier**. Obtain each type and variety of door hardware from a single manufacturer, unless otherwise indicated.

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.

D. Regulatory Requirements: Comply with NFPA 70, NFPA 80, NFPA 101 and ANSI A117.1 requirements and guidelines as directed in the model building code including, but not limited to, the following:

1. NFPA 70 "National Electrical Code", including electrical components, devices, and accessories listed and labeled as defined in Article 100 by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
2. Where indicated to comply with accessibility requirements, comply with Americans with Disabilities Act (ADA), "Accessibility Guidelines for Buildings and Facilities (ADAAG)," ANSI A117.1 as follows:
   a. Handles, Pulls, Latches, Locks, and other Operating Devices: Shape that is easy to grasp with one hand and does not require tight grasping, tight pinching, or twisting of the wrist.
   b. Door Closers: Comply with the following maximum opening-force requirements indicated:
      1) Interior Hinged Doors: 5 lbfapplied perpendicular to door.
      2) Fire Doors: Minimum opening force allowable by authorities having jurisdiction.
   c. Thresholds: Not more than 1/2 inch high. Bevel raised thresholds with a slope of not more than 1:2.
3. NFPA 101: Comply with the following for means of egress doors:
   a. Latches, Locks, and Exit Devices: Not more than 15 lbfto release the latch. Locks shall not require the use of a key, tool, or special knowledge for operation.
   b. Thresholds: Not more than 1/2 inchhigh.
4. Fire-Rated Door Assemblies: Provide door hardware for assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having

jurisdiction, for fire ratings indicated, based on testing according to NFPA 252 (neutral pressure at 40" above sill) or UL-10C.

a. Test Pressure: Positive pressure labeling.

E. Electrified Door Hardware: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

F. Keying Conference: Conduct conference to comply with requirements in Division 01 Section "Project Meetings." Keying conference to incorporate the following criteria into the final keying schedule document:

1. Function of building, purpose of each area and degree of security required.
2. Plans for existing and future key system expansion.
3. Requirements for key control storage and software.
4. Installation of permanent keys, cylinder cores and software.
5. Address and requirements for delivery of keys.

G. Access Control Conference: Conduct conference to comply with requirements in Division 01 Section "Project Meetings." Conference is to include representatives of the Owner, Architect, Contractor, CM if applicable, and Access Control (or Security) Supplier. Access control conference to incorporate the following criteria into the final keying schedule document:

1. Function of building, purpose of each area and degree of security required.
2. Plans for existing and future access control system expansion.
3. Requirements for access control storage of credentials and software.
4. Assignment and distribution of permanent access control credentials, badging equipment, and software.
5. Access control privilege assignments including doors, time schedules, users, user groups, special credential functions, etc.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Inventory door hardware on receipt and provide secure lock-up for door hardware delivered to Project site.

B. Deliver hardware for aluminum doors to GC in timely manner so as not to delay fabrication of aluminum doors and frames. Balance of hardware may be delivered to GC at same time, packaged separately from aluminum door hardware, and may be billed as stored materials.

C. Tag each item or package separately with identification related to the final door hardware sets, and include basic installation instructions, templates, and necessary fasteners with each item or package.

D. Deliver keys to Owner by registered mail or overnight package service. Obtain Owner's contact name and address from Architect.

1.6 COORDINATION

A. Templates: Distribute door hardware templates for doors, frames, and other work specified to be factory prepared for installing door hardware. Distribute templates in a timely manner so as not to delay suppliers. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.

B. Electrical System Roughing-in: Coordinate layout and installation of electrified door hardware with connections to power supplies, fire alarm system and detection devices, access control system, and security system.

1.7 WARRANTY

A. General Warranty: Reference Division 01, General Requirements. Special warranties specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

B. Warranty Period: Written warranty, executed by manufacturer(s), agreeing to repair or replace components of standard and electrified door hardware that fails in materials or workmanship within specified warranty period after final acceptance by the Owner. Failures include, but are not limited to, the following:

1. Structural failures including excessive deflection, cracking, or breakage.
2. Faulty operation of the hardware.
3. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
4. Electrical component defects and failures within the systems operation.

C. Standard Warranty Period: One year from date of Substantial Completion, unless otherwise indicated.

D. Special Warranty Periods:

1. Ten years for mortise locks and latches.
2. Five years for exit hardware.
3. Ten years for manual door closers.
4. Two years for electromechanical and integrated access control door hardware.
5. Five years for motorized electric latch retraction exit devices.

1.8 MAINTENANCE SERVICE

A. 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 door hardware.

B. Maintenance Service: Beginning at Substantial Completion, provide (6) 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 hardware operation. Provide parts and supplies same as those used in the manufacture and installation of original products.

1.9 EXTRA MATERIALS

A. Furnish full-size units of door hardware described below, before installation begins, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Door Hardware:
   a. (2) complete closers (heavy duty parallel arm)
   b. (2) office function locksets
   c. (5) rim key cylinders
   d. (10) mortise key cylinders

PART 2 - PRODUCTS

2.1 SCHEDULED DOOR HARDWARE

A. General: Provide door hardware for each door to comply with requirements in this and door hardware sets indicated in Part 3 "Door Hardware Sets" Article.

1. Door Hardware Sets: Provide quantity, item, size, finish or color indicated, and named manufacturers' products.

B. Designations: Requirements for design, grade, function, material, 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 the purpose of establishing minimum requirements. Manufacturers' names are abbreviated in Part 3 "Door Hardware Schedule" Article.
2. References to BHMA Standards: In addition to other requirements in this section, provide products complying with or exceeding these standards and requirements for description, quality, and function.

C. Substitutions: Requests for substitution and product approval for inclusive mechanical and electrified access control door hardware, in compliance with specifications, must be submitted in writing and in accordance with the procedures and time frames outlined in Division 01 "Substitution Procedures". Approval of requests is at the discretion of the architect, owner, and their designated consultants.

D. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include manufacturers specified.

2.2 BUTT HINGES, GENERAL

A. Quantity: Provide the following, unless otherwise indicated:

1. Two Hinges: For doors with heights up to 60 inches.
2. Three Hinges: For doors with heights 61 to 90 inches.
3. Four Hinges: For doors with heights 91 to 120 inches.
4. For doors with heights more than 120 inches, provide 4 hinges, plus 1 hinge for every 30 inches of door height greater than 120 inches.

B. Template Requirements: Except for hinges and pivots to be installed entirely (both leaves) into wood doors and frames, provide only template-produced units.

C. Hinge Height, Width, and Weight: Unless otherwise indicated, provide the following:

1. Doors with Exit Devices or 3’6” or more in width: 5” high, heavy-weight hinges.
2. Doors less than 3’6” in width: 4-1/2” high, standard-weight hinges.
3. Width: 4-1/2” heavy-weight, 4" standard-weight, unless proper clearance requires a different width.
4. Doors with Closers: Ball-bearing hinges.

D. Hinge Base Metal: Unless otherwise indicated, provide the following:

1. Exterior and in-swinging restroom door hinges: Stainless steel, with stainless-steel pin.
2. Balance of hinges: Steel, with steel pin.

E. Hinge Options: Provide the following:

1. Nonremovable Pins: Provide set screw in hinge barrel that, when tightened into a groove in hinge pin, prevents removal of pin while door is closed; for reverse bevel lockable doors.
2. Corners: Square.
3. Number of knuckles: Five.

F. Fasteners: Comply with the following:

1. Machine Screws: For metal doors and frames. Install into drilled and tapped holes.
2. Wood Screws: For wood doors and frames.
3. Threaded-to-the-Head Wood Screws: For fire-rated wood doors.
4. Screws: Phillips flat-head. Finish screw heads to match surface of hinges.

G. Template Hinge Dimensions: BHMA A156.7.

H. Available Manufacturers:

1. Hager Companies (HAG).
2. McKinney Products Company; an ASSA ABLOY Group company (MCK).
3. Stanley Commercial Hardware; Div. of The Stanley Works (STH).

4. PBB, Inc. (PBB)
5. Ives (IVE).

2.3 CONTINUOUS HINGES

A. Provide hinge of general series as indicated in hardware sets and of proper shape and model to suit door and frame configuration.

B. Continuous, Pinless-Type Hinges: Extruded-aluminum, pinless, hinge leaves; with concealed, self-lubricating thrust bearings.

1. Available Manufacturers:

a. Architectural Builders Hardware (ABH).
b. Hager Companies (HAG).
c. IVES Hardware; an Allegion Company (IVE).
d. National Guard Products (NGP).
e. Pemko Manufacturing Co. (PEM).
f. Select Products Limited (SEL).
g. Stanley; Div. of DormaKaba (STA).
h. Zero International (ZRO).

2.4 ELECTRONIC ACCESSORIES

A. Electronic Power Transfers:

1. Concealed: For new doors and frames, concealed when door is closed. All metal construction, cast housing with steel backboxes, two universal joints and rigid tubing. Acceptable Manufacturers:

a. Security Door Controls (SDC).
b. Securitron Door Controls (SEC).
c. Architectural Builders Hardware (ABH).
d. Hager (HAG).
e. Von Duprin (VON).

2.5 LOCKS AND LATCHES, GENERAL

A. Accessibility Requirements: Where indicated to comply with accessibility requirements, comply with the U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA), Accessibility Guidelines for Buildings and Facilities (ADAAG)."

1. Provide operating devices that do not require tight grasping, pinching, or twisting of the wrist and that operate with a force of not more than 5 lbf.

B. Latches and Locks for Means of Egress Doors: Comply with NFPA 101. Latches shall not require more than 15 lbf to release the latch. Locks shall not require use of a key, tool, or special knowledge for operation.

C. Electrified Locking Devices: BHMA A156.25. Equal in all characteristics to model specified.

1. Available Manufacturers:

a. Best Access Systems; Div. of The Stanley Works (BAS).
b. Corbin Russwin Architectural Hardware; an ASSA ABLOY Group company (CR).
c. SARGENT Manufacturing Company; an ASSA ABLOY Group company (SGT).
d. Schlage Commercial Lock Division; an Allegion Company (SCH). Basis of design.

D. Lock Trim:

1. Levers: Cast.
   a. Schlage 17 model with full smooth return.
2. Roses: Forged.
   a. Schlage A model.
3. Dummy Trim: Match lever lock trim and roses.
4. Lockset Designs: Provide design indicated in hardware sets, or, if sets are provided by another manufacturer, provide designs that match those designated.

E. 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.

F. Backset: 2-3/4 inches, unless otherwise indicated.

G. Strikes: Manufacturer's standard strike with strike box for each latchbolt or lock bolt, with curved lip extended to protect frame, finished to match door hardware set, and as follows:

1. Strikes for Mortise Locks and Latches: BHMA A156.13.

2.6 MECHANICAL LOCKS AND LATCHES

A. Lock Type: Mortise or cylindrical as indicated by model number in the hardware sets.

B. Lock Functions: Function numbers and descriptions indicated in door hardware sets comply with the following:

1. Mortise Locks: BHMA A156.13.

C. Mortise and Cylindrical Locks: BHMA Grade 1.

1. Available Manufacturers:

a. Best Access Systems; Div. of The Stanley Works (BAS).

b. Corbin Russwin Architectural Hardware; an ASSA ABLOY Group company (CR).
c. SARGENT Manufacturing Company; an ASSA ABLOY Group company (SGT).
d. Schlage Commercial Lock Division; an Allegion Company (SCH). Basis of design.

D. Compatibility with Key Cylinders: fully warranted for use with key cylinder furnished.

2.7 DOOR BOLTS

A. Bolt Throw: Comply with testing requirements for length of bolts required for labeled fire doors, and as follows:

1. Mortise Flush Bolts: Minimum 3/4-inch throw.

2. Available Manufacturers:

a. Door Controls International (DCI).
b. Glynn-Johnson; an Allegion Company (GJ).
c. Hager Companies (HAG).
d. IVES Hardware; an Allegion Company (IVS).
e. McKinney Products Company; an ASSA ABLOY Group company (MCK).
f. Rockwood Manufacturing Company (RM).
g. Trimco (TRI).

2.8 EXIT DEVICES

A. Exit Devices: BHMA A156.3, Grade 1.

B. Accessibility Requirements: Where handles, pulls, latches, locks, and other operating devices are indicated to comply with accessibility requirements, comply with the U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA), Accessibility Guidelines for Buildings and Facilities (ADAAG)."

1. Provide operating devices that do not require tight grasping, pinching, or twisting of the wrist and that operate with a force of not more than 5 lbf.

C. Exit Devices for Means of Egress Doors: Comply with NFPA 101. Exit devices shall not require more than 15 lbf to release the latch. Locks shall not require use of a key, tool, or special knowledge for operation.

D. Panic Exit Devices: Listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for panic protection, based on testing according to UL 305.

E. Fire Exit Devices: Devices complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire and panic protection, based on testing according to UL 305 and NFPA 252.

F. Electric Latch Retraction: Motorized, 24VDC, maximum 1.0A inrush, maximum 0.3A holding; fully warranted for use with other manufacturers' properly sized 24VDC filtered regulated power supplies. Basis of design: Von Duprin QEL.

G. Removable Mullions

1. BHMA A156.3.
2. Key removable.
3. Provide head cap spacers, angle brackets, and other mounting accessories as needed for proper mounting, and anchoring and support of screws, as needed for top jamb configuration.
4. Provide mullion stabilizer sets for mullions at exterior openings.

H. Outside Trim: As specified in hardware sets; material and finish to match locksets, unless otherwise indicated.

1. Match design for locksets and latchsets, unless otherwise indicated.

I. Fasteners. Manufacturer's standard, except furnish sex bolts for attachments to doors.

J. Shims: Provide shims if needed for clearance.

K. Available Manufacturers:

1. Precision Hardware, Inc. (PH).
2. SARGENT Manufacturing Company; an ASSA ABLOY Group company (SGT).
3. Von Duprin; an Allegion Company (VON). Basis of design.

2.9 KEY CYLINDERS

A. Standard Lock Cylinders: BHMA A156.5, Grade 1.

B. Cylinders: Provide cylinders for all devices requiring key cylinders to properly function: constructed from brass or bronze, stainless steel, or nickel silver, and complying with the following:

1. Number of Pins: Six.
2. Keyway: Patented Schlage Primus as directed by Owner.
3. Mortise Type: Threaded cylinders with rings and straight- or clover-type cam.
4. Rim Type: Cylinders with back plate, flat-type vertical or horizontal tailpiece, and raised trim ring.

C. Permanent Cores: Manufacturer's standard; finish face to match lockset; complying with the following:

1. Large-format Removable Cores: Core insert, removable by use of a special key; for use only with core manufacturer's cylinder and door hardware.

D. Construction Keying: Comply with the following:

1. Construction Cores: Provide keyed brass construction cores that are replaceable by permanent cores for all locking devices. Provide 6 construction master keys.

a. Remove construction cores as directed by Owner.
b. Furnish permanent cores to Owner for installation.

E. Supplemental Items: Provide cylinder spacers, collars, and correct cams as needed for proper function of locking devices.

F. Available Manufacturers:

1. Best Access Systems; Div. of The Stanley Works (BAS).
2. Corbin Russwin Architectural Hardware; an ASSA ABLOY Group company (CR).
3. SARGENT Manufacturing Company; an ASSA ABLOY Group company (SGT).
4. Schlage Commercial Lock Division; an Allegion Company (SCH). Basis of design.

2.10 KEYING

A. Keying System: Factory registered, complying with guidelines in BHMA A156.28, Appendix A. Incorporate decisions made in keying conference, and as follows:

1. Existing System: Master key or grand master key locks to Owner's existing system.

B. Keys: Nickel silver.

1. Stamping: Permanently inscribe each key with a visual key control number and include the following notation:

a. Notation: "DO NOT DUPLICATE."

2. Quantity: Provide the following:

a. Cylinder Change Keys: Three per cylinder.
b. Master Keys: Six per master.
c. Grand Master Keys: Six.
d. Great-Grand Master Keys: Five.
e. Control Keys: Two.
f. Construction Control Keys: Two.
g. Blanks: One hundred forty-four.

2.11 KEY CONTROL SYSTEM

A. Key Control Cabinet: Steelmaster Dupli-Key Cabinet, with key capacity of 150 percent of the number of locks.

1. Wall-Mounted Cabinet: Cabinet with hinged-panel door equipped with key-holding panels and pin-tumbler cylinder door lock.
2. Locate and mount per direction of Architect.

2.12 FIRE DEPARTMENT KEY BOX

A. Provide (1) fully recessed hinged fire department key box.

1. Basis of specification: Knox-Box Model 3200 x RMK x Aluminization x Black.

2. Available Manufacturers:
   a. Knox Company.
   b. Approved equal.

B. Locate in exterior wall as directed by Architect.

2.13 SURFACE CLOSERS

A. Accessibility Requirements: Where handles, pulls, latches, locks, and other operating devices are indicated to comply with accessibility requirements, comply with the U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA), Accessibility Guidelines for Buildings and Facilities (ADAAG)."

1. Comply with the following maximum opening-force requirements:

   a. Interior, Non-Fire-Rated Hinged Doors: 5 lbf applied perpendicular to door.
   b. Fire Doors: Minimum opening force allowable by authorities having jurisdiction.

B. Door Closers for Means of Egress Doors: Comply with NFPA 101. Door closers shall not require more than 30 lbf to set door in motion and not more than 15 lbf to open door to minimum required width.

C. Fasteners: Manufacturer’s standard for arms, shoes and brackets. Sex bolts for fastening closers to doors.

D. Mounting Accessories: Provide shoes, brackets, drop plates, spacers, etc., as needed for proper mounting of closers and arms to door and frame.

E. Spring Size of Units: Provide field-sizable closers, adjustable for spring sizes 1-6, plus 50% extra spring power at spring size 6, to meet field conditions and requirements for opening force.

F. Cylinders: 1-1/2" minimum diameter; cast iron or high-silicon alloy aluminum.

G. Mounting Configuration: Unless otherwise indicated by model number in the hardware sets:

1. Do not furnish closers capable of being mounted on the corridor side of doors.
2. Do not furnish regular arm closers in areas accessible to students.
3. If tri-pack closers are furnished for regular arm applications, remove parallel arm shoe from closer box before delivering to job.
4. Parallel Arm closers are to be manufacturer's double forged rigid models.

H. Available Manufacturers and Series for Rack and Pinion Surface Closers:

1. LCN Closers; an Allegion Company (LCN): 4040XP series. Basis of design.
2. SARGENT Manufacturing Company; an ASSA ABLOY Group company (SGT): 281 series.
3. Detex (DTX): D4551 series.

2.14 AUTOMATIC DOOR OPERATORS

A. Standard: Set up operator to comply with Low Energy BHMA A156.19 standard. Operator shall also be capable of complying with High Energy BHMA A156.10 standard with no additional equipment required other than safety sensors.

B. Performance Requirements:

1. Not more than 15 lbf1 inch from latch edge of door to prevent stopped door from opening or closing.
2. If power fails, not more than 30 lbf1 inch from latch edge of door to manually set door in motion.
3. **Warranted for use on out-swinging exterior doors with the use of a supplemental stop.**

C. Operation: Power opening and spring closing; **power closing to get door latched when encountering resistance**. When not in automatic mode, door operator shall function as manual door closer, with or without electrical power.

D. Operating System: Electromechanical.

E. Microprocessor Control Unit: Solid-state controls.

F. Features:

1. Adjustable opening and closing speed.
2. Adjustable opening and closing force.
3. Adjustable backcheck.
4. Adjustable latch speed.
5. Adjustable hold-open time of not less than 0 to 30 seconds.
6. Adjustable time delay.
7. Adjustable acceleration.
8. Obstruction recycle.
9. **Provide lock interface relay when not specified as part of locking device power supply.**

G. Mounting: Surface mounted to top jamb.

H. Mounting Accessories: Provide shoes, brackets, drop plates, spacers, etc., as needed for proper mounting of operators and arms to door and frame.

I. Bollards:

1. Of material, size, configuration and shape indicated.
2. Material: Stainless steel.
3. Available Manufacturers for Bollards:

    a. Wikk Industries.

J. Actuators:

1. Wall Push-Plate Switch: Semiflush, wall-mounted, door control switch; of material, size, and shape indicated; mounted in recessed junction box. Provide engraved message as indicated.
2. Material: Stainless steel.
3. Message: International symbol of accessibility and "Push to Open."
4. Available Manufacturers for Actuators:

    a. BEA (BEA).
    b. Wikk Industries.

K. Automatic Door Operator Signage:

1. Comply with BHMA A156.19.
2. Consult Architect before applying signage to door.

L. Available manufacturers for Automatic Door Operators:

1. Besam SW200i series. (BSM).
2. LCN Closers; an Allegion Company (LCN); Senior Swing series. Basis of design.
3. Stanley Commercial Hardware; Div. of The Stanley Works (STH); M-Force series.

2.15 PROTECTIVE TRIM UNITS

A. Size:
1. Width
    a. Singles, and pairs with removable mullions or surface applied astragals: 2 inches less than door width on push side and 1 inch less than door width on pull side
    b. Other pairs: 1 inch less than door width
2. Height: as specified in door hardware sets; or, if constrained by door bottom rail height, 1" less bottom rail height.

B. Fasteners: Manufacturer's machine or self-tapping countersunk screws.

C. Metal Protective Trim Units: BHMA A156.6; beveled 4 sides; fabricated from 0.050-inch- thick stainless steel.

D. Available Manufacturers:

1. Hager Companies (HAG).
2. IVES Hardware; an Allegion Company (IVS).
3. Hiawatha (HIW).
4. Burns (BRN).
5. Rockwood Manufacturing Company (RM).
6. Trimco (TRI).

2.16 MECHANICAL WALL AND FLOOR STOPS AND HOLDERS

A. Stops and Bumpers: BHMA A156.16, Grade 1.

1. Provide wall stops for doors unless floor, overhead, or other type stops are scheduled or indicated. Do not mount floor stops where they will impede traffic. Provide floor stops (and spacers if needed) of proper height and configuration to accommodate floor condition. Where floor or wall stops are not appropriate, provide overhead holders.
2. Properties. Cast construction with fastener suitable for wall or floor condition.
3. Available Manufacturers:
   a. Hager Companies (HAG).
   b. IVES Hardware; an Allegion Company (IVS).
   c. Hiawatha (HIW).
   d. Burns (BRN).
   e. Rockwood Manufacturing Company (RM).
   f. Trimco (TRI).

2.17 OVERHEAD STOPS AND HOLDERS

A. BHMA A156.8, Grade 1. Template for maximum degree of opening before encountering obstruction.

B. Available Manufacturers:

1. Architectural Builders Hardware Mfg., Inc. (ABH).
2. Glynn-Johnson; an Allegion Company (GJ).
3. Hager (HAG).
4. Rixson Specialty Door Controls; an ASSA ABLOY Group company (RIX).
5. SARGENT Manufacturing Company; an ASSA ABLOY Group company (SGT).

2.18 SILENCERS

A. Provide silencers (though not listed in the hardware sets) for Metal Door Frames: BHMA A156.16, Grade 1; neoprene or rubber, minimum diameter 1/2 inch; fabricated for drilled-in application to frame.

B. Available Manufacturers:

1. Glynn-Johnson; an Allegion Company (GJ).
2. Hager Companies (HAG).
3. IVES Hardware; an Allegion Company (IVS).
4. McKinney Products Company; an ASSA ABLOY Group company (MCK).
5. Rockwood Manufacturing Company (RM).
6. Trimco (TRI).

2.19 DOOR GASKETING

A. General: Provide continuous weather-strip gasketing on exterior hollow metal doors and provide smoke, light, or sound gasketing on interior doors where indicated or scheduled. Provide noncorrosive fasteners as indicated by models in hardware sets.

1. Perimeter Gasketing: Apply to head and jamb, forming seal between door and frame. If hardware is to be attached to the frame and would interfere with the gasketing, then provide hardware compatible gasketing that does not need to be cut for the mounting of hardware.

2. Meeting Stile Gasketing: Fasten to meeting stiles, forming seal when doors are closed.
3. Mullion Gasketing: Fasten to mullions, forming seal when doors are closed.
4. Sweeps: Apply to bottom of in-swinging exterior hollow metal doors, or as required for sound attenuation, forming seal with threshold or floor when door is closed.
5. Seals integral to threshold at out-swinging exterior hollow metal doors.

B. Requirements per type of rated door provided (these requirements supersede models indicated in hardware sets):

1. Category A wood doors: provide models indicated in hardware sets.
2. Category B wood doors: provide Category G&H seals at jambs and meeting edges. If Category H seals are indicated in hardware sets, provide Cat G seals in addition to the Category H seals.
3. Category A and B hollow metal doors: provide models indicated in hardware sets.

C. Air Leakage: Not to exceed 0.50 cfm per foot of crack length for gasketing other than for smoke control, as tested according to ASTM E 283.

D. Smoke-Labeled Gasketing: Assemblies complying with NFPA 105 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for smoke-control ratings indicated, based on testing according to UL 1784.

1. Provide smoke-labeled gasketing on 20-minute-rated doors and on smoke-labeled doors.

E. Fire-Labeled Gasketing: Assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to NFPA 252 or UBC Standard 7-2.

1. Test Pressure: After 5 minutes into the test, neutral pressure level in furnace shall be established at 40 inches or less above the sill.

F. Sound-Rated Gasketing: Assemblies that are listed and labeled by a testing and inspecting agency, for sound ratings indicated, based on testing according to ASTM E 1408.

G. Mullion Gasketing: Sealing up to 1/4" gaps, 4 vanes, adhesive backed, collapsible to 1/32", black. Basis of Design: DHSI (DHS) Model MS-SA/75 x BK.

H. Replaceable Seal Strips: Provide only those units where resilient or flexible seal strips are easily replaceable and readily available from stocks maintained by manufacturer.

I. Jamb Gasketing Materials:
1. Adhesive Seals. As specified in hardware sets or approved equal.
2. Intumescents: As required.
3. Screwed-on weatherstrip and sweeps. Neoprene.
4. Panic type thresholds. Neoprene.

J. Available Manufacturers for Jamb Gaskets (provided they provide items with neoprene inserts):

1. Hager Companies (HAG).

2. National Guard Products (NGP).
3. Pemko Manufacturing Co. (PEM).
4. Reese Enterprises (REE).
5. Zero International (ZER).

2.20 THRESHOLDS

A. Standard: BHMA A156.21

B. Accessibility Requirements: Where thresholds are indicated to comply with accessibility requirements, comply with the U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA), Accessibility Guidelines for Buildings and Facilities (ADAAG)."

1. Bevel raised thresholds with a slope of not more than 1:2. Provide thresholds not more than 1/2 inch high.

C. Thresholds for Means of Egress Doors: Comply with NFPA 101. Maximum 1/2 inch high.

D. Fasteners: ¼-20 machine screws and expansion anchors.

E. Gasketing material: At panic-type thresholds: neoprene.

F. Available Manufacturers (provided they provide items with neoprene inserts):

1. Hager Companies (HAG).
2. National Guard Products (NGP).
3. Pemko Manufacturing Co. (PEM).
4. Reese Enterprises (RE).
5. Zero International (ZRO).

2.21 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, 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. Do not furnish manufacturer's standard materials or forming methods if different from specified standard.

C. Fasteners: Manufacturer’s standard, except as noted in product sections of this specification.

2.22 FINISHES

A. Standard: BHMA A156.18, as indicated in door hardware sets.

B. Protect mechanical finishes on exposed surfaces from damage by applying a 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 one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other 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 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: Comply with DHI A115 Series.

1. Surface-Applied Door Hardware: Drill and tap doors and frames according to ANSI A250.6.

B. Wood Doors: Comply with DHI A115-W Series.

3.3 INSTALLATION

A. Low-energy Automatic Door Operators:

1. Installer is to have current AAADM certification to install automatic door operators and actuating systems.

B. 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: DHI's "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames."
2. Wood Doors: DHI WDHS.3, "Recommended Locations for Architectural Hardware for Wood Flush Doors."

C. Mounting Locations:

1. Wall Stops: Locate so that lockset spindle and wall stop share horizontal and vertical centerlines.
2. Closers and Overhead Stop/Holders: Template and mount closers and overhead stops for maximum degree of opening before door encounters obstruction or so as to interface with

specified wall stops and holders. When used with closers, template and locate overhead stops so that closer arm does not fully extend and bottom out. These functionality requirements override any degree of opening information in the specifications or submittals.

D. 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 specified in Division 09 Sections. 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.

E. Key Control System: Tag keys and place them on markers and hooks in key control system cabinet, as determined by final keying schedule. Document cross-indexing per manufacturer's instructions.

F. Weatherstrip and Gasketing with Metal Retainers: Fit up as needed for neat appearance with no gaps between retainers or bulbs.

G. Thresholds: Set thresholds for exterior and acoustical doors in full bed of sealant complying with requirements specified in Division 07 Section "Joint Sealants." **Position for complete seal with bottom of doors with no penetration of air or daylight.**

3.4 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.

B. Overhead Stops/Holders: Set adjustable stops for maximum degree of opening before door encounters obstruction. Adjust friction to control door.

C. Door Closers:

1. Unless otherwise required by authorities having jurisdiction, adjust sweep period so that, from an open position of 70 degrees, the door will take at least 3 seconds to move to a point 3 inches from the latch, measured to the leading edge of the door.
2. Adjust latch period so that door does not slam nor injure fingers.
3. **Adjust spring power for minimum force required so that door properly and reliably latches. It is recommended that all closers be adjusted to a Spring Size 1 (either at the factory or at the facility of the Contract Hardware Supplier) prior to delivery to job; they can then be adjusted up to meet requirements. ADA maximum force to open a non-rated interior doors is 5 lbf; 8.5lbf for an exterior non-rated door. Installer is required to adjust spring power on every closer during installation using a door force gage. If ADA requirements cannot be met due to door-**

frame-hardware clearance issues of HVAC issues, bring to Contractors attention to resolve problem.

4. Adjust backcheck to slow door down before hitting stop point so as to prevent damage to closer, arm, door, frame, and fasteners.

D. Occupancy Adjustment: Approximately six months after date of Substantial Completion, Installer shall examine and readjust, including adjusting operating forces, each item of door hardware as necessary to ensure function of doors, door hardware, and electrified door hardware.

3.5 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.

3.6 DOOR HARDWARE SCHEDULE (on following pages followed by Door-Set Index)

Hardware Set Prefix Key:

A Indicates auto operator.

E Indicates hard-wired electronics requiring electrical work and materials.

No prefix indicates no electronics.

Hardware Set AE01

Non-electrified Items

(1)	Key Removable Mullion	KR-4954 x 154	689	VON
(1)	Rim Cylinder	Primus LFIC 6-pin	626	SCH
(1)	Mortise Cylinder	Primus LFIC 6-pin	626	SCH
(1)	Closer, w/Spring Stop	4040XP SCUSH	689	LCN
(2)	Kick Plate	KO050 8 x 2LDW x CS x B4E	630	TRI
(1)	Cat H Adhesive Mullion Seal/Mute	MS-SA/75	Black	DHS
(1)	Cat H Adhesive Jamb Seal Set Note: Apply to top jamb only.	2525B	Brown	NGP
(1)	Cat H Jamb Seal Set Note: Apply to side jambs only.	135NA	628	NGP
(1)	Panic Threshold	896N x RCE	628	NGP

Electrified Items

(2)	Continuous Hinge	SL24HD x EPT Prep	628	SEL
(2)	Electric Power Transfer	PTM-2AL		SDC
(1)	Panic Device, Rim, 03	QEL-99NL x 697NL (RHRB)	626	VON
(1)	Panic Device, Rim, 02	QEL-99DT x 697DT	626	VON
(1)	Automatic Door Operator Note: Locate on RHRB door leaf.	Senior Swing	628	LCN
(2)	Actuator, Single-gang	S-SG-3-WR	630	WIK

Note: Locate (1) actuator on exterior wall under cardreader; locate (1) actuator on interior wall as located by

Architect; both at 36" AFF.

(2) Door Contact, ¾", Pop-in, DPDT 195-12 White GRI

(1) Lot: Card Reader (single-gang), control circuitry, low voltage power, cabling, terminations, programming, etc. (see electrical specifications).

Electrical Note:

Provide 12x16x6 junction box as located on electrical drawings. Provide conduit with pull string from junction box to auto operator, to actuators, to cardreader, to power transfers, and door contacts. Provide low voltage cabling and terminations for fully system functionality.

System Function:

Free egress. Ingress by key or card. Presenting valid card retracts exit device latchbolts and enables exterior actuator. Pressing exterior actuator signals auto operator to open RHRB door. Door closes and relocks after time delay. Pressing interior actuator retracts exit device latchbolts and signals auto operator to open RHRB door. Door closes and relocks after time delay. Doors are monitored for door position.

Hardware Set E01

Non-electrified Items:

(1)	Mortise Cylinder	Primus LFIC 6-pin	626	SCH
(1)	Closer, w/Spring Stop	4040XP SCUSH	689	LCN
(1)	Kick Plate	KO050 8 x 2LDW x CS x B4E	630	TRI
(1)	Lock Guard, Mortise Lock	5000T	626	TRI
(1)	Overhead Rain Drip	16A	628	NGP
(1)	Cat H Adhesive Jamb Seal Set Note: Apply to top jamb only.	2525B	Brown	NGP
(1)	Cat H Jamb Seal Set Note: Apply to side jambs only.	135NA	628	NGP
(1)	Panic Threshold	896N x RCE	628	NGP

Note 1: 3/8" door undercut required for proper mating of door bottom with seal integral to threshold.

Electrified Items:

(1)	Continuous Hinge	SL24HD x EPT Prep	628	SEL
(1)	Electric Power Transfer	PTM-2AL		SDC
(1)	Electric Mortise Lock	L9092EU-17A	626	SDC
(1)	Door Contact, ¾", Pop-in, DPDT	195-12	White	GRI

(1) Lot: Card Reader (single-gang), control circuitry, low voltage power, cabling, terminations, programming, etc. (see electrical specifications).

Electrical Note:

Provide 12x16x6 junction box as located on electrical drawings. Provide conduit with pull string from junction box to cardreader, to power transfer, and door contact. Provide low voltage cabling and terminations for fully system functionality.

System Function:

Free egress. Ingress by key or card. Door is monitored for door position.

Hardware Set E01A

Non-electrified Items:

(3)	Butt Hinges	BB1191 4.5 x 4.0	630	HAG
(1)	Double-cylinder Deadbolt	L462	630	SCH
(3)	Mortise Cylinder	Primus LFIC 6-pin	626	SCH
(1)	Closer, Regular Arm	4040XP Reg	689	LCN
(1)	Kick Plate	KO050 8 x 2LDW x CS x B4E	630	TRI
(1)	Wall Stop, Convex	1278CX	626	TRI

Electrified Items:

(1)	Electric Power Transfer	PTM-2AL		SDC
(1)	Electric Mortise Lock	L9092EU-17A	626	SDC
(1)	Door Contact, ¾", Pop-in, DPDT	195-12	White	GRI

(1) Lot: Card Reader (single-gang), control circuitry, low voltage power, cabling, terminations, programming, etc. (see electrical specifications).

Electrical Note:

Provide 12x16x6 junction box as located on electrical drawings. Provide conduit with pull string from junction box to cardreader, to power transfer, and door contact. Provide low voltage cabling and terminations for fully system functionality.

System Function:

Free egress. Ingress by key or card. Door is monitored for door position.

Hardware Set E01B

Non-electrified Items:

(3)	Butt Hinges	BB1168 5 X 4.5	652	HAG
(1)	Mortise Cylinder	Primus LFIC 6-pin	626	SCH
(1)	Closer, w/Stop	4040XP CUSH	689	LCN
(1)	Kick Plate	KO050 8 x 2LDW x CS x B4E	630	TRI

Electrified Items:

(1)	Electric Power Transfer	PTM-2AL		SDC
(1)	Electric Mortise Lock	L9092EU-17A	626	SDC
(1)	Door Contact, ¾", Pop-in, DPDT	195-12	White	GRI

(1) Lot: Card Reader (single-gang), control circuitry, low voltage power, cabling, terminations, programming, etc. (see electrical specifications).

Electrical Note:

Provide 12x16x6 junction box as located on electrical drawings. Provide conduit with pull string from junction box to cardreader, to power transfer, and door contact. Provide low voltage cabling and terminations for fully system functionality.

System Function:

Free egress. Ingress by key or card. Door is monitored for door position.

Hardware Set E01C

Non-electrified Items:

(1)	Continuous Hinge	SL24HD	628	SEL
(1)	Manual Flush Bolt	3917-12	626	TRI
(1)	Manual Flush Bolt	3917-24 (top)	626	TRI
(1)	Mortise Cylinder	Primus LFIC 6-pin	626	SCH
(2)	Closer, w/Spring Stop	4040XP SCUSH	689	LCN
(2)	Kick Plate	KO050 8 x 2LDW x CS x B4E	630	TRI
(1)	Lock Guard, Mortise Lock	5000T	626	TRI
(1)	Overhead Rain Drip	16A	628	NGP
(1)	Cat H Adhesive Jamb Seal Set Note: Apply to top jamb only.	2525B	Brown	NGP
(1)	Cat H Jamb Seal Set Note: Apply to side jambs only.	135NA	628	NGP
(1)	Panic Threshold	896N x RCE	628	NGP

Note 1: 3/8" door undercut required for proper mating of door bottom with seal integral to threshold.

Note 2: Overlapping steel welded astragal on push side of inactive leaf by door supplier.

Electrified Items:

(1)	Continuous Hinge	SL24HD x EPT Prep	628	SEL
(1)	Electric Power Transfer	PTM-2AL		SDC
(1)	Electric Mortise Lock	L9092EU-17A	626	SDC
(1)	Door Contact, ¾", Pop-in, DPDT	195-12	White	GRI

(1) Lot: Card Reader (single-gang), control circuitry, low voltage power, cabling, terminations, programming, etc. (see electrical specifications).

Electrical Note:

Provide 12x16x6 junction box as located on electrical drawings. Provide conduit with pull string from junction box to cardreader, to power transfer, and door contact. Provide low voltage cabling and terminations for fully system functionality.

System Function:

Free egress. Ingress by key or card. Doors are monitored for door position.

Hardware Set E02

Non-electrified Items

(1)	Key Removable Mullion	KR-4954 x 154	689	VON
(2)	Offset Pull	1191-10 x N-MD Mtg	630	TRI
(1)	Rim Cylinder	Primus LFIC 6-pin	626	SCH
(1)	Mortise Cylinder	Primus LFIC 6-pin	626	SCH
(2)	Closer, w/Spring Stop	4040XP SCUSH x 4040-30 x 4040-61	689	LCN
(1)	Cat H Adhesive Mullion Seal/Mute	MS-SA/75	Black	DHS
(1)	Panic Threshold	896N x RCE	628	NGP

Note 1: Jamb seals and meeting edge seals by aluminum door supplier.

Electrified Items

(2)	Continuous Hinge	SL11HD x EPT Prep	628	SEL
(2)	Electric Power Transfer	PTM-2AL		SDC
(1)	Panic Device, Rim, 03	QEL-33ANL x 697NL	626	VON
(1)	Panic Device, Rim, 02	QEL-33ADT x 697DT	626	VON
(2)	Door Contact, ¾", Pop-in, DPDT	195-12	White	GRI

(1) Lot: Card Reader (single-gang), control circuitry, low voltage power, cabling, terminations, programming, etc. (see electrical specifications).

Electrical Note:

Provide 12x16x6 junction box as located on electrical drawings. Provide conduit with pull string from junction box to cardreader, to power transfers, and door contacts. Provide low voltage cabling and terminations for fully system functionality.

System Function:

Free egress. Ingress by key or card. Doors are monitored for door position.

Hardware Set E02A

Non-electrified Items

(1)	Key Removable Mullion	KR-4954 x 154	689	VON
(1)	Rim Cylinder	Primus LFIC 6-pin	626	SCH
(1)	Mortise Cylinder	Primus LFIC 6-pin	626	SCH
(2)	Closer, w/Spring Stop	4040XP SCUSH	689	LCN
(2)	Kick Plate	KO050 8 x 2LDW x CS x B4E	630	TRI
(1)	Cat H Adhesive Mullion Seal/Mute	MS-SA/75	Black	DHS
(1)	Cat H Adhesive Jamb Seal Set Note: Apply to top jamb only.	2525B	Brown	NGP
(1)	Cat H Jamb Seal Set Note: Apply to side jambs only.	135NA	628	NGP
(1)	Panic Threshold	896N x RCE	628	NGP

Electrified Items

(2)	Continuous Hinge	SL24HD x EPT Prep	628	SEL
(2)	Electric Power Transfer	PTM-2AL		SDC
(1)	Panic Device, Rim, 03	QEL-99NL x 697NL	626	VON
(1)	Panic Device, Rim, 02	QEL-99DT x 697DT	626	VON
(2)	Door Contact, ¾", Pop-in, DPDT	195-12	White	GRI

(1) Lot: Card Reader (single-gang), control circuitry, low voltage power, cabling, terminations, programming, etc. (see electrical specifications).

Electrical Note:

Provide 12x16x6 junction box as located on electrical drawings. Provide conduit with pull string from junction box to cardreader, to power transfers, and door contacts. Provide low voltage cabling and terminations for fully system functionality.

System Function:

Free egress. Ingress by key or card. Doors are monitored for door position.

Hardware Set E02B

Non-electrified Items

(1)	Rim Cylinder	Primus LFIC 6-pin	626	SCH
(1)	Closer, w/Spring Stop	4040XP SCUSH	689	LCN
(1)	Kick Plate	KO050 8 x 2LDW x CS x B4E	630	TRI
(1)	Overhead Rain Drip	16A	628	NGP
(1)	Cat H Adhesive Jamb Seal Set Note: Apply to top jamb only.	2525B	Brown	NGP
(1)	Cat H Jamb Seal Set Note: Apply to side jambs only.	135NA	628	NGP
(1)	Panic Threshold	896N x RCE	628	NGP

Electrified Items

(1)	Continuous Hinge	SL24HD x EPT Prep	628	SEL
(1)	Electric Power Transfer	PTM-2AL		SDC
(1)	Panic Device, Rim, 03	QEL-99NL x 697NL	626	VON
(1)	Door Contact, ¾", Pop-in, DPDT	195-12	White	GRI

(1) Lot: Card Reader (single-gang), control circuitry, low voltage power, cabling, terminations, programming, etc. (see electrical specifications).

Electrical Note:

Provide 12x16x6 junction box as located on electrical drawings. Provide conduit with pull string from junction box to cardreader, to power transfers, and door contacts. Provide low voltage cabling and terminations for fully system functionality.

System Function:

Free egress. Ingress by key or card. Door is monitored for door position.

Hardware Set 01

All hardware by overhead door supplier.

Hardware Set 02

(3)	Butt Hinges	BB1279 4.5 x 4.0	652	HAG
(1)	Storeroom Lock	L9080-17A	626	SCH
(1)	Mortise Cylinder	Primus LFIC 6-pin	626	SCH
(1)	Kick Plate	KO050 8 x 2LDW x CS x B4E	630	TRI
(1)	Wall Stop, Convex	1278CX	626	TRI

Hardware Set 02A

(2)	Continuous Hinge	SL24HD	628	SEL
(1)	Manual Flush Bolt	3917-24 (top)	626	TRI
(1)	Manual Flush Bolt	3917-12	626	TRI
(1)	Storeroom Lock	L9080-17A	626	SCH
(1)	Permanent Core	Primus LFIC 6-pin	626	SCH
(2)	Closer, w/Spring Stop	4040XP SCUSH	689	LCN
(2)	Kick Plate	KO050 8 x 2LDW x CS x B4E	630	TRI
(1)	Lock Guard, Mortise Lock	5000T	626	TRI
(1)	Overhead Rain Drip	16A	628	NGP
(1)	Cat H Adhesive Jamb Seal Set Note: Apply to top jamb only.	2525B	Brown	NGP
(1)	Cat H Jamb Seal Set Note: Apply to side jambs only.	135NA	628	NGP
(1)	Panic Threshold	896N x RCE	628	NGP

Note 1: 3/8” door undercut required for proper mating of door bottom with seal integral to threshold.

Note 2: Overlapping steel welded astragal on push side of inactive leaf by door supplier.

Hardware Set 02B

(6)	Butt Hinges	BB1279 4.5 x 4.0	652	HAG
(1)	Manual Flush Bolt	3917-24 (top)	626	TRI
(1)	Manual Flush Bolt	3917-12	626	TRI
(1)	Storeroom Lock	L9080-17A	626	SCH
(1)	Permanent Core	Primus LFIC 6-pin	626	SCH
(2)	Kick Plate	KO050 8 x 2LDW x CS x B4E	630	TRI
(2)	Wall Stop, Convex	1278CX	626	TRI

Hardware Set 02C

(6)	Butt Hinges	BB1279 4.5 x 4.0	652	HAG
(1)	Manual Flush Bolt	3917-24 (top)	626	TRI
(1)	Manual Flush Bolt	3917-12	626	TRI
(1)	Storeroom Lock	L9080-17A	626	SCH

(1)	Permanent Core	Primus LFIC 6-pin	626	SCH
(2)	Kick Plate	KO050 16 x 2LDW x CS x B4E	630	TRI
(2)	Wall Stop, Convex	1278CX	626	TRI

Hardware Set 02D

(3)	Butt Hinges	BB1279 4.5 x 4.0	652	HAG
(1)	Storeroom Lock	L9080-17A	626	SCH
(1)	Mortise Cylinder	Primus LFIC 6-pin	626	SCH
(1)	Kick Plate	KO050 16 x 2LDW x CS x B4E	630	TRI
(1)	Wall Stop, Convex	1278CX	626	TRI

Hardware Set 02E

(6)	Butt Hinges	BB1279 4.5 x 4.0	652	HAG
(1)	Manual Flush Bolt	3917-24 (top)	626	TRI
(1)	Manual Flush Bolt	3917-12	626	TRI
(1)	Classroom Security Lock	L9457-17A	626	SCH
(2)	Permanent Core	Primus LFIC 6-pin	626	SCH
(2)	Kick Plate	KO050 8 x 2LDW x CS x B4E	630	TRI
(1)	Wall Stop, Convex	1278CX	626	TRI
(1)	Overhead Stop, HD, Surface	900S	630	GLY
	Note: Mount on LHRB door leaf.			

Hardware Set 02F

(3)	Butt Hinges	BB1279 4.5 x 4.0	652	HAG
(1)	Storeroom Lock	L9080-17A	626	SCH
(1)	Mortise Cylinder	Primus LFIC 6-pin	626	SCH
(1)	Kick Plate	KO050 16 x 2LDW x CS x B4E	630	TRI
(1)	Overhead Stop, HD, Surface	900S	630	GLY

Hardware Set 02G

(3)	Butt Hinges	BB1279 4.5 x 4.0	652	HAG
(1)	Storeroom Lock	L9080-17A	626	SCH
(1)	Mortise Cylinder	Primus LFIC 6-pin	626	SCH
(1)	Overhead Stop, HD, Surface	900S	630	GLY

Hardware Set 02H

(3)	Butt Hinges	BB1168 5 X 4.5	652	HAG
(1)	Storeroom Lock	L9080-17A	626	SCH
(1)	Mortise Cylinder	Primus LFIC 6-pin	626	SCH
(1)	Closer, w/Stop	4040XP CUSH	689	LCN
(1)	Kick Plate	KO050 8 x 2LDW x CS x B4E	630	TRI
(1)	Cat H Jamb Seal Set	135NA	628	NGP

Hardware Set 02J

(6)	Butt Hinges	BB1279 4.5 x 4.0	652	HAG
(1)	Manual Flush Bolt	3917-24 (top)	626	TRI
(1)	Manual Flush Bolt	3917-12	626	TRI
(1)	Storeroom Lock	L9080-17A	626	SCH

(1)	Permanent Core	Primus LFIC 6-pin	626	SCH
(2)	Overhead Stop, HD, Surface	900S	630	GLY

Hardware Set 02K

(3)	Butt Hinges	BB1168 5 X 4.5	652	HAG
(1)	Storeroom Lock	L9080-17A	626	SCH
(1)	Mortise Cylinder	Primus LFIC 6-pin	626	SCH
(1)	Kick Plate	KO050 8 x 2LDW x CS x B4E	630	TRI
(1)	Wall Stop, Convex	1278CX	626	TRI

Hardware Set 02L

(3)	Butt Hinges	BB1168 5 X 4.5	652	HAG
(1)	Storeroom Lock	L9080-17A	626	SCH
(1)	Mortise Cylinder	Primus LFIC 6-pin	626	SCH
(1)	Kick Plate	KO050 8 x 2LDW x CS x B4E	630	TRI
(1)	Overhead Stop, HD, Surface	900S	630	GLY

Hardware Set 02M

(3)	Butt Hinges	BB1191 4.5 x 4.0	630	HAG
(1)	Storeroom Lock	L9080-17A	626	SCH
(1)	Mortise Cylinder	Primus LFIC 6-pin	626	SCH
(1)	Closer, Regular Arm	4040XP Reg	689	LCN
(1)	Kick Plate	KO050 8 x 2LDW x CS x B4E	630	TRI
(1)	Mop Plate	KM050 4 x 1LDW x CS x B4E	630	TRI
(1)	Wall Stop, Convex	1278CX	626	TRI

Hardware Set 03

(3)	Butt Hinges	BB1279 4.5 x 4.0	652	HAG
(1)	Keypad Lock	CO-100-MS-70-SPA-primus	626	SCH
(1)	Permanent Core	Primus LFIC 6-pin	626	SCH
(1)	Closer, Regular Arm	4040XP Reg	689	LCN
	Note: Provide special templating so as not to conflict with overhead stop.			
(1)	Kick Plate	KO050 8 x 2LDW x CS x B4E	630	TRI
(1)	Lock Guard, In-swinging	ILP 212 - CP	652	DJO
(1)	Overhead Stop, HD, Concealed	100S x ADJ	630	GLY
(1)	Cat H Jamb Seal Set	135NA	628	NGP
(1)	Door Bottom Shoe/Drip	216APK	628	PEM
(1)	¼" Saddle Threshold	513 x RCE	628	NGP

Note 1: ¾" door undercut required for proper mating of door shoe with threshold. Mount threshold, then door shoe, then kick plate butted to door shoe. Notch door shoe as required for tight fit-up.

Hardware Set 03A

(3)	Butt Hinges	BB1279 4.5 x 4.0	652	HAG
(1)	Keypad Lock	CO-100-MS-70-SPA-primus	626	SCH
(1)	Permanent Core	Primus LFIC 6-pin	626	SCH
(1)	Closer, Regular Arm	4040XP Reg	689	LCN
(1)	Kick Plate	KO050 8 x 2LDW x CS x B4E	630	TRI
(1)	Wall Stop, Convex	1278CX	626	TRI

Hardware Set 03B

(3)	Butt Hinges	BB1279 4.5 x 4.0	652	HAG
(1)	Keypad Lock	CO-100-MS-70-SPA-primus	626	SCH
(1)	Permanent Core	Primus LFIC 6-pin	626	SCH
(1)	Closer, Regular Arm	4040XP Reg	689	LCN
(1)	Kick Plate	KO050 8 x 2LDW x CS x B4E	630	TRI
(1)	Lock Guard, In-swinging	ILP 212 - CP	652	DJO
(1)	Wall Stop, Convex	1278CX	626	TRI
(1)	Cat H Jamb Seal Set	135NA	628	NGP
(1)	Door Bottom Shoe/Drip	216APK	628	PEM
(1)	¼" Saddle Threshold	513 x RCE	628	NGP

Note 1: ¾" door undercut required for proper mating of door shoe with threshold. Mount threshold, then door shoe, then kick plate butted to door shoe. Notch door shoe as required for tight fit-up.

Hardware Set 03C

(2)	Continuous Hinge	SL24HD	628	SEL
(1)	Manual Flush Bolt	3917-24 (top)	626	TRI
(1)	Manual Flush Bolt	3917-12	626	TRI
(1)	Keypad Lock	CO-100-MS-70-SPA-primus	626	SCH
(1)	Permanent Core	Primus LFIC 6-pin	626	SCH
(2)	Closer, w/Spring Stop	4040XP SCUSH	689	LCN
(2)	Kick Plate	KO050 8 x 2LDW x CS x B4E	630	TRI
(1)	Lock Guard, Mortise Lock	5000T	626	TRI
(1)	Overhead Rain Drip	16A	628	NGP
(1)	Cat H Adhesive Jamb Seal Set Note: Apply to top jamb only.	2525B	Brown	NGP
(1)	Cat H Jamb Seal Set Note: Apply to side jambs only.	135NA	628	NGP
(1)	Panic Threshold	896N x RCE	628	NGP

Note 1: 3/8" door undercut required for proper mating of door bottom with seal integral to threshold.

Note 2: Overlapping steel welded astragal on push side of inactive leaf by door supplier.

Hardware Set 03D

(1)	Continuous Hinge	SL24HD	628	SEL
(1)	Keypad Lock	CO-100-MS-70-SPA-primus	626	SCH
(1)	Permanent Core	Primus LFIC 6-pin	626	SCH
(1)	Closer, w/Spring Stop	4040XP SCUSH	689	LCN
(1)	Kick Plate	KO050 8 x 2LDW x CS x B4E	630	TRI
(1)	Lock Guard, Mortise Lock	5000T	626	TRI
(1)	Overhead Rain Drip	16A	628	NGP
(1)	Cat H Adhesive Jamb Seal Set Note: Apply to top jamb only.	2525B	Brown	NGP
(1)	Cat H Jamb Seal Set Note: Apply to side jambs only.	135NA	628	NGP
(1)	Panic Threshold	896N x RCE	628	NGP

Note 1: 3/8" door undercut required for proper mating of door bottom with seal integral to threshold.

Hardware Set 04

(3)	Butt Hinges	BB1279 4.5 x 4.0	652	HAG
(1)	Classroom Security Lock	L9457-17A	626	SCH
(2)	Mortise Cylinder	Primus LFIC 6-pin	626	SCH
(1)	Kick Plate	KO050 8 x 1LDW x CS x B4E	630	TRI
(1)	Wall Stop, Convex	1278CX	626	TRI

Hardware Set 04A

(6)	Butt Hinges	BB1279 4.5 x 4.0	652	HAG
(1)	Manual Flush Bolt	3917-24 (top)	626	TRI
(1)	Manual Flush Bolt	3917-12	626	TRI
(1)	Classroom Security Lock	L9457-17A	626	SCH
(2)	Mortise Cylinder	Primus LFIC 6-pin	626	SCH
(1)	Closer, HD Parallel Arm	4040XP EDA	689	LCN
(2)	Kick Plate	KO050 8 x 1LDW x CS x B4E	630	TRI
(2)	Wall Stop, Convex	1278CX	626	TRI

Hardware Set 04B

(3)	Butt Hinges	BB1279 4.5 x 4.0	652	HAG
(1)	Classroom Security Lock	L9457-17A	626	SCH
(2)	Mortise Cylinder	Primus LFIC 6-pin	626	SCH
(1)	Closer, HD Parallel Arm	4040XP EDA	689	LCN
(1)	Kick Plate	KO050 8 x 1LDW x CS x B4E	630	TRI
(1)	Wall Stop, Convex	1278CX	626	TRI

Hardware Set 05

(1)	Butt Hinges	BB1191 4.5 x 4.0	630	HAG
(2)	Spring Hinges	1150 4.5 x 4.0	630	HAG
(1)	Privacy Set, Cylindrical	ND40S-SPA	626	SCH
(1)	Wall Stop, Concave	1270CV	626	TRI

Note 1: Adjust hinges to pull door almost closed but not to latch.

Hardware Set 05A

(1)	Butt Hinges	BB1191 4.5 x 4.0	630	HAG
(2)	Spring Hinges	1150 4.5 x 4.0	630	HAG
(1)	Privacy Set, Cylindrical	ND40S-SPA	626	SCH
(1)	Wall Stop, Convex	1278CX	626	TRI

Note 1: Adjust hinges to pull door almost closed but not to latch.

Hardware Set 05B

(1)	Butt Hinges	BB1191 4.5 x 4.0	630	HAG
(2)	Spring Hinges	1150 4.5 x 4.0	630	HAG
(1)	Privacy Set, Cylindrical	ND40S-SPA	626	SCH
(1)	Hinge Pin Stop	1507	625	DJO

Note 1: Adjust hinges to pull door almost closed but not to latch.

Hardware Set 06

(3)	Butt Hinges	BB1191 4.5 x 4.0	630	HAG
(1)	Storeroom Lock w/DB and Indicator	L9480-17A x L283-722	626	SCH
(2)	Mortise Cylinder	Primus LFIC 6-pin	626	SCH
(1)	Closer, Regular Arm	4040XP Reg	689	LCN
(1)	Kick Plate	KO050 8 x 2LDW x CS x B4E	630	TRI
(1)	Mop Plate	KM050 4 x 1LDW x CS x B4E	630	TRI
(1)	Wall Stop, Convex	1278CX	626	TRI

Hardware Set 07

(3)	Butt Hinges	BB1191 4.5 x 4.0	630	HAG
(1)	Classroom Security Lock	L9457-17A	626	SCH
(2)	Mortise Cylinder	Primus LFIC 6-pin	626	SCH
(1)	Closer, Regular Arm	4040XP Reg	689	LCN
(1)	Kick Plate	KO050 8 x 2LDW x CS x B4E	630	TRI
(1)	Mop Plate	KM050 4 x 1LDW x CS x B4E	630	TRI
(1)	Wall Stop, Convex	1278CX	626	TRI

Hardware Set 07A

(3)	Butt Hinges	BB1191 4.5 x 4.0	630	HAG
(1)	Classroom Security Lock	L9457-17A	626	SCH
(2)	Mortise Cylinder	Primus LFIC 6-pin	626	SCH
(1)	Closer, HD Parallel Arm	4040XP EDA	689	LCN
(1)	Kick Plate	KO050 8 x 2LDW x CS x B4E	630	TRI
(1)	Mop Plate	KM050 4 x 1LDW x CS x B4E	630	TRI
(1)	Wall Stop, Convex	1278CX	626	TRI

Hardware Set 07B

(6)	Butt Hinges	BB1279 4.5 x 4.0	652	HAG
(1)	Manual Flush Bolt	3917-12	626	TRI
(1)	Manual Flush Bolt	3917-24 (top)	626	TRI
(1)	Classroom Security Lock	L9457-17A	626	SCH
(2)	Mortise Cylinder	Primus LFIC 6-pin	626	SCH
(1)	Closer, HD Parallel Arm	4040XP EDA	689	LCN
(1)	Kick Plate	KO050 8 x 2LDW x CS x B4E	630	TRI
(2)	Wall Stop, Convex	1278CX	626	TRI

Hardware Set 08

(3)	Butt Hinges	BB1279 4.5 x 4.0	652	HAG
(1)	Office Lock	L9050-17A	626	SCH
(1)	Mortise Cylinder	Primus LFIC 6-pin	626	SCH
(1)	Kick Plate	KO050 8 x 2LDW x CS x B4E	630	TRI
(1)	Wall Stop, Convex	1278CX	626	TRI

Hardware Set 09

Cased open frame. No hardware required.

3.7 **DOOR-SET INDEX**

Door	HW Set
BCHS	
BC-001	E01
BC-001.1	01
BC-002	02
BC-003	03
BC-003.1	01
BC-004	03A
BC-005	04
BC-006	03B
BC-006.1	01
BC-101.1	E02
BC-101.2	E02A
BC-101A	AE01
BC-101B	E02A
BC-102	E01
BC-102.1	01
BC-102.2	01
BC-103.1	04
BC-103.2	02A
BC-104	02B
BC-105	02B
BC-106	02B
BC-107	02B
BC-108A.1	E02B
BC-108A.2	E01A
BC-108A.A	05
BC-108A.B	05
BC-108A.C	05
BC-108A.D	05
BC-108A.E	05
BC-108A.F	05
BC-108A.G	05
BC-108A.H	05
BC-108A.I	05
BC-108A.J	05
BC-108B.1	E02B
BC-108B.2	E01A
BC-108B.A	05
BC-108B.B	05
BC-108B.C	05
BC-108B.D	05
BC-108B.E	05
BC-108C.2	02
BC-109	06
BC-110	02C
BC-200	02D
BC-203	02M
BC-203.A	05B
BC-203.B	05
BC-203A	09
BC-204.1	04A
BC-204.2	04A
BC-204A	02F
BC-AV101	E01B
BC-E100.1	02J
BC-E100.2	02G
BC-E200.1	02J
BC-E200.2	02G
BC-EL01	02H
BC-F101	07B
BC-F102.1	08
BC-F102.2	08
BC-F103	02
BC-F105A.A	05A
BC-F105A.B	05
BC-F105A.C	05
BC-F105B	09
BC-FS01	02G
BC-M001	E02B
BC-M100	02A
BC-M200	02K
BC-M201.1	02L
BC-M201.2	02L
BC-M201.3	02L
BC-M201.4	02L
BC-M201.5	02L
BC-M201.6	09
BC-M201.7	09
BC-MDF200	E01B
BC-P201	07
BC-P204A	09
BC-P204A.A	05A
BC-P204A.B	05
BC-P205	07
BC-P208A	09
BC-P208A.A	05A
BC-P208A.B	05
BC-P208A.C	05
BC-S101	07
BC-S102	08
BC-S103	02
BC-S104	09
BC-S105B	09
BC-S105B.A	05
BC-S105B.B	05A
BC-S105C	09
BC-S111	07
BC-S112	08
BC-S113	02
BC-S114	09
BC-S115B	09
BC-S115B.A	05
BC-S115B.B	05
BC-S115B.C	05A
BC-S115C	09
BC-W200	07A
BC-W200A	02
BC-W201	07A
BC-W201A	02
BC-W202	02E

BC-W203	08

BC-W204	02D

E**ND OF SECTION 08 71 00**

SECTION 08 80 00 – GLAZING

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This Section includes glazing for the following products and applications, including those specified in other Sections where glazing requirements are specified by reference to this Section:

1. Windows.
2. Doors.
3. Interior view window lites.
4. Glass for curtain wall systems.
6. Safety Film and Anchoring System
   a. Product Data and Installation Information shown on Drawings. Refer to sheets labeled "Exterior Window & Opening Elevations.

B. Related:
1. Window Graphics on film applied to glass surfaces: See Division 10 Section "Building Signage".

1.03 DEFINITIONS

A. Interspace: Space between lites of an insulating-glass unit that contains dehydrated air or a specified gas.

B. Deterioration of Coated Glass: Defects developed from normal use that are attributed to the manufacturing process and not to causes other than glass breakage and practices for maintaining and cleaning coated glass contrary to manufacturer's written instructions. Defects include peeling, cracking, and other indications of deterioration in metallic coating.

C. Deterioration of Insulating Glass: Failure of hermetic seal under normal use that is attributed to the manufacturing process and not to causes other than glass breakage and practices for 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.

1.04 PERFORMANCE REQUIREMENTS

A. General: Provide glazing systems capable of withstanding normal thermal movement and wind and impact loads (where applicable) without failure, including loss or glass breakage attributable to the following: defective manufacture, fabrication, and installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; or other defects in construction.

B. Glass Design: Glass thickness designations indicated are minimums. Confirm glass thickness by analyzing Project loads and in-service conditions. Provide glass lites in the thickness designations indicated for various size openings, but not less than thicknesses and in strengths (annealed or heat treated) required to meet or exceed the following criteria:

1. Glass Thicknesses: Select minimum glass thicknesses to comply with ASTM E 1300, according to the following requirements:

a. Design Wind Loads: Determine design wind loads applicable to Project from basic wind speed indicated in miles per hour at 33-feet above grade, Importance Factor, and Exposure Category indicated on the Drawings; according to ASCE 7, Section 6.5, "Method 2-Analytical Procedure" and The Kentucky Building Code; based on mean roof heights above grade.
b. Probability of Breakage for Vertical Glazing: 8 lites per 1000 for lites set vertically or not more than 15-degrees off vertical and under wind action.

1) Load Duration: 3-seconds.

c. Minimum glass thickness; refer to Glazing Schedule at end of specification.

C. Thermal Movements: Provide glazing that allows for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures acting on glass framing members and glazing components. 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.

1.05 SUBMITTALS

A. Product Data: For each glass product and glazing material indicated.

B. Samples for Initial Selection: Manufacturer's color charts consisting of actual units or sections of units showing the full range of colors available for the following:

C. Samples for Verification:

1. Glass: For each type of glass product indicated, other than monolithic clear float glass, in the form of 12-inch square Samples for glass and of 12-inch-long Samples for sealants. Install

sealant Samples between two strips of material representative in color of the adjoining framing system.
2. Color samples for spandrel panels. Selection of full range of manufacturer's available options.

D. Glazing Schedule: Use same designations indicated on Drawings.

E. Product Test Reports: For each of the following types of glazing products:

1. Insulating glass.
2. Glazing sealants.
3. Glazing tapes.
4. Glazing gaskets.

F. Warranties: Special warranties specified in this Section.

1.06 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who has completed glazing similar in material, design, and extent to that indicated for this Project; whose work has resulted in glass installations with a record of successful in-service performance; and who employs glass installers for this Project who are certified under the National Glass Association's Certified Glass Installer Program.

1. Engage an experienced glazier who has completed glazing similar in material, design, and extent to that indicated for Project with a record of successful in-service performance.

B. Single-Source Responsibility for Glass: Obtain glass from one source for each product indicated below:

1. Primary glass of each (ASTM C 1036) type and class indicated.
2. Heat-treated glass of each (ASTM C 1048) condition indicated.
3. Insulating glass of each construction indicated.

C. Single-Source Responsibility for Glazing Accessories: Obtain glazing accessories from one source for each product and installation method indicated.

D. Safety Glass: Products complying with ANSI Z97.1 and testing requirements of 16 CFR Part 1201 for Category II materials.

1. Subject to compliance with requirements, provide safety glass permanently marked with certification label of Safety Glazing Certification Council (SGCC) or other certification agency acceptable to authorities having jurisdiction.

E. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below unless more stringent requirements are indicated. Refer to these publications for glazing terms not otherwise defined in this Section or in referenced standards.

1. IGMA Publication for Insulating Glass: SIGMA TM-3000, "Glazing Guidelines for Sealed Insulating Glass Units."

F. Insulating-Glass Certification Program: Permanently marked either on spacers or on at least one component lite of units with appropriate certification label of the Insulating Glass Certification Council.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Protect glazing materials to comply with manufacturer's directions and as needed to prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.

1.08 PROJECT CONDITIONS

A. Environmental Conditions: Do not proceed with glazing when ambient and substrate temperature conditions are outside the limits permitted by glazing materials manufacturer or when glazing channel substrates are wet from rain, frost, condensation, or other causes.

1. Install liquid sealants at ambient and substrate temperatures above 40 deg F.

1.09 WARRANTY

A. General: Warranties specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and will be in addition to and run concurrent with other warranties made by the Contractor under requirements of the Contract Documents.

B. Manufacturer's Warranty on Insulating Glass: Submit written warranty signed by manufacturer of insulating glass agreeing to furnish replacements for insulating glass units that deteriorate as defined in "Definitions" article, f.o.b. point of manufacture, freight allowed Project site, within specified warranty period indicated below. Warranty covers only deterioration due to normal conditions of use and not to handling, installing, protecting, and maintaining practices contrary to glass manufacturer's published instructions.

1. Warranty Period: Manufacturer's standard but not less than 10 years after date of Substantial Completion.

PART 2 PRODUCTS

2.01 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 products specified.
2. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include:

a. Vitro (formerly PPG Industries)
b. Oldcastle Glass
c. Pilkington Glass
d. Guardian
e. LOF

2.02 PRIMARY FLOAT GLASS

A. Annealed Float Glass: ASTM C 1036, Type I (transparent glass, flat), Class 1 (clear) unless otherwise indicated and Quality q3 (glazing select).

B. Refer to Primary Clear Float Glass Product Data Sheet for Class 1 uncoated tinted glass for monolithic glazing.

C. Refer to requirements for sealed insulating glass units for performance characteristics of assembled units composed of tinted glass, coated or uncoated, relative to visible light transmittance, U-values, shading coefficient, and visible reflectance.

2.03 HEAT-TREATED FLOAT GLASS

A. Fabrication Process: By vertical (tong-held) or horizontal (roller-hearth) process, at manufacturer's option, except provide horizontal process where indicated as tongless or free of tong marks.

B. Uncoated, Clear, Heat-Treated Float Glass: ASTM C 1048, Condition A (uncoated surfaces), Type I (transparent glass, flat), Class 1 (clear), Quality q3 (glazing select).

2.04 INSULATING GLASS

A. Sealed Insulating Glass Units: Preassembled units consisting of organically sealed lites of glass separated by dehydrated air spaces complying with ASTM E 774 and with other requirements indicated, including those in Insulating Glass Product Data Sheet at the end of this Section.

1. For properties of individual glass lites making up units, refer to requirements specified elsewhere in this Section applicable to types, classes, kinds, and conditions of glass products comprising lites of insulating glass units Heat strengthened where specified to comply with system performance requirements specified and fully tempered where safety glass is designated or required.
2. Performance characteristics designated for coated insulating glass are nominal values based on manufacturer's published test data for units with lites 6 mm thick and nominal 1/2-inch dehydrated space between lites, unless otherwise indicated.
3. U-values are expressed as Btu/hr x sq. ft. x deg F.

2.05 ELASTOMERIC GLAZING SEALANTS

A. General: Provide products of type indicated, complying with the following requirements:

1. Compatibility: Select glazing sealants and tapes of proven compatibility with other materials they will contact, including glass products, seals of insulating glass units, and glazing channel substrates, under conditions of installation and service, as demonstrated by testing and field experience.
2. Suitability: Comply with sealant and glass manufacturer's recommendations for selecting glazing sealants and tapes that are suitable for applications indicated and conditions existing at time of installation.
3. Colors: Provide color of exposed joint sealants to comply with the following:

    a. Match colors indicated by reference to manufacturer's standard designations.
    b. Provide selections made by Architect from manufacturer's full range of standard colors for products of type indicated.

B. Elastomeric Glazing Sealant Standard: Provide manufacturer's standard chemically curing, elastomeric sealants of base polymer indicated that comply with ASTM C 920, including those referencing ASTM classifications for Type, Grade, Class and Uses.

2.06 GLAZING TAPES

A. Back-Bedding Mastic Glazing Tape: Preformed, butyl-based elastomeric tape with a solids content of 100 percent, nonstaining and nonmigrating in contact with nonporous surfaces, with or without spacer rod as recommended by tape and glass manufacturers for application indicated, packaged on rolls with a release paper backing, and complying with AAMA 800.

B. Expanded Cellular Glazing Tape: Closed-cell, polyvinyl chloride foam tape, factory coated with adhesive on both surfaces, packaged on rolls with release liner protecting adhesive, and complying with AAMA 800 for product 810.5.

C. Available Products: Subject to compliance with requirements, glazing tape that may be incorporated in the Work include the following:

1. Back-Bedding Mastic Glazing Tape without Spacer Rod:

a. PTI 303 Glazing Tape (shimless), Protective Treatments, Inc.
b. S-M 5700 Poly-Glaze Tape Sealant, Schnee-Morehead, Inc.
c. Tremco 440 Tape, Tremco Inc.
d. Extru-Seal, Pecora Corp.
e. PTI 606 Architectural Sealant Tape, Protective Treatments, Inc.
f. Dyna-Seal, Pecora Corp.
g. PTI 626 Architectural Sealant Tape, Protective Treatments, Inc.
h. S-M 5710 H.P Poly-Glaze Tape Sealant, Schnee-Morehead, Inc.
i. SST-800 Tape, Tremco, Inc.

2. Back-Bedding Mastic Glazing Tape With Spacer Rod:
   a. PTI 303 Glazing Tape (with shim), Protective Treatments, Inc.
   b. Pre-shimmed Tremco 440 Tape, Tremco, Inc.
   c. PTI 606 Architectural Sealant Tape, Protective Treatments, Inc.

3. Expanded Cellular Glazing Tape:
   a. Norseal V-980 Closed-Cell Glazing Tape, Norton Company.

2.07 GLAZING GASKETS

A. Dense Compression Gaskets: Molded or extruded gaskets of material indicated below, complying with standards referenced with name of elastomer indicated below, and of profile and hardness required to maintain watertight seal:

1. Neoprene, ASTM C 864.
2. EPDM, ASTM C 864.
3. Silicone, ASTM C 1115.
4. Thermoplastic polyolefin rubber, ASTM C 1115.
5. Any material indicated above.

B. Soft Compression Gaskets: Extruded or molded closed-cell, integral-skinned gaskets of material indicated below, complying with ASTM C 509, Type II, black, and of profile and hardness required to maintain watertight seal:

1. Neoprene.
2. EPDM.
3. Silicone.
4. Thermoplastic polyolefin rubber.
5. Any material indicated above.

C. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the work include the following companies.

1. Preformed Gaskets:

   a. Advanced Elastomer Systems, L.P.

b. Schnee-Morehead, Inc.
c. Tremco, Inc.

2.08 MISCELLANEOUS GLAZING MATERIALS

A. General: Provide products of material, size, and shape complying with referenced glazing standard, 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 with a Shore, Type A durometer 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. Plastic Foam Joint Fillers: Preformed, compressible, resilient, nonstaining, nonextruding, nonoutgassing, strips of closed-cell plastic foam of density, size, and shape to control sealant depth and otherwise contribute to produce optimum sealant performance.

G. Perimeter Insulation for Fire-Resistive Glazing: Identical to product used in test assembly to obtain fire-resistive rating.

2.09 FABRICATION OF GLASS AND OTHER GLAZING PRODUCTS

A. Fabricate glazing units in sizes required to glaze 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.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine glass framing, with glazier present, for compliance with the following:

1. Manufacturing and installation tolerances, including those for size, squareness, offsets at corners.
2. Presence and functioning of weep system.
3. Minimum required face or edge clearances.
4. Effective sealing between joints of glass-framing members.

B. Do not proceed with glazing until unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings that are not firmly bonded to substrates.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the film installation under the project conditions.

3.03 GLAZING, GENERAL

A. Comply with combined recommendations of manufacturers of glass, sealants, gaskets, and other glazing materials, except where more stringent requirements are indicated, including those in referenced glazing publications.

B. Glazing channel dimensions as indicated on Drawings provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances. Adjust as required by Project conditions during installation.

C. Protect glass from edge damage during handling and installation as follows:

1. Use a rolling block in rotating glass units to prevent damage to glass corners. Do not impact glass with metal framing. Use suction cups to shift glass units within openings; do not raise or drift glass with a pry bar. Rotate glass lites with flares or bevels on bottom horizontal edges so edges are located at top of opening, unless otherwise indicated by manufacturer's label.
2. Remove damaged glass from Project site and legally dispose of off site. Damaged glass is glass with edge damage or other imperfections that, when installed, weaken glass and impair performance and appearance.

D. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction sealant-substrate testing.

E. Install elastomeric setting blocks in sill rabbets, sized and located to comply with referenced glazing standard, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.

F. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.

G. Provide spacers for glass sizes larger than 50 united inches (length plus height) as follows:

1. Locate spacers inside, outside, and directly opposite each other. Install correct size and spacing to preserve required face clearances, except where gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and 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.

H. Provide edge blocking to comply with requirements of referenced glazing publications, unless otherwise required by glass manufacturer.

I. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.

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 manner recommended by gasket manufacturer to prevent corners from pulling away; seal corner joints and butt joints with sealant recommended by gasket manufacturer.

3.04 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 in one continuous length. Do not stretch tapes to make them fit opening.

C. Where framing joints are vertical, cover these joints by applying tapes to heads and sills first and then to jambs. Where framing joints are horizontal, cover these joints by applying tapes to jambs and 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 just before each lite 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.

I. Trim excess tape glazing to be flush with stop.

3.05 GASKET GLAZING (DRY)

A. Fabricate compression gaskets in lengths recommended by gasket manufacturer to fit openings exactly, with stretch allowance during installation.

B. Secure compression gaskets in place with joints located at corners to compress gaskets producing a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.

C. Install gaskets so they protrude past face of glazing stops.

3.06 SEALANT GLAZING (WET)

A. Install continuous spacers between glass lites and glazing stops to maintain glass face clearances and to prevent sealant from extruding into glass channel weep systems until sealants cure. Secure spacers 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. Install pressurized gaskets to protrude slightly out of channel to eliminate dirt and moisture pockets.

3.07 PROTECTION AND CLEANING

A. Protect glass from breakage immediately after installation by attaching crossed streamers to framing held away from glass. Do not apply markers to glass surface. Remove nonpermanent labels, and clean surfaces.

B. Protect glass from contact with contaminating substances resulting from construction operations including weld splatter. If, despite such protection, contaminating substances do come into contact with glass, remove them immediately as recommended by glass manufacturer.

C. 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 build-up of dirt, scum, alkali deposits, or stains, and remove as recommended by glass manufacturer.

D. Remove and replace glass that is broken, chipped, cracked, abraded, or damaged in any way, including natural causes, accidents and vandalism, during construction period.

E. Wash glass on both faces in each area of Project not more than 4 days prior to date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended by glass manufacturer.

F. For cleaning of applied film, follow manufacturer’s recommendations.

SCHEDULE OF PRODUCTS USED:

PRODUCT DATA SHEET 1 – PRIMARY CLEAR FLOAT:

A. Primary Clear Float Glass Designation, where indicated.

B. Nominal Performance Characteristics are as indicated below:

1. Visible Light Transmittance: 89% Minimum

PRODUCT DATA SHEET 2 – INSULATING GLASS (STANDARD):

A. Passive Solar Low-E Insulating-Glass Units:

1. Overall Unit Thickness: 1” for windows and 3/4” for exterior doors
2. Thickness of Each Lite: 1/4”
3. Interspace Content: Argon gas

4. Outdoor Lite: Clear glass with Low-E coating on second surface.

    a. Annealed, Kind HS (heat strengthened), or Kind FT (fully tempered); as required.

5. NFRC U-Factor when insulated with Solarban 60: 0.26 - 0.28
6. NFRC SHGC when insulated with Solarban 60: 0.19 – 0.27
7. Indoor Lite: Class 1 (clear) float glass.

    a. Annealed, Kind HS (heat strengthened), or Kind FT (fully tempered); as required.

8. Nominal Performance Characteristics of Solarban 60 are as indicated below:

    a. Visible Light Transmittance: 70%
    b. Visible Light Reflectance, int 12%
    c. Visible Light Reflectance, ext 11%
    d. Summer Daytime U-Value: .24
    e. Winter Nighttime U-Value: .29
    f. Solar Heat Gain Coefficient: .39
    g. Light to Solar Gain: 1.79

END OF SECTION 08 80 00

SECTION 08 95 20 – INSULATED TRANSLUCENT WALL SYSTEM

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 insulated translucent sandwich panel system and accessories as shown and specified. Work includes providing and installing:

1. Flat 2-3/4" thick factory prefabricated structural insulated translucent sandwich panels.
2. Aluminum installation system
3. Aluminum sill flashing

B. Related Sections:

1. Division 03 Section "Cast-in-Place Concrete"
2. Division 05 Section "Structural Steel Framing"
3. Division 06 Section "Rough Carpentry"
4. Division 07 Section Sheet Metal Flashing and Trim"
5. Division 07 Section "Joint Sealants"
6. Division 08 Section "Glazing"

1.3 SUBMITTALS

A. Submit manufacturer's product data. Include construction details, material descriptions, profiles and finishes of components.

B. Submit shop drawings. Include elevations and details.

C. Submit manufacturer's color charts showing the full range of colors available for factory-finished aluminum.

1. When requested, submit samples for each exposed finish required, in same thickness and material indicated for the work and in size indicated below. If finishes involve normal color variations, include sample sets consisting of two or more units showing the full range of variations expected.

a. Sandwich panels: 14" x 28" units
b. Factory finished aluminum: 5" long sections

D. Submit Installer Certificate, signed by installer, certifying compliance with project qualification requirements.

E. Submit product reports from a qualified independent testing agency indicating each type and class of panel system complies with the project performance requirements, based on comprehensive testing of current products. Previously completed reports will be acceptable if for current manufacturer and indicative of products used on this project.

1. Reports required are:

a. International Building Code Evaluation Report
b. Flame Spread and Smoke Developed (UL 723)
c. Burn Extent (ASTM D 635)
d. Color Difference (ASTM D 2244)
e. Impact Strength (UL 972)
f. Bond Tensile Strength (ASTM C 297 after aging by ASTM D 1037)
g. Bond Shear Strength (ASTM D 1002)
h. Beam Bending Strength (ASTM E 72)
i. Insulation U-Factor (NFRC 100)
j. NFRC System U-Factor Certification (NFRC 700)
k. Solar Heat Gain Coefficient (NFRC or Calculations)
l. Condensation Resistance Factor (AAMA 1503)
m. Air Leakage (ASTM E 283)
n. Structural Performance (ASTM E 330)
o. Water Penetration (ASTM E 331)
p. 1200°F Fire Resistance (SWRI)
q. Daylight Autonomy and full Daylight Analysis

1.4 QUALITY ASSURANCE

A. Manufacturer's Qualifications

1. Material and products shall be manufactured by a company continuously and regularly employed in the manufacture of specified materials for a period of at least ten consecutive years and which can show evidence of those materials being satisfactorily used on at least six projects of similar size, scope, and location. At least three of the projects shall have been in successful use for ten years or longer.
2. Panel system must be listed by an ANSI accredited Evaluation Service, which requires quality control inspections and fire, structural and water infiltration testing of sandwich panel systems by an accredited agency.
3. Quality control inspections shall be conducted at least once each year and shall include manufacturing facilities, sandwich panel components and production sandwich panels for conformance with AC177 “Translucent Fiberglass Reinforced Plastic (FRP) Faced Panel Wall, Roof and Skylight Systems” as issued by the ICC-ES.

B. Installer’s Qualifications: Installation shall be by an experienced installer, which has been in the business of installing specified panel systems for at least two consecutive years and can show evidence of satisfactory completion of projects of similar size, scope, and type.

1.5 PERFORMANCE REQUIREMENTS

A. The manufacturer shall be responsible for the configuration and fabrication of the complete panel system.

1. When requested, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
2. Standard panel system shall have less than 0.01 cfm/ft² air leakage by ASTM E 283 at 6.24 PSF (50 mph) and no water penetration by ASTM E 331 at 15 PSF; and structural testing by ASTM E 330.
3. Deflection of entire system shall be no more than L/90, unless otherwise indicated.
4. Structural Loads; Provide system capable of handling the following loads:

    a. Positive Wind Load: 15 PSF
    b. Negative Wind Load: 15 PSF

1.6 DELIVERY STORAGE AND HANDLING

A. Deliver panel system, components and materials in manufacturer's standard protective packaging.

B. Store panels on the long edge; several inches above the ground, blocked and under cover in accordance with manufacturer's storage and handling instructions.

1.7 WARRANTY

A. Submit manufacturer's and installer's written warranty agreeing to repair or replace panel system work, which fails in materials or workmanship within five (5) years of the date of delivery. Failure of materials or workmanship shall include leakage, excessive deflection, deterioration of finish on metal in excess of normal weathering, defects in accessories, insulated translucent sandwich panels and other components of the work.

PART 2 - PRODUCTS

2.1 MANUFACTURER

A. The basis for this specification is for products manufactured by Kalwall Corporation. Other manufacturers may bid this project provided they comply with all of the performance requirements of this specification and submit evidence thereof. Listing other manufacturers' names in this specification does not constitute approval of their products or relieve them of compliance with all the performance requirements contained herein.

B. Basis of Design: Kalwall Corporation

C. Equal products by the following manufacturers will be considered.

1. Kingspan

2. Unigrid.

2.2 PANEL COMPONENTS

A. Face Sheets

1. Translucent faces: Manufactured from glass fiber reinforced thermoset resins, formulated specifically for architectural use.

    a. Thermoplastic (e.g. polycarbonate, acrylic) faces are not acceptable.
    b. Face sheets shall not deform, deflect, or drip when subjected to fire or flame.

2. Interior face sheets:

    a. Flame spread: Underwriters Laboratories (UL) listed, which requires periodic unannounced retesting, with flame spread rating no greater than 50 and smoke developed no greater than 250 when tested in accordance with UL 723.
    b. Burn extent by ASTM D 635 shall be no greater than 1”.

3. Exterior face sheets:

    a. Color stability: Full thickness of the exterior face sheet shall not change color more than 3 CIE Units DELTA E by ASTM D 2244 after 5 years outdoor South Florida weathering at 5° facing south, determined by the average of at least three white samples with and without a protective film or coating to ensure long-term color stability. Color stability shall be unaffected by abrasion or scratching.
    b. Strength: Exterior face sheet shall be uniform in strength, impenetrable by handheld pencil and repel an impact minimum of 70 ft. lbs. without fracture or tear when impacted by a 3-1/4” diameter, 5 lb. free-falling ball per UL 972.

4. Appearance:

    a. Exterior face sheets: Smooth .070 thick and crystal in color.
    b. Interior face sheets: Smooth .045 thick and white in color.
    c. Face sheets shall not vary more than ± 10% in thickness and be uniform in color.

B. Grid Core

1. Thermally Broken I-beam grid core shall be of 6063-T6 or 6005-T5 alloy and temper with provisions for mechanical interlocking of muntin-mullion and perimeter. Width of I-beam shall be no less than 7/16”.
2. I-beam Thermal break: Minimum 1”, thermoset fiberglass composite.

C. Laminate Adhesive

1. Heat and pressure resin type adhesive engineered for structural sandwich panel use, with minimum 25-years field use. Adhesive shall pass testing requirements specified by the International Code Council "Acceptance Criteria for Sandwich Panel Adhesives"."
2. Minimum tensile strength of 750 PSI when the panel assembly is tested by ASTM C 297 after two exposures to six cycles each of the aging conditions prescribed by ASTM D 1037.
3. Minimum shear strength of the panel adhesive by ASTM D 1002 after exposure to four separate conditions:

    a. 50% Relative Humidity at 68° F: 540 PSI
    b. 182° F: 100 PSI
    c. Accelerated Aging by ASTM D 1037 at room temperature: 800 PSI
    d. Accelerated Aging by ASTM D 1037 at 182° F: 250 PSI

2.3 PANEL CONSTRUCTION

A. Provide sandwich panels of flat fiberglass reinforced translucent face sheets laminated to a grid core of mechanically interlocking I-beams. The adhesive bonding line shall be straight, cover the entire width of the I-beam and have a neat, sharp edge.

1. Thickness: 2-3/4"
2. Light transmission: 26 %
3. Solar heat gain coefficient .31
4. Panel U-factor by NFRC certified laboratory: 2-3/4" thermally broken grid of .23U
5. Complete insulated panel system shall have NFRC certified U-factor of .28.
6. Grid pattern: Vertical Plank pattern (Basis of Design: Vertikal)

B. Standard panels shall deflect no more than 1.9" at 30 PSF in 10' 0" span without a supporting frame by ASTM E 72.

C. Standard panels shall withstand 1200° F fire for minimum one hour without collapse or exterior flaming.

D. Thermally broken panels: Minimum Condensation Resistance Factor of 80 by AAMA 1503 measured on the bond line.

2.4 BATTENS AND PERIMETER CLOSURE SYSTEM

A. Closure system: Standard extruded aluminum 6063-T6 and 6063-T5 alloy and temper clamp-tite screw type closure system.

B. Sealing tape: Manufacturer's standard, pre-applied to closure system at the factory under controlled conditions.

C. Fasteners: 300 series stainless steel screws for aluminum closures, excluding final fasteners to the building.

D. Finish:

1. Manufacturer's factory applied finish, which meets the performance requirements of AAMA 2604. Color to be selected from manufacturer's standards.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Installer shall examine substrates, supporting structure and installation conditions.

B. Do not proceed with panel installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Metal Protection:

1. Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer or by applying sealant or tape recommended by manufacturer for this purpose.
2. Where aluminum will contact concrete, masonry or pressure treated wood, protect against corrosion by painting contact surfaces with bituminous paint or method recommended by manufacturer.

3.3 INSTALLATION

A. Install the panel system in accordance with the manufacturer's suggested installation recommendations and approved shop drawings.

1. Anchor component parts securely in place by permanent mechanical attachment system.
2. Accommodate thermal and mechanical movements.
3. Set perimeter framing in a full bed of sealant compound, or with joint fillers or gaskets to provide weather-tight construction.

B. Install joint sealants at perimeter joints and within the panel system in accordance with manufacturer's installation instructions.

3.4 CLEANING

A. Clean the panel system interior and exterior, immediately after installation.

B. Refer to manufacturer's written recommendations.

END OF SECTION 08 45 23

SECTION 09 29 00 – GYPSUM BOARD ASSEMBLIES

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

B. Refer to the Drawings for locations of work to be performed.

1.02 SUMMARY

A. Section includes:
1. Metal stud wall framing.
2. Metal soffit and bulkhead framing.
4. Gypsum board and joint treatment.
5. Acoustic insulation.

1.03 PERFORMANCE REQUIREMENTS

A. Stud Selection: Select stud thickness so unbraced span does not exceed heights permitted by the Steel Stud Manufacturers Associations (SSMA) with maximum deflection of 1/360 for 5 psf uniform load.

B. Acoustic Attenuation for above restroom ceilings.

1.04 SUBMITTALS

A. Shop Drawings:
1. Indicate details associated with suspended ceilings.

B. Product Data:
1. Submit data on metal framing, gypsum board, joint tape; and acoustic accessories.
2. Indicate maximum unbraced height permitted for each stud gauge and yield strength.

1.05 QUALITY ASSURANCE

A. Perform Work in accordance with the following Gypsum Association reference standards:
1. GA-214 - Recommended Specification: Levels of Gypsum Board Finish.
2. GA-216 - Recommended Specifications for the Application and Finishing of Gypsum Board.
3. GA-600 - Fire Resistance Design Manual.

B. Fire Rated Construction: Rating as indicated on Drawings.
1. Tested Rating: Determined in accordance with ASTM E-119.

1.06 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years documented experience.

B. Installer: Company specializing in performing Work of this section with minimum three years documented experience.

C. Design partitions and ceilings under direct supervision of professional engineer experienced in design of this Work and licensed at Project location.

PART 2 PRODUCTS

2.01 GYPSUM BOARD ASSEMBLIES

A. Metal Framing Manufacturers:
   1. Current member of SSMA.

B. Available Gypsum Board and Joint Treatment Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include the following:
   1. Georgia Pacific
   2. Lafarge North America
   3. National Gypsum
   4. United States Gypsum Company

C. Abuse-Resistant Gypsum Board:

   1. Subject to compliance with requirements, provide basis of design product or a comparable product by one of the following manufacturers:
      a. Georgia Pacific
      b. Lafarge North America
      c. National Gypsum Company
      d. United States Gypsum Company

D. Acoustic Insulation Manufacturers:
   1. CertainTeed; Thermafiber Sound Attenuation Fire Blankets (SAFB) or CertaPro AcoustaTherm Batts.
   2. Johns Manville; MinWool-1200 Sound Attention Fire Batts or Sound Control Batts.
   3. Owens Corning; Sound Attenuation Batts (Mineral Wool) or Sound Attenuation Batts.
   4. Thermafiber; Thermafiber Sound Attenuation Fire Blankets (SAFB).

2.02 INTERIOR GYPSUM BOARD

A. Comply with ASTM C-36 / C-36M or ASTM C-1396 / C-1396M, as applicable to type of gypsum board indicated and whichever is more stringent.
B. General Use, High Impact applications everywhere.

1. Basis-of-Design Product: National Gypsum Hi-Impact XP Wallboard system or a comparable product by one of the manufacturers listed above. ASTM C-36, manufactured to produce greater resistance to surface indentation and through penetration than standard gypsum panels. **Use board with color facing paper.**
2. Available Manufacturers: Subject to compliance with requirements, provide the basis of design product or a comparable product by one of the Available Manufacturers listed in the Gypsum Board Assemblies Article above.
3. Thickness: 5/8-inch.
4. Core: Type X
4. Long Edges: Tapered and featured (rounded or beveled) for prefilling.
5. Additional applicable testing for impact-resistant material:

    a. Surface Abrasion – Modified ASTM D-4977 – Mean Depth of Abrasion: 0.015”.
    b. Surface Indentation Resistance – Modified ASTM D-5420: Mean Depth of Abrasion: 0.114”.
    c. Single Drop Soft Body Impact Test – Modified ASTM E-695 – ft/lbs required to penetrate: equal/greater than 540.
    d. Progressive Soft Body Impact Test – Modified ASTM E-695 – ft/lbs required to penetrate: equal/greater than 420.
    e. Hard Body Impact Test – Ft/lbs required to penetrate: equal/greater than 160.

C. Ceiling application: Manufactured to have more sag resistance than regular-type gypsum board.
    1. Thickness: 5/8-inch.
    2. Long Edges: Tapered.
    3. Classification: Type X

2.03 FRAMING MATERIALS

A. Studs and Tracks: ASTM C-645; galvanized sheet steel, size as indicated on Drawings, 'C' shape with the following minimum base metal thicknesses:
    1. Studs: Minimum 20-gauge / 33 mils, yield stress, Fy = 33 ksi.
    2. Studs and tracks with thicknesses equivalent to those specified are permitted, provided structural properties meet or exceed properties of studs with specified thickness.

B. Deep Leg Deflection Track: ASTM C-645 top runner with 2-1/2” or greater deep flanges, 30 mils, 20-gauge, 33 ksi.

C. Furring, Framing and Accessories: ASTM C-645.

D. Fasteners for Framing: ASTM C-1513.

E. Anchorage to Substrate: Tie wire, nails, screws, and other metal supports, of type and size to suit application; to rigidly secure materials in place.

2.04 ACCESSORIES

A. Acoustic Insulation: ASTM C-665, Type I, unfaced semi rigid mineral fiber or fiberglass batt type, thickness indicated on Drawings, friction fit, with maximum flame/smoke properties of 25/450 in accordance with ASTM E-84.

B. Metal Trim: ASTM C-1047; hot-dipped galvanized steel; with or without paper facing.
   1. Corner beads.
   2. Edge Beads: Profile to suit application.
   3. Expansion joints.

C. Joint Materials:
   1. Gypsum Board: ASTM C-475 / C-475M; reinforcing tape, joint compound, and water.

D. Fasteners for Gypsum Board:
   1. Metal Framing 33-mils Thick and Less: ASTM C-1002, Type S.
   2. Metal Framing Greater than 33-mils Thick: ASTM C-954.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that site conditions are ready to receive work and opening dimensions are as indicated on Drawings.

3.02 INSTALLATION

A. Metal Stud Framing Installation:
   1. Install framing studs in accordance with GA-216 and GA-600.
   2. Framing Spacing: 16”o.c.
   3. Extend studs minimum 6-inches above ceilings, unless otherwise specified or otherwise indicated on Drawings.

      a. Laterally brace studs within 3-inches of top track.
      b. Do not attach metal stud runner track to the metal roof deck. Provide support from structural members only.

   4. Extend stud framing through the ceiling to the deck (roof or floor) above for fire rated partitions, acoustically rated partitions, and other partitions indicated on Drawings.
      a. Provide deep leg deflection track as top runner.
      b. Maintain clearance under structural building members to avoid deflection transfer to studs.
      c. Laterally brace studs within 12-inches of top track.
      d. Do not fasten studs to top track.

5. Blocking: Bolt or screw steel channels to studs. Install blocking for support of plumbing fixtures, toilet partitions, wall cabinets, toilet accessories, hardware, handrails, grab bars, and other fittings and fixtures supported by gypsum board partitions.

B. Wall Furring Installation:
   1. Erect wall furring for direct attachment to concrete masonry walls.
   2. Erect furring channels vertically; space maximum 16-inches o.c. unless indicated otherwise, not more than 4-inches from floor and ceiling lines and abutting walls. Secure in place on alternate channel flanges at maximum 24- inches on center.
   3. Erect metal stud framing tight to concrete masonry walls, attached by adjustable furring brackets.
   4. Fireblock furred spaces at fire rated walls maximum 10-feet on center horizontally and vertically in accordance with applicable code.

C. Furring For Fire Ratings: Install furring as required for fire resistance ratings indicated and to GA-600 requirements.

D. Acoustic Accessories Installation:
   1. Comply with ASTM C-919 and manufacturer's instructions to achieve STC ratings indicated on Drawings.
   2. Place acoustic insulation in partitions tight within spaces, around cut openings, behind and around electrical and mechanical items within or behind partitions, and tight to items passing through partitions.
   3. Close off sound flanking paths around or through gypsum board assemblies including sealing partitions above acoustic ceilings.

E. Gypsum Board Installation:
   1. Install gypsum board in accordance with GA-216 and GA-600.
   2. Erect single layer gypsum board vertically, with edges occurring over firm bearing.
   3. Double Layer Applications:

      a. Secure second layer to first with fasteners.
      b. Place second layer parallel to first layer. Offset joints of second layer from joints of first layer.
   4. At stairwell and other walls extending for heights greater than one floor, install gypsum board horizontally with ends staggered and occurring over framing. Install horizontal control joint at floor lines.
   5. Use screws when fastening gypsum board to metal furring or framing.

   6. Place control joints consistent with lines of building spaces as indicated and at the following spacing when not indicated:

      a. Maximum Length Between Control Joints: 30- feet.
      b. Maximum Ceiling Area Contained Between Control Joints: 900 sf.
      c. At corners of door heads, at each jamb.

7. Place corner beads at external corners. Use longest practical length. Place edge trim where gypsum board abuts dissimilar materials and locations as indicated.

F. Joint Treatment:
1. Finish in accordance with the following GA-214 Levels:

a. Level 1: None.
b. Level 2: Wall surfaces above finished ceilings, concealed from view.
c. Level 3: None.
d. Level 4: Wall and ceiling surfaces exposed to view.
e. Level 5: None.

2. Joints Exposed to View: Feather coats on to adjoining surfaces so that camber is maximum 1/32-inch.

3.03 ERECTION TOLERANCES

A. Maximum Variation of Finished Gypsum Board Surface from True Flatness: 1/8-inch in 10-feet in any direction.

END OF SECTION 09 29 00

SECTION 09 30 00 – TILE

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

B. Refer to the Drawings for locations of work to be performed.

1.02 DEFINITIONS

A. Tile includes surfacing units made from clay or other ceramic materials. The types of work of this Section include:
   1. Quarry Floor Tile
   2. Tile Base

1.03 QUALITY ASSURANCE

A. Tile Manufacturing Standard: TCA 137.1. Furnish tile complying with Standard Grade requirements, unless otherwise indicated.

B. Proprietary Materials: Handle, store, mix and apply proprietary setting and grouting materials in compliance with manufacturer's instructions.
   1. Provide materials obtained from one source for each type of color of tile, grout and setting material.

1.04 SUBMITTALS

A. Product Data: Submit manufacturer’s technical information and installation instructions for materials required, except bulk materials. Include certifications and other data to show compliance with these Specifications.

B. Samples:
   1. For initial selection of colors, submit manufacturer’s color charts consisting of actual tiles or sections of tiles showing full range of colors available, for each type of tile specified. Include samples of grout and accessories requiring color selection.

1.05 PRODUCT HANDLING

A. Deliver packaged materials and store in original containers with seals unbroken and labels intact until tie of use, in accordance with manufacturer’s instructions.

1.06 JOB CONDITIONS

A. Maintain environmental conditions and protect work during and after installation in accordance with referenced standards and manufacturer's printed recommendations.

PART 2 PRODUCTS

2.01 TILE PRODUCTS

A. Available Manufacturers:
   a. Dal-Tile Corp (Basis-of-Design)
   b. Louisville Tile
   c. American Olean

B. Quarry Tile: Refer to "Floor Finish Schedule" in the Drawings.

C. Quarry Tile Base: Refer to "Base Finish Legend" in the Drawings.

D. Unglazed Quarry Tile
   1. Provide square-edges flat tile complying with the following requirements:
      a. Wearing surface: non-abrasive
      b. Nominal facial dimensions: 6-inch x 6-inch
      c. Nominal thickness: 1/2"
      d. Face: Plain
      f. Square edge: No pillow edges

E. Trim and Special Shapes: Rounded external corners and trim shapes, of same material and finish as base.

2.02 MORTAR AND GROUT

A. Thick-Set Cement Mortar (for quarry tile): ANSI A-108.1.

B. Latex-Portland Cement Grout: Compound composed of portland cement with latex additive for a more flexible and less permeable grout. Color as selected by Architect from manufacturer's standard colors.

   1. Provide product with latex additive which is compatible with latex additive in latex-portland cement mortar.
   2. Products offered by manufacturers to comply with requirements, include the following:

      a. TEC (Basis of Design)
      b. Latex Modified Floor Grout: L&M-Surco Mfg., Inc.
      b. Laticrete Dry Bond: Laticrete International, Inc.
      c. Custom Building Products

2.03 MISCELLANEOUS MATERIALS

A. Temporary Protective Coating: Either product indicated below that is formulated to protect exposed surfaces of tile against adherence of mortar and grout; compatible with tile, mortar, and grout products; or easily removable after grouting is completed without damaging grout or tile.
   1. Petroleum paraffin wax, fully refined and odorless, containing at least 0.5 percent oil with a melting point of 120 to 140 degrees F per ASTM D-87.
   2. Grout release in form of manufacturer's standard proprietary liquid coating that is specially formulated and recommended for use as temporary protective coating for tile.

C. Metal Trim: Schluter Systems (Louisville Tile), Dilex-Ahka, Satin Anodized Aluminum

D. Tile Cleaner: A neutral cleaner capable of removing soil and residue without harming tile and grout surfaces, specially approved for materials and installations indicated by tile and grout manufacturers.

D. Grout Sealer: Manufacturer's standard silicone product for sealing grout joints that does not change color or appearance of grout.
   1. Products:
      a. MAPEI Corp.; KER 004, Keraseal Penetrating Sealer for unglazed grout and tile
      b. W.R. Bonsal Company; Grout Sealer
      c. Bostik; CermaSeal Grout Sealer
      d. C-Cure; Penetrating Sealer 978

PART 3 EXECUTION

3.01 INSPECTION

A. Examine surfaces to receive tile work and conditions under which tile will be installed. Do not proceed with tile work until surfaces and conditions comply with requirements indicated in referenced tile installation standard.

B. 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 installed tile.

   1. Verify that substrates for setting tile are firm; dry; clean; free of oil, waxy films, and curing compounds; and within flatness tolerances required by referenced ANSI A108 Series of tile installation standards for installations indicated.
   2. 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 before installing tile.
   3. Verify that joints and cracks in tile substrates are coordinated with tile joint locations; if not coordinated, adjust joint locations in consultation with Architect.

3.02 INSTALLATION, GENERAL

A. ANSI Tile Standard: Comply with applicable parts of ANSI 108 series of tile installation standards included under "American National Standard for the Installation of Ceramic Tile".

B. TCA Installation Guidelines: TCA “Handbook for Ceramic Tile Installation”, comply with TCA installation methods indicated or, if not otherwise indicated, as applicable to installation conditions shown.

C. Extend tile work into recess under or behind equipment and fixtures, to form a complete covering without interruptions, except as otherwise shown. Terminate work neatly at obstructions, edges and corners without disrupting pattern or joint alignments. Lay-out room so as not to have cuts less than half a tile.

D. 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 that plates, collars, or covers overlap tile.

E. Jointing Pattern: Unless otherwise shown, lay tile in grid pattern. Align joints when adjoining tiles on floor, base and trim are same size. Lay-out tile work and center tile fields in both directions in each space or on each wall area. Adjust to minimize tile cutting. Provide uniform joints widths, unless otherwise shown. Provide uniform joint widths, unless otherwise indicated.

E. Expansion Joints: Locate expansion joints and other sealant filled joints, including control, contraction, and isolation joints, where indicated, or if not indicated, at spacing and location recommended in TCA “Handbook for Ceramic Tile Installation”, and approved by Architect. Do not saw-cut joints after installing tiles.
   1. Locate joints in tile surfaces directly above joints in concrete substrates.
   2. Prepare joints and apply sealants to comply with requirements in Division 7 Section "Joint Sealants."

F. Grout tile to comply with referenced installation standards, using grout materials indicated.

   1. Mix and install proprietary components to comply with grout manufacturer’s directions.

G. Lay tile in flat and consistent plane with no waves and no tiles ‘proud’ of adjacent tile.

H. Cut edges or exposed sharp conditions are to be ground smooth.

J. Broken or chipped tiles are to be removed and replaced.

3.04 FLOOR INSTALLATION METHOD

A. General: Install tile to comply with requirements in the Floor Tile Installation Schedule, including those referencing TCA installation methods and ANSI A108 Series of tile installation standards.
   1. For installations indicated below, follow procedures in ANSI A108 Series tile installation standards for providing 95 percent mortar coverage.

      a. Tile floors in wet areas.
         1) Where floor drains are provided, tile bed shall be prepared and tile installed to provide minimum ¼ per 1’-0” slope to the floor drain.

b. Tile floors composed of rib-backed tiles.

B. Quarry Tile: Install tile to comply with requirements indicated below for setting bed methods, TCA installation methods related to types of subfloor construction and grout types:

1. Thick Set-Portand Cement Mortar: ANSI A-108.1
   a. Bond Coat: Portland cement paste on plastic bed; or thin-set portland cement on cured bed, ANSI A-108.5, at Contractor's option.
   b. Concrete Subfloors, Interior: TCA F121
   c. Grout: Latex-Portland Cement
   d. Waterproofing and Antifracture Membrane:

      1) Laticrete International - No. 9235
      2) Mapro - PRP 315
      3) Mer-Kote Products - BFP Membrane

3.05 CLEANING AND PROTECTION

A. Cleaning: Upon completion of placement and grouting, clean all tile surfaces so they are free of foreign matter.
   1. Unglazed tile may be cleaned with acid solutions only when permitted by tile and grout manufacturer's printed instructions, but not sooner than (14) days after installation. Protect metal surfaces, cast and vitreous plumbing fixtures from effects of acid cleaning. Flush surface with clean water before and after cleaning.

B. Finished Tile Work: Leave finished installation clean and free of cracked, chipped, broken, unbonded, or otherwise defective work.

C. Sealer for Grout: Apply sealer to cementitous grout joints according to grout sealer manufacturer written instructions. As soon as grout sealer has penetrated grout joints, remove excess sealer that has gotten on tile faces by wiping with soft cloth.

D. Protection: When recommended by tile manufacturer, apply a protective coat of neutral protective cleaner to completed tile walls and floors. Protect installed tile work with "Kraft" paper or other heavy covering during construction period to prevent damage and wear.
   1. Prohibit foot and wheel traffic from using tiled floors for at least three days after grouting is completed.
   2. Before final inspection, remove protective coverings and rinse neutral cleaner from tile surfaces.

3.06 MAINTENANCE STOCK

A. Provide (1) unopened and any partial boxes of quarry tile, and quarry tile base to Owner at completion of the Project.

END OF SECTION 09 30 00

SECTION 09 51 13 - ACOUSTICAL LAY-IN CEILINGS

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 acoustical and other panel ceiling materials and exposed suspension systems for ceilings.

1.3 RELATED

A. Division 09 Section “Gypsum Board Assemblies” for gypsum ceiling edge trim/fascia.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Coordination Drawings: Drawn to scale and coordinating acoustical panel ceiling installation with hanger attachment to building structure and ceiling mounted items:

C. Samples: For each exposed finish.

D. Product test reports.

E. Research/evaluation reports.

F. Maintenance data.

1.5 QUALITY ASSURANCE

A. Acoustical Testing Agency Qualifications: An independent testing laboratory or an NVLAP-accredited laboratory.

B. Fire-Test-Response Characteristics:

1. Surface-Burning Characteristics: Acoustical panels complying with ASTM E 1264 for Class A materials, when tested per ASTM E 84.

    a. Smoke-Developed Index: 450 or less.

C. Seismic Standard: Comply with the following:

1. ASCE 7, "Minimum Design Loads for Buildings and Other Structures": Section 9, "Earthquake Loads."

1.6 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Full-size panels equal to 2% of quantity installed.

2. Suspension System Components: Quantity of each exposed component equal to 2% of quantity installed.

PART 2 - PRODUCTS

2.1 ACOUSTICAL PANEL CEILINGS, GENERAL

A. Acoustical Panel Standard: Comply with ASTM E 1264.

B. Metal Suspension System Standard: Comply with ASTM C 635.

C. Attachment Devices: Size for five times the design load indicated in ASTM C 635, Table 1, "Direct Hung," unless otherwise indicated. Comply with seismic design requirements.

D. Wire Hangers, Braces, and Ties: Zinc-coated carbon-steel wire; ASTM A 641/A 641M, Class 1 zinc coating, soft temper.

1. Size: Select wire diameter so its stress at 3 times hanger design load (ASTM C 635, Table 1, "Direct Hung") will be less than yield stress of wire but provide not less than 0.106-inch- diameter wire.

E. Metal Edge Moldings and Trim: Type and profile indicated or, if not indicated, manufacturer's standard moldings for edges and penetrations that comply with seismic design requirements; formed from sheet metal of same material, finish, and color as that used for exposed flanges of suspension system runners.

2.2 ACOUSTICAL PANELS FOR ACOUSTICAL PANEL CEILING:

A. Basis-of-Design Product: Subject to compliance with requirements, provide USG Sheetrock Lay-in Ceiling panel ClimaPlus Vinyl (Item No 3260) panel or a comparable product by one of the following:

1. Armstrong
2. Certainteed

B. Vinyl coated lay-in ceiling panel, sealed edges, meets USDA/FSIS requirements for food processing.

C. Color: White.

D. LR: Not less than 0.77

E. CAC: Not less than 35.

F. Edge/Joint Detail: Square

G. Thickness: 1/2”

H. Modular Size: 24 by 24 inches, as shown.

I. Washable (ASTM D4828), Soil-resistive, scratch (Hess rake test) and impact resistant (ASTM D1037)

J. Recycled content: 80%

K. Accessories: Provide hold-down clips at tiles in all restrooms.

L. Steel Suspension System: Main and cross runners roll formed from cold-rolled steel sheet, prepainted, electrolytically zinc coated, or hot-dip galvanized according to ASTM A 653/A 653M, not less than G30 coating designation, with prefinished 15/16-inch-wide metal caps on flanges.

1. Structural Classification: Intermediate-duty system.
2. End Condition of Cross Runners: Override (stepped) type.
3. Cap Material: Steel cold-rolled sheet.
4. Color: White

M. Accessories: Provide outside corner bullnose trim for use at all CMU bullnose conditions.

2.3 METAL SUSPENSION SYSTEM FOR ACOUSTICAL PANEL CEILING

A. Basis-of-Design Product: Subject to compliance with requirements, provide USG Interiors, Inc.; Donn ZXLA or a comparable product by one of the following:

1. Armstrong
2. Chicago Metallic Corporation

B. 15/16" galvanized steel system made of painted hot-dipped galvanized steel with an aluminum face, polyester paint finish, and stainless-steel clip for corrosion protection: Grid components are connected with plug-in positive-lock insertion for quick installation and removal without tools. Standard cross tees have offset ends that rest on main tees for better appearance without sagging or twisting. The cross tees also cantilever during installation without dropping out. Special corrosion-proof, stainless-steel locking tee ends provide pullout tension values in excess of 200 lbs. A painted, hot-dipped galvanized M7Z wall molding is recommended for maximum system performance.

1. Structural Classification: Intermediate-duty system.
2. End Condition of Cross Runners: Override (stepped) type.
3. Tee ends: corrosion-proof, stainless-steel locking, to provide pull-out tension values in excess of 200 lbs.
4. Aluminum-capped grid system, suitable for use in food processing areas, meets USDA/FSIS requirements.

C. Accessories: Provide outside corner bullnose trim for use at all CMU bullnose conditions.

PART 3 - EXECUTION

3.1 VERIFICATION

A. Verify that ceiling elevation shown is minimum 8” below building structure to maintain clearances for systems. If this clearance is not available, notify Architect before proceeding.

3.2 INSTALLATION

A. Comply with ASTM C 636 and seismic design requirements indicated, per manufacturer's written instructions and CISCA's "Ceiling Systems Handbook."

B. Measure each ceiling area and establish layout of acoustical panels to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width panels at borders.

1. The majority of tiles along any ceiling edge shall be provided with a minimum panel width of 6”. Where the shape of a space requires that incidental panel widths of less than 6” are required, they will be acceptable.
2. Support wires to be installed at ends of each main tee at a maximum of 6” from wall.

3. Support wires to be installed at either side of each splice, maximum 6” from splice.
4. Support wires to be installed throughout grid at maximum of 4’-0” o.c.

C. Suspend ceiling hangers from building's structural members, plumb and free from contact with insulation or other objects within ceiling plenum. Splay hangers only where required to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with location of hangers, use trapezes or equivalent devices. 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.

1. All ceiling support wires to be attached to building structure. Do not hang from roof deck bulb tees or joist bridging. Do not support ceilings directly from permanent metal forms or floor deck; anchor into concrete slabs or from bar joists. Do not attach hangers to steel deck tabs or to steel roof deck.

D. Install edge moldings and trim of type indicated at perimeter of acoustical ceiling area and where necessary to conceal edges of acoustical panels. Screw attach moldings to substrate at intervals not more than 16 inches o.c. and not more than 3 inches from ends, leveling with ceiling suspension system to a tolerance of 1/8 inch in 12 feet. Miter corners accurately and connect securely.

1. Install outside corner bullnose trim at all CMU bullnose conditions.

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 a neat, precise fit.

G. Install acoustical clouds according to manufacturer’s guidelines.

END OF SECTION 09 51 13

SECTION 09 65 00 – RESILIENT FLOORING

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 DESCRIPTION OF WORK

A. Extent of resilient flooring and accessories is shown on Drawings and in Schedules.

B. Provide wall base as noted on the Room Finish Schedule and on all casework toe kicks at exposed sides.

C. Special floor preparation required to grind floor, fill cracks and leveling fill as required for a smooth installation. All existing slabs where tile has been removed shall be ground / polished to a high sheen (no color-80-grit) to receive new resilient flooring.

1.03 QUALITY ASSURANCE

A. Manufacturer: Provide each type of resilient flooring and accessories as produced by a single manufacturer, including recommended primers, adhesives, sealants, and leveling compounds.

1. Wherever possible, provide required resilient flooring and accessories produced by a single manufacturer.

B. Fire Test Performance: Unless otherwise indicated, provide resilient flooring having the following classifications or properties when tested in accordance with the standard fire tests referenced below:

1. Flame Spread: Not more than 75 as per ASTM E 84.
2. Smoke Developed: Not more than 450 as per ASTM E662.

1.04 SUBMITTALS

A. Product Data: Submit 2-copies of manufacturer’s technical data and installation instructions for each type of resilient flooring and accessory.

B. Samples: Submit, for verification purposes, samples of each type, color, and pattern of resilient flooring, including accessories, required, indicating full range of color and pattern variation.

C. Maintenance Instructions: Submit 2-copies of manufacturer’s recommended maintenance practices for each type of resilient flooring and accessory.

1.05 JOB CONDITIONS

A. Maintain minimum temperature of 70-degrees F in spaces to receive resilient flooring for at least 48-hours prior to installation, during installation, and not less than 48-hours after installation. Store resilient flooring materials in spaces where they will be installed for at least 48-hours before beginning installation. Subsequently, maintain minimum temperature of 70-degrees F in areas where work is completed.

B. Install resilient flooring and accessories after other finishing operations, including painting, have been completed. Do no install resilient flooring over concrete slabs until the latter have been cured and are sufficiently dry to achieve bond with adhesive as determined by manufacturer's recommended bond and moisture test.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products which may be incorporated in the work include the following:

1. Sport Flooring:

a. Forbo: Marmoleum Sport Flooring (Basis of Design Product) or approved equal by:

1. American Biltrite
2. Flexco
3. Noraplan
3. StaticWorx

2.02 MATERIALS

A. Colors and Patterns: As shown or as selected by Architect / Owner from manufacturer's full color range.

B. Sport Flooring:

1. Size: As indicated on drawings.
2. Non-asbestos
3. Thickness: 0.12 inch minimum
4. Furnish tile from (1) lot sufficient for the entire Project, including repair and attic stock.

C. Resilient Base:

1. See specification section 09 65 13.

D. Accessories:

1. Edge Reducing Strips: Beveled 1-inch to 1-1/2-inch wide by thickness required of vinyl or rubber, same manufacturer as base; colors as selected by Architect. Use where polished concrete floor meets other finished flooring, unless otherwise noted.
2. Moldings and Edge Strips: Same material as flooring, profile to suit flooring material transitions.

E. Adhesives:

1. Provide water resistant type adhesive as recommended by manufacturer of material being installed.
2. Asphalt emulsions and other non-waterproof emulsions will not be accepted.
3. Non-Asbestos.
4. Contractor and Manufacturer must warrant that adhesive will not bleed or seep through tile joints after installation.
5. Primers and Adhesives: Waterproof; types recommended by flooring manufacturer.

F. Trowelable underlayment and patching compound:

1. Latex modified, Portland cement-based formulation as manufactured by Ardex or approved equal. Gypsum based products are not acceptable.

PART 3 EXECUTION

3.01 PREPARATION OF EXISTING CONCRETE SLABS

A. All existing slabs where tile has been removed shall be ground / polished to a high sheen (no color-80-grit) to receive new resilient flooring.

B. Remove existing floor covering including adhesive.

B. Surfaces to be treated must be clean, dry and absorbent. Confirm surface absorbency with light spray water. If surface does not wet uniformly, use the manufacturer's recommended surface cleaner or mechanical process to remove remaining surface contaminants.

C. For existing concrete floor, surfaces must be clean and structurally sound. Remove all foreign materials including bond breakers, curing agents, surface grease and oil manufacturer's recommended surface prep cleaner.

D. Surface and air temperatures for application should be 40-100 degrees F.
E. Grind the concrete surface with diamond grinding and tooling equipment as needed to achieve the desired exposure. Equipment should be capable of getting to within 1/8-inch of wall surface to minimize handwork.

1. Multiple passes in different directions, removing scratches from previous pass.

2. Remove residue with buffing pads.

F. Remove all dust and debris using an auto-scrubbing machine using manufacturer's recommended cleaner.

G. Grind concrete surface / floor to a 80-grit finish.

3.02 PREPARATION

A. Install resilient flooring materials upon subflooring as indicated.

B. Perform mat bond tests in each major area (1 per ~ 1,000 sq. ft.). This shall consist of the proposed subfloor preparation, mitigation and leveling or smoothing products. Examine after 72-hours to determine whether the bond of the system is very good to the substrate, if the preparation is sufficient and to look for signs of moisture. Do not proceed with the installation until all the results of the bond test are acceptable.

C. Inspect subflooring before starting work. Notify Architect in writing of any defects in subflooring. Do not proceed with the Work of this Section until such defects have been entirely corrected. Starting of the Work is this Section shall mean acceptance of condition of the subflooring by Contractor for the Work of this Section.

D. Immediately prior to installation of resilient flooring materials, subflooring shall be level, free of springiness, dust, grit, grease, thoroughly dry and in proper condition to receive flooring.

E. Subflooring is to have high sports ground smooth and low spots filled with Ardex or other approved cementitious latex based fill material. Floor to be smooth without dimples or bumps. Entire area of floor is to be sanded prior to installation of flooring. Sweep or vacuum, mop slab to remove all loose material prior to application of primer or adhesive to ensure a smooth finished floor.

3.03 INSTALLATION

A. General:

1. Extend resilient flooring below casework and cabinets.
2. Install flooring using method indicated in strict compliance with manufacturer's recommendations. Extend flooring into toe spaces, door reveals, and into closets and similar openings.
3. Maintain reference markers, holes, or openings that are in place or plainly marked for future cutting by repeating on finish flooring as marked on subfloor. Use chalk or other non-permanent marking devices.
4. Install flooring on covers for telephone and electrical ducts and other such items as occur within finished floor areas. Maintain overall continuity of color and pattern with pieces of flooring installed on these covers. Tightly cement edges to perimeter of floor around covers and to covers.

5. Tightly cement flooring to subbase without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, or other surface imperfections. Hand roll flooring at perimeter of each covered area to assure adhesion.

B. Deliver materials to the Project Site in manufacturer's original containers with brand name identified. Store materials at 70-degrees F. Maintain 70-degrees F in spaces where flooring is being installed for at least 48-hours before, during and 48-hours after installation. Provide adequate ventilation to take off moisture and fumes. Unless otherwise specified, materials and methods used are per manufacturer's recommendations.

C. Adhesive: Apply adhesive to floor with notched steel trowel or spray adhesive, as per manufacturer's printed installation directions.

D. Tile: Lay tile so that entire under surface will be bonded securely in place. Fit tiles so that each is in tight contact with surrounding tiles and align joints.

1. Tile shall be laid with grain running in one direction. Checkerboard style is not acceptable.
2. Edges: Lay field out from midpoint of long axis of space so that opposite edge tile will be of equal width, discounting minor offsets. Scribe tile carefully to wall and cut to ensure clean sharp edge. Adjust as necessary to avoid use of cut widths less than 1/2 tile at room perimeters. Lay tile square to room axis, unless otherwise shown.
3. Remove and replace tiles that indicate "telegraphing" or "pings" of dirt or debris or other imperfections as determined by Architect.

E. Base: Secure base to walls, partitions, with waterproof cement. Make joints tight; ensure that base has its top, bottom and edges are in firm contact with wall and floor.

F. Accessories:

1. Place resilient edge strips tightly butted to flooring and secure with adhesive. Install edging strips at edges of flooring which would otherwise be exposed.

3.04 CLEANING AND PROTECTION

A. Initial Maintenance (min, 72-hours after installation):

1. Dust mop or vacuum the floor to remove dirt or girt.
2. Survey the floor for any damaged areas.
3. Damp mop areas using a green seal certified cleaner.
4. Scrub the floor thoroughly with a floor scrubber using the manufacturer approved pad. Do not allow the area to dry during scrubbing.
5. Wet vacuum the soiled solution, rinse the floor with clean water and allow to dry.
6. Buff to a high shine per the manufacturer's instructions (NO WAX).

B. Remove any excess adhesive or other surface blemishes, using neutral type cleaners as recommended by flooring manufacturer. **Protect installed flooring with heavy "Kraft" paper or other covering.**

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. Use protection methods recommended in writing by manufacturer.

3.05 ADDITIONAL MATERIALS (Attic Stock):

A. Provide to Owner, and store in place designated by the Owner, (6) unopened boxes of each material and color installed.

END OF SECTION 09 65 00

SECTION 09 65 13 - RESILIENT WALL BASE AND ACCESSORIES

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. Resilient wall base.
2. Molding accessories.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Samples for Initial Selection: For each type of product indicated.

C. Samples for Verification: For each type of product indicated, in manufacturer's standard-size Samples but not less than 2” long, of each resilient product color, texture, and pattern required.

1.4 QUALITY ASSURANCE

A. The wall base and trim shall be constructed of first quality materials, properly vulcanized, and shall be smooth and free from imperfections which detract from its appearance. The base shall conform fully to all the requirements of Standard Specification F-1861, Type TS (Thermoset Vulcanized Rubber), Group1 (solid).

1.5 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.

1.6 PROJECT CONDITIONS

A. Maintain 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 post installation period, maintain temperatures within range recommended by manufacturer, but not less than 60 deg F or more than 95 deg F.

C. Install resilient products after other finishing operations, including painting and vinyl floor installation, have been completed.

1.7 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Furnish no less than two percent (2%) of each type, color, pattern, and size of resilient product installed.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to manufacturers specified.

B. Basis of Design Product: The design for the cove base is based on the product specified. Subject to compliance with requirements, provide either the named product or a comparable product by one of the other manufacturers specified.

2.2 RESILIENT WALL BASE (Rubber)

A. Type TP (Thermoplastic Rubber), 4”, as indicated, x 1/8” rubber cove base vulcanized and extruded from a synthetic rubber compound conforming with ASTM F 1861. Design with a ribbed back and top-lip for tight fit. Provide smooth, low-gloss satin or matte finish that resists scuffing, gouging and most chemicals.

1. Basis of Design Product: Johnsonite; Traditional Wall Base.

2. Available Manufacturers:

a. Armstrong World Industries, Inc.
b. Azrock Commercial Flooring
c. Burke Mercer Flooring Products
d. Flexco

e. Johnonsite
f. Roppe Corporation
g. Mohawk Group

B. Lengths: Provide product in rolls, not sections.

C. Outside Corners: Job formed.

D. Inside Corners: Mitered, job formed.

E. Color: To be selected from manufacturer's full range of available colors.

2.3 INSTALLATION MATERIALS

A. Sharp utility knife, hand roller, 1/8" notched trowel or wall base cartridge gun, trowelable Leveling and Patching Compounds:

B. Adhesives: Water-resistant type recommended by manufacturer to suit resilient products and substrate conditions indicated.

1. For treads: as recommended by tread manufacturer to meet site conditions.

2. Use adhesives that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):

a. Cove Base Adhesives: 50 g/L.

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.

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.
2. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Prepare substrates according to manufacturer's written recommendations to ensure adhesion of resilient products.

B. 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.

C. Use trowelable leveling and patching compound to fill cracks, holes, and depressions in substrates.

D. Move resilient products and installation materials into spaces where they will be installed at least 48 hours in advance of installation.

1. Do not install resilient products until they are the same temperature as the space where they are to be installed.

E. Sweep and vacuum clean substrates to be covered by resilient products 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 RESILIENT WALL BASE INSTALLATION

A. Apply wall base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is scheduled.

B. Install wall base in lengths as long as practicable without gaps at seams and with tops of adjacent pieces aligned.

C. Tightly adhere wall base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.

D. Do not stretch wall base during installation.

E. On masonry surfaces or other similar irregular substrates, fill voids along top edge of wall base with manufacturer's recommended adhesive filler material.

F. Job-Formed Corners:

1. Outside Corners: Use straight pieces of maximum lengths possible. Form without producing discoloration (whitening) at bends. Shave back of base at points where bends occur and remove strips perpendicular to length of base that are only deep enough to produce a snug fit without removing more than half the wall base thickness.
2. Inside Corners: Use straight pieces of maximum lengths possible. Form by cutting an inverted V-shaped notch in toe of wall base at the point where corner is formed. Shave back of base where necessary to produce a snug fit to substrate.

3.4 RESILIENT ACCESSORY INSTALLATION

A. Resilient Molding Accessories: Butt to adjacent materials and tightly adhere to substrates throughout length of each piece. Install reducer strips at edges of floor coverings that would otherwise be exposed.

3.5 CLEANING AND PROTECTION

A. Perform the following operations immediately after completing resilient product 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.

    a. Do not wash surfaces until after time period recommended by manufacturer.

B. Protect resilient products 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.

END OF SECTION 09 65 13

SECTION 09 67 23 – RESINOUS FLOORING

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This Section includes one resinous flooring system, one with epoxy body.

1. Application Method: Flat metal or plastic blade, power, or hand troweled.

1.03 SUBMITTALS

A. Product Data: For each type of product indicated. Include manufacturer's technical data, application instructions, and recommendations for each resinous flooring component required.

B. Samples for Verification: For each resinous flooring system required, 5 inches square, applied to a rigid backing.

C. Product Schedule: Use resinous flooring designations indicated in Part 2 and room designations indicated on Drawings in product schedule.

D. Installer Certificates: Signed by manufacturer certifying that installers comply with specified requirements.

E. Maintenance Data: For resinous flooring to include in maintenance manuals.

1.04 QUALITY ASSURANCE

A. No request for substitution shall be considered that would change the generic type of floor system specified (i.e. Epoxy resin mortar based flooring system with urethane sealers). Equivalent materials of other manufactures may be substituted only on approval of Architect or Engineer. Request for substitution will only be considered only if submitted 10 days prior to bid date. Requests will be subject to specification requirements described in this section.

B. Installer Qualifications: Engage an experienced installer (applicator) who is experienced in applying resinous flooring systems similar in material, design, and extent to those indicated for this Project, whose work has resulted in applications with a record of successful in-service performance, and who is acceptable to resinous flooring manufacturer.

1. Engage an installer who is certified in writing by resinous flooring manufacturer as qualified to apply resinous flooring systems indicated.

2. Contractor shall have completed at least 10 projects of similar size and complexity.

C. Source Limitations: Obtain primary resinous flooring materials, including primers, resins, hardening agents, grouting coats, and topcoats, through one source from a single manufacturer, with not less than ten years of successful experience in manufacturing and installing principal materials described in this section. Provide secondary materials, including patching and fill material, joint sealant, and repair materials, of type and from source recommended by manufacturer of primary materials.

D. Manufacturer Field Technical Service Representatives: Resinous flooring manufacture shall retain the services of Field Technical Service Representatives who are trained specifically on installing the system to be used on the project.

1. Field Technical Services Representatives shall be employed by the system manufacture to assist in the quality assurance and quality control process of the installation and shall be available to perform field problem solving issues with the installer.

E. Mockups: Apply mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Apply full-thickness mockups on 48-inch-square floor area selected by Architect.

a. Include 48-inch length of integral cove base.

2. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

F. Pre-installation Conference:

1. General contractor shall arrange a meeting not less than thirty days prior to starting work.

2. Attendance:

a. General Contractor
b. Architect/Owner's Representative.
c. Manufacturer/Installer's Representative.

1.05 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.

B. Store materials to prevent deterioration from moisture, heat, cold, direct sunlight, or other detrimental effects. Store material per product data.

C. All materials used shall be factory pre-weighed and pre-packaged in single, easy to manage batches to eliminate on-site mixing errors. No on-site weighing or volumetric measurements allowed.

1.06 PROJECT 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 application.

1. Maintain material and substrate temperature between 65 and 85 deg F during resinous flooring application and for not less than 24 hours after application.

B. Lighting: Provide permanent lighting or, if permanent lighting is not in place, simulate permanent lighting conditions during resinous flooring application.

C. Close spaces to traffic during resinous flooring application and for not less than 24 hours after application unless manufacturer recommends a longer period.

D. Concrete substrate shall be properly cured. A vapor barrier must be present for concrete subfloors on or below grade. Otherwise, an osmotic pressure resistant grout must be installed prior to the resinous flooring.

1.07 WARRANTY

A. Manufacturer shall furnish a single, written warranty covering both material and workmanship for a period of (1) full years from date of installation or provide a joint and several warranty signed on a single document by material manufacturer and applicator jointly and severally warranting the materials and workmanship for a period of (1) full year from date of installation. A sample warranty letter must be included with bid package or bid may be disqualified.

PART 2 PRODUCTS

2.01 RESINOUS FLOORING

A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include,

1. Broadcast systems will not be accepted. Trowel mortar only.

B. Basis-of-Design Product:

1. Dur-A-Flex.

C. Acceptable Manufactures (subject to section 1.04 above):

1. Sherwin-Williams
2. Elegant Epoxy Flooring

D. Product: Subject to compliance with requirements:

1. Dur-A-Quartz.

E. System Characteristics:

1. Color and Pattern: TBD
2. Wearing Surface: smooth Matte finish.
3. Integral Cove Base: TBD
4. Overall System Thickness: 3/16 inch.

F. System Components: Manufacturer's standard components that are compatible with each other and as follows:

Note: Components listed below are the basis of design intent; all bids will be compared to this standard including resin chemistry, color, wearing surface, thickness, and installation procedures, including number of coats. Contractor shall be required to comply with all the requirements of the Specifications and all of the components required by the Specifications, whether or not such products are specifically listed above.

1. Primer:

a. Resin: Epoxy.
b. Formulation Description: 2 component, 100% solids.
c. Type: non pigmented.
d. Finish: standard.
e. Number of Coats: one.

2. Mortar Base:

a. Resin: Epoxy.
b. Formulation Description: 3 component, 100% solids.
c. Application Method: Flat Metal or plastic blade trowel.

1) Thickness of Coats: 3/16 inch.
2) Number of Coats: One.

d. Aggregates: Pigmented quartz Blended aggregate.

3. Groutcoat:

a. Resin: Epoxy.
b. Formulation Description: 2 component, 100% high solids.

c. Type: Clear.

d. Finish: standard.
e. Number of Coats: one.

4. Sealer:

a. Resin: Epoxy
b. Formulation Description: 2 component, 100% solids.
c. Type: Clear.
d. Finish: Matte.
e. Number of Coats: one.

5. Topcoat:

a. Resin: VOC EPA Compliant, Waterborne, Aliphatic Polyurethane.
b. Formulation Description: 2 component 100% high solids.
c. Type: Clear.
d. Finish: Matte.
e. Number of Coats: Two.

G. System Physical Properties: Provide resinous flooring system with the following minimum physical property requirements when tested according to test methods indicated:

1. Compressive Strength: 6,000 psi after 7 days per ASTM C 579.
2. Tensile Strength: 1,500 psi per ASTM C 307.
3. Flexural Strength: 2,200 psi per ASTM C 580.
4. Flexural Modulus of Elasticity: 5.0 x 105 psi per ASTM C 580.
5. Hardness: 85 to 90, Shore D per ASTM D 2240.
6. Impact Resistance: > 160 in. lbs. per ASTM D 2794.
7. Abrasion Resistance: 0.06 gm max. weight loss per ASEM D 4060, CS-17
8. Flammability: Class 1 per ASTM E-648, E-662
9. Thermal Coefficient of Linear Expansion: 9 x 10-6 in./n oF
10. VOC Content per ASTM D 2369, Method E
11. Cure Rate: 12 hours for foot traffic, 24 hours normal operations.

2.02 ACCESSORY MATERIALS

A. Primer: Type recommended by manufacturer for substrate and body coats indicated.

B. Waterproofing Membrane: Type recommended by manufacturer for substrate and primer and body coats indicated.

C. Patching, Leveling and Fill Material: Resinous product of or approved by resinous flooring manufacturer and recommended by manufacturer for application indicated.

D. Joint Sealant: Type recommended or produced by resinous flooring manufacturer for type of service and joint condition indicated.

PART 3 EXECUTION

3.01 PREPARATION

A. General: Prepare and clean substrates according to resinous flooring manufacturer's written instructions for substrate indicated. Provide clean and dry substrate for resinous flooring application.

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. Mechanically prepare 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 or Diamond Grind with a dust-free system.

2. Repair damaged and deteriorated concrete according to resinous flooring manufacturer's written recommendations.

3. Verify that concrete substrates meet the following requirements.

a. Perform in situ probe test, ASTM F 2170. Proceed with application only after substrates do not exceed a maximum potential equilibrium relative humidity of 85 percent.
b. Perform anhydrous calcium chloride test, ASTM F 1869. Proceed with application only after substrates have maximum moisture-vapor-emission rate of 6 lb of water/1000 sq. ft. of slab in 24 hours.

C. Use patching and fill material to fill holes and depressions in substrates according to manufacturer's written instructions.
D. Treat control joints and other nonmoving substrate cracks to prevent cracks from reflecting through resinous flooring according to manufacturer's written recommendations.

3.02 APPLICATION

A. General: Apply components of resinous flooring system according to manufacturer's written instructions to produce a uniform, monolithic wearing surface of thickness indicated.

1. Coordinate application of components to provide optimum adhesion of resinous flooring system to substrate, and optimum intercoat adhesion.

2. Cure resinous flooring components according to manufacturer's written instructions. Prevent contamination during application and curing processes.
3. At substrate expansion and isolation joints, provide joint in resinous flooring to comply with resinous flooring manufacturer's written recommendations.

    a. Apply joint sealant to comply with manufacturer's written recommendations.

B. Apply primer where required by resinous system, over prepared substrate at manufacturer's recommended spreading rate.

C. Integral Cove Base: Apply cove base mix to wall surfaces before applying flooring. Apply according to 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: 4 inches high.

D. Troweled Mortar: Mix mortar material according to manufacturer's recommended procedures. Uniformly spread mortar over substrate using manufacturer's specially designed screed box adjusted to manufacturer's recommended height. Hand trowel apply mixed material over freshly primed substrate using steel finishing trowels or power trowel material using manufacturer's specially designed power trowel blades.

E. Groutcoat: Remove excess unbonded granules by lightly abrading or scraping and vacuuming the floor surface. Mix and apply grout coat with strict adherence to manufacturer's installation procedures and coverage rates.

F. Sealer: Lightly sand or scrape surface to remove any floor surface irregularities. Mix and apply sealer with strict adherence to manufacturer's installation procedures.

G. Matte Finish: Lightly sand or scrape surface to remove any floor surface irregularities. Mix and roller apply mar resistant finish with strict adherence to manufacturer's installation procedures.

3.03 TERMINATIONS

A. Chase edges to “lock” the flooring system into the concrete substrate along lines of termination.

B. Penetration Treatment: Lap and seal coating onto the perimeter of the penetrating item by bridging over compatible elastomer at the interface to compensate for possible movement.

C. Trenches: Continue flooring system into trenches to maintain monolithic protection. Treat cold joints to assure bridging of potential cracks.

D. Treat floor drains by chasing the flooring system to lock in place at point of termination.

3.04 JOINTS AND CRACKS

A. Treat control joints and to maintain monolithic protection.

B. Treat cold joints and construction joints to bridge potential cracks and to maintain monolithic protection on horizontal and vertical surfaces as well as horizontal and vertical interfaces.

C. Vertical and horizontal contraction and expansion joints are treated by installing backer rod and compatible sealant after coating installation is completed. Provide sealant type recommended by manufacturer for traffic conditions and chemical exposures to be encountered.

3.05 CLEANING, PROTECTING, AND CURING

A. Cure resinous flooring materials in compliance with manufacturer's directions, taking care to prevent contamination during stages of application and prior to completion of curing process. Close area of application for a minimum of 24 hours.

B. Protect resinous flooring materials from damage and wear during construction operation. Where temporary covering is required for this purpose, comply with manufacturer's recommendations for protective materials and method of application. General Contractor is responsible for protection.

C. Cleaning: Remove temporary covering and clean resinous flooring just prior to final inspection. Use cleaning materials and procedures recommended by resinous flooring manufacturer. General Contractor is responsible for cleaning prior to inspection.

END OF SECTION 09 67 23

SECTION 09 91 13 - EXTERIOR PAINTING

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 surface preparation and the application of paint systems on the following exterior substrates:

1. Concrete.
2. Steel.
3. Galvanized metal.
4. Cast iron.
5. Aluminum.

B. The work includes painting and finishing of interior and exterior exposed items and surfaces throughout project including all back-priming, except as otherwise indicated.

1. Surface preparation, priming and coats of paint specified are in addition to shop-priming and surface treatment specified under other sections of work.

C. Work includes field painting of exposed piping (insulated or not insulated) installed under mechanical plumbing or fire protection or electrical work, unless otherwise shown. Where located on wall, paint to match wall.

D. The exterior work shall include items attached to the building, including but not limited to the following:

1. Ferrous pipe rails, brackets, etc.
2. Ferrous cast iron downspout boots, etc.
3. Hollow metal door frames and doors.
4. Telephone or electrical panel boxes, conduit, weather heads, cover plates, etc.

E. "Paint" as used herein means all coating systems materials, including primers, emulsions, enamels, stains, sealers and fillers, and other applied materials whether used as primer, intermediate or finish coats.

F. Surfaces to be Painted: Except where natural finish of material is specifically noted as a surface not to be painted, paint exposed surfaces whether or not colors are designated in "schedules". Where items

or surfaces are not specifically mentioned, paint the same as similar adjacent materials or areas. If color or finish is not designated, Architect will select these from standard colors or finished available.

G. Following categories of work are not included as part of field-applied finish work.

1. Pre-finished Items: Unless otherwise indicated, do not include painting when factory-finishing or installer-finishing is specified for such items as (but not limited to) metal toilet enclosures, prefinished partition systems, acoustic materials, architectural woodwork and casework, and finished mechanical and electrical equipment, including light fixtures, switchgear and distribution cabinets.

2. Concealed Surfaces: Unless otherwise indicated, painting is not required on surfaces such as walls or ceilings in concealed areas and generally inaccessible areas, foundation spaces, furred areas, utility tunnels, pipe spaces and duct shafts.

3. Finished Metal Surfaces: Metal surfaces of anodized aluminum, stainless steel, chromium plate, copper, bronze and similar finished materials will not require finish painting, unless otherwise indicated.

4. Operating Parts: Unless otherwise indicated, moving parts of operating units, mechanical and electrical parts, such as valve and damper operators, linkages, sensing devices, motor and fan shafts will not require finish painting.

H. Do not paint over any code-required labels, such as Underwriters' Laboratories and factory Mutual, or any equipment identification, performance rating, name, or nomenclature plates.

I. Related Sections include the following:

1. Division 05 Sections for shop priming of metal substrates with primers specified in this Section.
2. Division 09 Section "Interior Painting" for surface preparation and the application of paint systems on interior substrates.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Samples for Initial Selection: For each type of topcoat product indicated.

C. Samples for Verification: For each type of paint system and each color and gloss of topcoat indicated.

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.

D. Product List: For each product indicated, include the following:

1. Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules.

1.4 QUALITY ASSURANCE

A. Applicator Qualifications: A firm or individual experienced in applying paints and coatings similar in material, design, and extent to those indicated for this Project, whose work has resulted in applications with a record of successful in-service performance.

B. Source Limitations: Obtain block fillers and primers for each coating system from the same manufacturer as the finish coats.

C. Mockups: Apply benchmark samples 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 sq. ft..
b. Other Items: Architect will designate items or areas required.

2. Final approval of color selections will be based on benchmark samples.

a. If preliminary color selections are not approved, apply additional benchmark samples of additional colors selected by Architect at no added cost to Owner.

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 deg F.

1. Maintain containers in clean condition, free of foreign materials and residue.
2. Remove rags and waste from storage areas daily.

1.6 PROJECT CONDITIONS

A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F.

B. Do not apply paints in snow, rain, fog, or mist; when relative humidity exceeds 85 percent; at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.

1.7 EXTRA MATERIALS

A. Furnish extra materials described below that are from same production run (batch mix) as materials applied and that are packaged for storage and identified with labels describing contents.

1. Quantity: Furnish an additional percent, but not less than 1 gal. of each material and color applied.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Benjamin Moore & Co.
2. ICI Paints.
3. Porter Paints.
4. PPG Architectural Finishes, Inc.
5. Sherwin-Williams Company

2.2 PAINT, GENERAL

A. 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 manufacturers of topcoat for use in paint system and on substrate indicated.

B. Colors: As selected by Architect from manufacturer's full range.

2.3 METAL PRIMERS

A. Masonry Primer:
1. Basis-of-Design Product: Loxon Concrete & Masonry Primer Sealer.
   a. PPG
   b. Benjamin Moore

B. Galvanized Metal Pretreatment:

1. Basis-Of-Design Product: Manufacturer’s recommended galvanized prep material.
   a. Sherwin Williams

b. PPG
c. Benjamin Moore

C. Galvanized Metal Primer:

1. Basis-Of-Design Product: Sherwin Williams Pro Industrial Pro-Cryl Universal Primer B66-310 Series
   a. PPG
   b. Benjamin Moore

D. Metal Primer:

1. Basis-Of-Design Product: Sherwin Williams Pro Industrial Pro-Cryl Universal Primer B66-310 Series
   a. PPG
   b. Benjamin Moore

2.4 EXTERIOR LATEX PAINTS

A. Exterior Semi-gloss Latex: Factory-formulated semi-gloss latex for exterior application.

1. Basis-Of-Design Product: Sherwin Williams A-100 Exterior Latex Semi-Gloss, A82 Series
   a. PPG
   b. Benjamin Moore

B. Exterior Flat Latex for Textured Finish:
1. Basis of Design Sherwin Williams Ultracrete Textured Masonry Topcoat Fine, A44-800 Series
   a. PPG
   b. Benjamin Moore

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 work.

B. Verify suitability of substrates, including surface conditions and compatibility with primers.

C. Begin coating application only after unsatisfactory conditions have been corrected and surfaces are dry.

1. Beginning coating application constitutes Contractor's acceptance of substrates and conditions.

3.2 PREPARATION

A. Comply with manufacturer's written instructions and recommendations applicable to substrates and paint systems indicated.

B. Remove plates, machined surfaces, and similar items already in place that 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 dirt, oil, grease, and incompatible paints and encapsulants.

1. Remove incompatible primers and reprime substrate with compatible primers as required to produce paint systems indicated.

D. Steel Substrates: Remove rust and loose mill scale. Clean using methods recommended in writing by paint manufacturer.

E. Galvanized-Metal Substrates: Remove grease and oil residue from galvanized sheet metal fabricated from coil stock by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints.

F. Aluminum Substrate: Etch with acid wash and sand with light sandpaper to rough up finish to receive primer coat.

3.3 APPLICATION

A. Apply coatings according to manufacturer's written instructions.

1. Use applicators and techniques suited for paint and substrate indicated.
2. Paint surfaces behind movable items same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed items with prime coat only.

B. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.

C. Apply paints to produce surface films without cloudiness, spotting, gaps, laps, roller tracking, brush marks, runs, sags, or other surface imperfections. Cut in sharp lines and color breaks.

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 EXTERIOR PAINTING SCHEDULE

A. Concrete: ***(Concrete only where noted to be painted.)***
   1. Masonry Primer
   2. Exterior Flat Latex for Textured Finish
   3. Exterior Flat Latex for Textured Finish

B. Steel and Cast Iron Substrates:

   1. Latex System: Semi-gloss finish.

      a. Prime Coat: Alkyd metal primer.
      b. Intermediate Coat: Exterior semi-gloss acrylic enamel.
      c. Topcoat: Exterior semi-gloss acrylic enamel.

C. Galvanized Metal Substrates:

   1. Latex System: Semi-gloss finish.

      a. Pretreatment: Galvanized metal pretreatment
      b. Prime Coat: Galvanized metal primer.
      c. Intermediate Coat: Exterior semi-gloss acrylic enamel.
      d. Topcoat: Exterior semi-gloss acrylic enamel.

D. Aluminum:

   1. Latex System: Semi-gloss finish.

      a. Pretreatment: Acid Etch and Light Sandpaper.
      b. Prime Coat: Metal primer.
      c. Intermediate Coat: Exterior semi-gloss acrylic enamel.
      d. Topcoat: Exterior semi-gloss acrylic enamel.

E. PVC [Roof vents, piping, etc] (Flat):

1. Primer : n/a – Finish paint is a self-priming product.
2. Finish Coats (3) PPG: Break-Through! 250 Interior/Exterior Satin Water-Borne Acrylic Series: V50-410, DFT: 2.0-4.0 mils per coat.

END OF SECTION 09 91 13

SECTION 09 91 23 - INTERIOR PAINTING

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 surface preparation and the application of paint systems on the following interior substrates:

1. Concrete.
2. Concrete masonry units (CMU).
3. Brick.
4. Steel.
5. Wood.
6. Gypsum board.

B. The work includes painting and finishing of interior and exterior exposed items and surfaces throughout project including all back-priming, except as otherwise indicated.

1. Surface preparation, priming and coats of paint specified are in addition to shop-priming and surface treatment specified under other sections of work.

C. Work includes field painting of exposed wiremold, ductwork, piping (insulated or not insulated) installed under mechanical plumbing or fire protection or electrical work, unless otherwise shown. Where located on wall, paint to match wall. Where occurring at ceilings, paint white.

E. "Paint" as used herein means all coating systems materials, including primers, emulsions, enamels, stains, sealers and fillers, and other applied materials whether used as primer, intermediate or finish coats.

F. Surfaces to be Painted: Except where natural finish of material is specifically noted as a surface not to be painted, paint exposed surfaces whether or not colors are designated in "schedules". Where items or surfaces are not specifically mentioned, paint the same as similar adjacent materials or areas. If color or finish is not designated, Architect will select these from standard colors or finished available.

G. Following categories of work are not included as part of field-applied finish work.

1. Pre-finished Items: Unless otherwise indicated, do not include painting when factory-finishing or installer-finishing is specified for such items as (but not limited to) metal toilet enclosures,

prefinished partition systems, acoustic materials, architectural woodwork and casework, and finished mechanical and electrical equipment, including light fixtures, switchgear and distribution cabinets.

2. Concealed Surfaces: Unless otherwise indicated, painting is not required on surfaces such as walls or ceilings in concealed areas and generally inaccessible areas, foundation spaces, furred areas, utility tunnels, pipe spaces and duct shafts.

3. Finished Metal Surfaces: Metal surfaces of anodized aluminum, stainless steel, chromium plate, copper, bronze and similar finished materials will not require finish painting, unless otherwise indicated.

4. Operating Parts: Unless otherwise indicated, moving parts of operating units, mechanical and electrical parts, such as valve and damper operators, linkages, sensing devices, motor and fan shafts will not require finish painting.

H. Do not paint over any code-required labels, such as Underwriters' Laboratories and factory Mutual, or any equipment identification, performance rating, name, or nomenclature plates.

I. Related Sections include the following:

1. Division 05 Sections for shop priming of metal substrates with primers specified in this Section.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Samples for Initial Selection: For each type of topcoat product indicated.

C. Samples for Verification: For each type of paint system and in each color and gloss of topcoat indicated.

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.

D. Product List: For each product indicated, include the following:

1. Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules.
2. Printout of current "MPI Approved Products List" for each product category specified in Part 2, with the proposed product highlighted.

1.4 QUALITY ASSURANCE

A. Applicator Qualifications: A firm or individual experienced in applying paints and coatings similar in material, design, and extent to those indicated for this Project, whose work has resulted in applications with a record of successful in-service performance.

B. Source Limitations: Obtain block fillers and primers for each coating system from the same manufacturer as the finish coats.

C. Mockups: Apply benchmark samples 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. Wall and Ceiling Surfaces: Provide samples of at least 100 sq. ft..
    b. Other Items: Architect will designate items or areas required.

2. Apply benchmark samples after permanent lighting and other environmental services have been activated.
3. Final approval of color selections will be based on benchmark samples.

    a. If preliminary color selections are not approved, apply additional benchmark samples of additional colors selected by Architect at no added cost to Owner.

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 deg F.

1. Maintain containers in clean condition, free of foreign materials and residue.
2. Remove rags and waste from storage areas daily.

1.6 PROJECT CONDITIONS

A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F.

B. Do not apply paints when relative humidity exceeds 85 percent; at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.

1.7 EXTRA MATERIALS

A. Furnish extra materials described below that are from same production run (batch mix) as materials applied and that are packaged for storage and identified with labels describing contents.

1. Quantity: Furnish an additional 1 gal. of each material and color applied.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Sherwin Williams
2. Benjamin Moore & Co.
3. PPG Architectural Finishes, Inc.
4. Seal Krete

2.2 PAINT, GENERAL

A. 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 manufacturers of topcoat for use in paint system and on substrate indicated.

B. Colors: As selected by Architect from manufacturer's full range.

2.3 CONCRETE UNIT MASONRY BLOCK FILLERS

A. Masonry Block Filler:

1. Basis-Of-Design Product: Sherwin Williams PrepRite Block Filler B25W25

2.4 PRIMERS/SEALERS

A. Interior Latex Primer/Sealer:

1. Basis-Of-Design Product: Sherwin Williams ProMar 200 Zero VOC Interior Latex Primer White

B. Galvanized Metal Pretreatment:

1. Basis-Of-Design Product: Manufacturer’s recommended galvanized prep material.
   a. Sherwin Williams
   b. PPG
   c. Benjamin Moore

C. Galvanized and Non-Galvanized Metal Primer:

1. Basis-Of-Design Product: Sherwin Williams Pro Industrial Pro-Cryl Universal Primer B66-310 Series
   a. PPG
   b. Benjamin Moore

D. Concrete Floor Primer:

1. Basis of Design Product: Seal Krete Lock-Down Concrete Bonding Primer.

E. Interior Alkyd Metal Primer:

1. Basis-Of-Design Product: Sherwin Williams Pro Industrial Pro-Cryl Universal Primer B66-310 Series
   a. PPG
   b. Benjamin Moore

F. Wood Primer:
1. Basis of Design Product: Sherwin Williams PrepRite ProBlock Latex Primer/Sealer B51 Series
   a. PPG
   b. Benjamin Moore

2.5 LATEX PAINTS

A. Interior Low Sheen Latex:

1. Basis-Of-Design Product:
   a. Sherwin Williams ProMar 200 Zero VOC Interior Latex Eggshell
   b. Benjamin Moore

B. Interior Semi-Gloss Latex:

1. Basis-Of-Design Product:
   a. Sherwin Williams ProMar 200 Zero VOC Interior Latex Semi-Gloss
   b. Benjamin Moore

C. Interior Gloss Latex:

1. Basis-Of-Design Product:
   a. Sherwin Williams ProMar 200 Zero VOC Interior Latex Gloss
   b. Benjamin Moore

D. Interior Steel:
1. Basis-of-Design Product: Sherwin Williams Pro Industrial Acrylic Gloss, B66-650 Series
   a. PPG
   b. Benjamin Moore

E. Interior Ceilings:
1. Basis-of-Design Product: Sherwin Williams ProMar 200 Zero VOC Interior Latex Flat B30-2600 Series
a. PPG
b. Benjamin Moore

F. Dry Fall:
1. Basis-of-Design Product:
a. Sherwin Williams Pro Industrial Waterborne Acrylic Dryfall Flat, B42-80 Series
b. Benjamin Moore

2.6 CONCRETE FLOOR SEALER

A. Water-based acrylic-epoxy blend for use on concrete and masonry surfaces
1. Basis of Design Product: Seal Krete Epoxy Seal

2.7 STAIN
1. Basis-of-Design Product: Sherwin Williams Wood Classics 250 Stain, A49-800 Series
a. PPG
b. Benjamin Moore

2.8 WOOD SEALER
1. Basis-of-Design Product: Sherwin Williams Wood Classics Waterborne Polyurethane Satin.
a. PPG
b. Benjamin Moore

2.9 PREPARATION

A. Galvanized Metal Prep
1. Use primer manufacturer's recommended preparation product.

B. Concrete Etching

1. Basis of Design Product: Seal Krete Klean-N-Etch.

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 work.

B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:

1. Concrete: 12 percent.
2. Masonry (Clay and CMU): 12 percent.
3. Wood: 15 percent.
4. Gypsum Board: 12 percent.

C. Verify suitability of substrates, including surface conditions and compatibility with finishes and primers.

D. Begin coating application only after unsatisfactory conditions have been corrected and surfaces are dry.

1. Beginning coating application constitutes Contractor's acceptance of substrates and conditions.

3.2 PREPARATION

A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates indicated.

B. Remove plates, machined surfaces, and similar items already in place that 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 dirt, oil, grease, and incompatible paints and encapsulants.

1. Remove incompatible primers and reprime substrate with compatible primers as required to produce paint systems indicated.

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. Concrete Masonry Substrates: Remove 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.

F. Steel Substrates: Remove rust and loose mill scale. Clean using methods recommended in writing by paint manufacturer.

G. Galvanized Metal Substrates: Remove grease and oil residue from galvanized sheet metal fabricated from coil stock by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints.

H. Wood Substrates:

1. Scrape and clean knots, and apply coat of knot sealer before applying primer.
2. Sand surfaces that will be exposed to view, and dust off.
3. Prime edges, ends, faces, undersides, and backsides of wood.
4. After priming, fill holes and imperfections in the finish surfaces with putty or plastic wood filler. Sand smooth when dried.

I. Gypsum Board Substrates: Do not begin paint application until finishing compound is dry and sanded smooth.

J. Cotton or Canvas Insulation Covering Substrates: Remove dust, dirt, and other foreign material that might impair bond of paints to substrates.

3.3 APPLICATION

A. Apply paints according to manufacturer's written instructions.

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. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.

C. 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.

D. Painting Mechanical and Electrical Work: Paint 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. Electrical Work:

    a. Switchgear.
    b. Panelboards.
    c. Electrical equipment that is indicated to have a factory-primed finish for field painting.

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. Latex System: Semi-gloss finish.

    a. Prime Coat: Masonry Block Filler.
    b. Intermediate Coat: Interior semi-gloss latex.
    c. Topcoat: Interior semi-gloss latex.

B. Steel Substrates:

1. Latex System: Gloss finish.

    a. Prime Coat: Metal Primer
    b. Intermediate Coat: Interior gloss latex.
    c. Topcoat: Interior gloss latex.

C. Gypsum Board / Wood Substrates:

1. Latex System: Eggshell finish.

    a. Prime Coat: Interior latex primer/sealer.
    b. Intermediate Coat: Interior low sheen latex.
    c. Topcoat: Interior low sheen latex.

D. Galvanized Metal Substrates:

1. Latex System: Semi-gloss finish.

a. Pretreatment: Galvanized metal pretreatment
b. Prime Coat: Metal Primer
c. Intermediate Coat: Interior semi-gloss latex.
d. Topcoat: Interior semi-gloss latex.

E. Cotton or Canvas Insulation-Covering Substrates: Including pipe and duct coverings.

1. Latex System: Semi-gloss.

a. Prime Coat: Interior semi-gloss latex.
b. Topcoat: Interior semi-gloss latex.

F. Open ceiling areas:
1. Dry Fall
a. Prime Coat: Metal Primer
b. Topcoat: Dry Fall

G. Concrete Floors, exposed:

1. Concrete Floor Sealer

a. Etch bare concrete
b. Prime Coat: Concrete Binding Primer
c. Intermediate Coat: Concrete Floor Sealer
d. Topcoat: Concrete Floor Sealer, applied in direction perpendicular to the first

H. Galvanized Metal Duct Interior (where exposed through diffuser):

1. Latex System: Low sheen

a. Pretreatment: Galvanized metal pretreatment
b. Topcoat: Interior low sheen latex.

END OF SECTION 09 91 23

SECTION 10 14 00 – BUILDING SIGNAGE

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Provide specialty building signage:

1. Panel Signs as indicated in the Drawings.
2. Cast Metal Plaques.
3. Window Graphics.
4. Interior Vinyl Graphic Lettering as indicated in the Drawings.

1.03 SUBMITTALS

A. Product Data: Submit manufacturer's technical data and installation instruction for each type of sign required.

B. Samples: Submit samples of each sign type and material showing finishes, colors, surfaces textures and qualities of manufacturer and design of each sign component including graphics.

1. Submit full-size sample units, if requested by Architect. Acceptable units may be installed as part of the Work.

C. Shop Drawings: Submit shop drawings for fabrication and erection of specialty signs. Include plans, elevations and large scale details of sign wording and lettering layout. Show anchorages and accessory items. Furnish location template drawings for items supported or anchored to permanent construction.

1.04 QUALITY ASSURANCE

A. Comply with governing codes and regulations. Provide products of acceptable manufacturers which have been in satisfactory use in similar service for three (3) years. Use experienced installers. Deliver, handle and store materials in accordance with manufacturer's instructions.

B. Single-Source Responsibility: For each separate sign type required, obtain signs from one source of a single manufacturer.

C. Design Concept: The Drawings indicate sizes, profiles and dimensional requirements of signs and are based on the specific types and models indicated. Sign units by other manufacturers

may be considered provided any deviation in dimensions and profiles do not change the design concept as judged by the Architect. The burden of proof of equality is on the proposer.

1.05 PROJECT CONDITIONS

A. Field Measurements: Take field measurements prior to preparation of shop drawings and fabrication to ensure proper fitting. Show recorded measurements on final shop drawings. Coordinate fabrication schedule with construction progress to avoid delays.

PART 2 PRODUCTS

2.01 MATERIALS

A. Cast Acrylic Sheet: Provide cast (not extruded or continuous cast) methyl methacrylate monomer plastic sheet, in sizes and thicknesses indicated, with a minimum flexural strength of 16,000 psi, when tested according to ASTM D790, with a minimum allowable continuous service temperature of 176-degrees F, and of the following general types:

1. Opaque Sheet: Where sheet material is indicated as “opaque,” provide colored opaque acrylic sheet in colors and finishes as selected from the manufacturer’s standards.
2. Color Coatings for Acrylic Plastic Sheet: Use color coatings, including inks and paints for copy and background colors that are recommended by acrylic manufacturers for optimum adherence to acrylic surface and are non-fading for the application intended.
3. ADA Specifications: All content and style complies with ADDAG (4.30.107), Americans with Disabilities Act Accessibility Guidelines for Buildings and Facilities.
4. Braille: Grade 2 Braille is to be the same color as the sign face, with no interruption of the smooth, clean surface of the sign.

    a. Provide Braille room names and numbers integral with sign construction in correspondence with printed names and numbers. Surface applied Braille is not acceptable.

5. Contrast: The background of the sign must be matte or non-glare in appearance. The contrast between the background and characters shall be a minimum of 70 to 1, and the gloss of the materials used shall be within 11 to 19 degrees on a 60 degree meter.

B. ABS Plastic: Provide high-impact thermoplastic composed of copolymers of acrylonitrile, butadiene, and styrene.

C. Aluminum Castings: Provide aluminum castings of alloy and temper recommended by the sign manufacturer for the casting process used and for the use and finish indicated.

D. Aluminum Sheet: Provide aluminum sheet of alloy and temper recommended by the sign manufacturer per the type of use and finish indicated, and with not less than the strength and durability properties in ASTM B 209 for 5005-H15.

E. Fasteners: Use concealed fasteners fabricated from metals that are not corrosive to the sign material and mounting surface.

1. Mounting: Mount to the wall surface with permanent double-faced, high bond, vinyl foam tape and silicone adhesive for irregular, porous or vinyl covered surfaces.

F. Anchors and Inserts: Use nonferrous metal or hot-dipped galvanized anchors and inserts for exterior installation and elsewhere as required for corrosion resistance. Use toothed steel or lead expansion bolt devices for drilled-in-place anchors. Furnish inserts, as required, to be set into concrete or masonry work. Provide fasteners at necessary length to properly fasten to substrate.

2.02 PANEL SIGNS

A. Available Manufacturers: Subject to compliance with requirements, provide one of the following:

1. ASI Sign Systems, Inc.
2. Bayuk Graphic Systems, Inc.
3. Contemporary Plastics, Inc.
4. Cornerstone
5. Dura Architectural Signage
6. Fast Signs
7. Innerface
8. Johnson Signs
9. MAC Graphics
10. Mills Manufacturing
11. Nelson Harkins

B. Panels Signs: Comply with requirements indicated for materials, thicknesses, finishes, colors, design, shapes, sizes, and details of construction.

1. Produce smooth, even, level sign surfaces, constructed to remain flat under installed conditions with a tolerance of plus or minus 1/16-inch, and measured diagonally.

C. Unframed Panels Signs: Fabricate signs with edges mechanically and smoothly finished to conform with the following requirements:

1. Edge Condition: Square Cut.
2. Corner Condition: Corners rounded to 1/2-inch radius.

D. Graphic Content and Style: Provide sign copy that complies with the requirements indicated for size, style, spacing, content, position, metal, finishes, and colors of letters, numbers, and other graphics.

1. Refer to “SIGNAGE” sheet for required types.

E. Raised Copy: Machine-cut copy characters from matte-finished opaque acrylic sheet and chemically welded to the acrylic sheeting foaming sign panel face. Produce precisely formed characters with square cut edges free from burrs and cut marks.

1. Panel Material: Matte-finished clear acrylic with opaque color coatings subsurface applied. Minimum 1/8-inch-thick material.
2. Raised Copy Thickness: 1/16-inch
3. Letter Height: As approved by Architect on shop drawings
4. Letter Style: Optima semi-bold

2.03 CAST METAL PLAQUES

A. Available Manufacturers: Subject to compliance with requirements, provide one of the following:

1. Andco Industries Corp.
2. A.R.K. Ramos Manufacturing Company, Inc.
3. Best Manufacturing
4. Cornerstone
5. Fast Signs
6. Grandview Aluminum Products, Inc.
7. Mills Manufacturing
8. Nelson Harkins

B. Plaques: Castings shall be free from pits, scale, sand holes or other defects. Comply with requirements specified for metal, border style, background texture and finish, and with requirements shown for thickness, size, shape and copy. Hand-tool and buff borders and raised copy to produce the manufacturer's standard satin polished finish. Refer to the "Finish" Article for other finish requirements.

1. Size: 24-inches x 32-inches.
2. Metal: Aluminum
3. Border Style: No. 5 double raised line border as manufacturer by Mills Manufacturing or equal.
4. Rosettes: No. 2 type as manufactured by Mills Manufacturing or equal.
5. Text: Unlimited text as supplied by Architect after bidding.
6. Background Texture: Manufacturer's standard pebble finish.
7. Background Finish: Provide the manufacturer's standard baked enamel finish. Color to be selected by Architect.

2.04 CAST METAL LETTERS

A. Manufacturer:

1. Signarama
2. Cornerstone

B. Metal and Finish:

1. Satin Aluminum. Finish to be selected by Architect.

C. Type:

1. Cast aluminum.

D. Style:

1. Letter Style: Bahnschrift

E. Letter size:

1. Exterior Reverse Channel Letters (20-inches tall, x 1-inch-deep returns):

a. Text: **See Building Elevations on A2 Series Drawings**
b. Illuminated
c. Mounted to low-profile metal C Channel rail at top and bottom. Rails flush mounted to metal siding on stud framing. Paint rails to match substrate.
d. Refer to the Drawings for location.

2.05 WINDOW GRAPHICS

A. Color graphics printed on PVC film:
1. 5.6 mil black/white composite PVC with approximately 1.7mm perforations, removable acrylic pressure-sensitive adhesive.
2. Compatible with UV, Solvent, Eco-Solvent, and Latex ink systems.
3. Perforation pattern: Approximately 20% perforated, 80% retained.
4. Basis of Design: Grimco Briteline Dual Perf 80/20.
5. Acceptable manufacturers of film: Grimco, 3M (Clear Focus).
6. Potential installers (not limited to): Lynn Imaging, ESP Window Tint, Signarama Downtown, FastSigns

2.06 FINISHES

A. Color and Surface Textures: For exposed sign material that required selection of materials with integral or applied colors, surface textures or other characteristics related to appearance, provide color matches indicated, or if not indicated, as selected by the Architect from the manufacturer's full range of colors.

B. Metal Finishes: Comply with NAAMM "Metal Finishes Manual: for finish designations and application recommendations.

C. Aluminum Finishes: Finish designations prefixed by "AA" conform to the system established by the Aluminum Association for designating aluminum finishes.

1. Class II Clear Anodized Fine Satin Finish: AA-M31C21A31 (Mechanical Finish: Fine satin directional textured; Chemical Finish: Fine matte etched finish; Anodic Coating: Class II Architectural, clear film thicker that 0.4 mil).
2. Baked-Enamel Finish: AA-M4xC12C42R1x (Mechanical Finish: Manufacturer's standard, other non-directional textures; Chemical Finish: Chemical conversion coating, acid chromate-fluoride-phosphate pretreatment; Organic Coating: as specified below). Apply baked enamel in compliance with the paint manufacturer's specifications for cleaning, conversion coating and painting.

    a. Organic Coating: Thermosetting-modified acrylic enamel primer/topcoat system complying with AAMA 603.8, except with a minimum dry film thickness oif 1.5 mils, medium gloss.

        1) Color: As selected by the Architect from the manufacturer's full range of colors.

PART 3 EXECUTION

3.01 INSTALLATION, GENERAL

A. Install signage units and components at locations shown or scheduled, securely mounted with adhesive tape and screws. Attach signs to substrate in accordance with manufacturer's instruction based on anchorage method indicated.

B. Install sign components level, plumb and at heights determined by the Architect. Cooperate with other trades for installation of sign units to the finish surface.

C. Do not install signs until substrates have received all required finishes and finish coats. Damaged sign units, as determined by the Architect, shall be replaced at the expense of the Contractor.

3.02 WINDOW GRAPHICS

A. Verify that graphics are of appropriate resolution for high-quality printing of image. Coordinate with Architect during this verification.

B. Print in controlled conditions, package for protection, and deliver to site, keeping in protective covering until ready for installation.

C. Installation shall be by same company providing material and printing, maintaining responsibility for material until installation is complete.

3.03 CLEANING AND PROTECTION

A. Restore any damaged finishes. Clean and protect work from damage.

B. At the completion of the installation, clean sign surfaces in accordance with manufacturer's instructions.

END OF SECTION 10 14 00

SECTION 10 28 00 – RESTROOM ACCESSORIES

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

B. Refer to the Drawings for locations of work to be performed.

1.02 WORK INCLUDED

A. Furnish labor and materials to complete restroom accessories indicated, as specified herein, or both.

B. Accessories: Include anchors, plates, screws, bolts, expansion shields and like required by types of accessories selected and by construction to which they are to be secured.

1. Exposed hardware: Finish to match accessory.

1.04 SUBMITTALS

A. Product Data: For each type of product indicated. Include the following:

1. Construction details and dimensions.
2. Anchoring and mounting requirements, including requirements for cutouts in other work and substrate preparation.
3. Material and finish descriptions.
4. Features that will be included in the Project.
5. Manufacturer's warranty.

B. Product Schedule: Indicating types, quantities, sizes, and installation locations by room of each accessory required.

1. Identify locations using room designations indicated on Drawings.
2. Identify products using designations indicated on Drawings.

C. Maintenance Data: Restroom accessories to include in maintenance manuals.

1.05 QUALITY ASSURANCE

A. Source Limitations: For products listed together in the same articles in Part 2, provide products of same manufacturer unless otherwise approved by Architect.

1.06 COORDINATION

A. 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.

B. Individually pack and wrap accessory item, each complete with required trimmings, anchors, fastenings, bolts, screws and like; label each item indicating type of accessory, floor and room or space designation.

C. Deliver inserts and anchoring devices set into concrete or masonry as required to prevent delaying the Work.

1.07 WARRANTY

A. Special Mirror Warranty: Manufacturer's standard form in which manufacturer agrees to replace mirrors that develop visible silver spoilage defects and that fail in materials or workmanship within specified warranty period.

1. Warranty Period: 15 years from date of Substantial Completion, minimum. (Where manufacturer’s standard warranty exceeds 15 years, manufacturer’s standard warranty shall be provided.

PART 2 PRODUCTS

2.01 MATERIALS

A. Stainless Steel: ASTM A 666, Type 304, 0.0312-inch minimum nominal thickness, unless otherwise indicated.

B. Galvanized Steel Mounting Devices: ASTM A 153/A 153M, hot-dip galvanized after fabrication.

C. 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.

D. Chrome Plating: ASTM B 456, Service Condition Number SC 2 (moderate service).

E. Mirrors: ASTM C 1503, Mirror Glazing Quality, clear-glass mirrors, nominal 1/4-inch thick.

F. ABS Plastic: Acrylonitrile-butadiene-styrene resin formulation.

2.02 RESTROOM ACCESSORIES

A. Basis-of-Design Product: The design for accessories is based on products indicated. Subject to compliance with requirements, provide the named product or a comparable product by one of the following:

1. A & J Washroom Accessories, Inc.
2. Bobrick Washroom Equipment, Inc.
3. Bradley Corporation.
4. American Specialties Inc.
5. General Accessory Manufacturing Co. (GAMCO).
6. Impact
7. World (for hand dryer)
8. Bradley (for hand dryer)
9. Tork (for Paper Towel)

B. Paper Towel (Roll) Dispenser (TA-1):

1. Basis-of-Design Product: Tork Paper Hand Towel Roll Dispenser – 83 TR
2. Mounting: Surface mounted.
3. Minimum Capacity: 8” wide x 8” diameter paper towel roll.
4. Material and Finish: Plastic – Color Smoke
5. Refill Indicators: Viewing window.

C. Toilet Paper Dispenser (TA-2):

1. Basis-of-Design Product: Bobrick B-2888.
2. Description: Surface-Mounted Multi-Roll Toilet Tissue Dispenser.
3. Mounting: Surface mounted.
4. Operation: Limit stop/controlled delivery with theft-resistant spindle.
5. Capacity: Designed for 5 ¼” diameter tissue rolls.
6. Material and Finish: Satin-finish stainless steel unit.

D. Soap Dispenser (TA-3):

1. Basis of Design Product: Impact Foam-eeze 9326
2. Finish/Shell: Black/Gray ABS
3. Lockset: keyed
4. Refill Indicators: Viewing window
5. 1000 ml (34 oz) capacity; dispenses 0.7 ml of foamed liquid per stroke

E. Toilet Grab Bar (TA-4, TA-5, TA-6, TA-7):

1. Basis-of-Design Product: Bobrick B-6806
2. Mounting: Flanges with concealed fasteners.
3. Material: Stainless steel, 0.05-inch thick; smooth, No.4, satin finish.
4. Outside Diameter: 1-1/2 inches.

5. Configuration and Length: As indicated on Drawings.

F. Mop and Holder with shelf and hooks (TA-8):

1. Basis-of-Design Product: Bobrick B-239.
2. Description: 34" shelf with three anti-slip mop holders and four hooks.
3. Material and Finish: Stainless steel, No. 4 finish (satin).

G. Mirror Units (TA-9):

1. Basis-of-Design Product (TA-9): Bobrick B-290, 18" x 36"
2. Frame: Stainless-steel welded frame, 0.05-inch thick; smooth, No.4, satin finish.
3. Hangers: Produce rigid, tamper- and theft-resistant installation, using method indicated below.
   a. Wall bracket of galvanized steel, equipped with concealed locking devices – Lock Tab style.

H. Electric Hand-Dryer (TA-10):

1. Basis of Design: Push Button-Operated Warm Air Hand Dryer 2904-28 surface mount, as manufactured by Bradley
2. Operation: Push button, not automated, with 25 second time limit.
3. Shell: 1/4-inch-thick cast iron cover.
3. Finish: white porcelain enamel
3. Motor: Universal type, 1/10 HP at 7500 RPM, 115 volt, 20 amps, 2,300 watts, 60Hz
4. Dryer shall deliver 7,300 linear feet of air per minute (LFM)
5. Install where shown on Drawings.
6. Acceptable manufacturer: World or Dayton

I. Baby Changing Station (TA-11):

1. Basis-of-Design Product (TA-11): Model KB310-SSWM with external stainless steel bag hook as manufactured by Koala Kare Products, a Division of Bobrick
2. Size: 37" x 21".
3. Surface Mounted, Horizontal Orientation.
4. Finish: Satin Stainless Steel.
5. Weight Capacity: 300 LBS
6. Bed Surface Material: Microban antimicrobial.

7. Handles: Station shall have two solid handles that allow operation with less than 5 lbs. of force. Handles rest below 27" for cane detection when unit is in the down position.

2.03 FABRICATION

A. General: Fabricate units with tight seams and joints, and exposed edges rolled. 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

3.01 INSTALLATION

A. Install accessories where indicated, or as directed.

B. 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.

C. Grab Bars: Install to withstand a downward load of at least 250 lbf (1112 N), when tested according to method in ASTM F 446.

D. During installation of accessories, until finally installed, accepted, protect items by approved means to maintain accessories in perfect condition. Remove damaged or defective work; replace with perfect work without extra cost to Owner.

3.02 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 recommendations.

END OF SECTION 10 28 00

SECTION 10 44 00 - 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. This Section includes the following:

1. Portable fire extinguishers.
2. Cabinets for fire extinguishers.
3. Mounting brackets for fire extinguishers.

1.3 SUBMITTALS

A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for fire-protection cabinets.

1. Fire Extinguishers: Include rating and classification.
2. Fire-Protection Cabinets: Include roughing-in dimensions, details showing mounting methods, relationships of box and trim to surrounding construction, door hardware, cabinet type, trim style, and panel style.

B. Samples for Verification: For each type of exposed factory-applied color finish required for fire-protection cabinets, prepared on Samples of size indicated below.

1. Size: 6 by 6 inches square.

C. Maintenance Data: For fire extinguishers and fire-protection cabinets to include in maintenance manuals.

1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain fire extinguishers and fire-protection cabinets through one source from a single manufacturer.

B. NFPA Compliance: Fabricate and label fire extinguishers to comply with NFPA 10, "Portable Fire Extinguishers."

C. Fire Extinguishers: Listed and labeled for type, rating, and classification by an independent testing agency acceptable to authorities having jurisdiction.

1.5 COORDINATION

A. Coordinate size of fire-protection cabinets to ensure that type and capacity of fire extinguishers indicated are accommodated.

1.6 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of portable 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: Manufacturer's standard warranty or one year from date of Substantial Completion, whichever is longer.

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 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. Basis-of-Design Product: The design for each product is based on the product named. Subject to compliance with requirements, provide either the named product or a comparable product by one of the other manufacturers specified.

2.2 MATERIALS

A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B.

B. Aluminum: Alloy and temper recommended by aluminum producer and manufacturer for type of use and finish indicated, and as follows:

1. Sheet: ASTM B 209.

2. Extruded Shapes: ASTM B 221.

C. Tempered Float Glass: ASTM C 1048, Kind FT, Condition A, Type I, Quality q3, 3 mm thick, Class 1 (clear).

2.3 PORTABLE FIRE EXTINGUISHERS

A. Available Manufacturers:

1. JL Industries, Inc.
2. Larsen's Manufacturing Company.
3. Potter Roemer; Div. of Smith Industries, Inc.

B. General: Provide fire extinguishers of type, size, and capacity indicated.

1. Valves: Manufacturer's standard.
2. Handles and Levers: Manufacturer's standard.
3. Instruction Labels: Include pictorial marking system complying with NFPA 10, Appendix B.

C. Multipurpose Dry-Chemical Type in Steel Container: UL-rated 3-A:40-B:C, 5-lb nominal capacity, with siliconized mono ammonium phosphate powder in manufacturer's standard enameled container.

1. Basis-Of-Design Product: Larsen’s MP5-A.
2. Usage: General purpose, mounted in cabinet.

2.4 FIRE-PROTECTION CABINET

A. Basis-of-Design Product: Larsen’s AL2409-R3 or a comparable product by one of the following:

B. Available Manufacturers:

1. JL Industries, Inc.
2. Larsen's Manufacturing Company.
3. Potter Roemer; Div. of Smith Industries, Inc.

C. Cabinet Type: Suitable for fire extinguisher.

D. Cabinet Construction: Nonrated.

E. Cabinet Material: Enameled-aluminum sheet.

1. Color: As selected by Architect from manufacturer's full range.

F. Semi-Recessed: Cabinet box recessed in walls where of sufficient depth. Semi-Recessed at CMU or frame walls.

1. Exposed Flat Trim at recessed cabinet: One-piece combination trim and perimeter doorframe overlapping surrounding wall surface with exposed trim face and wall return at outer edge (backbend) of 1/4 to 5/16 inch.
2. 2 ½" rolled edge.

G. Cabinet Door and Trim Material: Extruded aluminum.

1. Finish: Clear anodized.

H. Door Style: Fully glazed panel with frame.

I. Door Glazing: 1/8-inch clear tempered float glass.

J. Door Hardware: Manufacturer's standard door-operating hardware of proper type for cabinet type, trim style, and door material and style indicated.

1. Provide Lettered Door Handle: One-piece, cast-iron door handle with the word "FIRE" embossed into face.
2. Door Lock: Cam lock, that allows door to be opened during emergency by pulling sharply on door handle, with cylinder, keyed alike to other cabinets.
3. Provide manufacturer's standard hinge permitting door to open 180 degrees.

K. 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, with plated or baked-enamel finish.
2. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location. Locate as indicated by Architect.

a. Identify fire extinguisher in fire-protection cabinet with the words "FIRE EXTINGUISHER."

1) Location: Applied to cabinet door.
2) Application Process: Die-cut adhered vinyl.
3) Lettering Color: Red.
4) Orientation: Vertical.

2.5 MOUNTING BRACKETS

A. Available Manufacturers:

1. JL Industries, Inc.
2. Larsen's Manufacturing Company.
3. Potter Roemer; Div. of Smith Industries, Inc.

B. Mounting Brackets: Manufacturer's standard steel, designed to secure fire extinguisher to wall or structure, of sizes required for types and capacities of fire extinguishers indicated, with baked-enamel finish.

1. Color: Red.

C. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location. Locate as indicated by Architect.

1. Identify bracket-mounted fire extinguishers with the words "FIRE EXTINGUISHER" in red-letter decals applied to mounting surface.

a. Orientation: Vertical.

2.6 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.

B. Cabinet Doors and Trim: Fabricate according to manufacturer's standards, from materials indicated and coordinated with cabinet types selected.

2.7 FINISHES, GENERAL

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. Finish fire-protection cabinets after assembly.

D. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other 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. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.

B. Class II, Clear Anodic Finish: AA-M12C22A31 (Mechanical Finish: nonspecular as fabricated; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class II, clear coating 0.010 mm or thicker) complying with AAMA 611.

2.9 STEEL FINISHES

A. Surface Preparation: Clean surfaces of dirt, oil, grease, mill scale, rust, and other contaminants that could impair paint bond using manufacturer's standard methods.

B. Baked-Enamel Finish: Immediately after cleaning and pretreating, apply manufacturer's standard two-coat, baked-enamel finish consisting of prime coat and thermosetting topcoat. Comply with paint manufacturer's written instructions for applying and baking to achieve a minimum dry film thickness of 2 mils.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine walls and partitions for suitable framing depth and blocking where recessed cabinets will be installed.

B. Examine fire extinguishers for proper 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 recessed fire-protection cabinets as required by type and size of cabinet and trim style.

3.3 INSTALLATION

A. General: Install fire-protection specialties in locations and at mounting heights indicated or, if not indicated, at heights [indicated below:] [acceptable to authorities having jurisdiction.]

1. Fire-Protection Cabinets: 56 inches above finished floor to top of cabinet.
2. Mounting Brackets: 48 inches above finished floor to top of fire extinguisher.

B. Fire-Protection Cabinets: Fasten fire-protection cabinets to structure, square and plumb.

1. Unless otherwise indicated, provide recessed fire-protection cabinets. If wall thickness is not adequate for recessed cabinets, provide semi-recessed fire-protection cabinets.

2. Fasten mounting brackets to inside surface of fire-protection cabinets, square and plumb.

C. Mounting Brackets: Fasten mounting brackets to surfaces, square and plumb, at locations indicated.

D. Identification: Apply vinyl lettering at locations indicated.

3.4 ADJUSTING AND CLEANING

A. Remove temporary protective coverings and strippable films, if any, as fire-protection specialties 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.

D. Touch up marred finishes, or replace fire-protection cabinets that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by fire-protection cabinet manufacturer.

E. Replace fire-protection cabinets that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 10 44 00

SECTION 10 51 13 – METAL LOCKERS AND BENCHES

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 WORK INCLUDED

A. Installation of corridor lockers to include, but not limited to, all labor, materials and equipment required for new double-tiered lockers with recessed cup handles, built-in combination locks and slope-tops constructed on new (or existing) concrete bases.

1.03 SUBMITTALS

A. Product Data: Submit manufacturer's technical data and installation instruction for each type of locker required.

B. Shop Drawings: Submit shop drawings for fabrication and erection of lockers, including plans and elevations. Show anchorages and accessory items.

1.04 SAMPLES

A. Provide painted metal locker chips, from the manufacturer's full range, for selection.

1.05 WARRANTY

A. Contractor shall warrant all materials and workmanship of a period of one (1) year, unless otherwise noted. Any items requiring repair or replacement during the warranty period, due to manufacturing or installation defect, shall be corrected by the Contractor without additional cost to the Owner.

B. Built-in combination locks shall be warranted to be free from manufacturing defects for a period of five (5) years from the Date of Substantial Completion.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Listed manufacturers must adhere to the Technical Specifications and not assume that their standard unit will meet all requirements.

B. Available Manufacturers: Subject to compliance with requirements, provide one of the following:

1. LOCKERS
    a. **Basis of Design: ASI Storage Solutions**
    b. Penco Products
    c. Lyon Metal Products
    d. Elite Storage Products

2. LOCKER ROOM BENCHES
    a. **Basis of Design: ASI Storage Solutions**
    b. Penco Products
    c. Lyon Metal Products
    d. Elite Storage Products

2.02 PRODUCT

A. LOCKER ROOM LOCKERS:

- **a. Basis of Design: ASI Storage Solutions – Pro Collection.**
- b. Size: 24” wide x 24” deep x 72” high.
- c. Material: All major steel parts shall be of mild cold rolled commercial quality steel.
- d. Finish: All material shall be power washed, and phosphate treated for maximum finish color adhesion. All components shall be finished with a 2 mm hybrid epoxy/ polyester powder, electrostatically applied to ensure uniform thickness and baked to cure
- e. Construction: All lockers shall be built on a unit principle
- f. Locker Frames: Shall be 16 gauge formed in a channel shape.
- g. Ventilation: Open front; side shall be diamond perforated.
- h. Body: Tops, bottoms, sides and shelves shall be 16 gauge; backs shall be 18 gauge. Bottoms shall have two welded reinforcement channels. Bolt spacing shall not exceed 9” o.c.
- i. Interior Equipment: Each locker shall have one coat rod, two coat rod holders, and two single wall hooks.
- j. Number Plates: Each locker shall have a polished aluminum number plate riveted to door face with black numerals ½” high.
- k. Color: Doors, Frames, and all body parts shall be finished in same color
- l. Assembly: All locker components shall be assembled by use of rivets.
- m. Provide the Following:
    - i. Security Box: - 14-gauge lockable door with a 16-gauge side panel. The door shall be attached to a welded frame with a continuous hinge. The hinge shall be mounted to the door with aluminum rivets. The door shall have a recessed handle. Security box door frame members to be not less than 16 gauge formed to a channel shape. Vertical members shall have an additional flange to provide a continuous door strike. Provide built-in lock.
    - ii. Footlocker: Front footlocker panel shall include a single point latch with padlock strike plate and mini louvers. Footlocker top shall have a continuous hinge. Opening and closing shall be quieted by rubber bumpers mounted to the

contact points. Seat shall be strengthened with two reinforcement channels welded to the bottom of seat. Two side seat supports shall be fastened to side panels and inserted in a support tab on the front locker panel for added strength.

n. Base: Install lockers on CMU base, by others.

B. P.E. LOCKERS:

a. Basis of Design: ASI Storage Solutions – Competitor Collection

b. Size: Double Stacked, 12" wide x 18" deep x 60" high.

c. Material: All major steel parts shall be of mild cold rolled commercial quality steel.

d. Finish: All material shall be power washed, and phosphate treated for maximum finish color adhesion. All components shall be finished with a 2 mm hybrid epoxy/ polyester powder, electrostatically applied to ensure uniform thickness and baked to cure.

e. Construction: All lockers shall be built on a unit principle with common intermediate uprights separating units.

f. Door Frames: Shall be 16 gauge formed in a channel shape. Vertical members shall have additional flange to provide a continuous door strike. Cross frame members shall also be 16-gauge channel shaped, including intermediate cross frames on double and triple tier lockers

g. Doors: Shall be 14-gauge, channel shaped on both the lock and hinge side with angle formations across the top and bottom. Single, double and triple tier locker doors shall have a 16-gauge full height reinforcement channel.

h. Ventilation: All locker sides and doors 20" or higher shall be perforated with diamond-shaped openings ¾" wide x 1-1/2" high in a quantity and pattern to ensure maximum ventilation and maintain structural strength. All other doors shall have small diamond-shaped perforations 7/16" wide x 15/16" high.

i. Body: Backs shall be 18 gauge; all other body parts shall be 16 gauge. Bolt spacing shall not exceed 9" o.c.

j. Hinges: Shall be full length 16-gauge continuous piano type riveted to both door and frame.

k. Handles: Shall be one-piece 20 gauge deep drawn stainless steel cup designed to accommodate locks

l. Latching: All lockers shall have an 11-gauge frame hook secured to the frame. The frame hook shall have a padlock hasp protruding through the recessed handle. A rubber silencer shall be firmly secured to the frame at each latch hook.

m. Locking Device: Combination built-in locks shall be manufactured by the Master Lock Company #1630 with five changeable combinations and a 5-pin keyed cylinder supervisory entry feature. Lock shall automatically re-lock when door is closed. All locks shall be master keyed. Provide (10) master keys.

n. Interior Equipment: Single tier lockers 48" or higher shall have a shelf. If under 18" deep, locker shall have three wall hooks and one ceiling hook. Single tier lockers 18" deep or more shall have a coat rod instead of a ceiling hook. Double tier lockers shall have three wall hooks and one ceiling hook. Triple tier lockers shall have three wall hooks and one ceiling hook. Triple tier lockers shall have three wall hooks for 12" wide and 4 wall hooks for 15" and wider lockers.

o. Number Plates: Each locker shall have a polished aluminum number plate riveted to door face with black numerals ½" high.
p. Color: Doors, Frames, and all body parts shall be finished in same color
q. Assembly: All locker components shall be assembled by use of rivets.
r. Base: Install lockers on CMU base, by others.

C. LOCKER ROOM BENCHES:

a. Basis of Design: ASI Storage Solutions
b. Size 1: 48" long X 12" wide.
c. Size 2: 72" long X 12" wide.
d. Material: Hardwood, all corners rounded and sanded.
e. Finish: All Surfaces to be finished with two coats of clear lacquer.
f. Pedestal: Pedestal shall be 1-1/2" diameter steel tubing with 11-gauge steel flanges welded to each end. The bottom and top flange shall be 8" in diameter with three (3) holes for anchoring in each flange. The pedestal shall be 16-1/4" high and shall be powder coated to match lockers.

2.03 ACCESSORIES

A. Provide all necessary filler strips and trim required for complete installation. Fillers to be 14-gauge.

B. Provide 14-gauge, solid end panels with no exposed fasteners.

PART 3 EXECUTION

3.01 WORKMANSHIP

A. Erect work in thorough, workmanlike manner using workman skilled in the trade. Lockers to be set straight, plumb and true. Securely attach lockers to walls and base. At a minimum, fasten every third locker to the wall, top and bottom.

3.02 LOCKERS, GENERAL

A. Install metal lockers at locations shown on the Drawings in accordance with manufacturer's instructions.
B. Adjust doors and latches to provide easy operation, with no binding.
C. Provide the Owner with one can of touch-up paint, for each color used.
D. Provide control chart for locker combinations.

3.03 CLEANING AND PROTECTION

A. Wipe-out and clean all lockers after installation.

B. Restore damaged finishes caused by the locker installation. Clean and protect work from damage.

END OF SECTION 10 51 13

SECTION 11 52 13 - LARGE VENUE PROJECTION SCREENS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section Includes: This Section specifies electrically operated projection screens and accessories.

1.03 RELATED SECTIONS

A. Division 26 Sections for Common Work Results for Electrical: Power supply, conduit, and wiring.

1.04 DEFINITIONS

A. Gain: Indication of screen's luminance or brightness measured perpendicular to screen center and relative to magnesium carbonate block, which serves as standard for 1.0 gain. Higher numbers indicate greater brightness.

B. Viewing Angle: Horizontal angle from perpendicular center of screen at which gain or brightness decreases by 50%.

C. Format: Proportion of projection screen viewing area expressed as a ratio of width/height.

1.05 REFERENCES

A. International Code Council (ICC):

1. International Building Code.

B. Society of Motion Picture and Television Engineers (SMPTE):

C. Underwriters Laboratories Inc. (UL).

D. Underwriters' Laboratories of Canada (ULC).

1.06 ACTION SUBMITTALS

A. General: Submit listed action submittals in accordance with Contract Conditions and Division 01 Section "Submittals".

B. Product Data: Submit product data, including manufacturer's technical product data sheet, for specified products.

1. Material Safety Data Sheets (MSDS).

C. Shop Drawings: Indicate dimensions, fabrication, and installation details.

1. Include electric wiring diagrams.

D. Samples: Submit 2 samples of screen finish material having dimensions of 6 inches × 6 inches (152 × 152 mm).

1.07 INFORMATION SUBMITTALS

A. Quality Assurance:

1. Test Reports: Certified test reports showing compliance with specified performance characteristics and physical properties.
2. Certificates: Product certificates signed by manufacturer certifying that materials comply with specified performance characteristics, criteria, and physical requirements.
3. Manufacturer's installation instructions.

1.08 QUALITY ASSURANCE

A. Qualifications:

1. Worker experienced in performing work of this section who has specialized in work similar to that required of this project.

B. Regulatory Requirements:

1. Comply with International Building Code (IBC) and KBC.

1.09 DELIVERY, STORAGE & HANDLING

A. Storage and Protection:

1. Store electric projection screens in a dry, ventilated area, protected from exposure to harmful weather conditions, at a temperature less than 80 degrees F (27 degrees C).

B. Handling: Handle electrically operated projection screen materials with care in order to prevent damage.

C. Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.

1.010 PROJECT AMBIENT CONDITIONS

A. Project Location: Perform electrically operated projection screen work when temperatures are greater than 40 degrees F (4 degrees C).

1.011 SEQUENCING

A. Sequence with Other Work: Comply with projection screen manufacturer's written recommendations for sequencing construction operations.

1.012 MAINTENANCE MATERIALS

A. Use standard product line parts produced by manufacturer of electrically operated projection screens.

PART 2 PRODUCTS

2.01 Projection Screen - Tensioned Electrically Operated Concealed

A. Basis of Design:

1. DaLite:

a. Practice Field Space: Size of Viewing Surface (24'W x 12'"H), Computer 16:10 Ratio, Matte White.

B. Alternate Manufacturers & Products:

1. Draper Inc.
2. Stewart Filmscreen Corp.

PART 3 EXECUTION

3.01 INSTALLERS

A. Provide experienced and qualified technicians to install electrically operated projection screens.

3.02 MANUFACTURER'S INSTRUCTIONS

A. Compliance: Comply with manufacturer's written data, including product technical bulletins, product catalog installation instructions, product carton installation instructions and technical data sheets.

3.03 EXAMINATION

A. Site Verification of Conditions

1. Verify that conditions of substrates previously installed under other sections or contracts are acceptable with electrically operated projection screen installation.
2. Ensure electrical power supply is installed to meet electric projection screen requirements in accordance with Division 26 Section "General Provisions – Electrical".

a. Verify type and location of power supply.

3. Inform Architect of unacceptable conditions immediately upon discovery.
4. Proceed with installation only after unacceptable conditions have been corrected.

3.04 COORDINATION

A. Coordinate electric projection screen placement with placement of other ceiling and wall mounted components.

3.05 INSTALLATION

A. Install electric projection screens in accordance with reviewed shop drawings at locations and heights indicated.

1. Verify locations with Owner prior to installation.

B. Install viewing surface and drive assembly in housing only after interior construction is substantially complete.

C. Securely install screens plumb and level to supporting substrate.

3.06 FIELD QUALITY CONTROL

A. Testing and Inspection: Operate each screen 3 times to ensure viewing surfaces extend and retract through full range of motion.

1. Verify controls, limit switches and other components function as designed and meet project requirements.
2. Ensure viewing surface raising operation fully engages and lifts screen closure door into closed position.
3. Adjust motors, controls and components to allow for smooth, unobstructed screen operation.

3.07 FINAL CLEANING

A. Upon completion, remove surplus materials, rubbish, tools and equipment.

3.08 PROTECTION

A. Protect electrically operated projection screens from damage during construction.

B. Repair damage to adjacent materials caused by electrically operated projection screen work.

END OF SECTION 11 52 13

SECTION 11 66 23 – ATHLETIC EQUIPMENT

PART 1 GENERAL

1. SECTION INCLUDES
   A. Gymnasium and ECE/Special Needs Equipment
      1. Gymnasium Divider Curtains.
      2. Wall padding
      3. Archery curtain
      4. Ceiling Suspended Batting/Golf Cages.

2. RELATED SECTIONS
   A. Division 26 Electrical Sections: Installing electrical power to operate gymnasium equipment

3. REFERENCES
   A. ASTM E 84 – Standard Test Method for Surface Burning Characteristics of Building Materials.
   B. ASTM F 2440 – Standard Specification for Indoor Wall/Feature Padding.
   C. NFPA 255 – Surface Burning Characteristics of Building Materials.
   D. NFPA 265 – Standard Methods of Fire Tests for Evaluating Room Fire Growth Contribution of Textile Coverings on Full Height Panels and Walls
   E. NFPA 286 – Standard Methods of Fire Tests for Evaluating Contribution of Wall and Ceiling Interior Finish to Room Fire Growth.
   F. NFPA 701 – Methods of Fire Tests for Flame-Resistant Textiles and Films.

4. DESIGN REQUIREMENTS
   A. Basketball Backstops: Locate overhead attachments of basketball backstops in keeping with static equivalent loading and point reactions.

5. SUBMITTALS
   A. Comply with Section 01 30 00 – Submittal procedures.
   B. Product Data: Submit manufacturer's product data, including materials, components, fabrication, finish, and installation instructions per Section 01 34 00.
   C. Shop Drawings:
      1. Submit manufacturer's shop drawings, including plans, elevations, sections, and details, indicating locations, quantities, dimensions, tolerances, materials, fabrication, connections, hardware, fasteners, finish, electrical wiring diagrams, options, and accessories.
      2. Show location and detail of attachment to building structure.
   D. Samples: Submit manufacturer's color samples.
      1. Powder Coat Sample.
   E. Design Data
      1. Basketball Backstops: Submit manufacturer's design data, indicating static loads and point reactions.
   F. Test Reports: Submit manufacturer's certified test reports from testing performed by accredited independent testing laboratory, indicating compliance of materials with requirements as specified.

G. Manufacturer's Certification: Submit manufacturer's certification that materials comply with specified requirements and are suitable for intended application.
H. Manufacturer's Project References: Submit manufacturer's list of recently completed projects, including project name and location, name of architect, and type and quantity of gymnasium and play field equipment installed.
I. Operation and Maintenance Manual: Submit manufacturer's operation and maintenance manual; including operation, maintenance, adjustment, and cleaning instructions; trouble shooting guide; parts list; and electrical wiring diagrams.
J. Warranty: Submit manufacturer's standard and additional warranties.
K. Closeout Submittals: Operation and Maintenance Manual from manufacturer(s), including operation, maintenance, adjustment, and cleaning instructions; trouble-shooting guide; parts list; and electrical wiring diagrams.

6. QUALITY ASSURANCE
   A. Single Source Responsibility: Provide gymnasium equipment from single manufacturer.
   B. Manufacturer's Qualifications: Minimum of 5 consecutive years' experience manufacturing gymnasium equipment similar to that specified.
   C. Installer's Qualifications: Trained and approved by manufacturer.
   D. Manufacturer shall provide documentation showing welders and processes are AWS certified.
   E. Regulatory Requirements: Gymnasium equipment shall conform to latest rules and regulations.
      1. National Federation of State High School Associations (NFHS).
      2. Kentucky High School Athletics Association (KSHAA).

7. DELIVERY, STORAGE, AND HANDLING
   A. Delivery: Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly identifying product name and manufacturer.
   B. Storage: Store materials in clean, dry area indoors in accordance with manufacturer's instructions. Keep temporary protective coverings in place.
   C. Handling: Protect materials and finish from damage during handling and installation.

8. WARRANTY
   A. Provide 1 year warranty against defects in materials and workmanship, unless otherwise specified.

PART 2 PRODUCTS

A. Basis of Design: Porter Athletic
B. Available Manufacturers:
   1. Draper Inc.
   2. Performance Athletic Equipment Company.

3. Spalding Equipment.
4. ADP Lemco Athletic Equipment.

C. Substitutions: Requests for substitutions will be considered in accordance with Section 01 63 00.

2. PRODUCT – INTERIOR, GENERAL
   A. Fire-Test-Response Characteristics: Provide interior athletic equipment that meets the following requirements 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; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
      2. Flame-Spread Index: 25 or less.
      3. Smoke-Developed Index: 450 Insert value or less.
      4. Fire Growth Contribution: Comply with acceptance criteria of local code and authorities having jurisdiction when tested according to NFPA 265 for textile finishes and NFPA 286 for finishes other than textile.

3. GYMNASIUM DIVIDER CURTAINS
   A. Gymnasium Divider Curtains: Model No. 2080 gymnasium divider curtain.
      1. Size: Center roll-up type, 50 FT 0 IN wide by 29 FT 5.8037 IN high.
      2. Curtains: Compactly storing to dimension not to exceed 14 inches below structural attachment support, without using cables or straps for operation.
      3. Divider: Roll neatly and compactly on grooved, anodized, aluminum batten tube, 3-inch diameter.
      4. Roll Tube: Located at exactly 1/2 total height of curtain material. As roll tube rotates, it shall climb up upper portion of curtain, rolling up top and bottom sections simultaneously.
      5. Top and Bottom of Each Curtain: Fabricated with pocket to conceal continuous, 1-5/16-inch O.D. tubes extending full length of fabric to ensure proper support.
      6. Top Tube: Supported from overhead support structure with threaded rod-support fitting to provide horizontal alignment with floor, at minimum of 9'-0" o.c.
      7. Bottom Edge of Upper Section and Top Edge of Lower Section: Hemmed and contain 3/16-inch diameter cable to fit and hold curtain sections in 3-inch grooved, center-drive, aluminum batten tube.
      8. Bottom Half of Curtain: Flexivide solid-vinyl shall consist of polyester-reinforced fabric with weight of 19 ounces per square yard. Material shall contain antibacterial, fungi-resistant, and flame-retardant chemicals to meet requirements of ASTM E 84, Class A Rating and NFPA 701 large-scale test, and State of California test requirements.
      9. Top Half of Curtain: Fleximesh material shall be 11 by 11, 1,000 denier polyester base fabric, open polyester interlocking-grid weave with PVC coating, with an opacity of approximately 55%, and a finished weight of 9-11 ounces per square yard. Fleximesh material shall be flame-resistant and comply with Federal Standard 191, Method 5903.2, vertical fire-retardancy requirements.
      10. Upper and Lower Curtain Sections: Roll flat and compact to overhead storage position by tubular motors; 110-volt, 10-amp, single-phase; gear reducer; and break mechanism

concealed inside horizontal batten tube. Dual Motors: More than 60 feet long. More than 1,500 square feet.

11. Motor Electrical Power: Accomplished by self-retracting cable reel system.
12. Torque Reaction of Motors: Contained in wall-mounted, extruded, and anodized aluminum guide with cam-follower mechanism.
13. Flush Wall-Mounted Dual-Key Switch: Up and down. Cannot be instantly reversed to protect winch. For safety, key switch shall be located so operator has full view of curtain being operated. Switch shall be identical to that used for basketball backstops.

4. WALL PADDING

A. Wall Pad Dimensions: 2’-0” Wide by 6’-0” High
B. Foam: 2” Thick, Polyurethane Foam
C. Interior Foam: Bonded to 7/16” oriented strand wood board to minimize warping.
D. Panel shall meet the min. ASTM F2440 standard specification
E. Vinyl-Coated Polyester Cover shall meet the requirements of NFPA 101 Life Safety Code Passing NFPA-286. ASTM E-84 test is not considered equal.
F. Entire Face of Panel: Shall be upholstered in 19oz, fire-retardant, high-tensile, vinyl-coated polyester fabric material.
G. Cover material shall be designated as flame resistant in accordance with NFPA 701, and State of California.
H. Cover Material Tear Strength: 100 psi.
I. Cover Material Properties: Mildew resistant, rot resistant, with infection-combating fungicide.
J. Cover shall be folded and securely stapled to backside of the OSB.
K. Color: To be selected from manufacturer’s standard colors, minimum 14 from which to choose.

5. ARCHERY CURTAIN

A. Model No. 90670000A Roll-Fold Archery Gymnasium Divider Curtain (max size 120’-0” long or 4000 SQ. FT.)
   1. Material: Curtain fabric shall be a high tenacity woven nylon archery netting material.
   2. Edge and seam binding shall be a vinyl material no less than 18oz/yd. Vinyl color shall be white.
   3. Archery net fabric tensile strength shall be no less less than 65 pounds.
   4. Fabric shall be UV stabilized and heat set for quality purposes.
   5. Fabric aperture size shall be a 5/16” diamond shape
   6. Top of curtain to be fabricated with a pocket to conceal continuous 1-5/16" O.D. steel tube extending the full length of the curtain to ensure proper support. Tube shall be supported from roller assembly supports on adjustable chains not exceeding 12'-0" centers.
   7. Cable: Curtain shall be hoisted by 1/8" diagonal vandal-proof galvanized cable (2,100 lb. breaking strength each cable, spaced between 10'-0" and 12'-0" apart). Cables shall be

routed thru cable guides to fold the curtain in a compact accordion fold arrangement, which lies across bottom support tube as curtain is hoisted.

8. Support Assemblies: Upper ends of hoist cables shall terminate into individual hoist drums positioned on continuous zinc-plated 2-3/8" O.D. tube line shaft arrangement. Line shaft shall turn in support assemblies equipped with four steel ball bearing wheel rollers. Each support assembly shall be positioned adjacent to a cable hoist drum. Support assemblies shall be secured to structural roof framing supports by means of threaded rods and support chains to provide structural integrity and accommodate all slopes or building camber.
9. Coating: All metal parts not zinc-plated shall be powder coated.
10. Warranty: 1 year limited warranty.

6. Ceiling Suspended Double-Wide Batting/Golf Cages.

a. Model No. 90920002 Batting/Gold Cage, Ceiling Suspended Unit
b. Size: 24’ wide x 70’ long x 12’ high.
c. The four sides and top of cage shall be 3/4" square, knotless polypropylene mesh netting (#420 twine). Color of netting to be black. A 1/4" polypropylene rope shall be sewn into the perimeter of each section of netting. Netting shall be of sufficient size to allow approximately one foot of material to lie on floor to stop balls from being driven under netting.
d. Supporting frame (24' x 70') of cage to be constructed of 1-7/8" O.D. heavy-wall electro-plated tubing with cross spreaders located at 14'-0" centers for hoist cable attachments. Tee fittings shall be provided at each tubing junction. Hoist cables (12) shall be of 1/8" diameter, vandal-proof galvanized cable (2,100 lb. breaking strength each cable). Hoist cables (12) routed through pulley assemblies.
e. Bottom end of each cable shall terminate in a sling arrangement. Adjustable collars shall be provided for securing cable/sling to supporting frame, allowing for proper support and leveling of frame assembly.
f. Upper ends of hoist cables shall terminate into individual hoist drums positioned on continuous 2-3/8" O.D. tube line shaft arrangement. Line shaft shall turn in special support assemblies equipped with two 3" diameter polypropylene wheel rollers. Each support assembly shall be positioned adjacent to a cable hoist drum. Support assemblies shall be secured to structural roof framing support.
g. Motor Operated: Model No. 910060xx – Single Output Winch
    i. ¾ HP Electric Operator for Divider Curtains and Batting Cages

7. EQUIPMENT CONTROL

A. Key Switch: For curtain divider, batting cages, and archery net, Incorporate rotary up and down limit switches and flush wall-mounted dual-key switch to prevent improper operation of system.

PART 3 EXECUTION

1. EXAMINATION

A. Examine areas and supporting structure to receive gymnasium and play field equipment. Notify Architect in writing of conditions that would adversely affect installation or subsequent use. Do not proceed with installation until unsatisfactory conditions are corrected.

2. INSTALLATION

A. Install gymnasium equipment in accordance with manufacturer's instructions at locations indicated on the Drawings.

B. Install equipment plumb, level, straight, square, accurately aligned, correctly located, to proper elevation, and secure.

C. Install equipment using manufacturer's supplied hardware and fasteners.

D. Electrical: Install electrical power as specified in Division 26 electrical sections.

E. Repair minor damages to finish in accordance with manufacturer's instructions and as approved by Architect.

F. Remove and replace damaged components that cannot be successfully repaired, as determined by Architect.

3. ADJUSTING

A. Adjust basketball backstops, backboards, nets, and goals for plumb and level.

B. Adjust operating equipment to function properly and for smooth operation without binding.

C. Set and adjust electric winches' upper and lower limit controls.

4. CLEANING

A. Clean gymnasium and play field equipment promptly after installation in accordance with manufacturer's instructions.

B. Remove labels and temporary protective coverings.

C. Do not use harsh cleaning materials or methods that would damage finish.

5. DEMONSTRATION

A. Demonstrate operation and maintenance of gymnasium and play field equipment to Owner's personnel.

B. Furnish Owner with keys or passwords to equipment after demonstration.

6. PROTECTION

A. Protect installed gymnasium and play field equipment to ensure equipment will be without damage or deterioration at time of substantial completion.

END OF SECTION 11 66 23

SECTION 11 68 44 – OUTDOOR LED DISPLAY

PART 1: GENERAL

1.01 SECTION INCLUDES

A. LED message centers

B. Control software

1.02 REFERENCES

C. Standard for Electric Signs, UL48, CUL48, UL Energy Efficiency Verified (Green Leaf certification)

D. Standard for Control Centers for Changing Message Type Signs

E. Federal Communications Commission Part 15 Regulations for A Class devices.

F. National Electric Code

G. Designed to current UBC or IBC standards

1.03 SUBMITTAL

A. The electronic LED display manufacturer shall provide a complete technical submittal within 60 days of contract award and shall not proceed with LED Matrix manufacture until the submittal is approved.

B. Submit:

1. All LED display manufacturer qualifications, as specified herein.
2. LED display installation drawing.
3. AC Site Power Requirements, including legs and Amps per leg.
4. LED display control software operator's manual.
5. LED display installation and maintenance manual.

1.04 QUALIFICATIONS

A. LED display manufacturer shall:

1. Have an onsite quality assurance lab to verify product integrity.
2. Have at least one (1) Project Manager with PMI certification. Have a minimum of 75 years electrical sign manufacturing experience and 20 years of LED display manufacturing experience prior to the contract bid date.
3. Have a minimum of 50,000 permanently mounted LED displays in operation for a minimum period of one (1) year prior to the contract bid date.
4. Provide support via domestic, toll-free help desk and an online service knowledge base.

5. Provide proof of liability coverage of $10,000,000 aggregate.

B. Manufacturing experience with the following types electronic signs shall not satisfy the requirements:

1. Matrix displays that show a limited quantity of messages.
2. LCD displays.
3. Back-lit displays.

C. Manufacturer requirements:

1. Must be USA based with in-house domestic manufacturing capabilities for modules and internal circuit boards; in-house fabrication of all metalwork; in-house assembly of all components.
2. Minimum of 20 years in business under same name and producing same type of products.
3. Minimum of 200 USA based employees.
4. Manufacturer must have a minimum of 30,000 operating LED displays in the USA (under the same company name) at the time of this bid.
5. Must have a minimum of 25 sales/support managers based throughout the USA, a minimum of 10 full time service technicians, and a minimum of 20 customer service and support personnel in house.

1.05 WARRANTY

A. Warranty against material defects in material and workmanship for five (5) years from the date of shipment from factory dock.

B. Provide a ten (10) year parts availability guarantee.

C. Replacement parts shipped the same day when requested by 3 p.m. CT.

D. Provide toll-free service coordination.

PART 2: PRODUCT

2.01 Manufacturer

A. BASIS OF DESIGN: Watchfire Signs S-Series

B. Subject to compliance with requirements of this specification, the following manufacturers shall be acceptable:

a. Samsung

b. Translux

2.02 LED Display

C. Cabinet Construction

1. Cabinet dimensions shall not exceed:

a. (5') high by (8') wide. The front-to-back cabinet depth shall not exceed 8 inches.

b. The cabinet shall contain a full LED matrix measuring a minimum of:

i. (270) pixel rows high by (486) pixel columns wide.

2. Display configuration is single-face, one sided display.
3. The distance from the center of one line or column of pixels to the center of all adjacent lines or columns shall be Line Spacing 16.93mm both horizontally and vertically.
4. Maximum display power per face shall not exceed (105) Amps when 100% of the pixels are operating at their maximum possible drive current.
5. Cabinet weight per face shall not exceed 9lbs/sq ft
6. Display shall operate from the following power sources: 120/240 VAC, 60 Hz single-phase, including neutral and earth ground.
7. Display shall operate in a minimum ambient temperature range of -40° to +140°F (-40 to +60°C) and to a 95% humidity.
8. Internal display component hardware (nuts, bolts, screws, standoffs, rivets, fasteners, etc.) shall be fabricated from stainless steel, aluminum, nylon, or other durable corrosion-resistant materials suitable for the signage application.
9. Module components shall be 100% solid-state.
10. Display performance may not cause harmful radio, magnetic or electromagnetic interference. The display must accept any interference received, including interferences that may cause undesired operation.

D. Housing Frame

1. Display materials shall use non-corrosive materials or have a protective coating so they shall be anti-corrosive and not degrade or oxidize.

2. Cabinets must be constructed from extruded aluminum with precision-mitered corners, solid welds, and stainless fasteners.

3. The display shall be front or rear ventilated with adequate ventilation provided by the use of fans.

4. Steel mounting points that can be used for mounting purposes shall be provided with the display and have the ability to be adjusted for alternative mounting methods.

5. Shall include lifting supports that can be removed after installation.

C. Exterior Finish

1. The LED display front-facing cabinet shall be coated with a baked acrylic enamel.

D. Front Face Construction

1. To meet the display readability requirements, the front face must be constructed in such a manner that it provides high contrast, low sunlight reflection and durability in all weather and site conditions.

2. Minimum features of front face shall:

a. Provide UV resistance to prevent discoloring.

b. Include horizontal louvers over LEDs for contrast enhancement and sunlight shading.

c. Include vertical light traps to reduce light spill.

d. Use surface materials in the active LED area, such as metal, plastic, or other face materials, designed for low sunlight reflectivity.

E. Serviceability

1. The display housing shall provide safe and convenient rear and/or front service access for all modular assemblies, components, wiring, and other materials located within the housing.

2. All internal components shall be removable and replaceable by a single technician with proper tooling.

3. Service access shall be easily obtained by removal of one or more modules in front of the associated internal component and/or rear access panel.

4. Each module should allow easy removal with a latch with positive stops.

5. Displays shall be designed with service features that minimize potential bodily harm.

2.03 DISPLAY COMPONENTS

A. LED display modules shall be constructed for good readability, long life, and ease of service. Each display module shall be constructed as follows:

1. Each module within the product family shall be designed with the same physical footprint of 12” x 12”.

2. All modules and their components shall be fully encapsulated and sealed to meet IP-67 standards.

3. An LED module shall consist of LEDs with all drive electronics mounted on a single Printed Circuit Board (PCB).

4. LEDs shall be auto-inserted in order to maintain quality and uniformity of the LEDs within each LED module.

5. All surface mount LEDs shall be soldered using a reflow process to ensure uniformity, quality, and durability of all solder joints.

6. All PCBs shall be cleaned in a manner so as not to contain more than 2 parts per million contaminants.

7. Module signal and electrical connections shall be of the positive locking and removable type. Removal of a module from the display shall not require a de-soldering operation.

8. All LED display modules in a single display shall be identical in construction and interchangeable throughout the display with the ability to be field calibrated.

9. Display must be whole-sign color calibration, color and brightness before leaving factory.

10. Modules shall be individually attached to the cabinet frame.

11. Removal of one or more modules shall not affect the display’s structural integrity.

12. The distance from the center of one line or column of pixels to the center of all adjacent lines or columns shall be 16.93mm both horizontally and vertically.

13. Data shall be redundant, ensuring signal is communicated to the module from alternate directions in the event of a loss in signal path.

14. Confines high speed data signals to individual smart LED modules, each with its own microcontroller that runs the LEDs.

15. The display must not send high speed data signals from a receiver card to the module over multi-conductor cables to display an image.

16. The failure of a single pixel, module or power supply shall not cause the failure of any other pixel, module or power supply in the display.

17. All modules shall have no less than a 160° horizontal half-intensity viewing angle.

18. The transition of the viewing intensity shall be consistent throughout the viewing cone.

B. Pixels shall be constructed with discrete LEDs, and these discrete LEDs shall conform to the following specifications:

1. LEDs shall be non-diffused, ultra-bright, solid-state light emitting diodes.

2. Each color of LEDs used in all LED displays provided for this contract shall be from the same bin.

3. LED half-life shall be an estimated minimum of 100,000 hours.

4. Display shall have a minimum intensity of 8,000 nits maximum light output.

C. Power Supply

1. All power supplies shall be regulated, auto-ranging AC to DC power, with protection for the LED pixel, LED display and driver circuitry in the event of power spikes or surges.

2. Each power supply and their connectors shall be fully sealed to protect from corrosive environmental factors meeting IP-67 standards.

D. Internal Wiring

1. Use smart module design to minimize cables needed, reduce potential points of failure and reduce Mean Time Between Failures (MTBF).

2. Cables must be engineered and tested to withstand environmental conditions by using high grade automotive connectors instead of insulation displacement (ribbon-type cables) connectors.

3. Wiring for LED display modules and other internal components shall be installed in the housing in a neat and professional manner.

4. Wiring shall not impede the removal of display modules, power supplies or other display components.

5. Wires shall not make contact with or be bent around sharp metal edges.

6. All wiring shall conform to the National Electric Code.

E. The display shall be protected from electrical spikes and transients.

F. The manufacturer shall provide an earth-ground lug on the display.

2.04 DISPLAY PERFORMANCE

A. Display Capability

1. The LED display shall present messages that are continuous, uniform, and unbroken in appearance.

2. The LED display shall be capable of producing 73.8 quintillion colors.

3. Pixel Pitch: 16.93mm

4. Optimized Pixel Pitch: True 16mm

5. Each display pixel shall be composed of one each – red, green, and blue LEDS in a True Pixel design. Proprietary "HD" pixel layout shall not be acceptable.

6. Minimum LED's Per Square Foot: 972

7. Minimum LED's Per Square Meter: 10,462.5

8. Minimum Pixel Density per Square Foot: 324

9. Minimum Pixel Density Per Square Meter: 3,487.5

10. Matrix Configuration: 18 x 18 pixels

11. The display shall be able to display messages composed of any combination of alphanumeric text, punctuation symbols, and graphic images.

12. Video and message files shall have up to a 60 frame per second playback capability.

B. Controller

1. The display's controller shall be able to run independently from a content management system, allowing the display to continue to operate even if the controlling system is unreachable.

2. Each controller shall be connected to a light sensor allowing each LED display to automatically adjust brightness according to display direction and lighting conditions.

3. The controller shall allow connection to a temperature sensor that provides accurate site temperatures.

4. Active presentations, stored presentations, schedules, display configuration, time and date shall be stored in non-volatile memory. No external power or battery backup will be required to maintain this data.

C. Control and Communications

1. The display controller should be DHCP-enabled and allow for static IP addressing.

2. Each single-face display shall be controlled and monitored by its own LED controller.

3. The LED controller shall be able to receive instructions from and provide information by accessing Ignite using the following communication modes:

- Fiber-optic cable

2.05 CONTROL SOFTWARE

A. Control Software Option 3: Create, manage and delivery content to the display via Ignite Sports.

1. Ability to time and score multiple sports. Ability to create and customize unlimited scoreboards.

2. Includes built-in layout (zone) editor, content creation editor, playlist editor with drag-and-drop features, and live video input capability.

3. Include recall feature, allowing operator to return to the last playlist content display instead of returning to the start of the playlist.
4. Imports JPG, GIF, PNG, and TGA image files; AVI, MOV, MP4, MPG, WMV, MKV, M4V, FLV, and VOB video files; MP3, WAV and WMA audio files.
5. No annual fee.

PART 3: EXECUTION

3.0 EXAMINATION

Mounting structure to be installed by contractor to support desired displays in all locations. Verify that separate conduit is in place for power and data to display, unless fiber is being used. Verify that all control equipment has access to 120/240 VAC.

3.1 INSTALLATION

A. Support structure design depends on the mounting methods, display size, and weight. The structure design is critical and should be done only by a qualified individual. It is the customer's responsibility to ensure that the structure and mounting hardware are adequate.

B. It is the customer's responsibility to ensure that the installation meet local standards. The mounting hardware shall be capable of supporting all components to be mounted.

C. All mounted displays must be inspected by a qualified structural engineer.

D. Possible power and signal entrances are designated by etched markings. Separate conduit must be used to route the power, signal in wires, and signal out wires.

E. Displays must be grounded according to the provisions outlined in Article 250 of the National Electrical Code. The display must be connected to earth-ground. Proper grounding is necessary for reliable equipment operation and protects the equipment from damaging electrical disturbances and lightning.

F. All installations shall conform to Article 600 of the National Electrical Code.

END OF SECTION

SECTION 14 24 00 – HYDRAULIC PASSENGER ELEVATORS

PART 1 - GENERAL

1.01 Summary

A. This section specifies hydraulic elevators.

B. Work Required:

1. The work required under this section consists of all labor, materials and services required for the complete installation (including operational verification) of all the equipment required for the elevator(s) as herein specified.
2. All work shall be performed in a first class, safe and workmanlike manner.
3. In all cases where a device or part of the equipment is herein referred to in the singular, it is intended that such reference shall apply to as many of such devices or parts as are required to make complete installation.

C. Section Includes:

1. Pre-engineered hydraulic passenger elevator.
2. Elevator car enclosures, hoistway entrances and signal equipment.
3. Operation and control systems.
4. Accessibility provisions for physically disabled persons.
5. Equipment, machines, controls, systems and devices as required for safely operating the specified elevators at their rated speed and capacity.
6. Materials and accessories as required to complete the elevator installation.

1.01 Related Sections

A. The following sections contain requirements that relate to this section and are performed by trades other than the elevator manufacturer/installer.

1. Section 01 50 00 – Temporary Facilities: protection of floor openings and personnel barriers; temporary power and lighting.
2. Section 03 30 00 – Cast-In-Place Concrete: elevator pit, elevator motor and pump foundation, and grouting thresholds.
3. Section 04 20 00 – Unit Masonry Assemblies: masonry hoistway enclosure, building-in and grouting hoistway doorframes, and grouting of sills.
4. Section 05 50 00 – Metal Fabrications: pit ladder, divider beams, supports for entrances and rails, and hoisting beam at top of elevator hoistway.
5. Division 07 - Waterproofing of elevator pit.
6. Divison 23 for Heat Generation Equipment: ventilation and temperature control of elevator equipment areas.
7. Division 26 – General requirements for Electrical:
   a. Main disconnects for each elevator.
   b. Electrical power for elevator installation and testing.
   c. Disconnecting device to elevator equipment prior to activation of sprinkler system.
   d. The installation of dedicated GFCI receptacles in the pit and overhead.
   e. Lighting in controller area, machine area and pit.

f. Wiring for telephone service to controller.

8. Division 27 for Voice Communications: ADAAG-required emergency communications equipment.
9. Section 28 31 11 – Digital Addressable Fire Alarm System: fire and smoke detectors at required locations and interconnecting devices; fire alarm signal lines to contacts in the machine area.
10. Division 31 for Site Clearing: excavation for cylinder well casing.

B. Work Included by the General Contractor: Provide the following in accordance with the requirements of the Model Building Code and ANSI A17.1 Code. For specific rules, refer to ANSI A17.1, Section 300 for hydraulic elevators. State or local requirements must be used if more stringent.

1. Elevator hoist beam to be provided at top of elevator shaft. Beam must be able to accommodate proper loads and clearances for elevator installation and operation.
2. Supply in ample time for installation by other trades, inserts, anchors, bearing plates, brackets, supports and bracing including all setting templates and diagrams for placement.
3. Hoistway should be clear and plumb with variations not to exceed 1/2'' at any point.
4. Elevator hoistways shall have barricades, as required.
5. Provide rail bracket supports at pit, each floor and roof. For guide rail bracket supports, provide divider beams between hoistway at each floor and roof.
6. Pit floor shall be level and free of debris. Reinforce dry pit to sustain normal vertical forces from rails and buffers.
7. Where pit access is by means of the lowest hoistway entrance, a vertical ladder of non-combustible material extending 42'' minimum, (48'' minimum for A17.1-2000 areas) shall be provided.
9. Access to the machinery space must be in accordance with the governing authority or code.
10. All wire and conduit should run remote from either the hoistways or the equipment location.
11. When heat, smoke or combustion sensing devices are required, connect to terminals where elevator equipment is located. Contacts on the sensors should be sided for 120 volt D.C.
12. Install and furnish finished flooring in elevator cab.
13. Finished floors and entrance walls are not to be constructed until after sills and door frames are in place. Consult elevator contractor for rough opening size.
14. To maintain legal fire rating (masonry construction), door frames are to be anchored to walls and properly grouted in place.
15. The elevator wall shall interface with the hoistway entrance assembly and be in strict compliance with the elevator contractor's requirements.
16. General Contractor shall fill and grout around entrances, as required.
17. Elevator sill supports shall be provided at each opening.
18. All walls and sill supports must be plumb where openings occur.

19. For signal systems and power operated door: provide ground and branch wiring circuits, including main line switch. For car light and fan: provide a feeder and branch wiring circuits, including main line switch.
20. Provide supports, patching and recesses to accommodate hall button boxes, signal fixtures, etc.
21. Locate telephone and convenience outlet on control panel.

1.01 References

A. Comply with applicable building and elevator codes at the project site, including but not limited to the following:
   1. ASME A17.1/CSA B44, Safety Code for Elevators and Escalators.
   2. ASME A17.7/CSA B44, Performance-Based Safety Code for Elevators and Escalators.
   3. ADAAG, American Disabilities Act Accessibility Guidelines.
   4. ANSI A117.1, Building and Facilities, Providing Accessibility and Usability for Physically Handicapped People.
   5. ANSI/NFPA 70, (NEC) National Electrical Code.
   6. ANSI/UL 10B, Standard for Fire Test of Door Assemblies.
   7. ANSI/NFPA 80, Standard for Fire Doors and Other Opening Protectives.
   8. Building Codes IBC
   9. All Local Jurisdictional applicable codes.

1.02 System Description (Basis of Design)

A. Equipment Description: Hole-less Hydraulic elevator with machine-room less application
B. Equipment Control: Elevonic® Control System.
C. Quantity of Elevators: 1
D. Elevator Stop Designations: 1, 2
D. Stops: 2
E. Openings: Front Only
F. Travel: 9’-3”
G. Rated Capacity: 3000
H. Rated Speed: 100 fpm
I. Platform Size: 6’-6 3/4” W x 6’-2 3/4” D
J. Clear Inside Dimensions: 6' 5 9/16" x 5' 0 3/16"
K. Cab Height: 93”
L. Clear Cab Height: 7’-4 5/16” (2243 mm)
M. Entrance Type and Width: Center Opening - 3'6"
N. Entrance Height: 84”
O. Main Power Supply: 480 volts ± 5% of normal, three-phase, with a separate equipment grounding conductor.
P. Car Lighting Power Supply: 120 volts, single-phase, 15 amps, 60 Hz.
Q. Machine Location: No machine-room required, tank and controller in hoistway pit.
R. Signal Fixtures: Manufacturer’s standard with metal button targets (excluding CA).
S. Controller Location: In a machine space or closet

T. Operation :**Simplex Collective Operation:** Using a microprocessor-based controller, operation shall be automatic by means of the car and hall buttons. If all calls in the system have been answered, the car shall park at the last landing served.

U. Operation Features – Standard

1- Full Collective Operation

2- Anti-nuisance.

3- Fan and Light Protection.

4- Load Weighing Bypass.

5- Independent Service.

6- Firefighters' Service Phase I and Phase II (USA only); or Special Emergency Service Phase I and II – Emergency Recall and In-Car Emergency Operation (Canada only).

7- Top of Car Inspection.

V. Operation Features – Optional

1- Zoned Access at Bottom Landing.

2- Zoned Access at Upper Landing.

3- Express Priority Service with key-switch(es)

4- Emergency Hospital Service.

5- Automatic Rescue Operation

6- Automatic Standby Power Operation with Manual Override.

W. Door Control Features:

1- Door control to open doors automatically when car arrives at a landing in response to a normal hall or car call.

2- Elevator doors shall be provided with a reopening device that will stop and reopen the car door(s) and hoistway door(s) automatically should the door(s) become obstructed by an object or person.

3- Door protection shall consist of a two-dimensional, multi-beam array projecting across the car door opening.

4- Door nudging operation to occur if doors are prevented from closing for an adjustable period of time.

E. Seismic conditions do not exist.

1.03 Submittals

A. Product Data: Submit manufacturer’s product data for each system proposed for use. Include the following:

1. Signal and operating fixtures, operating panels and indicators.
2. Cab design, dimensions and layout.
3. Hoistway-door and frame details.
4. Electrical characteristics and connection requirements.
5. Expected heat dissipation of elevator equipment in hoistway (BTU).
6. Color selection chart for Cab and Entrances.

B. Shop Drawings: Submit approval layout drawings. Include the following:

1. Car, guide rails, buffers, and other components in hoistway.
2. Maximum rail bracket spacing.
3. Maximum loads imposed on guide rails requiring load transfer to building structure.
4. Clearances and travel of car.
5. Clear inside hoistway and pit dimensions.
6. Location and sizes of access doors, hoistway entrances and frames.

C. Operations and Maintenance Manuals: Provide manufacturer's standard operations and maintenance manual.

1.04 Quality Assurance

A. Manufacturer: Elevator manufacturer shall be ISO 9001 certified.
B. Manufacturer shall have a minimum of fifteen years of experience in the fabrication, installation and service of elevators.
C. Installer: Elevators shall be installed by the manufacturer.
D. Permits, Inspections and Certificates: The Elevator Contractor shall obtain and pay for necessary Municipal or State Inspection and permit as required by the elevator inspection authority, and make such tests as are called for by the regulations of such authorities. These tests shall be made in the presence of such authorities or their authorized representatives.

1.05 Delivery, Storage, and Handling

A. Should the building or the site not be prepared to receive the elevator equipment at the agreed upon date, the General Contractor will be responsible to provide a proper and suitable storage area on or off the premises.
B. Should the storage area be off-site and the equipment not yet delivered, then the elevator contractor, upon notification from the General Contractor, will divert the elevator equipment to the storage area. If the equipment has already been delivered to the site, then the General Contractor shall transport the elevator equipment to the storage area.

1.06 Warranty

A. Elevator manufacturer’s standard warranty shall apply and copies of this warranty shall be provided in closeout materials.

1.07 Maintenance and Service

A. Maintenance service consisting of regular examinations and adjustments of the elevator equipment shall be provided by the elevator contractor for a period of 12 months after the elevator has been turned over for the customer’s use. This service shall not be subcontracted but shall be performed by the elevator contractor. All work shall be performed by competent employees during regular working hours of regular working days. This service shall not cover adjustments, repairs or replacement of parts due to negligence, misuse, abuse or accidents caused by persons other than the elevator contractor. Only genuine parts and supplies as used in the manufacture and installation of the original equipment shall be provided.

B. The elevator control system must:

1. Provide in the controller the necessary devices to run the elevator on inspection operation.
2. Provide on top of the car the necessary devices to run the elevator in inspection operation.
3. Provide in the controller an emergency stop switch. This emergency stop switch when opened disconnects power from the brake and prevents the motor from running.

C. Provide system capabilities to enable a remote expert to create a live, interactive connection with the elevator system to enable the following functions:
   1. Remotely diagnose elevator issues with a remote team of experts
   2. Remotely return an elevator to service
   3. Provide real-time status updates via email
   4. Remotely make changes to selected elevator functions including:
      a. Control building traffic: Restrict floor access, remove car from group operation, shut down elevator, select up peak/down peak mode and activate independent service.
      b. Conserve energy: Activate cab light energy save mode, activate fan energy save mode, shut down car(s).
      c. Improve passenger experience: Extend door open times, change parking floor, activate auto car full, activate anti-nuisance, advance door opening, door nudging, extend specific floor extended opening time, release trapped passengers.

PART 2 - PRODUCTS

2.01 Manufacturer

A. Manufacturer: Design based upon Otis HydroFit machine room-less elevator system.

2.02 Design and Specifications

A. Provide machine-roomless, holeless hydraulic elevators equivalent to the Basis of Design from Otis Elevator Company. The control system and car design is based on materials and systems manufactured by Otis Elevator Company. Specifically, the system shall consist of the following components:
   1. The entire hydraulic system and the controller shall be located inside the hoistway. No extra machine room or control closet space is required.
   2. LED lighting standard in ceiling lights and elevator fixtures.
   3. Sleep mode operation for LED ceiling lights and car fan.

B. Approved Manufacturers:
   1. Otis Elevator Company (Basis of Design)
   2. DC Elevator.
   3. Schindler.
   4. Kone.
   5. Canton.

2.03 Equipment: Machine Components

A. The hydraulic system shall be of compact design suitable for operation under the required pressure. The power component shall be mounted in the hydraulic-fluid storage tank. The control valve shall control flow for up and down directions hydraulically and shall include an

integral check valve. A control section including control solenoids shall direct the main valve and control: up and down starting, acceleration, transition from full speed to leveling speed, up and down stops, pressure relief and manual lowering. All of these functions shall be fully adjustable for maximum smoothness and to meet contract conditions. System to be provided with a low-pressure switch and a shut-off valve.

B. The entire hydraulic system with hydraulic-fluid storage tank, power component and valves shall be located in the hoistway pit and be easily accessible for maintenance through an access door in the hoistway wall.
C. A microprocessor-based controller shall be provided, including necessary starting switches together with all relays, switches, solid-state components and hardware required for operation, including door operation, as described herein. A three (3) phase overload device shall be provided to protect the motor against overloading.
D. Controller Location: The controller shall be located together with the hydraulic system in the hoistway pit and be easily accessible for maintenance through the same access door that is also used for the hydraulic system.
E. A manual lowering feature shall permit lowering the elevator at slow speed in the event of power failure or for adjusting purposes.
F. Pressure Switch
G. Low-oil control.

2.04 Equipment: Hoistway Components

A. Plunger(s) and Cylinder(s): Each cylinder shall be constructed of steel pipe of sufficient thickness and suitable for the operating pressure. The top of each cylinder shall be equipped with a cylinder head with a drip ring to collect any oil seepage as well as an internal guide ring and self-adjusting packing. Each plunger shall be constructed of selected steel tubing or pipe of proper diameter machined true and smooth with a fine polished finish. Each plunger shall be provided with a stop ring electrically welded to it to prevent the plunger from leaving the cylinder. Each plunger and cylinder shall be installed plumb and shall operate freely with minimum friction.
B. Car Guide Rails: Tee-section steel rails with brackets and fasteners.
C. Polyurethane type buffers shall be used.
D. Wiring: Wiring for hoistway electrical devices included in scope of the elevator system, hall panels, pit emergency stop switch, and the traveling cable for the elevator car.
E. Hoistway Entrances:
    1. Frames: Entrance frames shall be of bolted construction for complete one-piece unit assembly. All frames shall be securely fastened to fixing angles mounted in the hoistway and shall be of UL fire rated steel.
    2. Sills Shall Be: Extruded Aluminum Sills at: LL, 1
    3. Doors: Entrance doors shall be of metal construction with vertical channel reinforcements.
    4. Fire Rating: Entrance and doors shall be UL fire rated for 1-1/2 hour for M1, M2, M3, D1, and D2 entrance arrangements or 1 hour for D3 entrance arrangements.
    5. Frame and Entrance Finishes: Brushed Stainless Steel Frames and Entrances at: LL, 1
    6. Entrance Marking Plates: Entrance jambs shall be marked with 4” x 4” plates having raised floor markings with Braille located adjacent to the floor marking. Marking plates shall be provided on both sides of the entrance.

7. Sight Guards: Sight guards will be furnished with all doors painted to match with painted doors, painted black for stainless steel doors.
8. Fascia: Galvanized sheet steel shall be provided at the front of the hoistway.

2.05 Equipment: Car Components

A. Cab: Standard, Steel Shell Cab with laminated wall panels. Laminate to be selected from manufacturer's catalog of choices. Brushed Stainless Steel finished base plate located at top and bottom.
B. Car Front Finish: Satin Stainless Steel.
C. Car Door Finish: Satin Stainless Steel.
D. Ceiling Type: Flat Ceiling with 4 LED Lights
E. Ceiling Finish: Brushed Steel Finish
F. Emergency Car Lighting: An emergency power unit employing a 6-volt sealed rechargeable battery and totally static circuits shall be provided to illuminate the elevator car in the event of building power failure.
G. Fan: A one-speed 120 VAC fan will be mounted to the ceiling to facilitate in-car air circulation, meeting A17.1 code requirements. The fan shall be rubber mounted to prevent the transmission of structural vibration and will include a baffle to diffuse audible noise. A switch shall be provided in the car-operating panel to control the fan.
H. Handrail: Flat rails with Brushed Steel Finish shall be provided on the side and rear walls
I. Threshold: Extruded Aluminum
J. Emergency Exit Contact: An electrical contact shall be provided on the car-top exit.
K. Guides: Car roller type guides at the top and the bottom.
L. Platform: Car platform shall be constructed of metal.
M. The LED ceiling lights and the fan should automatically shut off when the system is not in use and be powered back up after a passenger calls the elevator and pushes a hall button.
N. Certificate frame: Provide a Certificate frame with a satin stainless steel finish.

2.06 Equipment: Signal Devices and Fixtures

A. Car Operating Panel: A car operating panel shall be provided which contains all push buttons, key switches, and message indicators for elevator operation. The car operating panel shall have a satin stainless steel finish.
    1. A car operating panel shall be furnished. It shall contain a bank of round stainless steel, mechanical LED illuminated buttons. Flush mounted to the panel and marked to correspond to the landings served. All buttons to have raised numerals and Braille markings. The buttons shall be: Lexan 1/8" projecting buttons, fully illuminated by a white LED.
    2. The car operating panel shall be equipped with the following features:
        a. Raised markings and Braille to the left hand side of each push-button.
        b. Car Position Indicator at the top of and integral to the car operating panel.
        c. Door open and door close buttons.
        d. Inspection key-switch.
        e. Elevator Data Plate marked with elevator capacity and car number.
        f. Help Button: The help button shall initiate two-way communication between the car and a location inside the building, switching over to another location if the call is

unanswered, where personnel are available who can take the appropriate action. Visual indicators are provided for call initiation and call acknowledgement.

g. Landing Passing Signal: A chime bell shall sound in the car to signal that the car is either stopping at or passing a floor served by the elevator.
h. In car stop switch (toggle or key unless local code prohibits use)
i. Firefighter's hat
j. Firefighter's Phase II Key-switch
k. Call Cancel Button
l. Firefighter's Phase II Emergency In-Car Operating Instructions: worded according to A17.1 2000, Article 2.27.7.2.

B. Car Position Indicator: A digital, LED car position indicator shall be integral to the car operating panel.
C. Hall Fixtures: Hall fixtures shall be provided with necessary push buttons and key switches for elevator operation. All Hall fixtures shall have a Brushed Stainless Steel Finish**.**
   1. Hall Buttons: 1/8" (3mm) satin stainless steel button with blue or white LED illuminating halo
D. Car Lantern and Chime: A directional lantern visible from the corridor shall be provided in the car entrance. When the car stops and the doors are opening, the lantern shall indicate the direction in which the car is to travel and a chime will sound.
E. Access key-switch at top floor in entrance jamb.
F. Access key-switch at lowest floor in entrance jamb.

PART 3 - EXECUTION

3.01 PREPARATION

A. Take field dimensions and examine conditions of substrates, supports, and other conditions under which this work is to be performed. Do not proceed with work until unsatisfactory conditions are corrected.
B. Before starting elevator installation, inspect hoistway, hoistway openings, pits and machine rooms/control space, as constructed and verify all critical dimensions, and examine supporting structures and all other conditions under which elevator work is to be installed. Do not proceed with elevator installation until unsatisfactory conditions have been corrected in a manner acceptable to the installer.
C. Installation constitutes acceptance of existing conditions and responsibility for satisfactory performance.

3.02 INSTALLATION

A. Install elevator systems components and coordinate installation of hoistway wall construction.

   1. Work shall be performed by competent elevator installation personnel in accordance with ASME A17.1, manufacturer's installation instructions and approved shop drawings.
   2. Comply with the National Electrical Code for electrical work required during installation and verify with the Electrical Contractor that the proper power is being furnished for the elevator equipment.

B. Coordination: Coordinate elevator work with the work of other trades, for proper time and sequence to avoid construction delays. Use benchmarks, lines, and levels designated by the Contractor, to ensure dimensional coordination of the work.

C. Alignment: Coordinate installation of hoistway entrances with installation of elevator guide rails for accurate alignment of entrances with cars. Where possible, delay final adjustment of sills and doors until car is operable in shaft. Reduce clearances to minimum safe, workable dimensions at each landing.

D. Lubricate operating parts of system where recommended by manufacturer.

3.03 FIELD QUALITY CONTROL

A. Acceptance testing: Upon completion of the elevator installation and before permitting use of elevator, perform acceptance tests as required by A17.1 Code and State Elevator Inspector having jurisdiction. Perform other tests, if any, as required by governing regulations or agencies.

B. Advise Owner, Contractor, Architect, and governing authorities in advance of dates and times tests are to be performed on the elevator.

3.04 ADJUSTING

A. Make necessary adjustments of operating devices and equipment to ensure elevator operates smoothly and accurately.

3.05 CLEANING

A. Before final acceptance, remove protection from finished surfaces and clean and polish surfaces in accordance with manufacturer's recommendations for type of material and finish provided. Stainless stall shall be cleaned with soap and water and dried with a non-abrasive surface; shall not be cleaned with bleached-based cleansers.

B. At completion of elevator work, remove tools, equipment, and surplus materials from site. Clean equipment rooms and hoistway. Remove trash and debris.
   1. Use environmentally preferable and low VOC emitting cleaners for each application type. Cleaners that contain solvents, pine and/or citrus oils are not permitted.

3.06 PROTECTION

A. At time of Substantial Completion of the Project, or portion thereof, provide suitable protective coverings, barriers, devices, signs, or other such methods or procedures to protect elevator work from damage or deterioration. Maintain protective measures throughout remainder of construction period.

3.07 DEMONSTRATION

A. Instruct Owner's personnel in proper use, operations, and daily maintenance of elevators. Review emergency provisions, including emergency access and procedures to be followed at time of failure in operation and other building emergencies. Train Owner's personnel in normal procedures to be followed in checking for sources of operational failures or malfunctions.

B. Make a final check of elevator operation, with Owner's personnel present, immediately before Date of Substantial Completion of the Project. Determine that control systems and operating devices are functioning properly.

END OF SECTION 14 24 23