
**ARCHITECT'S ADDENDUM NO. 02
REVISION 2 DRAWINGS & SPECIFICATIONS**

TO: ALL HOLDERS OF BID CONSTRUCTION DOCUMENTS

**PROJECT: OSBORNE HIGH SCHOOL
STADIUM IMPROVEMENTS
2451 Favor Road SW
Marietta, GA 30060
CCSD Project No. 0811 / 9002**

**OWNER: COBB COUNTY PUBLIC SCHOOLS
440 Glover Street
Marietta, Georgia 30060**

**ARCHITECT: CHAPMAN GRIFFIN LANIER SUSSENBACH ARCHITECTS, INC.
2500 Cumberland Pkwy, Suite 350
Atlanta, GA 30339
CGLS Project No. 09001**

DATE: July 20, 2017

The items listed on the attached pages take precedence over referenced portions of Contract Documents for the project and, in executing a contract, shall become a part thereof.

Where any item called for in the Contract Documents is supplemented hereby, the original requirements shall remain in effect. All supplemental conditions shall be considered as added thereto.

Where any original item is amended, voided, or superseded hereby, the provisions of such items not so specifically amended, voided, or superseded shall remain in effect.

PART 1 - CHANGES TO THE DRAWINGS:

- 1-1 **SHEET A-0.1, INDEX OF DRAWINGS:** Add revised Date of "7-20-17" for all sheets changed by Addendum No. 2. Add new sheet S-6.03 FOUNDATION SECTIONS & DETAILS to the Structural Drawings.
- 1-2 **SHEET C100, DEMOLITION & REMOVAL PLAN:** Delete this sheet in its entirety and substitute new Sheet C100, dated revised 7-20-17 and attached. Noted to reflect light pole adjustments / relocations.

- 1-3 SHEET C300, SITE GRADING PLAN: Delete this sheet in its entirety and substitute new Sheet C300, dated revised 7-20-17 and attached. Revised as follows:
- A. Updated spot grading at SE corner of Field House.
 - B. Removed wall "G" label, existing wall noted to be maintained and field adjusted as necessary.
- 1-4 SHEET C310, STORM DRAINAGE PLAN: Delete this sheet in its entirety and substitute new Sheet C310, dated revised 7-20-17 and attached. Noted update per Cobb County Storm Review – Band and Gasket Type Joints.
- 1-5 SHEET C330, WALL PROFILES: Delete this sheet in its entirety and substitute new Sheet C330, dated revised 7-20-17 and attached. Revised as follows:
- A. Updated upper corners of Wall E and F where they interface with the planned Field House to match top of slab elevation. Also updated top of footings (TOF) at these locations to coordinate with column footing elevations.
 - B. Updated TOF profiles to provide additional cover in select locations at Wall "D", Wall "F", and to match at each side of the stair (Wall "D" and Wall "E")
- 1-6 SHEET C600, TREE REMOVAL PLAN: Delete this sheet in its entirety and substitute new Sheet C600, dated revised 7-20-17 and attached. Tree sampling per Cobb County Arborist Review.
- 1-7 SHEET C610, TREE REPLACEMENT & PLANTING PLAN: Delete this sheet in its entirety and substitute new Sheet C610, dated revised 7-20-17 and attached. Shifted trees to create minimum 20' from proposed light pole.
- 1-8 SHEET AP-1.01, ARCHITECTURAL PHASING PLAN: Delete this sheet in its entirety and substitute new Sheet AP-1.01, dated revised 7-20-17 and attached. Revised "CONSTRUCTION PHASING NOTES", light pole notes & added plaza lighting.
- 1-9 SHEET AS-1.01, ARCHITECTURAL SITE PLAN: Delete this sheet in its entirety and substitute new Sheet AS-1.01, dated revised 7-20-17 and attached. Revised to add exterior lighting and exterior equipment at field house.
- 1-10 SHEET A-4.01, ROOF PLANS & DETAILS: Delete this sheet in its entirety and substitute new Sheet A-4.01, dated revised 7-20-17 and attached. Revised to relocate roof downspouts at back of Pressbox / Concessions Building.
- 1-11 SHEET A-5.01, EXTERIOR BUILDING ELEVATIONS: Delete this sheet in its entirety and substitute new Sheet A-5.01, dated revised 7-20-17 and attached. Revised to show corrected locations of downspouts on Pressbox / Concessions Building.
- 1-12 SHEET A-6.01, BUILDING SECTIONS & WALL SECTIONS: Delete this sheet in its entirety and substitute new Sheet A-6.01, dated revised 7-20-17 and attached. Revised Building Section F7/A-6.01 & Wall Section A8/A-6.01.

- 1-13 SHEET A-6.02, WALL SECTIONS: Delete this sheet in its entirety and substitute new Sheet A-6.02, dated revised 7-20-17 and attached. Revised Window Sill Details B5 & C6/ A-6.02 and corrected downspout at Det. E3/A-6.02.
- 1-14 SHEET S-0.11, GENERAL NOTES: Delete this sheet in its entirety and substitute new Sheet S-0.11, dated revised 7-20-17 and attached. Revised to update seismic response coefficients.
- 1-15 SHEET S-0.13, GENERAL SCHEDULES: Delete this sheet in its entirety and substitute new Sheet S-0.13, dated revised 7-20-17 and attached. Revised to update Concrete Walls/Piers criteria in Concrete Mixtures Schedule to coordinate with Civil specifications.
- 1-16 SHEET S-1.01, OVERALL SITE PLAN: Delete this sheet in its entirety and substitute new Sheet S-1.01, dated revised 7-20-17 and attached. Revised to remove top of footing elevations on plan and noted to see civil drawings for top of footings to avoid conflicting with civil.
- 1-17 SHEET S-1.12, TICKET BOOTH PLANS & SECTIONS: Delete this sheet in its entirety and substitute new Sheet S-1.12, dated revised 7-20-17 and attached. Revised as follows:
- A. 1/S-1.12 & 2/S-1.12 – Clarified top of slab elevation referenced by plans.
 - B. 1/S-1.12 – Corrected plan note detail references.
 - C. 4/S-1.12 – Updated expansion anchor spacing to avoid conflict with H.S. stud.
- 1-18 SHEET S-1.13, SITE WALL SECTIONS & DETAILS: Delete this sheet in its entirety and substitute new Sheet S-1.13, dated revised 7-20-17 and attached. Revised as follows:
- A. 1, 2 & 3/S-1.13
 - i. Added horizontal bar at wall ledge.
 - ii. Updated Lb bars in schedule.
 - B. 1/S-1.13
 - i. Updated wall heights to match civil wall heights.
 - C. 3/S-1.13
 - i. Updated section to show bars in correct location and deleted footing key and its references.
 - ii. Added note to combine wall footings when necessary.
 - D. 6/S-1.13 – Corrected joint name in note.
- 1-19 SHEET S-2.11, FIELD HOUSE AND CONCESSIONS PRESSBOX FOUNDATION PLANS: Delete this sheet in its entirety and substitute new Sheet S-2.11, dated revised 7-20-17 and attached. Revised as follows:
- A. 1/S-2.11
 - i. Clarified top of footing elevation referenced by plans.

- ii. Corrected plan note detail references.
- iii. Added section cut on plan, 8/S-6.02, typical at interior CMU partitions for clarification.
- iv. Added depressed slab to match Architectural.
- v. Updated footing elevations and steps along grid E to coordinate with Civil. Deleted spread footing at 5/E.
- vi. Added section cut 1/S-6.03 at mechanical yard along grid E for clarification.

B. 2/S-2.11

- i. Clarified top of footing elevation referenced by plans.
- ii. Updated plan to show existing bleachers on south side.
 - 1. Updated section along bleacher to 2/S-6.03.
 - 2. Added plan note 12.
 - 3. Added footing steps and plan note 11 to coordinate new footing elevations with existing bleacher foundation elevation.
- iii. Added section cut on plan, 8/S-6.02, typical at interior CMU partitions, for clarification.

1-20 SHEET S-4.11, CONCESSIONS PRESSBOX FLOOR & ROOF FRAMING PLANS: Delete this sheet in its entirety and substitute new Sheet S-4.11, dated revised 7-20-17 and attached. Revised as follows:

- A. 1/S-4.11 & 2/S-4.11 – Clarified top of CMU, deck and steel elevation referenced by plans.

1-21 SHEET S-6.01, FOUNDATION SECTIONS & DETAILS: Delete this sheet in its entirety and substitute new Sheet S-6.01, dated revised 7-20-17 and attached. Revised as follows:

- A. 12/S-6.01 – Steel column and concrete pier rotated to match plan orientation.

1-22 SHEET S-6.02, FOUNDATION SECTIONS & DETAILS: Delete this sheet in its entirety and substitute new Sheet S-6.02, dated revised 7-20-17 and attached. Revised as follows:

- A. 7/S-6.02 – Modified vertical rebar and stirrups in pier and clarified required concrete cover.
- B. 9/S-6.02 – Clarified stirrup configuration at slab corners.

1-23 SHEET S-6.03, FOUNDATION SECTIONS & DETAILS: Add this new sheet S-6.03, dated 7-20-17 and attached. Revised as follows:

- A. 1/S-6.03 – Added new section at mechanical yard and building footing for clarification.

- B 2/S-6.03 – Added new section at pressbox/concession building next to existing bleachers.
 - C. 3/S-6.03 – Added new section to be used as alternate to 2/S-6.03 if bottom of existing footing locates top of new footing 2'-0" or less below top of slab.
- 1-24 SHEET S-6.11, FRAMING SECTIONS & DETAILS: Add this new sheet S-6.11, dated 7-20-17 and attached. Revised as follows:
- A. 3, 4 & 5/S-6.11 – OSB reference removed and note added to see Architectural for exterior sheathing.
 - B. 5/S-6.11 –Note added to grout CMU cell above coiling door.
- 1-25 SHEET S-6.12, FRAMING SECTIONS & DETAILS: Add this new sheet S-6.12, dated 7-20-17 and attached. Revised as follows:
- A. 1/S-6.12, 2/S-6.12, 3/S-6.12 & 4/S-6.12 – OSB reference removed and note added to see arch for exterior sheathing.
- 1-26 SHEET M-3.01, HVAC SCHEDULES & DETAILS: Delete this sheet in its entirety and substitute new Sheet M-3.01, dated revised 7-20-17 and attached. Revised to delete smoke detector points from EMS input/output as indicated.
- 1-27 SHEET E-0.01, SITE PLAN ELECTRICAL: Delete this sheet in its entirety and substitute new Sheet E-0.01, dated revised 7-20-17 and attached. Revised Courtyard lighting as indicated.
- 1-28 SHEET E-1.02, FLOOR PLANS - LIGHTING & POWER: Delete this sheet in its entirety and substitute new Sheet E-1.02, dated revised 7-20-17 and attached. Revised to relocate Stadium Sound System as indicated.
- 1-29 SHEET E-2.01, ELECTRICAL LEGENDS, SCHEDULES & DETAILS: Delete this sheet in its entirety and substitute new Sheet E-2.01, dated revised 7-20-17 and attached. Revised to relocate Stadium Sound System as indicated.

PART 2 - CHANGES TO THE SPECIFICATIONS

- 2-1 SECTION TABLE OF CONTENTS:
- A. Add "7/20/17" to the Revised Column for all specification sections revised by this addendum.
- 2-2 SECTION 03300, CONCRETE: Delete this section in its entirety and substitute the attached new section, dated revised July 20, 2017. (Added Sections 2.9 & 3.7).

- 2-3 SECTION 04100, MORTAR AND GROUT: Delete this section in its entirety and substitute the attached new section, dated revised July 20, 2017. (Added mortar Design Basis color selection).
- 2-4 SECTION 04210, BRICK MASONRY: Delete this section in its entirety and substitute the attached new section, dated revised July 20, 2017. (Added brick manufacturers and selections).
- 2-5 SECTION 04220, CONCRETE UNIT MASONRY: Delete this section in its entirety and substitute the attached new section, dated revised July 20, 2017. (Revised weep type).
- 2-6 SECTION 07100, SHEET MEMBRANE WATERPROOFING: Delete this section in its entirety.
- 2-7 SECTION 13125, METAL BUILDING SYSTEM: Delete this section in its entirety and substitute the attached new section, dated revised July 20, 2017. (Revised note to indicate pre-fabricated canopies).

PART 3 – QUESTIONS AND ANSWERS

- 3-1 Q. The concrete spec for the outside work is different from the details noted on the civil plans. Is it 3500 or 3000 psi?
A. Concrete for outside work is as shown on the civil drawings, details, and specifications which call for 3000 psi.
- 3-2 Q. The section thru the wall at the press box looks like there is a mortar net type material in the cavity, but none specified. What is the product specified?
A. Specification 04150 has the mortar net specified. See specification 04150, section 2.9 for product information.
- 3-3 Q. Specifications call for GC to pay for permits. Will county charge for school permits?
A. The county will not charge for school building permits but it's the contractor's responsibility to contact the county and verify this information and any other required fees.
- 3-4 Q. Cavity Foam Insulation is noted on 07210. Rigid wall insulation is shown on sections. Which is used?
A. Rigid wall insulation should be used.

For all other questions see revised drawings and specs this addendum.

END OF ADDENDUM NO. 02

ADDENDUM NO. 2
Issued July 20, 2017

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<u>SECTION AND DESCRIPTION</u>	<u>ISSUED</u>	<u>REVISED</u>
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<u>SECTION AND DESCRIPTION</u>	<u>ISSUED</u>	<u>REVISED</u>	
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ADDENDUM NO. 2
Issued July 20, 2017

SECTION 03300

CAST-IN-PLACE CONCRETE

1.0 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. Description:
1. This section includes cast-in-place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes, for the following:
 - a. Footings.
 - b. Foundation Walls.
 - c. Site Retaining Walls.
 - d. Slabs-On-Grade.
 - e. Concrete Toppings.
- B. Related Documents and Standards:
1. All referenced standards and cited publications shall be those specifically denoted within the applicable building code noted in the General Notes of the Construction Drawings.
 2. All cast-in-place concrete work on this project shall conform to the Construction Documents, applicable building code including referenced standards, the requirements of "Specification for Structural Concrete" ACI-301 (Chapters 1-5, & Chapters 6-14 as applicable) and "Specifications for Tolerances for Concrete Construction and Materials" ACI 117, in coordination with clarifications, exemptions, and additions in the Construction Documents.
- C. Related Sections:
1. Division 03 Specifications – Concrete Construction.
 2. Division 07 Specifications – Thermal and Moisture Protection.
 3. Division 31 Specifications – Earthwork.

1.3 QUALITY ASSURANCE:

- A. Mockups: Cast concrete slab-on-grade to demonstrate typical joints, surface finish, texture, tolerances, and standard of workmanship.
 - 1. Build panel approximately 200 sq. ft. for slab-on-grade in the location indicated or, if not indicated, as directed by Architect.
 - 2. Approved panels may become part of the completed Work if undisturbed at time of Substantial Completion.

- B. Preinstallation Conference: Conduct conference at Project site.
 - 1. Before submitting design mixtures, review concrete design mixture and examine procedures for ensuring quality of concrete materials. Require representatives of each entity directly concerned with cast-in-place concrete to attend, including the following:
 - a. Contractor's superintendent.
 - b. Independent testing agency responsible for concrete design mixtures.
 - c. Ready-mix concrete manufacturer.
 - d. Concrete subcontractor.
 - 2. Review special inspection and testing and inspecting agency procedures for field quality control, concrete finishes and finishing, cold- and hot-weather concreting procedures, curing procedures, construction contraction and isolation joints, joint-filler strips, semirigid joint fillers, forms and form removal limitations, shoring and reshoring procedures, vapor-retarder installation, anchor rod and anchorage device installation tolerances, steel reinforcement installation, floor and slab flatness and levelness measurement, concrete repair procedures, and concrete protection.

1.4 SUBMITTALS:

- A. Design Mixtures:
 - 1. Indicate amounts of mixing water to be withheld for later addition at Project site.

- B. Steel Reinforcement Shop Drawings: Placing drawings that detail fabrication, bending, and placement. Include 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.

- C. Formwork layout and dimension shop drawings.

- D. Material Test Reports: For the following, from a qualified testing agency, indicating compliance with requirements:
 - 1. Aggregates

- E. Material Certificates: For each of the following as applicable on the project, signed by manufacturers:
 - 1. Cementitious materials.
 - 2. Admixtures.
 - 3. Form materials and form-release agents.
 - 4. Steel reinforcement and accessories.
 - 5. Fiber reinforcement.
 - 6. Waterstops.
 - 7. Curing compounds.
 - 8. Floor and slab treatments.
 - 9. Bonding agents.
 - 10. Adhesives.
 - 11. Vapor retarders.
 - 12. Semirigid joint filler.
 - 13. Joint-filler strips.
 - 14. Repair materials.

- F. Floor surface flatness and levelness measurements to determine compliance with specified tolerances.

- G. Minutes of preinstallation conference.

1.5 INFORMATION SUBMITTALS:

- A. Formwork Shop Drawings: Signed and sealed by a Licensed Design Engineer in the state in which the project is located.
 - 1. Calculations for Formwork, Shoring, Reshoring, and Backshoring: Signed and sealed by a Licensed Design Engineer in the state in which the project is located.

2.0 PRODUCTS

2.1 FORM-FACING MATERIALS:

- A. Comply with ACI 347.

- B. Earth forms may be used for footing forms where sides of the excavation are cut true, in firm soil. If earth is not suitable to be used as "earth form," no consideration will be given to any claim for additional cost of formwork. Contractor shall provide material and labor to provide formwork without additional cost to Owner.

2.2 STEEL REINFORCEMENT:

- A. Reinforcing Bars: ASTM A 615 Grade 60 deformed.
- B. Low-Alloy-Steel Reinforcing Bars: ASTM A 706, deformed.
 - 1. For use where weldable reinforcing is called out in construction documents.
- C. Plain-Steel Welded Wire Reinforcement: ASTM A 1064, plain, fabricated from as-drawn steel wire into flat sheets.

2.3 REINFORCEMENT ACCESSORIES:

- A. Bar Supports: Manufacture bar supports from plastic, or precast concrete according to CRSI's "Manual of Standard Practice," of greater compressive strength than concrete for use in foundations and slabs-on-grade only.

2.4 CONCRETE MATERIALS:

- A. Cementitious Material: Use the following cementitious materials, of the same type, brand, and source, throughout Project:
 - 1. Portland Cement: ASTM C 150, Type I and Type III for high-early strength (when required). Supplement with the following:
 - a. Fly Ash: ASTM C 618, Class F or C.
 - b. Ground Granulated Blast-Furnace Slag: ASTM C 989, Grade 100 or 120.
 - c. Use of supplemental cementitious materials may be rejected by Architect/Structural Engineer of Record for certain applications on project.
 - 2. Blended Hydraulic Cement: ASTM C 595, Type IS portland blast-furnace slag, Type IP portland-pozzolan, Type I (PM) pozzolan-modified Portland, Type I (SM) slag-modified portland cement. Use of blended hydraulic cement may be rejected by Architect/Structural Engineer of Record for certain applications on project.
- B. Silica Fume: ASTM C 1240, amorphous silica. Use of blended hydraulic cement may be rejected by Architect/Structural Engineer of Record for certain applications on project.
- C. Normal-Weight Aggregates: ASTM C 33, coarse aggregate or better, graded. Select grading class per type of construction or location used, and in relation to specific weathering region. Provide aggregates from a single source.
 - 1. Maximum Coarse-Aggregate Size: See schedule on Construction Drawings.

- D. Water: Shall be potable.

2.5 ADMIXTURES:

- A. Air-Entraining Admixture: ASTM C 260.
- B. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and that will 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/C 494M, Type A.
 2. Retarding Admixture: ASTM C 494/C 494M, Type B.
 3. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.
 4. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.
 5. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.
 6. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.

2.6 FIBER REINFORCEMENT:

- A. Fiber reinforcement may be requested for substitution by contractor. Architect/Structural Engineer of Record shall review for compliance any substitution requested and approve or reject as necessary.

2.7 WATERSTOPS:

- A. Coordinate with Division 07 specifications and architectural drawings for waterstop requirements.

2.8 VAPOR RETARDERS:

- A. Sheet Vapor Retarder meeting ASTM E 1745, minimum 15 mil thickness. Coordinate with Division 03 and 07 specifications and Architectural Drawings for additional requirements or increased thickness. See Construction Drawings for locations required. Install per qualified geotechnical engineer's recommendation and ACI 302.1 requirements.

2.9 JOINT DEVICES AND MATERIALS:

- A. Joint Filler: Nonextruding, resilient asphalt impregnated fiberboard or felt complying with ASTM D 1751, ¼ inch (6 mm) thick and 4 inches (101 mm) deep; tongue and groove profile.

- B. Construction Joint Devices: Integral galvanized steel; 4 inch (101 mm) deep, formed to tongue and groove profile, with removable top strip exposing sealant trough, knockout holes spaced at 6 inches (150 mm), ribbed steel spikes with tongue to fit top screed edge.

2.10 CONCRETE MIXTURES, GENERAL:

- A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 301 and ACI 318 chapter 5. Design mixtures shall meet the minimum requirements tabulated in the construction documents.
- B. Cementitious Materials: Use fly ash, pozzolan, ground granulated blast-furnace slag, and silica fume as needed. Limit percentage, by weight, of cementitious materials other than portland cement in concrete per ACI 301 requirements for concrete exposed to deicing chemicals. Requirements of table 4.2.2.1 of ACI 301 shall be adhered to.
- C. Admixtures: Use admixtures according to manufacturer's written instructions.
 - 1. Use water-reducing, high-range water-reducing, plasticizing, or retarding admixtures in concrete, as required, for placement and workability, and project specific conditions.

2.11 CONCRETE MIXING:

- A. Ready-Mixed Concrete:
 - 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.

3.0 EXECUTION

3.1 FORMWORK:

- A. Limit concrete surface irregularities, designated by ACI 347R as abrupt or gradual, as follows:
 - 1. Class A, 1/8 inch for exposed smooth-formed finished surfaces.
 - 2. Class B, 1/4 inch for exposed rough-formed finished surfaces.

3.2 STEEL REINFORCEMENT:

- A. General: Comply with CRSI's "Manual of Standard Practice" for placing reinforcement.
- B. Install welded wire reinforcement in longest practicable lengths on bar supports spaced to minimize sagging. Lap edges and ends of adjoining sheets at least two full panels. Offset laps of adjoining sheet widths to prevent continuous laps in either direction. Lace overlaps with wire.

3.3 CONCRETE PLACEMENT:

- A. Do not add water to concrete during delivery or at Project site. Add water at project site only as noted on delivery ticket, and prior to beginning placement.
- B. Cold-Weather Placement: Comply additionally with ACI 306 & ACI 306.1 and as follows:
 - 1. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.
- C. Hot-Weather Placement: Comply with ACI 305 and as follows:
 - 1. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water.

3.4 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. Float Finish:
 - 1. Apply float finish to surfaces to receive trowel finish and to be covered with fluid-applied or sheet waterproofing, built-up or membrane roofing, or sand-bed terrazzo.
- C. Trowel Finish (after applying float finish):
 - 1. Apply a trowel finish to surfaces exposed to view or to be covered with resilient flooring, carpet, ceramic or quarry tile set over a cleavage membrane, paint, or another thin-film-finish coating system.
 - 2. Finish surfaces to the following tolerances, according to ASTM E 1155, for a randomly trafficked floor surface:

- a. Specified overall values of flatness, F(F) 35; and of levelness, F(L) 25; with minimum local values of flatness, F(F) 24; and of levelness, F(L) 17; for slabs-on-grade.
- D. Trowel and Fine-Broom Finish:
- 1. Apply a trowel finish to surfaces where ceramic or quarry tile is to be installed by either thickset or thin-set method.
 - 2. Comply with flatness and levelness tolerances for trowel-finished floor surfaces.
- E. Broom Finish: Apply a broom finish to exterior concrete platforms, steps and ramps, and elsewhere as indicated.
- 1. Coordinate required final finish with Architect before application.
- 3.5 CONCRETE PROTECTING AND CURING:
- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 301, ACI 305, ACI 306, and ACI 306.1 as applicable.
 - B. Cure concrete according to ACI 308.1, by one or a combination of the methods allowed in ACI301.
- 3.6 CONCRETE SURFACE REPAIRS:
- A. Defective Concrete: Repair and patch defective areas when approved by Architect/Structural Engineer of Record. Remove and replace concrete that cannot be repaired and patched to Architect/Structural Engineer of Record approval.
 - B. 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 per ACI 301, to the satisfaction of the Architect/Structural Engineer of Record.
 - C. Repairing Unformed Surfaces: Test unformed surfaces, such as floors and slabs, for finish and verify surface tolerances specified for each surface. For areas out of tolerance or specification, Contractor shall propose correction method to Architect/Structural Engineer of Record for approval.
- 3.7 JOINT DEVICES AND MATERIALS PLACEMENT:
- A. Separate slabs on grade from vertical surfaces with joint filler.

- B. Place joint filler in floor slab pattern placement sequence. Set top to required elevations. Secure to resist movement by wet concrete.
- C. Install joint devices in accordance with manufacturer's instructions.
- D. Install construction joint devices in coordination with floor slab pattern placement sequence. Set top to required elevations. Secure to resist movement by wet concrete.

3.8 FIELD QUALITY CONTROL:

- A. Concrete Tests: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:
 - 1. Testing Frequency: Obtain at least one composite sample set for each 75 cu. yd. or fraction thereof of each concrete mixture placed each day.
 - a. When frequency of testing will provide fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.
 - 2. Slump: ASTM C 143; one test at point of delivery for each composite sample, but not less than one test for each day's pour of each concrete mixture. Perform additional tests when concrete consistency appears to change.
 - 3. Concrete Temperature: ASTM C 1064; one test hourly when air temperature is 40 deg F and below and when 80 deg F and above, and one test for each composite sample.
 - 4. Air Content: ASTM C231 or ASTM C173 as applicable, one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
 - 5. Compression Test Specimens: ASTM C 31.
 - a. Cast and cure a minimum of four 6"x12" or five 4"x8" cylinder specimens for each composite sample.
 - b. Additional cylinders to be cast for high-early strength concrete and as required for contractor's means and methods.
 - 6. Compressive-Strength Tests: ASTM C 39; test one specimen at 7 days and one set of two (6"x12")/three (4"x8") specimens at 28 days. Should 28 day strength not be met, test remaining cylinder at 56 days. Should 28 day strength be met, remaining cylinder may be discarded. Additional tests for high-early strength concrete and as required for contractor's means and methods.
- B. Measure floor and slab flatness and levelness according to ASTM E 1155 as soon as possible but within 24 hours of finishing.

Elevated framing shall be measured in its shored condition (where applicable).

END OF SECTION

ADDENDUM NO. 2
Issued July 20, 2017

SECTION 04100

MORTAR AND GROUT

1.0 GENERAL

1.1 REFERENCES:

- A. Standards of the American Society for Testing and Materials (ASTM), as referenced herein.

1.2 SUBMITTALS:

- A. Product Data: Submit manufacturer's product specifications and mixing and installation instructions for each manufactured product.
- B. Samples: Submit samples of actual specified mortar for colored mortar; indicate range for each color selected.
 - 1. Samples shall be made using cement brand and aggregate source proposed for work on this project.
 - 2. Include prepared colored mortar samples of cast stone pointing mortar.
- C. Mix Designs: For each type of mortar and grout. Include description of type and proportions of ingredients. Include:
 - 1. Mix designs and mortar tests performed in accordance with the property specification of ASTM C270.
 - 2. Compressive strength test performed in accordance with ASTM C1019.

1.3 DELIVERY, STORAGE AND HANDLING:

- A. Deliver materials, except aggregate, in original unopened containers displaying product name, type, grade and mixing instructions.
- B. Store materials to prevent inclusion of foreign materials. Store cement, lime, and admixtures above ground level and covered to protect from moisture and contamination.

1.4 QUALITY ASSURANCE:

- A. Single Source Requirements: For each type of cement specified, only one brand shall be used throughout the project.
- B. Mock-up Panel: Furnish mortar for preparation of job mock-up panel specified in Brick Masonry section.

2.0 PRODUCTS

2.1 MATERIALS:

- A. Portland Cement: Meeting ASTM C150-17, Type "I" natural color, domestic manufacture. Only one brand shall be used throughout the project.
- B. Masonry Cement: Meeting ASTM C91-12, non-staining, 22% maximum air content by volume and proportioned to comply with requirements of ASTM C270-99b for Type "S" mortar as scheduled herein. Only one brand shall be used throughout the project.
- C. Hydrated Lime: Meeting ASTM C207-06(2011), Type "S".
- D. Pre-mixed, Colored Masonry Cement:
 - 1. Acceptable Products; pending compliance with specified characteristics and acceptable color range to match specified color:
 - a. CEMEX, Inc.; Colored Masonry Cement.
 - b. Essroc Italcementi Group; Flamingo Brixment Masonry Cement in Color.
 - c. LaFarge North America Inc.; either of the following:
 - 1) Lafarge Magnolia Mason's Mix Masonry Cement.
 - 2) Lafarge U.S. Cement Custom Color Masonry Cement.
 - d. National Cement Company, Inc., Coosa Masonry Cements
 - 2. Characteristics: Meeting ASTM C91-12, Type 'N' non-staining, 22% maximum air content by volume, with inert, alkali-resistant, fade-resistant mineral pigments and complete with water-reducing and plasticizing admixtures, proportioned to comply with requirements of ASTM C270-14 for Type 'N' mortar with minimum 28-day compressive strength of 750 psi.
 - 3. Color: Color formulated for Type 'N' mortar. Color shall be from manufacturer's white cement based formulations. Refer to Exterior Finish List for Mortar colors.

- E. Color Additives for Cast Stone Pointing Mortar: Natural or synthetic mineral oxides meet ASTM C979-16; sun-fast, lime-proof and alkali-resistant.
1. Additive shall not exceed 10% of the weight of the cement used.
 2. Color shall be as selected by Architect to match cast stone.
- F. Aggregate:
1. For mortar: Clean, hard, natural, washed sand meeting ASTM C144-11. Provide aggregate from a single source for colored mortar.
 2. For cement grout: Meeting ASTM C404-11, fine aggregate, size #1 for fine grout; size #8 for coarse grout, when minimum horizontal dimension of grouting space exceeds 4".
- F. Water Reducing and Plasticizing Admixture:
1. Acceptable products:
 - a. Chem-Masters; FreezBan NC.
 - b. Euclid Chemical Co., Accelguard 80.
 - c. Sonneborn / Degussa Building Systems; Trimix-NCA.
 2. Characteristics: Non-chloride admixture meeting ASTM C494-16, Type E. Admixtures containing calcium chloride shall not be permitted.
- G. Non-shrink Grout:
1. Acceptable products:
 - a. Bonsal American / Oldcastle Co., F-77 Construction Grout.
 - b. Degussa Building Systems; Masterflow 713 Plus.
 - c. Five Star Products, Inc.; Five Star Grout.
 - d. L&M Construction Chemicals, Inc., Crystex.
 - e. Sonneborn / Degussa Building Systems; SonogROUT.
 - f. W.R. Meadows, Inc.; 588.
 2. Characteristics: High flow, non-metallic, controlled expansive type grout.
- H. Anchoring Cement:
1. Acceptable products:
 - a. Bonsal American / Oldcastle Co., Bonsal Anchor Cement.
 - b. Chemrex, Inc. / Degussa Building Systems, Thorogrip.
 - c. Dayton Superior Corp., Ankertite.
 - d. Lambert Corp., Lambco Anchor Sement or Super Por-Rok.
 2. Characteristics: Pourable, self-leveling, quick-setting cement base, waterproof, non-shrinking hydraulic compound.

- I. Water: Clean, potable, free from deleterious amounts of alkalis, acids and organic materials.

2.2 PROPORTIONS:

- A. Type "S" Job-Mixed or Bag-Mixed Mortar: Proportion materials by volume in accordance with ASTM C270-14a, as follows:
 1. One part masonry cement to $\frac{1}{2}$ part Portland cement to aggregate proportioned at not less than $2\frac{1}{4}$ nor more than three times the volume of cement used; or,
 2. One part Portland cement and $\frac{1}{4}$ to $\frac{1}{2}$ parts hydrated lime to aggregate proportioned at no less than $2\frac{1}{4}$ nor more than three times the combined volume of cement and lime used.
 3. One part pre-mixed Type S masonry cement to aggregate proportioned not less than $2\frac{1}{4}$ nor more than three times the volume of masonry cement used, and as directed by masonry cement manufacturer's product data to produce Type S mortar.
- B. Type "N" Job-Mixed or Bag-Mixed Colored Mortar: Proportion materials by volume in accordance with ASTM C270-14a, as follows:

One part pre-mixed Type N masonry cement to aggregate proportioned not less than $2\frac{1}{4}$ nor more than three times the volume of masonry cement used, and as directed by masonry cement manufacturer's product data to produce Type N mortar. This method is required for pre-mixed colored masonry cement.
- C. Pointing Mortar for Cast Stone Work: One part masonry cement to one part Type "S" hydrated lime to four parts aggregate with color additives not exceeding 10% of the weight of the cement used.
- D. Cement Grout: Proportion materials by volume in accordance with ASTM C476-16 for fine or coarse grout as required; minimum 3000 psi compressive strength at 28 days.
- E. Non-Shrink Grout: Mix prepared non-shrink grout product with water as directed by manufacturer's product data to achieve a minimum compressive strength of 7000 psi at 28 days.
- F. Anchoring Cement: Mix prepared anchoring cement product with water as directed by manufacturer's product data for immediate use.

3.0 EXECUTION

3.1 MIXING:

- A. Mix mortar and cement grout in power-driven, drum-type mixers. Operate mixer a minimum of five minutes after addition of all materials.
- B. For job mixed mortars add water reducing and plasticizing admixture in accordance with admixture manufacturer's product data.
- C. Addition of other admixtures, including anti-freeze ingredients, will not be permitted.
- D. Measure materials for job mixed mortars in a one cubic foot container. DO NOT measure by shovels.
- E. Discard grout not placed within 1-1/2 hours after water is added to mix, or sooner, as indicated by grout manufacturer.

3.2 PLACING MORTAR AND GROUT:

- A. Place mortar as directed in Brick Masonry, Concrete Unit Masonry and Cast Stone Sections.
- B. Re-temper mortar as necessary to keep plastic. Use no mortar after setting has begun or after 2-1/2 hours of initial mixing.
- C. Place cement grout, non-shrink grout and anchoring cement as specified in other sections.
- D. Mortar Type Schedule:
 - 1. Mortar for concrete unit masonry work except architectural concrete masonry units shall be Type "S", natural color.
 - 2. Mortar for non-load bearing, above grade brick masonry, architectural concrete masonry veneer units and precast concrete units (with Initial Rate of Absorption above 30 gal/min/30 square inches) shall be Type "N" colored mortar. For masonry units with initial rate of absorption of 30 gal/min/30 square inches or less, use Type "S" colored mortar. Design Basis color equal to Argos, "Khaki".
 - 3. Mortar for below grade brick masonry shall be Type "S" natural color.
 - 4. Mortar for cast stone work shall be Type "N", colored mortar matching cast stone.

END OF SECTION

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ADDENDUM NO. 2
Issued July 20, 2017

SECTION 04210

BRICK MASONRY

1.0 GENERAL

1.1 REFERENCES:

- A. Applicable standards of the following as referenced herein:
1. American Society for Testing and Materials (ASTM).
 2. Brick Institute of America (BIA).

1.2 SUBMITTALS:

- A. Product Data:
1. Submit manufacturer's product data, mixing and application procedures for masonry cleaning compound.
 2. Submit written endorsement by brick manufacturer that proposed cleaning compound is acceptable for proper cleaning of actual brick masonry supplied for the project.
 3. Submit product data for proposed weep vents.
- B. Certificates: Indicate that materials supplied comply with specification requirements. Certificates shall be signed by brick manufacturer and shall state quantities and dates shipped.
- C. Samples: Submit five actual brick of each size, type and special shape indicating range of color, texture and size to be expected in finished work.

1.3 QUALITY ASSURANCE:

- A. Allowable tolerances:
1. Maximum variation from plumb in lines, surfaces & arrises:
 - a. 1/4" in 10'-0".
 - b. 3/8" in any story or 20'-0" maximum; 3/8" maximum non-cumulative.
 2. Maximum variation from plumb at external corners, expansion joints, and other conspicuous lines:
 - a. 1/4" in any story or 20'-0" maximum.
 - b. 3/8" in 40'-0" or more; 3/8" maximum, non-cumulative.
 3. Maximum variation from level or grades for exposed lintels, sills, parapets, horizontal grooves and other conspicuous lines:
 - a. 1/4" in any bay or 20'-0".

- b. 3/8" in 40'-0" or more; 3/8" maximum, non-cumulative.
4. Maximum variation of linear building line from established position in plan and related portions of columns, walls and partitions: 1/2" any bay or 20'-0"; 1/2" maximum, non-cumulative.
5. Maximum variation in cross-sectional dimensions of columns and thickness of walls: Not less than 1/4" smaller nor more than 1/2" larger than indicated.

1.4 DELIVERY, STORAGE AND HANDLING:

- A. Store brick masonry off the ground to prevent contamination by mud, dust and foreign materials which cause staining or other defects.
- B. Cover stored materials and keep dry.

1.5 JOB CONDITIONS:

- A. Environmental requirements:
 1. Lay no masonry when temperature of surrounding air has dropped below 45°F., unless it is rising; and at no time when temperature has dropped below 40°F., except by written permission from Architect.
 2. When masonry work is authorized during temperature below 40°F., but above freezing, mortar shall be provided at temperature between 70°F. and 100°F.
 3. Maintain air temperature above 40°F., on both sides of masonry for at least 72 hours after laying.
- B. Protection of work:
 1. During erection, keep walls dry by covering at end of each day or work period with a waterproof membrane, anchored and overhanging each side of wall at least 2'-0".
 2. Remove misplaced mortar or grout immediately.
 3. Protect face materials against staining.
 4. Protect sills, ledges and offsets from mortar droppings during construction.
- C. Sequencing and Scheduling: Do not enclose or cover mechanical or electrical work requiring inspection until such work has been accepted. Coordinate this work with work of other sections required to be built into masonry construction.

2.0 PRODUCTS

2.1 UTILITY FACE BRICK:

A. Face Brick:

1. Acceptable Products:
 - a. Design Basis: Cherokee Brick, "Old Brookwood".
 - b. Glen Gery, "Wyandot".
 - c. Acme, "Sable Pass".
2. Material: Meeting ASTM C216, Grade SW, Type FBS.
3. Texture: Velour.
4. Size: 3-1/2 to 3-5/8" wide by 3-1/2 to 3-5/8" high by 11-1/2 to 11-5/8" long, Utility sized brick.

2.2 ACCESSORY PRODUCTS:

- A. Weep Tubes: 3/8" diameter by 4" tubes with cotton inorganic fiber wicks and stainless steel insect screens.
- B. Masonry cleaning compound:
 1. Acceptable products:
 - a. Nova Chemical Corporation, Vanex.
 - b. ProSoCo, Inc., Sure Kleen Vana Trol.
 - c. Diedrich Technologies, Inc., 202V Vana-Stop.
 2. Type: Inorganic acid masonry cleaning agent formulated to prevent metallic staining.
 3. Masonry cleaning compound shall be acceptable to brick manufacturer.

3.0 EXECUTION

3.1 SAMPLE WALL PANEL:

- A. Erect a minimum 6' long, (plus minimum 2'-0" returns at each end to accomplish a "Z"-shaped plan), by 6' high sample wall panel of face brick using concrete unit masonry backup, mortar, and all accessories as specified in other sections. Orient panel as directed by the Architect.
- B. Indicate not less than the following:
 1. Bonding pattern.
 2. Mortar color & joint tooling.
 3. Brick colors, textures, & ranging.
 4. Back-up masonry construction.
 5. Cavity construction with Dampproofing & insulation.
 6. Horizontal reinforcing.
 7. Through-Wall flashing, weeps, & mortar collection material.
 8. External corner & internal corner.
 9. Control joint with sealant & backer rod.
 10. Specialty masonry unit features.
 11. Storefront window framing.
 12. Relationships to adjacent construction materials.
 13. General overall workmanship.

- C. Prepare the panel at least 14 days prior to beginning masonry work. Should the panel not be accepted, prepare additional panels until accepted by Architect.
- D. Maintain and protect the approved panel throughout work as standard of masonry work. Do not destroy panel until directed by Architect.

3.2 LAYOUT:

- A. Plan and Coordinate layouts for Drawing dimensions, minimal cutting, alignment of control joints with back-up masonry, and relationships to adjacent work.
- B. Control lines: Prior to the installation of brick masonry, apply indelible, plumb, vertical control lines on sheathing substrate or cavity insulation or backup masonry at spacing not to exceed 48 inches on center continuous for the full height of the brickwork for the purpose of maintaining plumb head joint alignment in alternate courses for the specified brick bond pattern.

3.3 INSTALLATION:

- A. Workmanship: Install no cracked, broken or chipped units exceeding ASTM allowances.
 - 1. Use abrasive power saws to cut bricks. Avoid slivers less than 2" wide.
 - 2. Lay brick plumb, true to line and with level courses, spaced within allowable tolerances specified.
 - 3. Do not furrow bed joints.
 - 4. When work is to be stopped and resumed, rake back 1/2 unit length in each course; TOOTHING IS STRICTLY PROHIBITED. Clean exposed surfaces of set masonry. Remove loose masonry and/or mortar prior to laying fresh masonry.
 - 5. Adjust units to final position while mortar is soft & plastic.
 - 6. If units are displaced after mortar has stiffened, remove units, clean joints and units of mortar and relay with fresh mortar.
 - 7. Cutting and patching of finish masonry to accommodate work of other trades shall be done so as not to mar appearance of finished surface.
 - 8. Adjust shelf angles to keep work level at proper elevation.
 - 9. Provide pressure relieving joints by placing continuous 1/8" foam neoprene pad under shelf angles.
 - 10. When joining fresh masonry to set or partially set masonry, remove loose brick and mortar and clean and dampen

exposed surface of set masonry prior to laying fresh masonry.

11. Provide solid brick units free of cores or frogs where sides of brick would be exposed in the finished work.
12. Mix units from various pallets of same type per manufacturer's recommendations to insure uniform color and texture throughout work. Localization of color and texture differentiations will not be permitted.
13. Wet brick with initial rate of absorption exceeding 30 grams/30 sq. in./min. when tested in accordance with ASTM C67-83.
14. Keep cavity in cavity walls clean and clear of mortar droppings and debris. Maintain indicated cavity clearance throughout masonry wall construction.

B. Mortar Beds:

1. Lay brick with full mortar coverage on horizontal and vertical joints in all courses.
2. Provide sufficient mortar on brick ends to fill head joints.
3. Rock closures into place with head joints thrown against two adjacent bricks in place.
4. Do not pound corners or jambs to fit stretcher units after setting in place.
5. Where adjustment to corners or jambs must be made after mortar has started to set, remove mortar and replace with fresh mortar.
6. Keep cavity in cavity walls clean by slightly beveling mortar bed to incline toward cavity. Trowel protruding mortar fins in cavity flat with inner face of wythe as work progresses. Wooden or metal lifting strips sized slightly smaller than cavity and attached with wire or rope for lifting may be used to keep cavities clean.

C. Mortar Joints:

1. Nominal thickness (vertical and horizontal joints): 3/8".
2. Tool joints exposed in finished work when "thumbprint" hard. Joints shall be tooled using a jointer at least 2'-0" in length. Use proper shaped jointing tools for tooling mortar joints. Use plastic or glass jointing tools if light colored mortar is used.
3. Joint profile: Concave except as indicated on drawings.
4. Trowel point or concave tool joints below grade.
5. Flush-cut joints not to be exposed in finished work.

D. Bonding Pattern: Lay brick in one-half running bond (unless otherwise noted). Head joints of alternate courses shall be vertically aligned; see layout criteria in paragraph 3.2 above.

E. Brick Control Joints: Provide 3/8"-wide joints at locations indicated, but spaced not to exceed 40'-0" horizontal centers for vertical joints.

Install materials as specified in Masonry Reinforcement and Accessories and Sealants & Caulking sections.

1. Construct vertical joints straight and plumb; horizontal joints level and true to line.
2. Keep joints free of mortar and debris.

F. Expansion Joints: Keep clean of mortar and debris. Make joints 1" wide (unless noted otherwise). Stop horizontal joint reinforcement 1" each side of joint. Install expansion joint seals in accordance with Expansion Control Section. Provide temporary 1" wide filler material for construction joint; remove prior to sealant and backer rod installation.

G. Flashing:

1. Clean surface of masonry smooth and free from projections which might puncture flashing material.
2. Place through-wall flashing on bed of mortar and cover with mortar.

H. Mortar Collection Material: Provide in cavity, behind exterior wythe, in front of through-wall flashing at all weep courses.

I. Weep Wicks:

1. Provide weeps at exterior masonry wythes, spaced at 2'-0" horizontal centers located at heads and sills of openings, in exterior walls at grade and at locations where flashing is indicated.
2. Form weeps by placing 1'-0" lengths of rope wick in mortar joints, extending into cavity. Leave wicks in place and cut off flush with exterior face of wall. Provide 8" minimum depth of washed pea gravel in wall cavities in pocket created by through-wall flashings.
3. Keep weep areas and cavity space above flashings free of mortar droppings.

J. Sealant Joints: Retain 1/2" deep by 1/4" wide sealant joint around outside perimeter of exterior doors, window frames and other wall openings.

K. Pointing: Cut out defective mortar joints and holes in exposed work. Re-point with new mortar matching adjacent in color and profile.

L. Dry Cleaning: Brush brick surfaces with stiff bristle brush to remove mortar droppings. Do not allow mortar droppings to harden on exposed surfaces.

M. Protection of Finished Work: Provide ground cover for a MINIMUM width of two feet (2'-0") on the ground around the base of all brick masonry to prevent discoloration of the completed brick masonry from mud stains or other construction activities. Maintain ground cover until permanent grassing or hardscape around brick masonry is established or completed.

3.4 FINAL CLEANING:

- A. At least 21 days prior to application of cleaning solution to brick work, apply solution to half the surface of sample panel. Should discoloration of brick or mortar joints, staining or efflorescence appear on sample panel notify Architect & await further instructions.
- B. No wet cleaning shall occur within seven days of placing masonry.
- C. At least two hours prior to application of cleaning solution to brick work, saturate mortar joints with clean water & flush off loose debris.
- D. Thoroughly wet walls before applying cleaning solution and thoroughly rinse walls after.
- E. Begin cleaning process at highest point of wall, working downward. Work in areas of 20 square feet maximum. Flush Wall as cleaning progresses to prevent accumulation of scum.
- F. Discard solutions containing debris and residue so not to contaminate adjacent areas.
- G. DON'TS: Do not use high pressure to apply cleaning solution. Do not scrub mortar joints with cleaning solution.
- H. Protect materials adjacent to brick work subject to corrosion from contact with cleaning solution. Temporarily protect all aluminum storefront and painted surfaces with 6 mil polyethylene sheeting. Rinse brick and surrounding surfaces immediately after cleaning with clear water.
- I. Apply manufactured cleaning compound to brick masonry as tested on job mock-up in accordance with manufacturer's product data. Flush with clean water.
- J. Remove stains in accordance with recommendations of the Brick Industry Association, "Technical Notes No. 20, dated 2006. Apply cleaning agents only after testing on sample panel.

END OF SECTION

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ADDENDUM NO. 2
Issued July 20, 2017

SECTION 04220

CONCRETE UNIT MASONRY

1.0 GENERAL

1.1 SUMMARY:

- A. Work described in this section includes providing concrete masonry units, including architectural concrete masonry units, and building in of work of other trades.
- B. Related Work Specified Elsewhere:
 - 1. Concrete.
 - 2. Brick Masonry.
 - 3. Mortar and Grout.
 - 4. Masonry Reinforcement and Accessories.
 - 5. Through-wall flashing.
 - 6. Metal door frame wall anchors.

1.2 REFERENCES:

- A. Applicable Standards:
 - 1. American Society for Testing and Materials (ASTM), standards as referenced herein.
 - 2. National Concrete Masonry Association (NCMA), "A Manual of Facts on Concrete Masonry."
 - 3. Portland Cement Association (PCA), "Concrete Masonry Handbook."

1.3 SUBMITTALS:

- A. Samples: Submit three samples for each type and each size of exposed concrete masonry unit, including architectural units, indicating range of color and texture proposed in finished work, for approval by the Architect. Surface textures on all types and sizes of units shall be identical.
- B. Certificates:
 - 1. Submit certificates from masonry manufacturer in triplicate prior to delivery of concrete masonry units to project site. Each certificate shall be signed by an authorized officer of the manufacturing company and shall contain the name and address of the Contractor, the project location and the

quantities and date or dates of shipment or delivery to which the certificate applies.

2. Units shall be certified for compliance with specification requirements, including compressive strength, moisture content, and linear drying shrinkage.
3. Time rated fire-resistant masonry units shall be certified by manufacturer to comply with mix design and equivalent thickness requirements of Underwriters' Laboratories (UL) for time ratings indicated. Certification shall include evidence of manufacturer's qualification by UL to manufacture fire rated units.

C. Shop Drawings:

1. Masonry Units: Show sizes, profiles, coursing, and locations of special shapes.
2. Reinforcing Steel: Detail bending and placement of unit masonry reinforcing bars. Comply with ACI 315, "Details and Detailing of Concrete Reinforcement."

1.4 DELIVERY, STORAGE AND HANDLING:

- A. Keep units dry. Allow air circulation around stacked units. Wet concrete masonry units shall not be installed.
- B. Protect units to be exposed in finish work from staining and physical damage of exposed faces.

1.5 JOB CONDITIONS:

A. Environmental Requirements:

1. Lay no masonry when temperature of surrounding air has dropped below 45°F., unless it is rising; and at no time when it has dropped below 40°F., except with written permission from the Architect.
2. When masonry work is authorized at temperatures below 40°F., but above freezing, provide mortar at temperature between 70°F. and 100°F. Maintain air temperature above 40°F. on both sides masonry for 72 hours after laying.
3. Protect masonry construction from direct exposure to wind and sun when erected in ambient air temperatures of 95°F. in the shade with relative humidity less than 50%.
4. Do not lay masonry units that are wet or frozen.
5. Remove any ice or snow formed on masonry bed by carefully applying heat until top surface is dry to the touch.
6. Remove all masonry determined to be damaged by freezing conditions.
7. Comply with cold-weather construction requirements contained in ACI 530.1-11/ASCE 6-11/TMS 602-11.

B. Protection of Work:

1. Keep walls dry during erection by covering at end of each day or work period with a waterproof membrane. Similarly protect partially completed walls not being worked on. Covering shall overhang at least 2'-0" on each side of wall and shall be anchored on each side of wall.
 2. Protect finished exposed work from stains.
 3. Mortar droppings sticking to unit faces shall be allowed to dry; then be removed with trowel and surface lightly scrubbed with bristled brush.
 4. Particular care shall be given to keeping masonry units clean in areas not to be painted.
- C. Install and inspect mechanical and electrical work prior to enclosing or covering with masonry. Where runs of piping or conduit are required, cut away masonry unit web without disturbing face or bond.
- D. Coordinate installation of masonry anchors with structural system to which masonry is attached.

1.6 QUALITY ASSURANCE:

- A. Manufacturer's Qualification: Manufacturer of time rated fire-resistant masonry units shall be qualified in writing by Underwriters' Laboratories (UL) for manufacture of fire-rated units.
- B. Installer's Qualification: Masonry subcontractor shall have a minimum of five (5) years experience in quality commercial grade construction and shall have successfully completed comparable work on time and in an acceptable manner.
- C. Allowable Tolerances:
1. Maximum variation from plumb: 1/4" in 10'-0" not to exceed 3/8" in 20'-0"; 3/8" maximum, non-cumulative.
 2. Maximum variation from level: 1/4" in 20'-0"; not exceeding 3/8" in 40'-0" or more; 3/8" maximum, non-cumulative.
 3. Maximum variation in linear building line from location indicated: 3/8" in 20'-0"; 3/8" maximum, non-cumulative.
- D. Concrete Unit Masonry Strength: Provide units with minimum average net-area compressive strength as listed in Section 1.4 B.2, Table 2 of TMS 402/602-16 required for the specified f'm.
- E. Detailing of masonry reinforcement and grout shall be in accordance with "Building Code Requirements for Masonry Structures (ACI 530-11/ASCE 5-11/TMS 402-11)."
- F. Masonry material, quality assurance and field execution for reinforced and grouted masonry construction shall be in accordance with "Specifications for Masonry Structures (ACI 530.1-11/ASCE 6-11/TMS 602-11)."

- G. Testing Agency: A Testing Agency paid for by the Owner shall perform full-time supervision for all reinforcement bar placement in CMU and all grout placement, verifying conformance with the contract documents.
- H. Structural Testing/Inspection Agency shall perform the following quality related items:
1. Verify reinforcing steel for quantity, size, and location.
 2. Verify placement of coarse grout as indicated in high or low lift procedure.
 3. Verify compressive strength of concrete masonry units, mortar, coarse grout, or masonry prisms for each 5,000 sq. ft. of surface area as follows:
 - a. Three (3) concrete masonry units shall be tested in accordance with ASTM C140.
 - b. Six (6) mortar cube specimens shall be tested, three (3) at 7-days and three (3) at 28-days, in accordance with ASTM C109.
 - c. Four (4) coarse grout specimens shall be tested, two (2) at 7-days and two (2) at 28-days, in accordance with ASTM C1019.
 - d. In lieu of individual tests of masonry units, mortar, and grout, if directed by the Design Professional, perform one (1) prism test (which consists of three prisms) in accordance with ASTM E447.
- I. The Structural Testing / Inspection Agency shall provide special inspections as required by Chapter 17 of the building code as required by Specification 01415.

2.0 PRODUCTS

2.1 CONCRETE MASONRY UNITS:

- A. Hollow Load-Bearing Units:
1. Meeting ASTM C90-16a.
 2. Nominal face dimensions: 8" by 1'-4".
 3. Thicknesses: As indicated on Drawings.
 4. Weight classification: Lightweight; maximum 105 pcf.
 5. Admixtures: Calcium chloride or admixtures containing more than 0.05 chloride ions are not permitted.
- B. Solid Load-Bearing Units:
1. Meeting ASTM C90-16a.
 2. Nominal face dimensions: 8" by 1'-4".
 3. Thicknesses: As indicated on Drawings.
 4. Weight classification: Lightweight; maximum 105 pcf.

5. Admixtures: Calcium chloride or admixtures containing more than 0.05 chloride ions are not permitted.
- C. Hollow Non-Loading Bearing Units:
1. Meeting ASTM C 90-16a.
 2. Nominal face dimensions: 8" by 1'-4".
 3. Thicknesses: As indicated on Drawings.
 4. Weight classification: Lightweight; maximum 105 pcf.
 5. Admixtures: Calcium chloride or admixtures containing more than 0.05 chloride ions are not permitted.
- D. Units shall be manufactured with lightweight aggregate meeting ASTM C 331.
- F. Fire-Rated Units: Manufacture in accordance with Underwriters' Laboratories Inc., Standard UL 618, "Standard for Concrete Masonry Units."
- G. All exposed vertical external corners of interior concrete masonry units shall be bullnose type, except external corners of fire-rated units shall have square edges field-ground to radius matching bullnose units, and corner cells filled solidly with grout to maintain in-effect fire-rating of the units.

2.2 ACCESSORY PRODUCTS:

- A. Weep Tubes: 3/8" diameter by 4" tubes with cotton inorganic fiber wicks and stainless steel insect screens.
- B. Masonry Cleaning Compound:
1. Acceptable products:
 - a. Nova Chemical Corporation, New Brick.
 - b. ProSoCo, Inc., Sure Kleen 600.
 - c. Diedrich Technologies, Inc., 202V Vana-Stop.
 2. Type: Inorganic acid.
 3. Cleaning compound shall be acceptable to architectural concrete masonry unit manufacturer.

2.3 REINFORCING:

- A. Reinforcing placement, grout cover and protection shall be in accordance with "Building Code Requirements for Masonry Structures (ACI 530-11/ASCE 5-11/TMS 402-11)."
- B. Reinforcing bar supports shall be used to hold reinforcement in place during construction. Supports shall be placed at the top and bottom of the reinforced masonry section and at intervals of 8'-0" o.c. (max.).
- C. Cleanouts shall be provided at all grout pour heights that exceed 5'-4".

3.0 EXECUTION

3.1 SAMPLE WALL PANEL:

- A. Erect sample panel for masonry work. Construct using an 8" nominal thickness backup wall incorporated into the required brick masonry sample panel as specified in Brick Masonry section.
- B. Indicate Not Less Than The Following:
 - 1. Bonding pattern.
 - 2. Mortar colors.
 - 3. Joint tooling (examples of flush, concave, & trowel point).
 - 4. Unit masonry colors and textures.
 - 5. Horizontal reinforcement.
 - 6. External bullnose corners (manufactured & field ground)
 - 7. Integration with brick masonry.
 - 8. Linear control joint with sealant & backer rod.
 - 9. Interior corner with raked-out mortar & caulked joint.
 - 10. General workmanship.
 - 11. Specialty units & special project conditions.
 - 12. Relationships with adjacent work
- C. Prepare panel at least 14 days prior to beginning masonry work. Should panel not be acceptable to the Architect, prepare additional panels until acceptable by the Architect.
- D. Maintain and protect panel throughout construction of masonry work as standard of masonry work. Do not destroy panel until directed by the Architect.

3.2 WORKMANSHIP:

- A. Lay only dry masonry units.
- B. Lay masonry plumb, level and true to line with accurate coursing as indicated on the Drawings.
- C. Bonding: Lay units in running bond with head joints centered in alternate courses. Center scored face unit joints over head joints in alternate courses. Lay units at radiused walls in stacked bond with head joints aligned.
- D. Cutting of masonry shall be done with abrasive power saw. Lay out units to minimize cutting. Remove cutting residue from architectural masonry immediately after cutting to avoid staining.
- E. Cavities: Keep cavities in cavity walls clean and clear of mortar droppings and debris. Maintain indicated cavity clearance throughout masonry wall construction. Use specified mortar collection material.

3.3 BUILDING IN OF OTHER WORK:

- A. Build in work of other trades indicated to be built in with masonry, including anchors, wall plugs, expansion joints and accessories, as work progresses. Space and align built-in parts and exercise care not to displace other materials from position. Fill in spaces around built-in items with cement grout.
- B. Fill hollow metal frames in masonry walls with cement grout. Rake back 1/2" joint between hollow metal frame and adjacent masonry to receive sealant.
- C. Lay masonry to receive flashing with smooth joints without projections that could puncture flashing materials. Provide fresh mortar on both sides of flashing in masonry joints.
- D. Unless indicated otherwise, provide minimum 8" of solid end bearing full height of wall from floor to bearing points for lintels, beams and other load-supporting members by either solid block or filling cores with cement grout.
- E. Provide lintels and bond beams where indicated using lintel blocks laid with joints matching adjacent work. Reinforcement shall be as indicated on the Structural Drawing Lintel Schedule and block filled with grout as indicated on the structural drawings.
- F. Where indicated, reinforce vertical concrete block cells, grouting solid with cement grout. Reinforcement is specified in Division 3.
- G. Do not apply uniform floor or roof loading for at least 12 hours after building masonry walls.
- H. Do not apply concentrated loads for at least 3 days after building masonry walls or columns.

3.4 MORTAR JOINTS:

- A. Bed Joints for Unreinforced Partitions:
 - 1. Lay first course in full bed of mortar.
 - 2. On all other bed joints, apply mortar on face shall only of masonry unit already laid.
 - 3. On masonry unit to be laid, apply a beveled buttering to face shell to ensure full bed joints.
- B. Bed Joints for Reinforced and Fire-Rated Partitions:
 - 1. Lay all courses in full bed of mortar.
 - 2. Head joints: Apply mortar to vertical face shells on both the masonry unit already laid and the unit to be laid to ensure full head joint.
- C. Place masonry unit by rolling it to a vertical position and shoving it against adjacent unit, achieving position and alignment with minimum of adjusting.

- D. Adjustment shall be made only while mortar is still soft and plastic by tapping to plumb and bringing to alignment. Remove unit and relay in fresh mortar when unit must be pulled back to align.
- E. Keep cavity in cavity walls clean by slightly beveling mortar bed to incline toward cavity. Trowel protruding mortar fins in cavity flat with inner face of wythe as work progresses.
- F. Check each unit as laid with mason's level for level and for plumbness with wall below. Comply with specified tolerances.
- G. Where adjustment must be made after mortar has started to set, remove and replace mortar with fresh mortar.
- H. Keep bed and head joints uniform in width, except for minor variations required to maintain bond and locate returns. Standard thickness for both horizontal and vertical mortar joints shall be 3/8".
- I. Cut units to align with vertical joints at corners and intersection of masonry walls. Units less than half length shall not be permitted. Install prefabricated tee joint reinforcement in alternate courses where abutting walls intersect.
- J. Weep Holes:
 - 1. Provide weep holes at exterior masonry wythes, spaced at 16" horizontal centers located at heads and sills of openings, in exterior walls at grade and at locations where flashing is indicated.
 - 2. Form weeps by placing 1'-0" lengths of rope wick in mortar joints, extending into cavity. Leave wicks in place and cut off flush with face of wall.
 - 3. Keep weep areas and cavity space above flashings free of mortar droppings.

3.5 EXPANSION JOINTS:

- A. Make joints 1" wide, unless otherwise indicated. Construct joints straight, vertically plumb, and uniform width.
- B. Keep joint clear of mortar by temporarily filling with fiberboard as wall is laid.
- C. Stop horizontal joint reinforcement 1" from expansion joints.
- D. Leave joint open and clean for installation of expansion joint assemblies in accordance with Expansion Control section.

3.6 MASONRY CONTROL JOINTS:

- A. Make joint 3/8" wide, unless otherwise indicated. Construct joints straight, vertically plumb, and uniform width. Use proper thickness

of allthread rod or similar product as a spacer to maintain joint width along height of wall being laid.

- B. Stop horizontal joint reinforcement 1" from control joints.
- C. Provide Vertical Joints:
 - 1. In running walls spaced maximum 25'-0" o.c.
 - 2. At structural columns.
 - 3. At abutments with concrete walls.
 - 4. Not closer than 5'-0" and not further than 12'-6" from wall corners.
 - 5. At locations where wall height changes.
 - 6. At locations where wall thickness changes.
 - 7. Where specifically & otherwise shown on the Drawings.
- D. Leave joint open and clean for caulking in accordance with Sealants and Caulkings Section. Caulk joints exterior and interior.
- E. Construct fire-rated masonry control joints in accordance with UL Joint System Designs indicated in UL Fire Resistance Directory for widths required to be sealed as tested per ANSI/UL 2079.

3.7 JOINT TREATMENT:

- A. Flush Joints: Strike joints in masonry to receive finish work of trades other than painting flush.
- B. Tooled joints in standard concrete masonry units and smooth faced architectural masonry units: Strike exposed joints flush and, when partially set, tool using concave tool.
- C. At scored smooth-face architectural units, use pointing mortar and tool joints concave to match stretcher and bed joints.
- E. Use proper shaped jointing tools for tooling mortar joints. Use plastic or glass jointing tools if light colored mortar is used.
- F. Tool horizontal joints before vertical joints. Remove mortar burrs after tooling; trimmed off flush with face of wall using a trowel or by rubbing with a burlap bag, brush or carpet.

3.8 CLEANING AND POINTING:

- A. Keep masonry work free of mortar droppings as work progresses and, at completion of work, rub masonry to remove excess mortar. Clean any exposed masonry of stains using water and cleaning compound, as required.
- B. Point mortar joints. Remove and replace units with excessive spalls or chips.

- C. Clean Architectural Masonry Units Using Specified Cleaning Solution as Follows:
1. At least 21 days prior to application of cleaning solution to masonry, apply solution to half the surface of sample panel. Should discoloration of masonry or mortar joints, staining or efflorescence appear on sample panel, notify the Architect and await further instructions.
 2. No wet cleaning shall take place within seven days of placing masonry.
 3. At least two hours prior to application of cleaning solution to masonry work, saturate mortar joints with clean water and flush off loose debris.
 4. Begin cleaning process at highest point of wall, working downward. Work in areas of 20 sq. ft., maximum. As cleaning progresses, flush wall to prevent accumulation of scum.
 5. Safely discard solution containing debris and residue.
 6. Do not scrub mortar joints with cleaning solution.
 7. Protect materials adjacent to masonry work which are subject to corrosion from contact with acid solution.
- D. Do not use high pressure spray to apply cleaning solution unless approved in advance by the Architect in writing.

END OF SECTION

ADDENDUM NO. 2
ISSUED JULY 20, 2017
SECTION 13125
METAL BUILDING SYSTEMS

1.0 GENERAL

1.1 SUMMARY: FIELD HOUSE BUILDING

A. Section Includes:

1. Concrete
2. Concrete Unit Masonry
3. Structural-steel framing
4. Metal roof panels.
5. Metal wall panels.
6. Hollow Metal Door Frames
7. Thermal Insulation
8. Accessories

B. Related work Specified Elsewhere:

1. Section 03000 – Cast-In-Place Concrete
2. Section 08110 – Hollow Metal Doors and Frames
3. Section 10530 – Prefabricated Canopies

1.2 REFERENCES:

- A. Terminology Standard: See MBMA's "Metal Building Systems Manual" for definitions of terms for metal building system construction not otherwise defined in this section or in referenced standards.

1.3 SUBMITTALS:

- A. Product Data: For each type of metal building system component. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for the following:
1. Structural steel framing systems.
 2. Metal roof panels.
 3. Acrylic skylight panels.
 4. Metal wall panels.
 5. Metal liner panels.
 6. Metal soffit panels.
 7. Insulation and vapor retarder facings.
 8. Flashing, trim & closures.

9. Accessories.
- B. Shop Drawings: Show the following building system components. Include plans, elevations, sections, detail and attachments to other work.
1. Anchor Bolt Plans: Submit anchor-bolt plans and templates before foundation work begins. Include location, diameter, and projection of anchor bolts required to attach metal building to foundation. Include column reactions at each location.
 2. Structural Framing Drawings: Show complete fabrication of primary and secondary framing; including provisions for openings. Indicate welds and bolted connections, distinguishing between shop and field applications. Include transverse cross-sections.
 - a. Show provisions for attaching roof curbs and pipe racks.
 3. Metal Roof and Wall Panel Layout Drawings: Show layouts of metal panels including methods of support. Include details of edge conditions, joints, panel profiles, corners, anchorage, trim, flashings, closures, and special details. Distinguish between factory- and field-assembled work; show locations of exposed fasteners.
 - a. Show roof mounted items including equipment supports, pipe supports and penetrations, lighting fixtures, and items mounted on roof curbs.
 - b. Show wall-mounted items including doors, windows, louvers and lighting fixtures.
 4. Accessory Drawings: Include details of the following items, at a scale of not less than 1-1/2 inches per 12 inches:
 - a. Flashing and trim.
 - b. Gutters.
 - c. Downspouts.
 - d. Support framing for pre-fabricated canopies.
- C. Samples for Initial Selection: For units with factory-applied color finish.
- D. Samples for Verification: For each type of exposed finished required, prepared on Samples of sizes indicated below:
1. Metal Panels: Nominal 12 inch (300 mm) long by actual panel width. Include fasteners, closures, and other exposed panel accessories.
 2. Flashing and Trim: 12 inches (300 mm) long. Include fasteners and other exposed accessories.
 3. Vapor Retarder Facings: Nominal 6-inch (150 mm) square samples.

4. Accessories: Nominal 12 inch (300 mm) long samples for each type of accessory.
 5. Trim & Closures
- E. Metal Building System Certification: For metal building systems indicated to comply with performance requirements and design criteria, include analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.4 INFORMATIONAL SUBMITTALS:

- A. Qualification Data: For qualified erector and professional engineer.
- B. Welding Certificates.
- C. Metal Building System Certificates: For each type of metal building system, from manufacturer.
 1. Letter of Design Certifications: Signed and sealed by a qualified professional engineer. Include the following:
 - a. Name and location of project.
 - b. Order number.
 - c. Name of manufacturer.
 - d. Name of Contractor.
 - e. Building dimensions including width, length, height, and roof slope.
 - f. Indicate compliance with AISC standards for hot-rolled steel and AISI standards for cold-rolled steel, including edition dates of each standard.
 - g. Governing building code and year of edition.
 - h. Design loads: Include dead load, roof live load, collateral loads, roof snow load, deflection, wind loads/speeds and exposure, seismic design category or effective peak velocity-related acceleration/peak acceleration, and auxiliary loads (cranes).
 - i. Load combinations: Indicate that the loads were applied acting simultaneously with concentrated loads, according to governing building codes.
 - j. Building Use Category: Indicate category of building use and its effect on load importance factors.
- D. Erector Certificates: For each product, from manufacturer.
- E. Material Testing Reports: For each of the following products:
 1. Structural steel including chemical and physical properties.

2. Bolts, nuts, and washers including mechanical properties and chemical analysis.
3. Tension-control, high-strength, bolt-nut-washer assemblies.
4. Shop primers.
5. Non-shrink grout.

F. Warranties: Sample of special warranties

1.5 CLOSEOUT SUBMITTALS:

A. Maintenance Data: For metal panel finishes to include in maintenance manuals.

1.6 QUALITY ASSURANCE:

A. Manufacturers Qualifications: A qualified manufacturer and member of MBMA.

1. IAS (AC472) Accredited Manufacturer.
2. Engineering Responsibility: Preparation of Shop Drawings and comprehensive engineering analysis by a qualified professional engineer.

B. Erector Qualifications: An experienced erector who specializes in erecting and installing work similar in material, design, and extent to that indicated for this Project and who is an acceptable manufacturer.

C. 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 metal building systems that are similar to those indicated for this Project in material, design, and extent.

D. Testing Agency Qualifications: Qualified according to ASTM E 329 for testing indicated.

E. Source Limitations: Obtain metal building system components, including primary and secondary framing and metal panel assemblies, from single source from single manufacturer.

F. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.1/D1.1M, "Structural Welding Code – Steel."
2. AWS D1.3, "Structural Welding Code – Sheet Steel."

- G. Structural Steel: Comply with AISC 360, "Specification for Structural Steel Buildings," for design requirements and allowable stresses.
- H. Cold-formed Steel: Comply with AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members" for design requirements and allowable stresses.
- I. Reinstallation Conference: Conduct conference at project site.
 - 1. Review methods and procedures related to metal building systems including, but not limited to, the following:
 - a. Condition of foundations and other preparatory work performed by other trades.
 - b. Structural load limitations.
 - c. Construction Schedule. Verify availability of materials and rector's personnel, equipment, and facilities needed to make progress and avoid delays.
 - d. Required tests, inspections, and certifications.
 - e. Unfavorable weather and forecasted weather conditions.
 - 2. Review methods and procedures related to metal roof panel and acrylic skylight roof panels assemblies including, but not limited to, the following:
 - a. Compliance with requirements for purlin and rafter conditions, including flatness and attachment to structural members.
 - b. Structural limitations of purlins and rafters during and after roofing.
 - c. Flashings, special roof details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that will affect metal roof panels.
 - d. Temporary protection requirements for metal roof panel assembly during and after installation.
 - e. Roof observation and repair after metal roof panel installation.
 - 3. Review methods and procedures related to metal wall panel assemblies including, but not limited to, the following:
 - a. Compliance with requirements for support conditions, including alignment between and attachment to structural members.
 - b. Structural limitations of girts and columns during and after wall panel installation.
 - c. Flashing, special details, wall penetrations, openings, and condition of other construction that will affect metal wall panels.
 - d. Attachment of exterior prefabricated canopies.

- e. Temporary protection requirements for metal wall panel assembly during and after installation,
- f. Wall observation and repair after metal wall panel installation.

1.7 DELIVERY, STORAGE AND HANDLING:

- A. Deliver components, sheets, panels, and other manufactured items so as not to be damaged or deformed. Package metal panels for protection during transportation and handling.
- B. Unload, store, and erect metal panels in a manner to prevent bending, warping, twisting, and surface damage.
- C. Stack metal panels horizontally on platform or pallets, covered with suitable watertight and ventilated covering. Store metal panels to ensure dryness, with positive slope for drainage of water. Do not store metal panels in contact with other materials that might cause staining, denting, or other surface damage.

1.8 PROJECT CONDITIONS:

- A. Weather Limitations: proceed with installation only when weather conditions permit metal panels to be installed according to manufacturers' written instructions and warranty requirements.
- B. Field Measurements:
 - 1. Establish Dimensions for Foundations: Comply with established dimensions on approved anchor-bolt plans, establishing foundation dimensions and proceeding with fabricating structural framing without field measurements. Coordinate anchor-bolt installation to ensure that actual anchorage dimensions correspond to established dimensions.
 - 2. Establish Dimensions for Metal Panels: Where field measurements cannot be made without delaying the work, either establish framing and opening dimensions and proceed with fabricating metal panels without field measurements, or allow for field trimming metal panels. Coordinate construction to ensure that actual building dimensions, locations of structural members, and openings correspond to established dimensions.

1.9 COORDINATION:

- A. Coordinate sizes and locations of concrete foundations and casting of anchor-bolt inserts into foundation walls and footings.

Concrete, reinforcement, and formwork requirements are specified in Division 3 section "Cast-in-Place Concrete."

- B. Coordinate installation of roof penetrations to provide a leakproof installation.
- C. Coordinate metal panel assemblies with rain drainage work, flashing, and construction of supports and other adjoining work to provide a leakproof installation.

1.10 WARRANTY:

- A. Special Warranty on Metal Panel Finishes: 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 D 2244.
 - b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
 - c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
 - 2. Finish Warranty Period: 25 years from date of substantial Completion.

2.0 PRODUCTS

2.1 MANUFACTURERS

- A. Acceptable Manufacturers; subject to compliance with specified requirements, provide American Building; rigid frame clear span, with gable configuration, tapered columns, tapered rafters and bypass girts, with Long Span III roof panels and Long Span III wall panels or comparable product by one of the following acceptable manufacturers:
 - 1. American Buildings Company; a Nucor Company.
 - 2. Butler Manufacturing; a Bluescope Steel Company.
 - 3. Ceco Building Systems; Division of NCI Building Systems, L.P.
 - 4. Kirby Building Systems Inc., a Nucor Company.
 - 5. Varco Pruden Buildings; a division of Bluescope Buildings NA, Inc.

2.2 MATAL BUILDING SYSTEMS:

- A. Description: Provide a complete, integrated set of mutually dependent components and assemblies that form a metal building system capable of withstanding structural and other loads, thermally induced movement, and exposure to weather without failure or infiltration of water into the building interior.
 - 1. Provide metal building system of size and with bay spacing, roof slopes, and spans indicated.
- B. Primary Frame Type:
 - 1. Rigid Clear Span: Solid-member, structural-framing system without interior columns.
- C. End-Wall Framing: manufacturer's standard, for buildings not required to be expandable, consisting of load-bearing end-wall and corner columns and rafters.
- D. Secondary-Frame Type:: Manufacturer's standard purlins and joists and exterior-framed (by-pass) girts. Framing members as required for attachment of exterior prefabricated canopies.
- E. Eave Height: Manufacturer's standard height, as indicated by nominal height on Drawings.
- F. Bay Spacing: As indicated on Drawings.
- G. Roof Slope: As indicated on Drawings.
- H. Roof System: Equal to Long Span III Panels as manufactured by American Buildings with field installed insulation.
- I. Exterior Wall System: Equal to Long Span III Panels as manufactured by American Buildings.

2.3 METAL BUILDING SYSTEM PERFORMANCE:

- A. Delegated Design: Design metal building system, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated..
- B. Structural Performance: Metal building systems shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated according to procedures in MBMA's "Metal Building Systems Manual."
 - 1. Loads: As indicated on Drawings and as required by MBMA's "Metal Building System manual."

2. Deflection Limits: Design metal building system assemblies to withstand design loads with deflections no greater than the following:
 - a. Purlins and Rafters: Vertical deflection of $l/240$ of the span.
 - b. Girts: Horizontal deflection of $l/120$ of the span.
 - c. Metal Roof Panels: Vertical deflection of $l/240$ of the span.
 - d. Metal Wall Panels: Horizontal deflection of $l/240$ of the span.
 - e. Design secondary framing system to accommodate deflection of primary framing and construction tolerances, and to maintain clearances at openings.
 3. Design Limits: Engineer building structure to withstand design loads with drift limits no greater than the following:
 - a. Lateral Drift: Maximum of $l/100$ of the building height.
 4. Metal panel assemblies shall withstand the effects of gravity loads with drift limits and under conditions indicated according to ASTM E 1592.
- C. Seismic Performance: Metal building system shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
- D. Thermal Movements: 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 calculations on surface temperatures of materials due to both solar and heat gain and nighttime-sky heat loss.
1. Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), Material surfaces.
- E. Air infiltration for Metal Roof Panels: Air leakage through assembly of not more than 0.06 cfm/sq. ft. (0.3 L/s per sq. m) of roof area when tested according to ASTM E 1680 at negative test-pressure difference of 1.57 lbf/sq. ft. (75 Pa).
- F. Air infiltration for Metal Wall Panels: Air leakage through assembly of not more than 0.06 cfm/sq. ft. (0.3 L/s per sq. m) of wall area when tested according to ASTM E 283 at static air-pressure difference of 1.57 lbf/sq. ft. (75 Pa).
- G. Water Penetration of Metal Roof Panels: No water penetration when tested according to ASTM E 1646 at test-pressure difference of 2.86 lbf/sq. ft. (137 Pa).

- H. Water Penetration for Metal Wall Panels: No water penetration when tested according to ASTM E 331 at a wind-load design pressure of not less than 2.86 lbf/sq. ft. (137 Pa).
- I. Wind Uplift Resistance: Provide metal roof panel assemblies that comply with UL 580 for Class 90.
- J. Thermal Performance: Provide insulated metal panel assemblies with the following maximum U-factors and minimum R-values for opaque elements when tested according to ASTM C 1363 or ASTM C 518:
 - 1. Metal Roof Panel Assemblies:
 - a. U-Factor: 0.065.
 - b. R-Value: 19.
 - 2. Metal Wall Panel Assemblies:
 - a. U-Factor: 0.113.
 - b. R-Value: 13.

2.4 STRUCTURAL STEEL FRAMING:

- A. PRIMARY FRAMING: Manufacturer's standard primary framing system, designed to withstand required loads and specified requirements. Primary framing includes transverse and lean-to frames; rafter, rake, and canopy beams; sidewalls, intermediate, end-wall, and corner columns; and wind bracing.
 - 1. General: Provide frames with attachment plates, bearing plates, and splice members. Factory drill for field-bolted assembly. Provide frame span and spacing indicated.
 - a. Slight variations in span may be acceptable if necessary to comply with manufacturer's standard, as approved by Architect.
 - 2. Rigid Clear Span Frames: I-shaped frame sections fabricated from shop-welded, built-up steel plates or structural steel shapes. Interior columns are not permitted.
 - 3. Frame Configuration: Single gable.
 - 4. Exterior Column Type: Tapered.
 - 5. Rafter Type: Tapered.
- B. End-Wall Framing: Manufacturer's standard primary end-wall framing fabricated for field-bolted assembly to comply with the following:
 - 1. End-Wall and Corner Columns: I-shaped sections fabricated from structural steel shapes; shop-welded, built-up steel plates; or C-shaped, cold-formed, structural steel sheet.
 - 2. End-Wall Rafters: C-shaped, cold-formed, structural steel sheet; or I-shaped sections fabricated from shop welded, built-up steel plates or structural steel shapes.

- C. Secondary Framing: Manufacturer's standard secondary framing, including purlins, girts, eave struts, flange bracing, base members, gable angles, clips, headers, jambs, framing for attachment of prefabricated canopies above exterior doors and other miscellaneous structural members. Unless otherwise indicated, fabricate framing from either cold-formed, structural steel sheet or roll-formed, metallic-coated steel sheet, pre-painted with coil coating, to comply with the following:
1. Purlins: C-or Z-shaped sections; fabricated from built-up steel plates, steel sheet, or structural steel shapes; minimum 2-1/2 inch (64 mm) wide flanges.
 - a. Depth: as needed to comply with system performance requirements.
 2. Girts: C- or Z-shaped sections; fabricated from built-up steel plates, steel sheet, or structural steel shapes; minimum 2-1/2 inch (64 mm) wide flanges.
 - a. Depth: As needed to comply with system performance requirements.
 3. Eave Struts: Unequal-flange, C-shaped sections; fabricated from built-up steel plates, steel sheet, or structural steel shapes; to provide adequate backup for metal panels.
 4. Flange Bracing: Minimum 2-by-2-by-1/8 inch (51-by-51-by-3 mm) structural steel angles of 1 inch (25 mm) diameter, cold-formed structural steel tubing to stiffen primary frame flanges.
 5. Sag Bracing: Minimum a-by-1-by-1/8 inch (25-by-25-by-4 mm) structural steel angles.
 6. Base or Sill Angles: Minimum 3-by-2 inch (76-by-51 mm) zinc coated (galvanized) steel sheet.
 7. Purlin and Girt Clips: Manufacturer's standard clips fabricated from steel sheet. Provide galvanized clips where clips are connected to galvanized framing members.
 8. Secondary End-Wall Framing: Manufacturer's standard sections fabricated from zinc-coated (galvanized) sheet steel.
 9. Framing for Openings: Channel shapes; fabricated from cold-formed, structural steel sheet or structural steel shapes. Frame head and jamb of door openings and head, jamb and sill openings.
 10. Miscellaneous Structural Members: Manufacturer's standard sections fabricated from cold-formed, structural steel sheet; built-up steel plates; or zinc coated (galvanized) steel sheet; designed to withstand required loads.
- D. Canopy Framing: Manufacturer's standard structural framing system, designed to withstand required loads; fabricated from

shop-welded, built-up steel plates or structural steel shapes. Provide frames with attachment plates and splice members, factory drill for field-bolted assembly.

1. Type: Rod supported.

E. Bracing: Provide adjustable wind bracing as follows:

1. Rods: ASTM A 36/A 46M; ASTM A 572/A572M, Grade 50 (345); or ASTM A 529/A 529M, Grade 50 (345); minimum ½ inch (13 mm) diameter steel; threaded full length or threaded a minimum of 6 inches (152 mm) at each end.
2. Cable: ASTM A 475, ¼ inch (6 mm) diameter, extra-high-strength grade, Class B, zinc-coated, seven-strand steel; with threaded end anchors.
3. Angles: Fabricated from structural steel shapes to match primary framing, of size required to withstand design loads.
4. Rigid Portal Frames: Fabricated from shop-welded, built-up steel plates or structural steel shapes to match primary framing; of size required to withstand design loads.
5. Fixed Base Columns: Fabricated from shop welded, built-up steel plates or structural steel shapes to match primary framing; of size required to withstand design loads.
6. Diaphragm Action of Metal Panels: Design metal building to resist wind forces through diaphragm action of metal panels.
7. Bracing: Provide wind bracing using any method specified above, at manufacturer's option.

F. Bolts: Provide plain-finish bolts for structural framing components that are primed or finished painted. Provide zinc-plated bolts for structural framing components that are galvanized.

G. Materials:

1. W-Shapes: ASTM A 992/A992M; ASTM A 572/A 572M, Grade 50 or 55 (345 or 380); or ASTM A 529/A 529M, Grade 50 or 55 (345 or 380).
2. Channels, Angles, M-Shapes, and S-Shapes: ASTM A 36/A 36M; ASTM A 572/A 572M, Grade 50 or 55 (345 or 380); or ASTM A 529/A 529M, Grade 50 or 55 (345 or 380).
3. Plate and Bar: ASTM A 36/A 36M; ASTM A 572/A 572M, grade 50 or 55 (345 or 380); or ASTM A 529/A 529M, Grade 50 or 55 (345 or 380).
4. Steel Pipe: ASTM A 53/A 53 M, Type E or S, Grade B.
5. Cold-Formed Hollow Structural Sections: ASTM A 500, Grade B or C, structural tubing.
6. Structural Steel Sheet: Hot-rolled, ASTM A 1011/A 1011M, Structural Steel (SS), Grade 30 through 55 (205 though 380), or High-Strength Low-Alloy Steel (HSLAS), Grades

- 45 through 70 (310 through 480); or cold-rolled, ASTM A 1008/A 1008M, Structural Steel (SS), Grade 25 through 80 (170 through 550), or High-Strength Low-Alloy Steel (HSLAS), Grade 45 through 70 (310 through 480).
7. Metallic-Coated (Galvanized) Steel Sheet Pre-painted with Coil Coating: Sheet steel, metallic coated by the hot-dip process and pre-painted by the coil-coating process to comply with ASTM A 755/A 755M.
 - a. Zinc-coated (Galvanized) Steel Sheet: ASTM A 653/A 653M, Structural Steel (SS), Grade 33 through 80 (230 through 550), or High-Strength Low-Allow Steel (HSLAS), Grade 50 through 80 (340 through 550); with G90 (Z275) coating designation.
 8. Non-High-Strength Bolts, Nuts and Washers: ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6), carbon-steel, hex-head bolts; ASTM A 563 (ASTM A 563 M) carbon-steel hex nuts; and ASTM F 844 plain (flat) steel washers.
 - a. Finish: Plain.
 9. High-Strength Bolts, Nuts, and Washers: ASTM A 325 (ASTM A 325M), Type 1, heavy-hex steel structural bolts; ASTM A 563 (ASTM A 563M) heavy-hex carbon-steel nuts; and ASTM F 436 (ASTM F 436M) hardened carbon-steel washers.
 - a. Finish: Plain.
 10. Tension-Control, High-Strength Bolt-Nut-Washer Assemblies: ASTM F 1852, Type .1, heavy-hex-head steel structural bolts with spline ends.
 - a. Finish: Plain.
 11. Unheaded Anchor Rods: ASTM A 36/A 36M.
 - a. Configuration: Straight.
 - b. Nuts: ASTM A 563 (ASTM A 563M) hex carbon steel.
 - c. Plate Washers: ASTM A 36/A 36M carbon steel.
 - d. Washers: ASTM 436 (ASTM F 436M) hardened carbon steel.
 - e. Finish: Plain.
 12. Headed Anchor Rods: ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6).
 - a. Configuration: Straight.
 - b. Nuts: ASTM A 563 (ASTM A 563M) hex carbon steel.
 - c. Plate Washers: ASTM A 36/A 36M carbon steel.
 - d. Washers: ASTM 436 (ASTM F 436M) hardened carbon steel.
 - e. Finish: Plain.
 13. Threaded Rods: ASTM A 36/A 36M.

- a. Nuts: ASTM A 563 (ASTM A 563M) hex carbon steel.
 - b. Washers: ASTM 436 (ASTM F 436M) hardened carbon steel.
 - c. Finish: Plain.
- H. Finish: Factory primed. Apply specified primer immediately after cleaning and pre-treating.
1. Apply primer to primary and secondary framing to a minimum dry film thickness of 1 mil (0.025 mm).
 - a. Prime secondary framing formed from uncoated steel sheet to a minimum dry film thickness of 0.5 mil (0.013 mm) on each side.
 2. Prime galvanized members with specified primer after phosphoric acid pretreatment.
 3. Primer: SSPC-Paint 15, Type I, red oxide.

2.5 METAL ROOF PANELS:

- A. Rib-profile Exposed-Fastener Metal Roof Panels: Formed with trapezoidal major valleys and intermediate stiffening valleys symmetrically spaced between major valleys; designed to be installed by lapping side edges of adjacent panels and mechanically attaching panels to supports using exposed fasteners in side laps.
1. Material: Zinc-coated (galvanized) steel sheet, 0.0177 inch (26 ga.) nominal thickness.
 - a. Exterior Finish: Siliconized polyester.
 - b. Color: As selected by Architect from manufacturer's full range of colors.
 2. Clips: Manufacturer's standard, floating type to accommodate thermal movement; fabricated from zinc-coated (galvanized) steel sheet.
 3. Joint Type: overlapped major valleys with exposed fasteners.
 4. Panel Coverage: 36 inches.
 5. Panel Height: 1-1/4 inches.
 6. Uplift Rating: UL 90.
- B. Materials:
1. Metallic-Coated Steel Sheet: Restricted-flatness steel sheet, metallic coated by the hot-dip process and prepainted by the coil-coating process to comply with ASTM A 755/A 755M.
 - a. Zinc-Coated (Galvanized) Steel Sheet: ASTM A 653/A 653M, G90 (Z275) coating designation; structural quality.
 - b. Surface: Smooth, flat finish.

C. Finishes:

1. Exposed Coil-Coated Finish:
 - a. Siliconized Polyester: Epoxy primer and silicone-modified, polyester-enamel topcoat; with a dry film thickness of not less than 0.2 mil (0.005 mm) for primer and 0.8 mil (0.02 mm) topcoat.
2. Concealed Finish: Apply pretreatment and manufacturer's standard white or light-colored acrylic or polyester backer finish, consisting of prime coat and wash coat with a minimum total dry film thickness of 0.5 mil (0.013 mm).

2.6 ROOF SKYLIGHT PANELS:

- A. Translucent panels: Manufacturer's standard 100 percent acrylic panels reinforced with long-span fiberglass fibers. Skylight panels to have same configuration as roofing panels.

2.7 METAL WALL PANELS:

- A. Rib-profile Exposed-Fastener Metal Wall Panels: Formed with trapezoidal major valleys and intermediate stiffening valleys symmetrically spaced between major valleys; designed to be installed by lapping side edges of adjacent panels and mechanically attaching panels to supports using exposed fasteners in side laps.

1. Material: Zinc-coated (galvanized) steel sheet, 0.0177 inch (26 ga.) nominal thickness.
 - a. Exterior Finish: Siliconized polyester.
 - b. Color: As selected by Architect from manufacturer's full range of colors.
2. Major-Rib Spacing: 12 inches (305 mm) o.c.
3. Panel Coverage: 36 inches.
4. Panel Height: 1-1/4 inches.

- B. Material Liner Panels: Provide same panels as indicated for wall panels.

C. Finishes:

1. Exposed Coil-Coated Finish:
 - a. Siliconized Polyester: Epoxy primer and silicone-modified, polyester-enamel topcoat; with a dry film thickness of not less than 0.2 mil (0.005 mm) for primer and 0.8 mil (0.02 mm) topcoat.
2. Concealed Finish: Apply pretreatment and manufacturer's standard white or light-colored acrylic or polyester backer finish, consisting of prime coat and wash coat with a minimum total dry film thickness of 0.5 mil (0.013 mm).

2.8 THERMAL INSULATION:

- A. Faced Metal Building Insulation: ASTM C 991, Type II, glass-fiber-blanket insulation; 0.5-lb/cu. Ft. (8-kg/cu. m) density; 2 inch (51 mm) wide, continuous, vapor-tight edge tabs; with a flame-spread index of 25 or less.
- B. Un-faced Metal Building Insulation: ASTM C 991, Type I, or NAIMA 202, glass-fiber-blanket insulation 0.5 lb/cu. ft. (8 kb/cu. m) density; 2 inch (51 mm) wide continuous, vapor-tight edge tabs; with a flame-spread index of 25 or less.
- C. Retainer Stripes: 0.025 inch (0.64 mm) nominal thickness, formed, metallic-coated steel or PVC retainer clips color to match insulation facing.
- D. Vapor Retarder Tape: Pressure-sensitive tape of type recommended by vapr-retarder manufacturer for sealing joints and penetrations in vapor retarder.

2.9 ACCESSORIES:

- A. General: Provide accessories as standard with metal building system manufacturer and as specified. Fabricate and finish accessories as the factory to greatest extent possible, by manufacturer's standard procedures and processes. Comply with indicated profiles and with dimensional and structural requirements.
 - 1. Form exposed sheet metal accessories that are without excessive oil-canning, buckling, and tool marks and that are true to line and levels indicated, with exposed edges folded back to form hems.
- B. Roof Panel Accessories: Provide components required for a complete metal roof panel assembly including skylights, copings, fascia, corner units, ridge closures, clips, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal roof panels unless otherwise indicated.
 - 1. Closures: Provide closures at eaves and ridges, fabricated of same material as metal roof panels.
 - 2. Clips: Manufacturer's standard, formed from steel sheet, designed to withstand negative-load requirements.
 - 3. Backing Plates: Provide metal backing plates at panel end splices, fabricated from material recommended by manufacturer.
 - 4. Closure Strips: Closed-cell, expanded, cellular, rubber or cross linked, polyolcfin-foam of closed-cell laminated polyethylene; minimum 1 inch (25 mm) thick, flexible

- closure strips; cut or pre-molded to match metal roof panel profile. Provide closure strips where indicated or necessary to ensure weathertight construction.
5. Thermal Space Blocks: Where metal panels attach directly to purlins, provide thermal space blocks of thickness required to provide 1 inch (25 mm) standoff; fabricated from extruded polystyrene.
- C. Wall Panel Accessories: Provide components required for a complete metal wall panel assembly including copings, fascia, mullions, sills, corner units, clips, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal wall panels unless otherwise indicated.
1. Closures: Provide closures at wall heads, jambs, and eaves and ridges, fabricated of same material as metal wall panels. Provide drip at any head conditions.
 2. Backing Plates: Provide metal backing plates at panel end splices, fabricated from material recommended by manufacturer.
 3. Closure Strips: Closed-cell, expanded, cellular, rubber or cross linked, polyolcfin-foam or closed-cell laminated polyethylene; minimum 1 inch (25 mm) thick, flexible closure strips; cut or pre-molded to match metal wall panel profile. Provide closure strips where indicated or necessary to ensure weathertight construction.
- D. Flashing and Trim: Formed from 0.022 inch (0.56 mm) nominal thickness, metallic-coated steel sheet or aluminum-zinc alloy-coated steel sheet pre-painted with coil coating; finished to match adjacent metal panels.
1. Provide flashing and trim as required to seal against weather and to provide finished appearance. Locations include, but are not limited to, eaves, rakes, corners, bases, framed openings, ridges, fascia, and fillers.
 2. Opening Trim: Formed from 0.022 inch (26 ga.) nominal thickness, metallic-coated steel sheet or aluminum-zinc alloy-coated steel sheet pre-painted with coil coating. Trim head and jamb of door openings, and head, jamb, and sill of other openings.
- E. Gutters: Formed from 0.022 inch (26 ga.) nominal thickness, metallic-coated steel sheet or aluminum-zinc alloy-coated steel sheet pre-painted with coil coating; finished to match roof fascia and rake trim. Match profile of gable trim, complete with end pieces, outlet tubes, and other special pieces as required. Fabricate in minimum 96 inch (2438 mm) long sections, sized according to SMACNA's "Architectural Sheet Metal Manual."

1. Gutter Supports: Fabricated from same material and finish as gutters.
 2. Strainers: Bronze, copper, or aluminum wire ball type outlets.
- F. Downspouts: Formed from 0.022 inch (26 ga.) nominal thickness, zinc-coated (galvanized) steel sheet or aluminum-zinc alloy-coated steel sheet pre-painted with coil coating; finished to match adjacent metal panels. Fabricate in minimum 10 foot (3 m) long sections, complete with formed elbows and offsets.
1. Mounting Straps: Fabricated from same material and finish as gutter.
- G. Pipe Flashing: Pre-molded, EPDM pipe collar with flexible aluminum ring bonded to base.
- H. Materials:
1. Fasteners: Self-taping screws, bolts, nuts, self-locking rivets and bolts, end-welded studs, and other suitable fasteners designed to withstand design loads. Provide fasteners with heads matching color of materials being fastened by means of plastic caps or factory-applied coating.
 - a. Fasteners to Metal Wall Panels: Self-drilling, type 410 stainless steel or self-tapping, Type 304 stainless steel or zinc-alloy-steel hex washer head, with EPDM sealing washers bearing on weather side of metal panels.
 - b. Fasteners for Flashing and Trim: Blind fasteners or self-drilling screws with hex washer head.
 2. Corrosion-Resistant Coating: Cold-applied asphalt mastic, compounded for 15-mil (0.4 mm) dry film thickness per coat. Provide inert-type non corrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.
 3. Nonmetallic, Shrink-Resistant Grout: ASTM C 1107, factory-packaged, non-metallic aggregate grout, non-corrosive, non-staining, mixed with water to consistency suitable for application and a 30-minute working time.
 4. Metal Panel Sealants:
 - a. Sealant Tape: Pressure-sensitive, 100 percent solids, gray polyisobutylene-compound sealant tape with release-paper backing. Provide permanently elastic, non-sag, non-toxic, non-staining tape of manufacturer's standard size.
 - b. Joint Sealant: ASTM C 920; one-part elastomeric polyurethane or polysulfide; of type, grade, class, and use classifications required to seal joints in

metal panels and remain watertight; and as recommended by metal building system manufacturer.

2.10 SOURCE QUALITY CONTROL:

- A. Testing Agency: Engage a qualified testing agency to evaluate product.
- B. Special Inspector: Engage a qualified special inspector to perform the following tests and inspections and to submit reports. Special inspector will verify that manufacturer maintains detailed fabrication and quality-control procedures and will review the completeness and adequacy of those procedures to perform the work.
 - 1. After fabrication, submit copy of certificate of compliance to authorities having jurisdiction, certify that Work was performed according to Contract requirements.
- C. Testing: Test and inspect shop connections form metal building according to the following:
 - 1. Bolted Connections: Shop-bolted connections shall be tested and inspected according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."
 - 2. Welded Connections: In addition to visual inspections, shop-welded connections shall be tested and inspected according to AWS D1.1D1.1M and the following inspection procedures, at the inspector's option:
 - a. Liquid Penetrate Inspection: ASTM E 165.
 - b. Magnetic Particle Inspection: ASTM E 708; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration will not be accepted.
 - c. Ultrasonic Inspection: ASTM E 164.
 - d. Radiographic Inspection: ASTM E 94.
- D. Product will be considered defective if it does not pass test and inspections.
- E. Prepare test and inspection reports.

2.11 FABRICATION:

- A. General: Design components and field connections required for erection to permit easy assembly.
 - 1. Make each piece and part of the assembly to correspond with previously prepared erection drawings, diagrams, and instruction manuals.

2. Fabricate structural framing to produce clean, smooth cuts and bends. Punch holes of proper size, shape, and location. Members shall be free of cracks, tears, and ruptures.
- B. Tolerances: Comply with MBMA's "Metal Building System Manual" for fabrication and erection tolerances.
- C. Primary Framing: Shop fabricate framing components to indicated size and section, with base plates, bearing plates, stiffeners, and other items required for erection welded into place. Cut, form, punch, drill, and weld framing for bolted field assembly.
1. Make shop connections by welding or by using high-strength bolts.
 2. Join flanges to webs of built-up members by a continuous, submerged arc-welding process.
 3. Brace compression flange of primary framing with steel angles or cold-formed structural tubing between frame web and purlin web or girt web, so flange compressive strength is within allowable limits for any combination of loadings.
 4. Weld clips to frames for attaching secondary framing.
 5. Shop Priming: Prepare surfaces for shop priming according to SSPC-SP-2. Shop prime primary framing with specified primer after fabrication.
- D. Secondary Framing: Shop fabricate framing components to indicated size and section by roll-forming or break-forming, with base plates, bearing plates, stiffeners, and other plates required for erection welded into place. Cut, form, punch, drill, and weld secondary framing for bolted field connections to primary framing.
1. Make shop connections by welding or by using non-high-strength bolts.
 2. Shop Priming: Prepare uncoated surfaces for shop priming according to SSPC-SP-2. Shop prime uncoated secondary framing with specified primer after fabrication.
- E. Metal Panels: Fabricate and finish metal panels at the factory to greatest extent possible, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements. Comply with indicated profiles and with dimensional and structural requirements.
1. Provide panel profile, including major ribs and intermediate stiffening ribs, if any, for full length of metal panels.

3.0 EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with erector present, for compliance with requirements for installation tolerances and other conditions affecting performance of the work.
- B. Before erection proceeds, survey elevations and locations of concrete and masonry-bearing surfaces and locations of anchor rods, bearing plates, and other embedments to receive structural framing, with erector present, for compliance with requirements and metal building system manufacturer's tolerances.
- C. Proceed with erection only after unsatisfactory condition have been corrected.

3.2 PREPARATION:

- A. Clean and prepare surfaces to be painted according to manufacturer's written instructions for each particular substrate condition.
- B. Provide temporary shores, guys, braces, and other supports during erection to keep structural framing secure, plumb, and in alignment against construction loads and loads equal in intensity to design loads. Remove temporary supports when permanent structural framing, connections, and bracing are in place unless otherwise indicated.

3.3 ERECTION OF STRUCTURAL FRAMING:

- A. Erect metal building system according to manufacturer's written erection instructions and erection drawings.
- B. Do not field cut, drill, or alter structural members without written approval from metal building manufacturer's professional engineer.
- C. Set structural framing accurately in locations and to elevations indicated, according to AISC specifications referenced in this section. Maintain structural stability of frame during erection.
- D. Base and bearing Plate: Clean concrete- and masonry-bearing surfaces with bond-reducing materials, and roughen surfaces prior to setting plates. Clean bottom surface of plates.
 - 1. Set plates for structural members on wedges, shims or setting nuts as required.
 - 2. Tighten anchor rods after supported members have been positioned and plumbed. Do not remove wedges, shims or setting nuts, but if protruding cut off flush with edge of plate before packing with grout.

3. Promptly pack grout solidly between bearing surfaces and plates so no voids remain. Neatly finish exposed surfaces; protect grout and allow to cure. Comply with manufacturer's written installation instructions for shrinkage-resistant grouts.
- E. Align and adjust structural framing before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that will be in permanent contact with framing. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.
1. Level and plumb individual members of structure.
 2. Make allowances for difference between temperature at time of erection and mean temperature when structure will be completed and in service.
- F. Primary Framing and End Walls: Erect framing level, plumb, rigid, secure, and true to line. Level base plates to a true even plane with full bearing to support structures, set with double-nutted anchor bolts. Use grout to obtain uniform bearing and to maintain level base line elevation. Moist-cure grout for not less than seven days after placement.
1. make field connections using high-strength bolts installed according to RCSC's "specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for bolt type and joint type specified.
 - a. Joint Type: Snug tightened or pre-tensioned.
- G. Secondary Framing: Erect framing level, plumb, rigid, secure, and true to line. Field bolt secondary framing to clips attached to primary framing.
1. Provide rake or gable purlins with tight-fitting closure channels and fascia.
 2. Locate and space wall girts to suit openings such as doors, windows and prefabricated canopies.
 3. Locate canopy framing and indicated.
 4. Provide supplemental framing at entire perimeter of openings, including doors, windows, louvers, ventilators, and other penetrations on roof and walls.
- H. Bracing: Install bracing in roof and side walls where indicated on erection drawings.
1. Tighten rod and cable bracing to avoid sag.
 2. Locate interior end-bay bracing where it does not interfere with openings.
- I. Framing for Openings: Provide shapes of proper design and size to reinforce openings and to carry loads and vibrations imposed,

including equipment furnished under mechanical and electrical work. Securely attach to structural framing.

- J. Erection Tolerances: Maintain erection tolerances of structural framing within AISC 303.

3.4 METAL PANEL INSTALLATION, GENERAL:

- A. Examination: Examine primary and secondary framing to verify that structural-panel support members and anchorages have been installed within alignment tolerances required by manufacturer.
 - 1. Examine roughing-in for components and systems penetrating metal panels, to verify actual locations of penetrations relative to seams before metal panel installation.
- B. General: Anchor metal panels and other components of the Work securely in place, with provisions for thermal and structural movement.
 - 1. Field cut metal panels as required for doors, windows, and other openings. Cut openings as small as possible, neatly to size required, and without damage to adjacent metal panel finished.
 - a. Field cutting of metal panels by torch is not permitted unless approved in writing by manufacturer.
 - 2. Install metal panels perpendicular to structural supports unless otherwise indicated.
 - 3. Flash and seal metal panels with weather closures at perimeter of openings and similar elements. Fasten with self-tapping screws.
 - 4. Locate and space fastenings in uniform vertical and horizontal alignment.
 - 5. Locate metal panel splices over, but not attached to, structural supports with end laps for alignment.
 - 6. Lap metal flashing over metal panels to allow moisture to run over and off the material.
- C. Lap-seam metal panels: Install screw fasteners using power tools with controlled torque adjusted to compress EPDM washers tightly without damage to washers, screw threads, or metal panels. Install screws in pre-drilled holes.
 - 1. Arrange and nest side-lap joints so prevailing winds blow over, not into, lapped joints. Lap ribbed or fluted sheets one full rib corrugation. Apply metal panels and associated items for neat and weatherproof enclosure. Avoid "panel creep" or application not true to line.

- D. Metal Protection: Where dissimilar metals connect to each other or corrosive substrates, protect against galvanic action by painting contact surfaces with corrosion-resistant coating, by applying rubberized-asphalt underlayment to each contact surface, or by other permanent separation as recommended by metal panel manufacturer.
- E. Joint sealers: Install gaskets, joint fillers, and sealants where indicated and where required for weatherproof performance of metal panel assemblies. Provide types of gaskets, fillers, and sealants indicated; or, if not indicated, provide types recommended by metal panel manufacturer.
 - 1. Seal metal panel end laps with double beads of tape or sealant for the full width of the panel. Seal side joints where recommended by metal panel manufacturer.
 - 2. Prepare joints and apply sealants to comply with requirements in section 07920 "Sealants and Caulking."

3.5 METAL ROOF PANEL INSTALLATION:

- A. General: Provide Metal roofing panels of full length from eave to ridge unless otherwise indicated or restricted by shipping limitations.
 - 1. Install ridge caps as metal roof panel work proceeds.
 - 2. Flash and seal metal roof and skylight panels with weather closures at eaves and rakes. Fasten with self-tapping screws.
- B. Ribbed Profile, Exposed Fastener Metal Roof Panels: Fasten metal roof panels with exposed fasteners and EPDM washers at each overlapping rib joint, at location and spacing and with fasteners recommended by manufacturer..
 - 1. Install clips to supports with self-drilling or self-taping fasteners.
 - 2. Install screw fasteners using power tools with controlled torque adjusted to compress EPDM washers tightly without damage to washers, screw threads, or metal panels. Install screws in pre-drilled holes.
 - 3. Install pressure plates at locations indicated in manufacturer's written installation instructions.
 - 4. Rigidly fasten eave end of metal roof panels and allow ridge end free movement due to thermal expansion and contraction. Pre-drill panels for fasteners.
 - 5. Provide metal closures at peaks, rake edges, rake walls, and each site of ridge caps.
 - 6. Provide waterproofing sealant at overlapping joints as recommended by metal roof panel manufacturer, or as necessary for waterproofing.

- C. Metal Roof Panels Installation Tolerances: Shim and align metal roof panels within installed tolerances of $\frac{1}{4}$ inch in 20 feet (6mm in 6m) on slope and location lines as indicated and within $\frac{1}{8}$ inch (3 mm) offset of adjoining faces and of alignment of matching profiles.

3.6 METAL WALL PANEL INSTALLATION:

- A. General: Install metal wall panels in orientation, sizes, and locations indicated on Drawings. Install panels perpendicular to girts, extending full height of building, unless otherwise indicated. Anchor metal wall panels and other components (including prefabricated canopies) of the Work securely in place, with provisions for thermal and structural movement.
1. Unless otherwise indicated, begin metal panel installation at corners with center of rib lined up with line of framing.
 2. Shim or otherwise plumb substrates receiving metal wall panels.
 3. When two rows of metal panels are required, overlap panels 4 inches (102 mm) minimum.
 4. When building height required two rows of metal panels at gable ends, align lap of gable panels over metal wall panels at eave height.
 5. Rigidly fasten base end of metal wall panels and allow eave end free movement for thermal expansion and contraction. Pre-drill panels.
 6. Flash and seal metal wall panels with weather closures at eaves, rakes, and at perimeter of all openings. Fasten with self-tapping screws.
 7. Install screw fasteners in pre-drilled holes.
 8. Install flashing and trim as metal wall panel work proceeds.
 9. Apply elastomeric sealant continuously between metal base channel (sill angle) and concrete, and elsewhere as indicated; or, if not indicated, as necessary for waterproofing.
 10. Align bottom of metal wall panels and fasten with blind rivets, bolts, or self-drilling or self-tapping screws.
 11. Provide weatherproof escutcheons for pipe and conduit penetrating exterior walls.
- B. Metal Wall Panels: Install metal wall panels on exterior side of girts. Attach metal wall panels to supports with fasteners as recommended by manufacture.
- C. Installation Tolerances: Shim and align metal wall panels within installed tolerances of $\frac{1}{4}$ inch in 20 feet (6mm in 6m), non-accumulative, on level, plumb, and on location lines as indicated,

and within 1/8" (3 mm) offset of adjoining faces and of alignment of matching profiles.

3.7 THERMAL INSULATION INSTALLATION:

- A. General: Install insulation concurrently with metal panel insulation, in thickness indicated to cover entire surface, according to manufacturers written instructions.
 - 1. Set vapor-retarder-faced units with vapor retarder towards warm side of construction unless otherwise indicated. Do not obstruct ventilation spaces except for firestopping.
 - 2. Tape joints and ruptures in vapor retarder, and seal each continuous area of insulation to the surrounding construction to ensure airtight installation.
 - 3. Install factory-laminated, vapor-retarder-faced blankets straight and true in one-piece lengths, with both sets of facing tabs sealed, to provide a complete vapor retarder.
 - 4. Install blankets straight and true in one-piece lengths, Install vapor retarder over insulation, with both sets of facing tabs sealed, to provide a complete vapor retarder.
- B. Blanket Roof Insulation: Comply with the following Installation method:
 - 1. Two Layers between Purlins with Spacer Block Insulation: Extend insulation and vapor retarder between purlins. Carry vapor retarder facing tabs up and over purlin, overlapping adjoining facing of next insulation course and maintaining continuity of retarder. Install later of filler insulation over first layer to fill space between purlins formed by thermal blocks. Hold in place with bands and crossbands below insulation.
 - a. Thermal Spacer Blocks: Where metal roof panels attached directly to purlins, install thermal spacer blocks.
 - 2. Retainer Strips: Install retainer strips at each longitudinal insulation joint, straight and taut, nesting with secondary framing to hold insulation in place.
- C. Blanket Wall Insulation: Extend insulation and vapor retarder over and perpendicular to top flange of secondary framing. Hold in place by metal panels fastened to secondary framing.
 - 1. Retainer Strips: Install retainer strips at each longitudinal insulation joint, straight and taut, nesting with secondary framing to hold insulation in place.

3.8 ACCESSORY INSTALLATION:

- A. General: Install accessories with positive anchorage to building and weathertight mounting, and provide for thermal expansion. Coordinate installation with flashing and other components.
 - 1. Install components required for a complete metal roof panel assembly, including skylights, trim, coping, ridge closures, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items.
 - 2. Install components for a complete metal wall panel assembly, including trim, copings, corners, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items.
 - 3. Where dissimilar metal contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with corrosion-resistant coating, by applying rubberized-asphalt underlayment to each contact surface, or by other permanent separation as recommended by manufacturer.

- B. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints and seams that will be permanently watertight and weather resistant.
 - 1. Install exposed flashing and trim that is without excessive oil-canning, buckling, and tool marks and that is true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and to result in waterproof and weather-resistant performance.
 - 2. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet (3 m) with no joints allowed within 24 inches (600 mm) of corner intersection. Where lapped or bayonet-type expansion provisions can not be used or would not be sufficiently weather resistant and waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch (25 mm) deep, filled with mastic sealant (Concealed within joints).

- C. Gutters: Joint sections with riveted-and-soldered or lapped-and-sealed joints. Attach gutters to eave with gutter hangers spaced as required for gutter size, but not more than 36 inches (914 mm) o.c. using manufacturer's standard fasteners. Provide end closures and seal watertight with sealant. Provide for thermal expansion.

- D. Downspouts: Joint sections with 1-1/2 inch (38 mm) telescoping joints. Provide fasteners designed to hold downspouts securely 1 inch (25 mm) away from walls; locate fasteners at top and bottom and approximately 60 inches (1524 mm) o.c. in between.
 - 1. Provide elbows at base of downspouts to direct water away from building, unless indicated otherwise.
- E. Pipe Flashing: Form flashing around pipe penetration and metal roof panels. Fasten and seal to panels as recommended by manufacturer.

3.9 FIELD QUALITY CONTROL:

- A. Special Inspections: Engage a qualified special inspector to perform the following special inspections:
 - 1. Inspection of fabricators.
 - 2. Steel Construction.
- B. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- C. Tests and Inspections:
 - 1. High-Strength, Field-Bolted Connections: Connections shall be tested and inspected during installation according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 bolt."
 - 2. Welded Connections: In addition to visual inspection, field-welded connections shall be tested and inspected according to A WS D1.1/D1.1M and the following inspection procedures, at inspector's option:
 - a. Liquid Penetrate Inspection: ASTM E 165.
 - b. Magnetic Particle Inspection: ASTM E 708; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration will not be accepted.
 - c. Ultrasonic Inspection: ASTM E 164.
 - d. Radiographic Inspection: ASTM E 94.
- D. Product will be considered defective if it does not pass tests and inspections.
- E. Prepare tests and inspection reports.

3.10 CLEANING AND PROTECTION:

- A. Repair damaged galvanized coatings on galvanized items with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.

- B. Remove and replace glass that has been broken, chipped, cracked, abraded, or damaged during construction period.

- C. Touchup Painting: After erection, promptly clean, prepare, and prime or re-prime field connections, rust spots, and abraded surfaces of prime-painted structural framing, bearing plates, and accessories.
 - 1. Clean and prepare surfaces by SSPC-SP 2, "Hand Tool Cleaning," or by SSPC-SP 3, "Power Tool Cleaning."
 - 2. Apply a compatible primer of same type as shop primer used on adjacent surfaces.

END OF SECTION

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