
SECTION 05 12 00 - STRUCTURAL STEEL FRAMING**PART 1 GENERAL****1.1 SECTION INCLUDES**

- A. Structural steel framing members, support members and struts.
- B. Base plates, shear stud connectors and expansion joint plates.
- C. Grouting under base plates.

1.2 REFERENCE STANDARDS

- A. AISC (MAN) - Steel Construction Manual; American Institute of Steel Construction, Inc..
- B. AISC S303 - Code of Standard Practice for Steel Buildings and Bridges; American Institute of Steel Construction, Inc..
- C. AISC S348 - Specification for Structural Joints Using ASTM A325 or A490 Bolts.
- D. ASTM A36/A36M - Standard Specification for Carbon Structural Steel.
- E. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
- F. ASTM A108 - Standard Specification for Steel Bar, Carbon and Alloy, Cold Finished.
- G. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
- H. ASTM A307 - Standard Specification for Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength.
- I. ASTM A325 - Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength.
- J. ASTM A325M - Standard Specification for Structural Bolts, Steel, Heat Treated 830 MPa Tensile Strength (Metric).
- K. ASTM A490 - Standard Specification for Structural Bolts, Alloy Steel, Heat-Treated, 150 ksi Minimum Tensile Strength.
- L. ASTM A490M - Standard Specification for High-Strength Steel Bolts, Classes 10.9 and 10.9.3, for Structural Steel Joints (Metric).
- M. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
- N. ASTM A501 - Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing.
- O. ASTM A563 - Standard Specification for Carbon and Alloy Steel Nuts.
- P. ASTM A563M - Standard Specification for Carbon and Alloy Steel Nuts [Metric].
- Q. ASTM A992/A992M - Standard Specification for Structural Steel Shapes.
- R. ASTM C1107/C1107M - Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink).
- S. ASTM F436 - Standard Specification for Hardened Steel Washers.
- T. ASTM F959 - Standard Specification for Compressible-Washer-Type Direct Tension Indicators for Use with Structural Fasteners.

- U. ASTM F1554 - Standard Specification for Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength.
- V. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination; American Welding Society.
- W. AWS D1.1/D1.1M - Structural Welding Code - Steel; American Welding Society.

1.3 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings:
 - 1. Indicate profiles, sizes, spacing, locations of structural members, openings, attachments, and fasteners.
 - 2. Connections.
 - 3. Indicate cambers and loads.
 - 4. Indicate welded connections with AWS A2.4 welding symbols. Indicate net weld lengths.
 - 5. For structural-steel connections indicated to comply with design loads, connections and structural analysis data shall be signed and sealed by the qualified Professional Engineer licensed in the State of Maryland responsible for their preparation.
- C. Manufacturer's Mill Certificate: Certify that products meet or exceed specified requirements.
- D. Mill Test Reports: Signed by manufacturer certifying that the product complies with specified requirements. Indicate structural strength, destructive test analysis and non-destructive test analysis.
- E. LEED Report: Accurately document the use of recycled materials and local/regional materials, as required by Section 01 35 14, Section 01 35 15, Section 01 35 16 and appropriate forms, and Section 01 60 00.
 - 1. Provide documentation of recycled content type and percentage, location of extraction/recovery of primary raw materials, steel mill process, location of mill, location of fabrication and costs.
- F. Welders Certificates: Certify welders employed on the Work, verifying AWS qualification within the previous 12 months.

1.4 QUALITY ASSURANCE

- A. Fabricate structural steel members in accordance with AISC "Steel Construction Manual."
- B. Comply with Section 10 of AISC "Code of Standard Practice for Steel Buildings and Bridges" for architecturally exposed structural steel.
- C. Maintain one copy of each document on site.
- D. Fabricator: Engage a firm experienced in fabricating structural steel similar to that indicated for this Project and within 15 percent this project size, with a record of successful in-service performance, as well as sufficient production capacity to fabricate structural steel without delaying the Work.
 - 1. Fabricator must be designated as an AISC-certified plant, Category STD.
 - 2. Contractor Option: Comply with the following procedures instead of engaging an AISC-Certified Plant:
 - a. Demonstrate that the fabricator has in place a quality control program for meeting IBC requirements and compliance with AISC recommendations and standards.

- b. At no additional cost to the Owner, provide for an independent field inspection of fabrications and welding to comply with IBC, AISC and AWS recommendations and standards.
 - c. Provide certified shop inspection reports signed by the fabricator and an independent inspection agency indicating that the steel, as fabricated, complies with requirements of Contract Documents.
 - d. Provide shop drawings signed and sealed by a qualified licensed Structural Engineer, within the project jurisdiction, responsible for design of connections.
 - e. The steel fabricator shall provide signed and sealed field modification details with backup computations for all field revisions.
 - f. Field modifications details and computations must be prepared by same licensed Structural Engineer preparing shop drawings.
3. Provide documentation that fabricator has provided material for and erected at least 3 projects within 15 percent of project size and complexity, in the last 6 years.
- E. Erector: Company specializing in performing the work of this Section with minimum 5 years of documented experience.
- F. Design connections not detailed on the Drawings under direct supervision of a Professional Structural Engineer experienced in design of this work and licensed in the State of Maryland.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Recycled Content: Provide W-shape, channel and angle shapes steel with minimum 90 percent total recycled content including at least 60 percent post-consumer recycled content, except as follows:
- 1. Plate and Bar: Minimum 30 percent total recycled content.
 - 2. Cold-Formed Hollow Structural Sections: Minimum 30 percent total recycled content.
 - 3. Steel Pipe: Minimum 30 percent total recycled content.
 - 4. All Other Steel Materials: Minimum 30 percent total recycled content.
- B. Regional Materials: Provide steel manufactured and of primary raw materials extracted or recovered within 500 mile radius of Project Site.
- C. Steel Angles and Plates: ASTM A36/A36M.
- D. Steel W Shapes and Tees: ASTM A992/A992M.
- E. Cold-Formed Structural Tubing: ASTM A500, Grade B.
- F. Hot-Formed Structural Tubing: ASTM A501, seamless or welded.
- G. Pipe: ASTM A53/A53M, Grade B, Finish black.
- H. Shear Stud Connectors: Made from ASTM A 108 Grade 1015 bars through 1020, headed-stud type, cold-finished carbon steel, AWS D1.1, Type B..
- I. Rods: ASTM A 36/A 36M.
- J. Structural Bolts and Nuts: Carbon steel, ASTM A307, Grade A Nuts: ASTM 563 hex carbon steel. Washers: ASTM F436, hardened carbon steel.
- K. High-Strength Structural Bolts, Nuts, and Washers: ASTM A325 (ASTM A325M), Type 1. Nuts: ASTM 563 hex carbon steel. Washers: ASTM F436, hardened carbon steel.
- L. High-Strength Structural Bolts: ASTM A490 (ASTM A490M), with matching ASTM A563 (ASTM A563M) nuts and ASTM F436 washers; Type 1 alloy steel.

- M. Headed Anchor Rods: ASTM F1554, Grade 36, plain, with matching ASTM A563 or A 563M nuts and ASTM F436 Type 1 washers.
- N. Load Indicator Washers: Provide washers complying with ASTM F959 at all connections requiring high-strength bolts.
- O. Welding Materials: AWS D1.1; type required for materials being welded.
- P. Grout: Non-shrink, non-metallic aggregate type, complying with ASTM C1107/C1107M and capable of developing a minimum compressive strength of 7,000 psi at 28 days.
- Q. Shop and Touch-Up Primer: Type specified in Division 9 painting sections, complying with VOC limitations of authorities having jurisdiction.
- R. Touch-Up Primer for Galvanized Surfaces: Fabricator's standard, complying with VOC limitations of authorities having jurisdiction.

2.2 FABRICATION

- A. Shop fabricate to greatest extent possible.
- B. Develop required camber for members.
- C. Thermal Cutting: Perform thermal cutting by machine to greatest extent possible.
 - 1. Plane thermally cut edges to be welded to comply with requirements of AWS D1.1.
- D. Bolt Holes: Drill or punch standard bolt holes perpendicular to metal surfaces.
- E. Finishing: Accurately finish ends of columns and other members transmitting bearing loads.

2.3 FINISH

- A. Shop prime structural steel members. Do not prime surfaces that will be fireproofed, field welded, in contact with concrete, or high strength bolted.
- B. Galvanize structural steel members to comply with ASTM A123/A123M. Provide minimum 1.7 oz/sq ft galvanized coating.
 - 1. Galvanize shelf angles, lintels and hung plates located in exterior walls.
 - 2. Galvanize all exterior steel.
- C. Surface preparation: SSPC-SP2: "Hand Tool Cleaning", or SSPC-SP3, "Power Tool Cleaning".
- D. Provide a dry film thickness of not less than 1.5 mil.
- E. Refer to Division 9 painting sections for primer specifications.

2.4 SOURCE QUALITY CONTROL

- A. High-Strength Bolts: Provide testing and verification of shop-bolted connections in accordance with AISC "Specification for Structural Joints Using ASTM A325 or A490 Bolts", testing at least 10 percent of bolts at each connection.
- B. Welded Connections: Visually inspect all shop-welded connections and test all full penetration welds using ultrasonic testing performed in accordance with ASTM E 164.

PART 3 EXECUTION

3.1 ERECTION

- A. Erect structural steel in compliance with AISC "Code of Standard Practice for Steel Buildings and Bridges".

- B. Allow for erection loads, and provide sufficient temporary bracing to maintain structure in safe condition, plumb, and in true alignment until completion of erection and installation of permanent bracing.
- C. Field weld components and shear studs indicated on shop drawings.
- D. Use carbon steel bolts only for temporary bracing during construction, unless otherwise specifically permitted on drawings. Install high-strength bolts in accordance with AISC "Specification for Structural Joints Using ASTM A325 or A490 Bolts".
- E. Do not field cut or alter structural members without approval of Architect.
- F. After erection, prime welds, abrasions, and surfaces not shop primed or galvanized, except surfaces to be in contact with concrete. Repair damaged galvanized coatings with galvanized repair paint.
- G. Grout solidly between column plates and bearing surfaces, complying with manufacturer's instructions for nonshrink grout. Trowel grouted surfaces smooth, splaying neatly to 45 degrees.

3.2 TOLERANCES

- A. Maximum Variation From Plumb: 1/4 inch per story, non-cumulative.
- B. Maximum Offset From True Alignment: 1/4 inch.

3.3 FIELD QUALITY CONTROL

- A. An independent testing agency will perform field quality control tests, as specified in Section 01 40 00. Inspection services shall conform to Section 1704.3 and Table 1704.3 of the IBC 2009 - International Building Code. Inspection services shall include, but not be limited to, setting of all bearing plates, alignment of structural members, all joints prior to welding for required clearance and preparation, and all welded and bolted connections.
- B. High-Strength Bolts: Provide testing and verification of field-bolted connections in accordance with AISC "Specification for Structural Joints Using ASTM A325 or A490 Bolts", A minimum of 10% of all bolted connections are to be tested. All bolted connections to have a visual inspection and any suspect connections are to be tested.
- C. In addition to visual inspection, field-welded shear connectors shall be tested and inspected according to the requirements of AWS D1.1 for stud welding and as follows:
 - 1. Bend tests will be performed when visual inspections reveal either less than a continuous 360-degree flash or welding repairs to any shear connector. A minimum of 25% of the Nelson studs are to be hammer tested. If more than 10% fail this test than 40% of the studs are to be tested.
 - 2. Tests will be conducted on additional shear connectors when weld fracture occurs on shear connectors already tested, according to requirements of AWS D1.1.
- D. Correct deficiencies in work that inspections indicate does not comply with the specified requirements.

END OF SECTION

SECTION 05 21 00 - STEEL JOIST FRAMING**PART 1 GENERAL****1.1 SECTION INCLUDES**

- A. Open web steel joists , with bridging, attached seats and anchors.
- B. Loose bearing members, such as plates or angles, and anchor bolts for site placement.
- C. Supplementary framing for floor and roof openings greater than 12 inches.
- D. Joist accessories.

1.2 REFERENCE STANDARDS

- A. ASTM A36/A36M - Standard Specification for Carbon Structural Steel.
- B. AWS D1.1/D1.1M - Structural Welding Code - Steel; American Welding Society.
- C. SJI (SPEC) - Catalog of Standard Specifications and Load Tables for Steel Joists and Joist Girders; Steel Joist Institute.
- D. SSPC-SP 2 - Hand Tool Cleaning; Society for Protective Coatings.
- E. IBC 2009 - International Building Code.

1.3 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings: Show layout, designation, number, type, location, and spacings of joists. Include joining and anchorage details, bracing, bridging, joist accessories; splice and connection locations and details; and attachments to other construction.
 - 1. Indicate locations and details of bearing plates to be embedded in other construction.
 - 2. Comprehensive engineering analysis of special joists signed and sealed by the qualified professional engineer licensed in the State of Maryland who is responsible for its preparation.
- C. LEED Report: Accurately document the use of recycled materials and local/regional materials, as required by Section 01 35 14, Section 01 35 15, Section 01 35 16 and appropriate forms, and Section 01 60 00.
 - 1. Provide documentation of recycled content type and percentage, location of extraction/recovery of primary raw materials, steel mill process, location of mill, location of fabrication and costs.
- D. Welders' Certificates: Submit manufacturer's certificates, certifying welders employed on the Work, verifying AWS qualification within the previous 12 months.
- E. Manufacturer's Certificates: Signed by manufacturers certifying that joists comply with requirements.
- F. Manufacturer's Mill Certificates: Signed by bolt manufacturers certifying that bolts comply with requirements.
- G. Design connections not detailed on the drawings under direct supervision of a Professional Structural Engineer experienced in design of this work and licensed in the State of Maryland.
- H. Perform Work, including that for headers and other supplementary framing, in accordance with SJI Standard Specifications Load Tables and SJI Technical Digest No.9.

1.4 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A firm experienced in manufacturing joists similar to those indicated for this Project and with a record of successful in-service performance.
 - 1. Manufacturer must be certified by SJI to manufacture joists complying with SJI standard specifications and load tables.
 - 2. Assumes responsibility for engineering special joists to comply with performance requirements. This responsibility includes preparation of Shop Drawings and comprehensive engineering analysis by a qualified professional engineer.
 - 3. Professional Engineer Qualifications: A professional engineer who is legally authorized to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of joists that are similar to those indicated for this Project in material, design, and extent.
- B. SJI Specifications: Comply with SJI's "Standard Specifications Load Tables and Weight Tables for Steel Joists and Joist Girders" (hereafter, "Specifications"), applicable to types of joists indicated.
- C. Welding: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code--Steel"; and AWS D1.3 "Structural Welding Code--Sheet Steel."

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Transport, handle, store, and protect products to SJI requirements.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Canam Group Inc: www.canam-steeljoists.ws
- B. CMC Joist: www.cmcjoist.com.
- C. Nucor-Vulcraft Group: www.vulcraft.com.

2.2 MATERIALS

- A. Recycled Content: Provide steel with minimum 30 percent total recycled content including at least 25 percent post-consumer recycled content.
- B. Regional Materials: Provide steel manufactured and of primary raw materials extracted or recovered within 500 mile radius of Project Site.
- C. Open Web Joists: SJI Type K Joists:
 - 1. Provide bottom and top chord extensions as indicated.
 - 2. End bearing of 2-1/2 inches on steel supports.
 - 3. End bearing of 4 inches on masonry supports.
 - 4. Finish: Shop primed.
 - 5. Steel: Comply with SJI's "Specifications" for chord and web members.
- D. Open Web Joists: SJI Type LH and DLH Joists:
 - 1. Provide bottom and top chord extensions as indicated.
 - 2. End bearing of 4 inches on steel supports.
 - 3. End bearing of 6 inches on masonry supports.
 - 4. Finish: Shop primed.
 - 5. Steel: Comply with SJI's "Specifications" for chord and web members.

- E. Bolts, Nuts and Washers: ASTM A 307, Nuts: ASTM A563, Washers: ASTM F436; plain.
- F. Structural Steel For Supplementary Framing and Joist Leg Extensions: ASTM A 36/A 36M.
- G. Welding Materials: AWS D1.1; type required for materials being welded.
- H. Shop and Touch-Up Primer: Type specified in Section 09 91 23, complying with VOC limitations of authorities having jurisdiction.

2.3 FABRICATION

- A. Manufacture steel joists to meet SJI's "Specifications", with steel angle top and bottom-chord members; of joist type and end and top-chord arrangements as indicated.
- B. Comply with AWS requirements and procedures for shop welding, appearance, quality of welds, and methods used in correcting welding work.
- C. Provide holes in chord members for connecting and securing other construction to joists.
- D. Camber steel joists according to SJI's "Specifications".
- E. Equip bearing ends of joists with manufacturer's standard beveled ends or sloped shoes if joist slope exceeds ¼ inch per twelve inches.
- F. Bridging: Provide bridging anchors and number of rows of horizontal and diagonal bridging of material, size, and type required by SJI's "Specifications" for type of joist, chord size, spacing, and span. Provide additional erection bridging if required for stability and where indicated on the Drawings.
- G. Fabricate steel bearing plates with integral anchorages of sizes and thicknesses indicated. Shop prime paint.
- H. Supply ceiling extensions, either extended bottom-chord elements or a separate extension unit of enough strength to support ceiling construction. Extend ends to within ½ inch of finished wall surface unless otherwise indicated.
- I. Supply miscellaneous accessories, including splice plates and bolts required by joist manufacturer to complete joist installation.

2.4 FINISH

- A. Prepare surfaces to be finished in accordance with SSPC-SP 2.
- B. Apply shop primer to joists and joist accessories to provide a continuous dry paint film not less than 2 mil thick; apply two coats of shop primer if necessary to meet specified dry film thickness.

PART 3 EXECUTION

3.1 ERECTION

- A. Erect joists with correct bearing on supports.
- B. Allow for erection loads. Provide sufficient temporary bracing to maintain framing safe, plumb, and in true alignment.
- C. Coordinate the placement of anchors for securing loose bearing members furnished as part of the work of this section.
- D. After joist alignment and installation of framing, field weld joist seats to steel bearing surfaces.
- E. Coordinate placement of anchors in concrete and masonry construction for securing bearing plates.

- F. After joist alignment and installation of framing, field weld joist seats to bearing plates.
- G. Position and field weld joist chord extensions and wall attachments as detailed.
- H. Install supplementary framing for roof openings greater than 18 inches.
- I. Do not permit erection of decking until joists are braced bridged, and secured or until completion of erection and installation of permanent bridging and bracing.
- J. Do not field cut or alter structural members without approval of joist manufacturer.
- K. After erection, prime welds and damaged shop primer, except surfaces specified not to be primed.

3.2 TOLERANCES

- A. Maximum Variation From Plumb: 1/4 inch.
- B. Maximum Offset From True Alignment: 1/4 inch.

3.3 FIELD QUALITY CONTROL

- A. An independent testing agency will perform field quality control tests, as specified in Section 01 40 00.
- B. Carbon Steel Bolts: Field-bolted connections will be visually inspected and shall conform to ASME B18.2.6-96 Fasteners for Use in Structural Applications and A307-03 Standard Specification for Carbon Steel Bolts and Studs, 60000 PSI Tensile Strength.
- C. Welded Connections: Visually inspect all field-welded connections and test 100 percent of full-penetration welds using ultrasonic testing performed in accordance with ASTM E 164.
- D. Correct deficiencies in work that inspections indicate are not in compliance with specified requirements.

END OF SECTION

SECTION 05 31 00 - STEEL DECKING**PART 1 GENERAL****1.1 SECTION INCLUDES**

- A. Acoustical roof deck.
- B. Roof deck.
- C. Composite floor deck.
- D. Metal form deck.
- E. Supplementary framing for openings up to and including 12 inches.
- F. Bearing plates and angles.
- G. Stud shear connectors.
- H. Acoustical insulation in roof deck flutes.

1.2 REFERENCE STANDARDS

- A. ASTM A36/A36M - Standard Specification for Carbon Structural Steel.
- B. ASTM A108 - Standard Specification for Steel Bar, Carbon and Alloy, Cold-Finished.
- C. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
- D. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- E. ASTM A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength, Low Alloy, and High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardened
- F. AWS D1.1/D1.1M - Structural Welding Code - Steel; American Welding Society.
- G. SDI (DM) - Publication No.31, Design Manual for Composite Decks, Form Decks, Roof Decks; Steel Deck Institute.
- H. SSPC-Paint 20 - Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic"); The Society for Protective Coatings.

1.3 PERFORMANCE REQUIREMENTS

- A. Select and design metal deck in accordance with SDI Design Manual.
- B. Calculate to structural working stress design and structural properties specified.
- C. Maximum Vertical Deflection of Floor Deck: 1/360.
- D. Maximum Vertical Deflection of Roof Deck: 1/240.

1.4 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittals procedures.
- B. Shop Drawings: Indicate deck plan, support locations, projections, openings, reinforcement, cellular raceways and outlet box locations, pertinent details, and accessories.
- C. Product Data: Provide deck profile characteristics, dimensions, structural properties, and finishes.
- D. Certificates: Certify that products furnished meet or exceed specified requirements.

- E. LEED Report: Accurately document the use of recycled materials and local/regional materials, as required by Section 01 35 14, Section 01 35 15, Section 01 35 16 and appropriate forms, and Section 01 60 00.
 - 1. Provide documentation of recycled content type and percentage, location of extraction/recovery of primary raw materials, steel mill process, location of mill, location of fabrication and costs.
- F. Welders Certificates: Certify welders employed on the Work, verifying AWS qualification within the previous 12 months.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Company specializing in performing the work of this Section with minimum 5 years of documented experience.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Cut plastic wrap to encourage ventilation.
- B. Separate sheets and store deck on dry wood sleepers; slope for positive drainage.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Canam Steel Corporation: www.canam-steeljoists.ws.
- B. Consolidated Systems, Inc.
- C. Epic Metals Corporation.
- D. Nucor-Vulcraft Group: www.vulcraft.com.
- E. Wheeling Corrugating Co: www.wheelingcorrugating.com.
- F. United Steel Deck , Inc: www.njb-united.com.

2.2 STEEL DECK

- A. All Deck Types: Select and design metal deck in accordance with SDI Design Manual.
 - 1. Calculate to structural working stress design and structural properties specified.
 - 2. Maximum Vertical Deflection of Floor Deck: 1/360 of span.
 - 3. Maximum Vertical Deflection of Roof Deck: 1/240.
 - 4. Maximum Vertical Deflection of Form Deck: 1/360 of span.
- B. Roof Deck: Non-composite type, fluted steel sheet:
 - 1. Galvanized Steel Sheet: ASTM A653/A653M, Structural Steel (SS) , with G60/Z180 galvanized coating for indoor locations and G90/Z275 galvanized coating for outdoor locations.
 - a. Grade as required to meet performance criteria.
 - 2. Structural Properties:
 - a. Section modulus: As indicated on the Drawings.
 - b. Span Design: Multiple.
 - 3. Minimum Metal Thickness, Excluding Finish: 22 gage.
 - 4. Nominal Height: 1-1/2 inch.
 - 5. Profile: Fluted; SDI WR.
 - 6. Formed Sheet Width: 36 inch.
 - 7. Side Joints: Lapped, mechanically fastened.
 - 8. End Joints: Lapped, welded.

9. Recycled Content: Provide steel with minimum 30 percent total recycled content, including at least 25 percent post-consumer recycled content.
 10. Regional Materials: Provide steel products manufactured and of primary raw materials extracted or recovered within 500 mile radius of Project Site.
- C. Acoustical Roof Deck:
1. Products:
 - a. EA Acoustical Roof Deck units by Epic Metals Corporation; round perforations.
 - b. Type BA deck by United Steel Deck, Inc.; round perforations.
 - c. Type BA deck by Consolidated Systems, Inc.; round perforations.
 - d. Type BA deck by Vulcraft; round perforations.
 - e. Type CFDA deck by Consolidated Systems, Inc.; round perforations.
 2. Cold-formed from steel sheets conforming to ASTM A653, Grade 40, or equal, having minimum yield strength of 40,000 psi.
 3. Before forming, the steel sheets shall have received a hot-dip protective coating of zinc conforming to ASTM A924 with a minimum coating class of G60/Z180 as defined in A653.
 4. The minimum uncoated thickness of material supplied shall be within 5 percent of the design thickness.
 5. Acoustical roof deck units shall have full depth positive registering sidelaps that can be fastened by welds or screws, or locking male/female laps.
 6. Whenever possible, acoustical roof deck units shall be fabricated to provide a minimum three span condition.
 7. Insulation:
 - a. Sound absorbing elements of 3 pound density fiberglass shall be factory installed within the deck cells; minimum 1-1/2 inch thickness.
 - b. To facilitate field painting of the perforated surfaces, the sound absorbing elements shall be supported above the panel on standoffs.
 - c. NRC System Rating: 0.90 minimum.
 8. Finish:
 - a. Cleaned, chemically treated and painted with 0.2 mil epoxy primer followed by a 0.5 mil polyester top coat primer oven cured off-white.
 - b. Contractor Option: The Contractor may provide a finish of 0.2 mils weldable urethane primer followed by a 3.0 mils minimum of Tnemec FC 20 Epoxy (off white) sprayed on and air dried.
- D. Composite Floor Deck: Fluted steel sheet embossed to interlock with concrete:
1. Ungalvanized Steel Sheet: ASTM A1008/A1008M, Designation SS, Grade 33, Type 1.
 - a. Grade as required to meet performance criteria.
 2. Primer: Shop coat over cleaned and phosphatized substrate.
 3. Structural Properties:
 - a. Section modulus: As indicated on the drawings.
 4. Span Design: Multiple.
 5. Minimum Metal Thickness, Excluding Finish: 20 gage.
 6. Nominal Height: 2 inches.
 7. Profile: Fluted; SDI WR.
 8. Formed Sheet Width: 36 inch.
 9. Side Joints: Lapped, welded.
 10. End Joints: Lapped, welded.

- E. Metal Form Deck: Corrugated sheet steel:
 - 1. Ungalvanized Steel Sheet: ASTM A1008/A1008M, Designation SS, Grade 33, Type 1.
 - 2. Primer: Shop coat of manufacturer's standard primer paint over cleaned and phosphatized substrate.

2.3 ACCESSORY MATERIALS

- A. Bearing Plates and Angles: ASTM A36/A36M steel.
- B. Stud Shear Connectors: Made from ASTM A 108 Grade 1015 bars.
- C. Welding Materials: AWS D1.1.
- D. Fasteners: Galvanized hardened steel, self tapping.
- E. Weld Washers: Mild steel, uncoated, 3/4 inch outside diameter, 1/8 inch thick.
- F. Shop and Touch-Up Primer: Type specified in Section 09 91 23, complying with VOC limitations of authorities having jurisdiction.
- G. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20, complying with VOC limitations of authorities having jurisdiction.
- H. Flute Closures: Closed cell foam rubber, 1 inch thick; profiled to fit tight to the deck.
- I. Acoustical Insulation: Glass fiber type, minimum 1.1 lb/cu ft density; profiled to suit deck.

2.4 FABRICATED DECK ACCESSORIES

- A. Sheet Metal Deck Accessories: Metal closure strips, wet concrete stops, and cover plates, 22 gage thick sheet steel minimum; of profile and size as indicated; finished same as deck.
- B. Cant Strips: Formed sheet steel, 16 gage thick, 45 degree slope, 3 1/2 inch nominal width and height, flange for attachment.
- C. Roof Sump Pans: 14 gage sheet steel, flat bottom, sloped sides, recessed 1-1/2 inches below roof deck surface, bearing flange 3 inches wide, sealed watertight.
- D. Floor Drain Pans: 14 gage sheet steel, flat bottom, sloped sides, recessed 1-1/2 inches below floor deck surface, bearing flange 3 inches wide, sealed watertight.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify existing conditions prior to beginning work.

3.2 INSTALLATION

- A. Erect metal deck in accordance with SDI Design Manual and manufacturer's instructions. Align and level.
- B. Place deck panels on supporting frame and adjust to final position with ends accurately aligned and bearing on supporting frame before permanently fastening..
- C. Provide additional reinforcement and closure pieces at openings as required for strength, continuity of deck, and support of other work..
- D. Weld deck in accordance with AWS D1.3.
- E. Where deck changes direction, install 6 inch minimum wide sheet steel cover plates, of same thickness as deck. Fusion welded 12 inches on center maximum.
- F. At floor edges, install concrete stops upturned to top surface of slab, to contain wet concrete. Provide stops of sufficient strength to remain stationary without distortion.

- G. At openings between deck and walls, columns, and openings, provide sheet steel closures and angle flashings to close openings.
- H. Close openings above walls and partitions perpendicular to deck flutes with single row of foam cell closures.
- I. Place metal cant strips in position and field weld.
- J. Weld stud shear connectors through steel deck to structural members below.
- K. Immediately after welding deck and other metal components in position, coat welds, burned areas, and damaged surface coating, with touch-up primer.

3.3 ROOF DECK INSTALLATION

- A. Fasten roof-deck panels to steel supporting members by arc spot (puddle) welds of the surface diameter indicated or arc seam welds with an equal perimeter that is not less than 1-1/2 inches long, and as follows:
 - 1. Weld Diameter: 5/8 inch, nominal.
 - 2. Weld Spacing: Weld edge ribs of panel at each support; space additional welds as indicated on Drawings.
- B. Side-Lap and Perimeter Edge Fastening: Fasten side laps and perimeter edges of panels between supports, at intervals not exceeding the lesser of 1/2 of the span or 36 inches, and as indicated on Drawings.
 - 1. Mechanically fasten with self-drilling, No. 10 diameter or larger, carbon-steel screws.
 - 2. Fasten with a minimum of 1-1/2 inch-long welds.
- C. End Bearing: Install deck ends over supporting frame with a minimum end bearing of 1-1/2 inches, with end joints lapped 2 inches minimum.

3.4 FLOOR DECK INSTALLATION

- A. Fasten floor-deck panels to steel supporting members by arc spot (puddle) welds of the surface diameter indicated and as follows:
 - 1. Weld Diameter: 5/8 inch, nominal.
 - 2. Weld Spacing: Weld edge ribs of panel at each support and at 12" on center.
- B. Side-Lap and Perimeter Edge Fastening: Fasten side laps and perimeter edges of panels between supports, at intervals not exceeding the lesser of half of the span or 36 inches, and as indicated on Drawings:
 - 1. Fasten with a minimum of 1-1/2-long welds.
- C. End Bearing: Install deck ends over supporting frame with a minimum end bearing of 1-1/2 inches, with end joints butted.

3.5 FIELD QUALITY CONTROL

- A. Engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.
- B. Inspection to include, but not limited to, deck alignment, support, welds, side lap attachment and touch-up galvanizing.
- C. Testing agency to report inspection results promptly and in writing to Contractor and Architect.
- D. Remove and replace work that does not comply with specified requirements.

- E. Additional inspecting, at Contractor's expense, must be performed to determine compliance of corrected work with specified requirements.

END OF SECTION

SECTION 05 40 00 - COLD-FORMED METAL FRAMING**PART 1 GENERAL****1.1 SECTION INCLUDES**

- A. Formed steel stud exterior wall framing.
- B. Formed steel joist framing and bridging.

1.2 REFERENCE STANDARDS

- A. AISI SG02-1 - North American Specification for the Design of Cold-Formed Steel Structural Members; American Iron and Steel Institute. (replaced SG-971)
- B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
- C. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- D. ASTM A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength, Low Alloy, and High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable
- E. ASTM C955 - Standard Specification for Load-Bearing (Transverse and Axial) Steel Studs, Runners (Tracks), and Bracing or Bridging for Screw Application of Gypsum Panel Products and Metal Plaster Bases.
- F. AWS D1.1/D1.1M - Structural Welding Code - Steel; American Welding Society.
- G. SSPC-Paint 20 - Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic"); Society for Protective Coatings.
- H. International Building Code.

1.3 DESIGN REQUIREMENTS

- A. Axial and wind load bearing elements shall be designed to the following conditions unless more stringent requirements are imposed by governing code; these requirements take precedent when more stringent than governing code.
 - 1. Gravity Loads: Per ASCE 7-2005.
 - 2. Wind Loads: Per ASCE 7-2005.
 - 3. Seismic Loads: Per ASCE 7-2005.
- B. Maximum Allowable Deflection:
 - 1. Backing of Masonry Veneer: 1: 600.
 - 2. Other Systems: 1: 240 of span.
- C. Wall and General System:
 - 1. Design to AISI SG-973 Cold-Formed Steel Design Manual.
 - 2. Design to provide for movement of components without damage, failure of joint seals, undue stress on fasteners, or other detrimental effects when subject to seasonal or cyclic day/night temperature ranges.
 - 3. Design system to accommodate construction tolerances, deflection of building structural members, and clearances of intended openings.
 - 4. Design to meet loading and anchorage requirements for window systems and curtainwall system must be based on calculations provided by the respective subcontractors.

5. Design cold-formed metal truss framing for exterior soffits to meet applicable wind uplift requirements.
6. Seismic Loads: Design and size components to withstand seismic loads and sway displacement as in accordance with IBC code.

1.4 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on standard framing members; describe materials and finish, product criteria, limitations .
- C. Product Data: Provide manufacturer's data on factory-made framing connectors, showing compliance with requirements.
- D. Shop Drawings: Indicate component details, framed openings, bearing, anchorage, loading, welds, and type and location of fasteners, and accessories or items required of related work.
 1. Indicate stud, ceiling joist, roof joist, roof rafter, and roof truss layout.
 2. Describe method for securing studs to tracks and for bolted framing connections.
 3. Provide calculations for loadings and stresses of specially fabricated framing, stamped by a Professional Structural Engineer licensed in the State of Maryland, who is responsible for its preparation.
 4. Provide details, shop drawings and calculations for factory-made framing connectors, stamped by a Professional Structural Engineer licensed in the State of Maryland, who is responsible for its preparation.
- E. LEED Report: Accurately document the use of recycled materials and local/regional materials, as required by Section 01 35 14, Section 01 35 15, Section 01 35 16 and appropriate forms, and Section 01 60 00.
 1. Provide documentation of recycled content type and percentage, location of extraction/recovery of primary raw materials, steel mill process, location of mill, location of fabrication and costs.

1.5 QUALITY ASSURANCE

- A. Calculate structural properties of framing members in accordance with requirements of AISI North American Specification for the Design of Cold-Formed Steel Structural Members.
 1. Maintain one copy of document on project site.
- B. Installer Qualifications: An experienced installer who has completed cold-formed metal framing similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.
- C. Mill certificates signed by steel sheet producer or test reports from a qualified independent testing agency indicating steel sheet complies with requirements, including uncoated steel thickness, yield strength, tensile strength, total elongation, chemical requirements, ductility, and galvanized-coating thickness.
- D. Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, qualified according to ASTM E 329 to conduct the testing indicated, as documented according to ASTM E 548.
- E. Welding: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code--Steel," and AWS D1.3, "Structural Welding Code--Sheet Steel."

1.6 PROJECT CONDITIONS

- A. Verify that field measurements are as indicated on the drawings.

PART 2 PRODUCTS

2.1 FRAMING SYSTEM

- A. Provide primary and secondary framing members, bridging, bracing, plates, gussets, clips, fittings, reinforcement, and fastenings as required to provide a complete framing system.

2.2 FRAMING MATERIALS

- A. Recycled Content: Provide steel with minimum 30 percent total recycled content including at least 25 percent post-consumer recycled content.
- B. Regional Materials: Provide steel manufactured and of primary raw materials extracted or recovered within 500 mile radius of Project Site.
- C. Studs and Track: ASTM C955; studs formed to channel, "C", or "Sigma" shape with punched web; U-shaped track in matching nominal width and compatible height.
 - 1. Gage and depth: As required to meet specified performance levels, but to be minimum 18 gage.
 - 2. Galvanized in accordance with ASTM A653/A653M G90/Z275 coating.
 - 3. Provide components fabricated from ASTM A 1008/A 1008M, Designation SS steel.
- D. Joists and Purlins: Fabricated from ASTM A653/A653M steel sheet, with G90/Z275 hot dipped galvanized coating.
 - 1. Base Metal: Structural Steel (SS), Grade 33/230 minimum.
 - 2. Gage and depth: As required to meet specified performance levels.
- E. Framing Connectors: Factory-made formed steel sheet, ASTM A653/A653M SS Grade 50, with G60/Z180 hot dipped galvanized coating and factory punched holes.
 - 1. Structural Performance: Maintain load and movement capacity required by applicable code, when evaluated in accordance with AISI North American Specification for the Design of Cold Formed Steel Structural Members; minimum 16 gage, 0.06 inch thickness.
 - 2. Movement Connections: Provide mechanical anchorage devices that accommodate movement using slotted holes, screws and anti-friction bushings, while maintaining structural performance of framing. Provide movement connections where indicated on drawings.
 - a. Where continuous studs bypass elevated floor slab, connect stud to slab in manner allowing vertical movement of slab without affecting studs; allow for minimum movement of 1/2 inch.
 - b. Where top of stud wall terminates below structural floor or roof, connect studs to structure in manner allowing vertical movement of slab without affecting studs; allow for minimum movement of 1/2 inch.
 - c. Provide top track preassembled with connection devices spaced to fit stud spacing indicated on drawings; minimum track length of 12 feet.
 - d. Acceptable Products: VertiClip(r) or DriftClip(tm) manufactured by The Steel Network Inc.
 - 3. Provide non-movement connections for tie-down to foundation, floor-to-floor tie-down, roof-to-wall tie-down, joist hangers, gusset plates, and stiffeners.

2.3 ACCESSORIES

- A. Bracing, Furring, Bridging: Formed sheet steel, thickness determined for conditions encountered; finish to match framing components.

- B. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20, Type I - Inorganic, complying with VOC limitations of authorities having jurisdiction.
- C. Insulated Box Header: Provide 1-1/2 inch rigid foam board insulation in each stud used in a box header design. Refer to section 07 21 00 for material information on foam board insulation.

2.4 FASTENERS

- A. Self-Drilling, Self-Tapping Screws, Bolts, Nuts and Washers: Hot dip galvanized per ASTM A153/A153M.
- B. Anchorage Devices: Power actuated.
- C. Welding: In conformance with AWS D1.1.

2.5 SHOP FABRICATED ASSEMBLIES

- A. Shop fabricate metal framing to the greatest extent possible.
- B. Fabricate assemblies of framed sections of sizes and profiles required; with framing members fitted, reinforced, and braced to suit design requirements.
- C. Fit and assemble in largest practical sections for delivery to site, ready for installation.

PART 3 EXECUTION

3.1 INSTALLATION OF STUDS

- A. Install components in accordance with manufacturers' instructions and ASTM C 1007 requirements.
- B. Align floor and ceiling tracks; locate to wall layout. Secure in place with fasteners at maximum 24 inches on center. Coordinate installation of sealant with floor and ceiling tracks.
- C. Construct corners using minimum of three studs. Install double studs at wall openings, door and window jambs.
- D. Install load bearing studs full length in one piece. Splicing of studs is not permitted.
- E. Install load bearing studs, brace, and reinforce to develop full strength and achieve design requirements.
- F. Coordinate placement of insulation in multiple stud spaces made inaccessible after erection.
- G. Install intermediate studs above and below openings to align with wall stud spacing.
- H. Provide deflection allowance in stud track, directly below horizontal building framing at non-load bearing framing.
- I. Attach cross studs to studs for attachment of fixtures anchored to walls.
- J. Install framing between studs for attachment of mechanical and electrical items, and to prevent stud rotation.
- K. Touch-up field welds and damaged galvanized surfaces with primer.

3.2 INSTALLATION OF JOISTS AND PURLINS

- A. Install framing components in accordance with manufacturer's instructions.
- B. Make provisions for erection stresses. Provide temporary alignment and bracing.
- C. Set floor and ceiling joists parallel and level, with lateral bracing and bridging.

- D. Locate joist end bearing directly over load bearing studs or provide load distributing member to top of stud track.
- E. Provide web stiffeners at reaction points.
- F. Touch-up field welds and damaged galvanized surfaces with primer.

3.3 TOLERANCES

- A. Maximum Variation from True Position: 1/8 inch.
- B. Maximum Variation of any Member from Plane: 1/8 inch.

3.4 FIELD QUALITY CONTROL

- A. Engage a qualified independent testing and inspection agency to perform field tests and inspections and prepare test reports.
- B. Inspections:
 - 1. Perform inspections in order to assure strict conformance to the shop drawings at all phases of construction.
 - 2. Check members for proper alignment, bearing, completeness of attachments, proper alignment, reinforcement, etc.
 - 3. Check attachments for conformance with the shop drawings; all welds shall be touched up as specified.
 - 4. Complete general inspection of structure prior to applying loads to those members.
 - 5. Inspections where and as required by local codes shall be controlled inspections.

END OF SECTION

SECTION 05 50 00 - METAL FABRICATIONS**PART 1 GENERAL****1.1 SECTION INCLUDES**

- A. Rough hardware.
- B. Steel ladders.
- C. Loose bearing and leveling plates.
- D. Loose steel lintels.
- E. Shelf angles.
- F. Support angles for elevator door sills.
- G. Steel framing and supports for overhead doors.
- H. Steel framing and supports for countertops.
- I. Steel framing and supports for mechanical and electrical equipment.
- J. Steel framing and supports for applications where framing and supports are not specified in other Sections.
- K. Miscellaneous metal trim.
- L. Metal bollards.
- M. Elevator sump grates.
- N. Miscellaneous storm drainage piping specialties.
- O. Pipe Grid.

1.2 REFERENCE STANDARDS

- A. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum; American Architectural Manufacturers Association.
- B. ASTM A36/A36M - Standard Specification for Carbon Structural Steel.
- C. ASTM A283/A283M - Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates.
- D. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
- E. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes [Metric].
- F. AWS D1.1/D1.1M - Structural Welding Code - Steel; American Welding Society.

1.3 QUALITY ASSURANCE

- A. Fabricator Qualifications: Firm experienced in producing metal fabrications similar to those indicated for this Project with a record of successful in-service performance, and with sufficient production capacity to produce required units without delaying the Work.
- B. Welding Standards: Comply with applicable provisions of AWS D1.1 "Structural Welding Code--Steel," AWS D1.2 "Structural Welding Code--Aluminum," and AWS D1.3 "Structural Welding Code--Sheet Steel."
 - 1. Certify that each welder has satisfactorily passed AWS qualification tests for welding processes involved and, if pertinent, has undergone recertification.

1.4 SUBMITTALS

- A. Shop drawings detailing fabrication and erection of each metal fabrication indicated. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items. Provide templates for anchors and bolts specified for installation under other Sections.
 - 1. For installed products indicated to comply with design loads include structural analysis data and shop drawings signed by the qualified professional engineer responsible for their preparation.
- B. Samples representative of materials and finished products as may be requested by Architect.
- C. Welder certificates signed by Contractor certifying that welders comply with requirements specified under the "Quality Assurance" Article.
- D. Qualification data for firms and persons specified in the "Quality Assurance" Article to demonstrate their capabilities and experience. Include a list of completed projects with project name, addresses, names of architects and owners, and other information specified.
- E. Qualification data for professional engineer responsible for designing fabrications indicated to comply with specific design loads.
- F. LEED Submittal: Documentation of recycled content and location of manufacture.

1.5 PROJECT CONDITIONS

- A. Field Measurements: Check actual locations of walls and other construction to which metal fabrications must fit by accurate field measurements before fabrication. Show recorded measurements on final shop drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
- B. Where field measurements cannot be made without delaying the Work, guarantee dimensions and proceed with fabricating products without field measurements. Coordinate construction to ensure that actual dimensions correspond to guaranteed dimensions. Allow for trimming and fitting.

PART 2 PRODUCTS

2.1 MATERIALS - STEEL

- A. Metal Surfaces, General:
 - 1. For metal fabrications exposed to view in the completed Work, provide materials selected for their surface flatness, smoothness, and freedom from surface blemishes.
 - 2. Do not use materials with exposed pitting, seam marks, roller marks, rolled trade names, or roughness.
 - 3. Recycled Content: Provide steel with minimum 30 percent total recycled content, 25 percent shall be post-consumer recycled content.
 - 4. Regional Materials: Provide steel manufactured and of primary raw materials extracted or recovered within 500 mile radius of Project Site.
 - 5. Domestic Origin: Consistent with the Maryland Annotated Code, Article 78A known as the "Buy American Steel" Act of the General Assembly of Maryland, Acts of 1978, provide steel manufactured in the United States of America.
- B. Steel Sections: ASTM A 36/A 36M.
- C. Steel Tubing: Product type (manufacturing method) and as follows:
 - 1. Cold-Formed Steel Tubing: ASTM A 500.

2. Hot-Formed Steel Tubing: ASTM A 501.
 - a. For exterior installations and where indicated, provide tubing with hot-dip galvanized coating per ASTM A 53.
- D. Plates: ASTM A 283.
- E. Steel Pipe: ASTM A 53, standard weight (schedule 40), unless otherwise indicated, or another weight required by structural loads.
 1. Galvanized finish for exterior installations and where indicated.
 2. Black finish elsewhere, unless otherwise indicated.
- F. Gray-Iron Castings: ASTM A 48, Class 30.
- G. Malleable-Iron Castings: ASTM A 47, Grade 32510 (ASTM A 47M, Grade 22010).
- H. Cast-in-Place Anchors in Concrete: Anchors of type indicated below, fabricated from corrosion-resistant materials capable of sustaining, without failure, the load imposed within a safety factor of 4, as determined by testing per ASTM E 488, conducted by a qualified independent testing agency.
 1. Threaded or wedge type; galvanized ferrous castings, either ASTM A 47 (ASTM A 47M) malleable iron or ASTM A 27/A 27M cast steel. Provide bolts, washers, and shims as required, hot-dip galvanized per ASTM A 153.
- I. Welding Materials: AWS D1.1/D1.1M; type required for materials being welded.

2.2 MATERIALS - ALUMINUM

- A. General:
 1. Recycled Content: Give preference to aluminum with the highest recycled content feasible.
- B. Extruded Aluminum: ASTM B221 (ASTM B221M), 6063 alloy, T6 temper.
- C. Aluminum-Alloy Rolled Tread Plate: ASTM B 632 (ASTM B 632M) Pattern 1, alloy 6061-T6.

2.3 PAINT

- A. Shop Primer for Ferrous Metal - Interior Locations, Loose Lintels, Plates, etc.: Refer to Division 9 painting specifications.
- B. Shop Finish - Exterior Fabrications (Stairs, Ladders, Frames, etc):
 1. Prepare galvanized surfaces as required by paint manufacturer.
 2. Electrostatic application of epoxy powder primer with 375f minimum 15 minute duration heat cure for maximum corrosion protection.
 3. Immediate electrostatic application of TGIC polyester powder color coat while metal temperature is minimum of 300f and heat cure for minimum 10 minutes at 400f.
 4. This process provides an average of 8-10 mils total coating thickness.
 5. Color to be selected by Architect.
- C. Shop Finish - Stair Gate Fabrication:
 1. Electrostatic application of epoxy powder primer with 375f minimum 15 minute duration heat cure for maximum corrosion protection.
 2. Immediate electrostatic application of TGIC polyester powder color coat while metal temperature is minimum of 300f and heat cure for minimum 10 minutes at 400f.
 3. This process provides an average of 8-10 mils total coating thickness.
 4. Color to be selected by Architect.

- D. Galvanizing Repair Paint: High-zinc-dust-content paint for regalvanizing welds in galvanized steel, with dry film containing not less than 94 percent zinc dust by weight, and complying with DOD-P-21035 or SSPC-Paint 20.
- E. Bituminous Paint: Cold-applied asphalt mastic complying with SSPC-Paint 12, except containing no asbestos fibers.

2.4 FASTENERS

- A. General: Provide plated fasteners complying with ASTM B 633, Class Fe/Zn 25 for electrodeposited zinc coating, for exterior use or where built into exterior walls. Select fasteners for the type, grade, and class required.
- B. Bolts and Nuts: Regular hexagon-head bolts, ASTM A 307, Grade A (ASTM F 568, Property Class 4.6), with hex nuts, ASTM A 563 (ASTM A 563M), and, where indicated, flat washers.
- C. Machine Screws: ANSI B18.6.3.
- D. Lag Bolts: ANSI B18.2.1 (ANSI B18.2.3.8M).
- E. Plain Washers: Round, carbon steel, ANSI B18.22.1 (ANSI B18.22M).
- F. Lock Washers: Helical, spring type, carbon steel, ANSI B18.21.1.
- G. Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to 6 times the load imposed when installed in unit masonry and equal to 4 times the load imposed when installed in concrete as determined by testing per ASTM E 488 conducted by a qualified independent testing agency.
 - 1. Material - General: Carbon steel components zinc-plated to comply with ASTM B 633, Class Fe/Zn 5.
 - 2. Material - Exposed exterior or in contact with ground: Group 1 alloy 304 or 316 stainless-steel bolts and nuts complying with ASTM F 593 (ASTM F 738M) and ASTM F 594 (ASTM F 836M).
- H. Toggle Bolts: FS FF-B-588, tumble-wing type, class and style as required.

2.5 GROUT

- A. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.
- B. Available Products: Subject to compliance with requirements, products that may be incorporated in the Work include, but are not limited to, the following:
 - 1. Construction Grout; W. R. Bonsal Co.
 - 2. Sure-grip High Performance Grout; Dayton Superior Corp.
 - 3. Euco N-S Grout; Euclid Chemical Co.
 - 4. Crystex; L & M Construction Chemicals, Inc.
 - 5. Masterflow 928 and 713; Master Builders Technologies, Inc.
 - 6. Sealtight 588 Grout; W. R. Meadows, Inc.
 - 7. SonogROUT 14; Sonneborn Building Products--ChemRex, Inc.

2.6 FABRICATION

- A. Form metal fabrications from materials of size, thickness, and shapes indicated but not less than that needed to comply with performance requirements indicated. Work to dimensions indicated or accepted on shop drawings, using proven details of fabrication and support. Use type of materials indicated or specified for various components of each metal fabrication.

- B. Form exposed work true to line and level with accurate angles and surfaces and straight sharp edges.
- C. Allow for thermal movement resulting from the following maximum change (range) in ambient temperature in the design, fabrication, and installation of installed metal assemblies to prevent buckling, opening up of joints, and overstressing of welds and fasteners. Base design calculations on actual surface temperatures of metals due to both solar heat gain and nighttime sky heat loss.
 - 1. Temperature Change (Range): 120 deg F.
- D. Shear and punch metals cleanly and accurately; remove burrs.
- E. Ease exposed edges to a radius of approximately 1/32 inch (1 mm), unless otherwise indicated. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.
- F. Remove sharp or rough areas on exposed traffic surfaces.
- G. Weld corners and seams continuously to comply with the following:
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove welding flux immediately.
 - 4. At exposed connections, finish exposed welds and surfaces smooth and blended so that no roughness shows after finishing, and contour of welded surface matches those adjacent.
- H. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners wherever possible. Use exposed fasteners of type indicated or, if not indicated, Phillips flat-head (countersunk) screws or bolts. Locate joints where least conspicuous.
- I. Provide for anchorage of type indicated; coordinate with supporting structure. Fabricate and space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.
- J. Shop Assembly: Preassemble items in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.
- K. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.
- L. Fabricate joints that will be exposed to weather in a manner to exclude water, or provide weep holes where water may accumulate.
- M. Fabricate items with joints tightly fitted and secured.
- N. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.
- O. Supply components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.

2.7 ROUGH HARDWARE

- A. Furnish bent, or otherwise custom-fabricated, bolts, plates, anchors, hangers, dowels, and other miscellaneous steel and iron shapes as required for framing and supporting woodwork, and for

anchoring or securing woodwork to concrete or other structures. Straight bolts and other stock rough hardware items are specified in Division 6 Sections.

- B. Fabricate items to sizes, shapes, and dimensions required. Furnish malleable-iron washers for heads and nuts that bear on wood structural connections, and furnish steel washers elsewhere.

2.8 STEEL LADDERS

- A. General: Fabricate ladders for the locations shown, with dimensions, spacings, details, and anchorages as indicated. Comply with requirements of ANSI A14.3.
- B. Siderails: Continuous, steel, 1/2-by-2-1/2-inch flat bars, with eased edges, spaced 18 inches apart.
- C. Bar Rungs: 3/4-inch diameter steel bars, spaced 12 inches o.c.
- D. Fit rungs in centerline of side rails, plug weld and grind smooth on outer rail faces.
- E. Support each ladder at top and bottom and at intermediate points spaced not more than 5 feet o.c. with welded or bolted steel brackets.
 - 1. Size brackets to support design dead and live loads indicated and to hold centerline of ladder rungs clear of the wall surface by not less than 7 inches.
 - 2. Extend side rails 42 inches above top rung, and return rails to wall or structure unless other secure handholds are provided. If the adjacent structure does not extend above the top rung, goose-neck the extended rails back to the structure to provide secure ladder access.
- F. Provide nonslip surfaces on top of each rung by coating with abrasive material metallurgically bonded to the rung by a proprietary process.
 - 1. Available Products: Subject to compliance with requirements, products that may be incorporated in the Work include, but are not limited to, the following:
 - a. Mebac, IKG Borden.
 - b. SLIP-NOT, W. S. Molnar Co.
- G. Galvanize ladders, including brackets and fasteners, in the following locations:
 - 1. Elevator pit.
 - 2. All exterior ladders.

2.9 LOOSE STEEL LINTELS

- A. Fabricate loose structural steel lintels from steel angles and shapes of size indicated for openings and recesses in masonry walls and partitions at locations indicated.
- B. Weld adjoining members together to form a single unit where indicated.
- C. Size loose lintels for equal bearing of 1 inch per foot of clear span but not less than 8 inches bearing at each side of openings, unless otherwise indicated.
- D. Hot dip galvanize loose steel lintels located in exterior walls.

2.10 LOOSE BEARING AND LEVELING PLATES

- A. Provide loose bearing and leveling plates for steel items bearing on masonry or concrete construction, made flat, free from warps or twists, and of the required thickness and bearing area. Drill plates to receive anchor bolts and for grouting as required. Galvanize after fabrication.

2.11 MISCELLANEOUS FRAMING AND SUPPORTS

- A. General: Provide steel framing and supports for applications indicated that are not a part of structural steel framework as required to complete the Work.
- B. Fabricate units to sizes, shapes, and profiles indicated and required to receive other adjacent construction retained by framing and supports. Fabricate from structural steel shapes, plates, and steel bars of welded construction using mitered joints for field connection. Cut, drill, and tap units to receive hardware, hangers, and similar items.
 - 1. Equip units with integrally welded anchors; furnish inserts if units must be installed after concrete is placed.
 - a. Except as otherwise indicated, space anchors 24 inches o.c. and provide minimum anchor units in the form of steel straps 1-1/4 inches wide by 1/4 inch thick by 8 inches long.
- C. Galvanize miscellaneous framing and supports in the following locations:
 - 1. Exterior locations.
 - 2. Interior locations where indicated.

2.12 MISCELLANEOUS STEEL TRIM

- A. Unless otherwise indicated, fabricate units from structural steel shapes, plates, and bars of profiles shown with continuously welded joints, and smooth exposed edges. Miter corners and use concealed field splices wherever possible.
- B. Provide cutouts, fittings, and anchorages as required to coordinate assembly and installation with other Work. Provide anchors, welded to trim, for embedding in concrete or masonry construction, spaced not more than 6 inches from each end, 6 inches from corners, and 24 inches o.c., unless otherwise indicated.
- C. Galvanize miscellaneous steel trim in the following locations:
 - 1. Exterior locations.
 - 2. Interior locations where indicated.

2.13 FRAME AND GRATE FOR ELEVATOR SUMP

- A. Basis-of-Design: Model R-4810-C by Neenah Foundry Company.
- B. Frames and grates to be Gray Iron, Class 35.

2.14 MISCELLANEOUS STORM DRAINAGE PIPING SPECIALTIES

- A. Downspout Boots: Provide downspout boots made from cast gray iron in heights indicated with inlets of size and shape to suit downspouts.
 - 1. Outlet: NPS 4 (DN 100) outlet, to discharge into pipe.
 - 2. Cast with ears to attach to building.
 - 3. Size: Inlet size to match downspout and NPS 4 (DN 100) outlet.
 - 4. Finish: Prepare for field painting.
- B. Downspout Adaptors: Provide downspout adaptors made from cast gray iron casting, for attaching to horizontal-outlet, parapet roof drain and to exterior, sheet metal downspout.
 - 1. Inlet size to match parapet drain outlet.

2.15 PIPE BOLLARDS

- A. Provide Schedule 40 black steel pipe of size and height indicated as detailed on the Drawings.
- B. Permanent Setting:

1. Set posts in concrete to a depth of 3'-0"; footing diameter minimum 3 times post diameter.
 2. Fill posts completely with concrete and dome on top.
- C. Finish: Painted as specified in Division 9 "Exterior Painting."

2.16 PIPE GRID

- A. Provide pipe grid where indicated.
- B. Pipe grid consists of a set of pipe battens installed (in plan) perpendicular to the joists.
- C. Individual pipe battens in each set to be located on 6-foot centers.
- D. Rest end of pipe battens on a shelf angle (3 inches x 2 inches) on sides that have masonry wall and secure in place by means of "U" bolts at ends of all pipes.
- E. Rigidly support pipe grid by means of 1/2 inch threaded rods located on centers that shall not exceed 8 feet.
- F. Assemble entire grid into a unit structure.
- G. Pipe battens that compose the grid consists of 1-1/2 inch, Schedule 40, black pipe with battens spanning from wall to wall.
- H. Connect hangers to the overhead structure; hangers provided at each joist where joist crosses the line of the pipe batten.

2.17 FINISHES - STEEL AND IRON

- A. Galvanizing: For those items indicated for galvanizing, apply zinc coating by the hot-dip process complying with the following requirements:
 1. ASTM A 153 for galvanizing iron and steel hardware.
 2. ASTM A 123 for galvanizing both fabricated and unfabricated iron and steel products made of uncoated rolled, pressed, and forged shapes, plates, bars, and strip 0.0299 inch (0.76 mm) thick or thicker.
- B. Preparation for Shop Priming: Prepare uncoated ferrous metal surfaces to comply with minimum requirements indicated below for SSPC surface preparation specifications and environmental exposure conditions of installed metal fabrications:
 1. Exteriors (SSPC Zone 1B): SSPC-SP 6 "Commercial Blast Cleaning."
 2. Interiors (SSPC Zone 1A): SSPC-SP 3 "Power Tool Cleaning."
- C. Apply shop primer to uncoated surfaces of metal fabrications, except those with galvanized finishes or to be embedded in concrete, sprayed-on fireproofing, or masonry, unless otherwise indicated. Comply with requirements of SSPC-PA 1 "Paint Application Specification No. 1" for shop painting.

2.18 FINISHES - ALUMINUM

- A. Finish designations prefixed by AA conform to the system established by the Aluminum Association for designating aluminum finishes.
- B. As-Fabricated Finish: AA-M10 (Mechanical Finish: as fabricated, unspecified).
- C. Class I Natural Anodized Finish (unless indicated otherwise): AAMA 611 AA-M12C22A41 Clear anodic coating not less than 0.7 mils thick.

2.19 FABRICATION TOLERANCES

- A. Squareness: 1/8 inch maximum difference in diagonal measurements.
- B. Maximum Offset Between Faces: 1/16 inch.

- C. Maximum Misalignment of Adjacent Members: 1/16 inch.
- D. Maximum Bow: 1/8 inch in 48 inches.
- E. Maximum Deviation From Plane: 1/16 inch in 48 inches.

PART 3 EXECUTION

3.1 PREPARATION

- A. Coordinate and furnish anchorages, setting drawings, diagrams, templates, instructions, and directions for installing anchorages, including concrete inserts, sleeves, anchor bolts, and miscellaneous items having integral anchors that are to be embedded in concrete or masonry construction. Coordinate delivery of such items to Project site.
- B. Set sleeves in concrete with tops flush with finish surface elevations. Protect sleeves from water and concrete entry.

3.2 INSTALLATION

- A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing miscellaneous metal fabrications to in-place construction. Include threaded fasteners for concrete and masonry inserts, toggle bolts, through-bolts, lag bolts, wood screws, and other connectors as required.
- B. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing miscellaneous metal fabrications. Set metal fabrication accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.
- C. Provide temporary bracing or anchors in formwork for items that are to be built into concrete masonry or similar construction.
- D. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop-welded because of shipping size limitations. Do not weld, cut, or abrade the surfaces of exterior units that have been hot-dip galvanized after fabrication and are intended for bolted or screwed field connections.
- E. Field Welding: Comply with the following requirements:
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove welding flux immediately.
 - 4. At exposed connections, finish exposed welds and surfaces smooth and blended so that no roughness shows after finishing, and contour of welded surface matches those adjacent.
- F. Corrosion Protection: Coat concealed surfaces of aluminum that will come into contact with grout, concrete, masonry, wood, or dissimilar metals with a heavy coat of bituminous paint.

3.3 SETTING LOOSE PLATES

- A. Clean concrete bearing surfaces of bond-reducing materials, and roughen to improve bond to surfaces. Clean bottom surface of bearing plates.
- B. Set loose leveling and bearing plates on wedges or other adjustable devices. After the bearing members have been positioned and plumbed, tighten the anchor bolts. Do not remove wedges or shims, but if protruding, cut off flush with the edge of the bearing plate before packing with grout.
 - 1. Use nonshrink, nonmetallic grout, unless otherwise indicated.

2. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

3.4 ADJUSTING AND CLEANING

- A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with same material as used for shop painting to comply with SSPC-PA 1 requirements for touching up shop-painted surfaces.
 1. Apply by brush or spray to provide a 2.0-mil (0.05-mm) minimum dry film thickness.
- B. For galvanized surfaces, clean welds, bolted connections, and abraded areas, and apply galvanizing repair paint to comply with ASTM A 780.

END OF SECTION

SECTION 05 51 00 - METAL STAIRS**PART 1 GENERAL****1.1 SECTION INCLUDES**

- A. Stairs with concrete treads.
- B. Structural steel stair framing and supports.

1.2 RELATED REQUIREMENTS

- A. Section 03 30 00 - Cast-in-Place Concrete: Placement of metal anchors in concrete.
- B. Section 04 20 00 - Unit Masonry: Placement of metal fabrications in masonry.

1.3 REFERENCE STANDARDS

- A. ASTM A36/A36M - Standard Specification for Carbon Structural Steel.
- B. AWS D1.1/D1.1M - Structural Welding Code - Steel; American Welding Society.
- C. SSPC-SP 2 - Hand Tool Cleaning; Society for Protective Coatings.

1.4 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings: Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories.
 - 1. Include the design engineer's stamp or seal on each sheet of shop drawings.
- C. Delegated Design Data: As required by authorities having jurisdiction.
- D. LEED Report: Accurately document the use of recycled materials and local/regional materials, as required by Section 01 35 14, Section 01 35 15, Section 01 35 16 and appropriate forms, and Section 01 60 00.
 - 1. Provide documentation of recycled content type and percentage, location of extraction/recovery of primary raw materials, location of fabrication and costs.
- E. Welders' Certificates.

1.5 QUALITY ASSURANCE

- A. Structural Designer Qualifications: Professional Structural Engineer experienced in design of this work and licensed in the State of Maryland, or personnel under direct supervision of such an engineer.
- B. Welder Qualifications: Show certification of welders employed on the Work, verifying AWS qualification within the previous 12 months.

PART 2 PRODUCTS**2.1 METAL STAIRS - GENERAL**

- A. Metal Stairs: Provide stairs of the design specified, complete with landing platforms, vertical and horizontal supports, railings, and guards, fabricated accurately for anchorage to each other and to building structure.
 - 1. Regulatory Requirements: Provide stairs and railings complying with the most stringent requirements of local, state, and federal regulations; where requirements of the contract documents exceed those of regulations, comply with the contract documents.

2. Structural Design: Provide complete stair and railing assemblies complying with the applicable local code.
 3. Dimensions: As indicated on drawings.
 4. Shop assemble components; disassemble into largest practical sections suitable for transport and access to site.
 5. No sharp or rough areas on exposed travel surfaces and surfaces accessible to touch.
 6. Separate dissimilar metals using paint or permanent tape.
- B. Metal Jointing and Finish Quality Levels:
1. Architectural: All joints as inconspicuous as possible, whether welded or mechanical.
 - a. Welded Joints: Continuously welded and ground smooth and flush.
 - b. Mechanical Joints: Butted tight, flush, and hairline; concealed fastenings only.
 - c. Exposed Edges and Corners: Eased to small uniform radius.
 - d. Metal Surfaces to be Painted: Sanded or ground smooth, suitable for highest quality gloss finish.
- C. Fasteners: Same material or compatible with materials being fastened; type consistent with design and specified quality level.
- D. Anchors and Related Components: Same material and finish as item to be anchored, except where specifically indicated otherwise; provide all anchors and fasteners required.

2.2 METAL STAIRS WITH CONCRETE TREADS

- A. Jointing and Finish Quality Level: Architectural, as defined above.
- B. Risers: Closed.
- C. Treads: Metal pan with field-installed concrete fill.
1. Concrete Depth: 1-1/2 inches, minimum.
 2. Tread Pan Material: Steel sheet.
 3. Tread Pan Thickness: As required by design; 14 gage, 0.075 inch minimum.
 4. Concrete Reinforcement: None.
 5. Concrete Finish: For resilient floor covering.
- D. Risers: Same material and thickness as tread pans.
1. Nosing Depth: Not more than 1-1/2 inch overhang.
 2. Nosing Return: Flush with top of concrete fill, not more than 1/2 inch wide.
- E. Stringers: Rolled steel channels.
1. Stringer Depth: 12 inches unless greater is indicated on Drawings.
 2. End Closure: Sheet steel of same thickness as risers welded across ends.
- F. Landings: Same construction as treads, supported and reinforced as required to achieve design load capacity.
- G. Finish: Shop- or factory-prime painted.
- H. Under Side of Stair: Exposed to view, to be finished same as specified for other exposed to view surfaces.

2.3 MATERIALS

- A. Steel Sections: ASTM A 36/A 36M.
- B. Ungalvanized Steel Sheet: Hot- or cold-rolled, except use cold-rolled where finished work will be exposed to view.
1. Hot-Rolled Steel Sheet: ASTM A1011/A1011M, Designation CS (commercial steel).

2. Cold-Rolled Steel Sheet: ASTM A1008/A1008M, Designation CS (commercial steel).
- C. Concrete Fill: Portland cement Type I, 3000 psi 28 day strength, 2 to 3 inch slump.
- D. Concrete Reinforcement: Mesh type as detailed, unfinished.

2.4 SHOP FINISHING

- A. Clean surfaces of rust, scale, grease, and foreign matter prior to finishing.
- B. Do not prime surfaces in direct contact with concrete or where field welding is required.
- C. Prime Painting: Use specified shop- and touch-up primer.
 1. Preparation of Steel: In accordance with SSPC-SP 2, Hand Tool Cleaning.
 2. Number of Coats: One.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that field conditions are acceptable and are ready to receive work.

3.2 PREPARATION

- A. When field welding is required, clean and strip primed steel items to bare metal.
- B. Supply items required to be cast into concrete and embedded in masonry with setting templates.

3.3 INSTALLATION

- A. Install components plumb and level, accurately fitted, free from distortion or defects.
- B. Provide anchors, plates, angles, hangers, and struts required for connecting stairs to structure.
- C. Allow for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.
- D. Provide welded field joints where specifically indicated on drawings. Perform field welding in accordance with AWS D1.1.
- E. Other field joints may be either welded or bolted provided the result complies with the limitations specified for jointing quality levels.
- F. Obtain approval prior to site cutting or creating adjustments not scheduled.
- G. After erection, prime welds, abrasions, and surfaces not shop primed or galvanized, except surfaces to be in contact with concrete.

3.4 TOLERANCES

- A. Maximum Variation From Plumb: 1/4 inch per story, non-cumulative.
- B. Maximum Offset From True Alignment: 1/4 inch.

END OF SECTION

SECTION 05 52 13 - PIPE AND TUBE RAILINGS**PART 1 GENERAL****1.1 SECTION INCLUDES**

- A. Wall mounted handrails.
- B. Stair railings and guardrails.

1.2 RELATED REQUIREMENTS

- A. Section 03 30 00 - Cast-in-Place Concrete: Placement of anchors in concrete.
- B. Section 04 20 00 - Unit Masonry: Placement of anchors in masonry.
- C. Section 09 21 16 - Gypsum Board Assemblies: Placement of backing plates in stud wall construction.
- D. Section 09 21 16 - Gypsum Board Assemblies: Placement of backing plates in stud wall construction.

1.3 REFERENCE STANDARDS

- A. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
- B. ASTM A276/A276M - Standard Specification for Stainless Steel Bars and Shapes; 2016.
- C. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
- D. ASTM A554 - Standard Specification for Welded Stainless Steel Mechanical Tubing; 2015.
- E. ASTM E935 - Standard Test Methods for Performance of Permanent Metal Railing Systems and Rails for Buildings.
- F. ASTM E985 - Standard Specification for Permanent Metal Railing Systems and Rails for Buildings.
- G. AWS D1.6/D1.6M - Structural Welding Code - Stainless Steel; 2007.
- H. SSPC-Paint 15 - Steel Joist Shop Paint; The Society for Protective Coatings.

1.4 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings: Indicate profiles, sizes, connection attachments, anchorage, size and type of fasteners, and accessories.
 - 1. Non-welded field connections in aluminum handrails to be limited to greatest fabricated section lengths; locations accepted by Architect and consistent for multiple locations.
- C. LEED Report: Accurately document the use of recycled materials and local/regional materials, as required by Section 01 35 14, Section 01 35 15, Section 01 35 16 and appropriate forms, and Section 01 60 00.
 - 1. Provide documentation of recycled content type and percentage, location of extraction/recovery of primary raw materials, location of fabrication and costs.

1.5 QUALITY ASSURANCE

- A. Mock-up: Build mock-up section of guardrail with attached handrail to demonstrate aesthetic effects and set quality standards for fabrication and erection.
 - 1. Size: 42 inches high x 48 inches wide.

PART 2 PRODUCTS

2.1 RAILINGS - GENERAL REQUIREMENTS

- A. Design, fabricate, and test railing assemblies in accordance with the most stringent requirements of ASTM E985 and applicable local code.
- B. Design railing assembly, wall rails, and attachments to resist lateral force of 75 lbs at any point without damage or permanent set. Test in accordance with ASTM E 935.
- C. Allow for expansion and contraction of members and building movement without damage to connections or members.
- D. Dimensions: See drawings for configurations and heights.
 - 1. Infill: Round vertical pickets; size and spacing indicated on drawings.
- E. Provide anchors and other components as required to attach to structure, made of same materials as railing components unless otherwise indicated; where exposed fasteners are unavoidable provide flush countersunk fasteners.
 - 1. For anchorage to concrete, provide inserts to be cast into concrete, for bolting anchors.
 - 2. For anchorage to masonry, provide brackets to be embedded in masonry, for bolting anchors.
 - 3. For anchorage to stud walls, provide backing plates, for bolting anchors.
- F. Provide welding fittings to join lengths, seal open ends, and conceal exposed mounting bolts and nuts, including but not limited to elbows, T-shapes, splice connectors, flanges, escutcheons, and wall brackets.

2.2 STEEL RAILING SYSTEM

- A. Steel Tube: ASTM A 500, Grade B cold-formed structural tubing.
- B. Steel Pipe: ASTM A 53/A 53M, Grade B Schedule 40, black finish.
- C. Stainless Steel Components:
 - 1. ASTM A666, Type 304.
 - 2. Stainless Steel Tubing: 16 gage (0.0625 inch), 1-1/2 inch diameter.
 - 3. Stainless Steel Finish: No. 4 Satin.
- D. Welding Fittings: Factory- or shop-welded from matching pipe or tube; seams continuously welded; joints and seams ground smooth.
- E. Shop and Touch-Up Primer: SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction.

2.3 FABRICATION

- A. Accurately form components to suit specific project conditions and for proper connection to building structure.
- B. Fit and shop assemble components in largest practical sizes for delivery to site.
- C. Fabricate components with joints tightly fitted and secured. Provide spigots and sleeves to accommodate site assembly and installation.
- D. Welded Joints:
 - 1. Exterior Components: Continuously seal joined pieces by continuous welds. Drill condensate drainage holes at bottom of members at locations that will not encourage water intrusion.
 - 2. Interior Components: Continuously seal joined pieces by continuous welds.

3. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.
4. Select proper welding method to result in consistent finish with final finish.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install components plumb and level, accurately fitted, free from distortion or defects, with tight joints.
- C. Anchor railings securely to structure.
- D. Conceal anchor bolts and screws whenever possible. Where not concealed, use flush countersunk fastenings.
- E. Handrail Field Joints:
 1. Clean area to be joined thoroughly.
 2. Apply epoxy adhesive to inside of pipe.
 3. Insert sleeve and fit components together, wipe excessive adhesive.
 4. Provide stainless steel set screws concealed on underside of handrail; fill head with epoxy setting adhesive and clean excess.

3.2 TOLERANCES

- A. Maximum Variation From Plumb: 1/4 inch per floor level, non-cumulative.
- B. Maximum Offset From True Alignment: 1/4 inch.
- C. Maximum Out-of-Position: 1/4 inch.

END OF SECTION

SECTION 05 53 20 - STAIR NOSINGS**PART 1 GENERAL****1.1 SECTION INCLUDES**

- A. Extruded aluminum stair nosings at exterior locations.

1.2 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Manufacturers product specifications, installation and maintenance instructions.
- C. Samples for initial selection, in the form of manufacturer's color charts or sections of units showing the full range of colors.
- D. Samples for verification, in the form of sections of units in manufacturer's standard sizes; prepare samples from same material to be used for the Work.

1.3 QUALITY ASSURANCE

- A. Single Source Responsibility: Obtain stair nosings from one source and from a single manufacturer.

1.4 SEQUENCING AND SCHEDULING

- A. Coordinate with metal stairs so that nosing sub-bases are available for placing integrally with metal pan stair fill.

PART 2 PRODUCTS**2.1 EXTRUDED ABRASIVE NOSINGS**

- A. Provide extruded aluminum units with abrasive filler consisting of aluminum oxide or silicon carbide grits, or a combination of both, in an epoxy-resin binder. Furnish in lengths as required to accurately fit each opening or conditions.
 - 1. Provide ribbed units, with abrasive filler strips projecting 1/16 inch (1.5 mm) above the aluminum extrusion and having the maximum recycled content feasible.
 - a. Primary Color: To be selected.
 - b. Highlight Color: Contrasting; to be selected.
 - 2. Provide two-piece design. Sub-channel to be set with stair pan fill (use plywood filler for tread).
- B. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the Work include, but are not limited to, the following:
 - 1. American Safety Tread Co., Inc.; TP-311 Ribbed
 - 2. Arden Architectural Specialties, Inc.; N-TB30
 - 3. Balco/Metalines, Inc.; DST-330
- C. Provide anchors for embedding units in concrete, either integral or applied to units, as standard with the manufacturer.
- D. Drill for mechanical anchors with countersunk holes located not more than 4 inches (100 mm) from ends and not more than 12 inches (300 mm) o.c., evenly spaced between ends, unless otherwise indicated. Provide closer spacing if recommended by the manufacturer.
- E. Set elevation of sub-channel and concrete fill levels to provide flush installation to top of finish.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Furnish sub-channel to exterior concrete step installer for installation at appropriate time.

3.2 INSTALLATION

- A. Install stair nosings in accordance with manufacturer's instructions.
- B. Install sub-channel with concrete fill.
- C. Install tread insert prior to Substantial Completion and protect from damage until acceptance; set insert in sealant applied to sub-channel and clean any sealant seeping from joint following installation of insert.
- D. Work shall be aligned plumb, level, and, where required, flush with adjacent surfaces and rigidly anchored to the substrate.
- E. Clean exposed surfaces as recommended by the manufacturer.

END OF SECTION

SECTION 05 58 13 - COLUMN COVERS**PART 1 GENERAL****1.1 This Section includes:**

- A. Decorative column covers.

1.2 SUBMITTALS

- A. Product Data: Manufacturer's data sheets on each product to be used, including:
 - 1. Preparation instructions and recommendations.
 - 2. Storage and handling requirements and recommendations.
 - 3. Installation methods.
- B. Shop Drawings:
 - 1. Shop drawings shall show dimensions, sizes, thickness, alloy(s), temper(s), finishes, joint(s), attachments and the relationship of adjoining work.
- C. Selection Samples: For each finish product specified, two complete sets of color chips representing manufacturer's full range of available colors and patterns.
- D. Verification Samples: For each finish product specified, two samples, minimum size 6 inches (150 mm) square, which depict actual product, color, and patterns.
- E. Certification:
 - 1. Submit certificates from column cover manufacturer attesting that products comply with specified requirements, including finish as specified.
 - 2. Submit list of projects completed. Projects listed shall be of similar type, scope and size, and shall have all necessary contact information for verification by the owner or Architect of Record.

1.3 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Single manufacturer with a minimum of ten projects of similar size and scope in the past five years shall manufacture, fabricate and deliver column covers and all primary products specified in this section.
- B. Installer / Fabricator Qualifications: Fabricator shall have a minimum of five years experience installing systems of similar type and scope as those specified in this section.
 - 1. Fabricator must own and operate facilities capable of creating and finishing all metal components.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Protect all materials during fabrication, shipment, site storage and erection to prevent damage to the finished work from other trades.
- B. Store column covers inside a well-ventilated area, away from uncured concrete and masonry and protected from weather, moisture, soiling, abrasion, extreme temperatures and humidity.
- C. Store and dispose solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

1.5 PROJECT CONDITIONS

- A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

1.6 WARRANTY

- A. Upon project close-out, provide Owner with a copy of the manufacturers standard one (1) year limited warranty against manufacturing defect on the column covers.
- B. Warranty on Column Cover Finishes may be extended up to a maximum of twenty-five (25) years following date of substantial completion.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Acceptable Manufacturer: Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the manufacturers specified.
 - 1. C/S Group.
 - 2. Fry Reglet Architectural Metals.
 - 3. Metalwerks.
 - 4. Nelson Industrial Inc.
 - 5. Pittcon.

2.2 MATERIALS

- A. All secondary mounting posts, anchors, clips and fasteners are to be provided as a complete package of this work.
- B. No exposed fasteners for metal closures are allowed.
- C. Aluminum:
 - 1. Minimum 0.090 inch thickness.
 - 2. Finish: Fluoropolymer coating containing minimum 70 percent Kynar resin or epoxy powder coat finish; match Architect's sample for color.

2.3 FABRICATION

- A. Design:
 - 1. Column covers shall have a closed vertical joint
 - 2. Provide recessed base and ceiling details including curved trim for ceiling support.
 - 3. Provide horizontal reveal 2'-8" above finished floor.
- B. Column cover shall be manufactured true to round geometry as shown on plan view of architectural drawings with a tolerance of +/- 1/16 inch (1.5mm).

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install column cover in accordance with manufacturer's written installation instructions and shop drawings.
- B. Column cover shall be erected plumb, level, square, true to line, securely anchored, and in proper alignment and relationship to work of other trades.
- C. Column cover shall be inspected before installation to be free from dents, scratches and other defects.

3.2 CLEANING

- A. Removal of protective covering shall occur immediately after installation to prevent adhesive transfer.
- B. Clean all surfaces following installation.
- C. Maintenance per manufacturer's finish maintenance instructions.

3.3 PROTECTION

- A. Protection of column covers from damage by other trades after installation. Protection to remain in place until directed by Architect.

END OF SECTION