

SECTION 05 50 00

METAL FABRICATIONS

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Shop fabricated metal items, related accessories, and fasteners.
 - 2. Strut system supports.

- B. Related Sections:
 - 1. Section 05 05 23 - Standards for Anchors and Fasteners.
 - 2. Section 09 91 00 - Painting.

1.02 REFERENCE STANDARDS

- A. American Architectural Manufacturers Association:
 - 1. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum.

- B. American Welding Society:
 - 1. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination.
 - 2. AWS D1.1/D1.1M - Structural Welding Code - Steel.
 - 3. AWS D1.2 - Structural Welding Code – Aluminum.

- C. ASTM International:
 - 1. ASTM A36/A36M - Standard Specification for Carbon Structural Steel.
 - 2. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
 - 3. ASTM A108 - Standard Specification for Steel Bar, Carbon and Alloy, Cold-Finished.
 - 4. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
 - 5. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
 - 6. ASTM A283/A283M - Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates.
 - 7. ASTM A325 - Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength.
 - 8. ASTM A325M - Standard Specification for Structural Bolts, Steel, Heat Treated 830 MPa Minimum Tensile Strength (Metric)
 - 9. ASTM A336/A336M - Standard Specification for Alloy Steel Forgings for Pressure and High-Temperature Parts.
 - 10. ASTM A501 - Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing.
 - 11. ASTM A527/A527M - Standard Specification for High Strength Low Alloy Columbium Vanadium Structural Steel.
 - 12. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
 - 13. ASTM A992/A992M - Standard Specification for Steel for Structural Shapes for use in Building Framing.
 - 14. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
 - 15. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars,

Rods, Wire, Profiles, and Tubes (Metric).

16. ASTM B633 - Electrodeposited coatings of Zinc on Iron and Steel.

D. California Department of Health Services:

1. CA/DHS/EHLB/R-174 - Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers, including 2004 Addenda.

E. The Society for Protective Coatings:

1. SSPC-Paint 15 - Steel Joist Shop Primer.
2. SSPC-Paint 20 - Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic").
3. SSPC-SP 2 - Surface Preparation Specification No. 2 Hand Tool Cleaning.

1.03 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate with other work supporting or adjoining miscellaneous metal and verify requirements for cutting out, fitting, and attaching.
2. [Coordinate strut system components with equipment installation specified in Section 11 70 00 - Healthcare Equipment.]

B. [Preinstallation Meeting:]

C. [Sequencing:]

D. Scheduling:

1. Ensure timely fabrication of items to be embedded or enclosed by other work.
2. Furnish information and assistance required for locating embedded items and be responsible for proper location.

1.04 [SUSTAINABLE CHARACTERISTICS]

A. Section 01 35 63 - Sustainability Project Requirements: Requirements for sustainable design compliance.

B. Materials and Resources Characteristics:

1. [Recycled Content Materials: Furnish materials with maximum available recycled content including:

SPEC NOTE *List materials specified in this section required to have recycled content.*

a. Steel must have a minimum of 65 percent post consumer recycled content and 20 percent post industrial recycled content

b. [_____.]

2. [Regional Materials: Furnish materials extracted, processed, and manufactured within 500 miles of Project site.]

SPEC NOTE *List materials specified in this section required to be regional materials.*

a. [_____.]

C. Indoor Environmental Quality Characteristics:

1. Paints and Coatings: Maximum volatile organic compound content in accordance with product and testing requirements of CA/DHS/EHLB/R-174.

1.05 SUBMITTALS

A. See Section 01 33 00 - Submittal Procedures, for submittal procedures.

- B. Shop Drawings:
 - 1. Show at large scale construction of various components including profiles, sizes, thickness of metals, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories.
 - 2. Include erection drawings, elevations, and details where applicable.
 - 3. Indicate welded connections using standard AWS A2.4 welding symbols. Indicate net weld lengths.
 - 4. Include information regarding concealed and exposed joints, welds, and fastenings.
 - 5. Where welded connectors, concrete, or masonry inserts are required to receive work, show size and locations required.
- C. Welders' Certificates: Submit certification for welders employed on the project, verifying AWS qualification within the previous 12 months.
- D. Samples: Only as requested.

1.06 [SUSTAINABLE DESIGN SUBMITTALS]

- A. Section 01 35 63 - Sustainability Project Requirements: Requirements for sustainable design submittals.
- B. Manufacturer's Certificate: Certify products meet or exceed specified sustainable design requirements.
 - 1. Materials Resources Certificates:
 - a. Certify source and origin for [salvaged] and][reused] products.
 - b. Certify recycled material content for recycled content products.
 - c. Certify source for regional materials and distance from Project site.
 - 2. Indoor Air Quality Certificates:
 - a. Certify volatile organic compound content for each interior paint and coating.
- C. Product Cost Data: Submit cost of products to verify compliance with Project sustainable design requirements. Exclude cost of labor and equipment to install products.
 - 1. Provide cost data for the following products:
 - a. Salvaged products.
 - b. Reused products.
 - c. Products with recycled material content.
 - d. Regional products.

1.07 QUALITY ASSURANCE

- A. Welders' Qualifications: Welders employed on the Work shall be certified in accordance with AWS D1.1/D1.1M within previous 12 months

1.08 DELIVERY, STORAGE, AND HANDLING

- A. Accept metal fabrications on site in labeled shipments. Inspect for damage.
- B. Deliver, store, and handle packaged materials in original containers with seals unbroken and labels intact until time of use.
- C. Discharge materials carefully and store on clean concrete surface or raised platform in safe, dry area. Do not dump onto ground.
- D. Protect metal fabrications from damage by exposure to weather.

PART 2 PRODUCTS

2.01 METAL MATERIALS

- A. Ferrous Metal:
 - 1. Structural Steel Shapes: ASTM A992/A992M.
 - 2. Structural Steel Channels, Angles, and Tees: ASTM A36/A36M.
 - 3. Miscellaneous Steel Items: ASTM A283/A283M.
 - 4. Steel Plates to be bent or Cold formed: ASTM A283/A283M, Grade C.
 - 5. Steel Bars and Bar-Size Shapes: ASTM A36/A36M.
 - 6. Cold-Rolled Carbon Steel Sheets: ASTM A336/A366M.
 - 7. Galvanized Carbon Steel Sheets: ASTM A653/A653M, with G90 zinc coating.
 - 8. Cold-Finished Steel Bars: ASTM A108.
 - 9. Steel Tubing (Hot-Formed, Welded, Or Seamless): ASTM A501.
 - 10. Steel Pipe: ASTM A53/A53M.

- B. Aluminum:
 - 1. Extrusions: ASTM B221, Alloy 6063, Temper T6.
 - 2. Sheets and Plates: ASTM B209, Alloy [_____], Temper [_____].
 - 3. Tubing: ASTM B210, Alloy 6063, Temper T6.
 - 4. Bars, Rods, and Wire: ASTM B211, Alloy 6063, Temper T6.

- C. Strut System Components:
 - 1. Description: Channel members and bolted connections fabricated to support loads without welded connections. Provide necessary nuts, bolts, connecting angles and accessories required for a functional system
 - 2. Product: Unistrut Corp.'s "Unistrut"; Grinnell Supply Sales Co.'s "Power-Strut"; Thomas & Betts Co.'s "Super Strut"; or equal. Numbers noted on Drawings are "Unistrut" to indicate desired sizes, configurations, and structural requirements.
 - 3. Finish: Manufacturer's standard corrosion resistant coating.

2.02 ACCESSORIES

- A. Fastenings for Ferrous Items:
 - 1. Provide Type 304 or 316 stainless steel fasteners for exterior use, and zinc plated fasteners with coating complying with ASTM B633, Class FE/ZNS.
 - 2. Bolts, Nuts, and Washers: ASTM A325/ASTM A325M, Type 1, galvanized to ASTM A153/A153M where connecting galvanized components.
 - 3. Expansion Anchors: [Comply with requirements on Drawings.]—~~or~~—[Wedge and sleeve type as noted. Hilti Inc.'s "Kwik Bolt TZ Expansion Anchors"; ITW Redhead's "Trubolt Wedge"; or equal.]

- B. Fastenings for Aluminum Items:
 - 1. Bolts, Nuts, and Washers: Stainless steel.

- C. Welding Materials:
 - 1. Steel: AWS D1.1/D1.1M; type required for materials being welded.
 - 2. Aluminum: AWS D.2; type required.

- D. Shop and Touch-Up Primer: SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction.

- E. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20, Type I - Inorganic, complying with VOC limitations of authorities having jurisdiction.

2.03 FABRICATION

- A. Preparation:
1. Verify sizes, designs, and locations of items; do so at site whenever construction progress permits.
- B. General Requirements:
1. Fabricate items from materials noted and make true to profiles shown. Obtain University's Representative's approval of proposed variations.
 2. Fit and shop assemble items in largest practical sections, for delivery to site.
 3. Fabricate related components of same material as fabrication.
 4. Fabricate items with joints tightly fitted and secured.
 5. Fabricate items with joints tightly fitted and secured.
 6. Miter corners and angles of frames and moldings unless otherwise noted.
 7. 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.
 8. Perform cutting, shearing, drilling, punching, threading, tapping as required for items or their adjacent work.
 9. Drill or punch holes; do not use cutting torch.
 10. Ensure shearing and punching leaves true lines and surfaces.
 11. Items to be Galvanized: Fabricate in accordance with recommended practices of ASTM A385/A385M and A123/A123M unless otherwise noted.
 12. Fabricate exterior items for assembly and installation on site without field-welding of joint.
 13. Ensure metal thickness and assembly details provide ample strength and stiffness.
 14. Supply components required for anchorage of fabrications.
- C. Anchorages and Fastenings
1. Fabricate anchors of same material and finish as fabrication, except where specifically noted otherwise.
 2. Provide fasteners and anchor assemblies required for complete fabrication, field assembly, and erection.
 3. Conceal fastenings wherever practicable.
 4. Size internally threaded diameters to accommodate galvanized threaded bolts where galvanizing is required.
 5. Employ welding wherever practicable; avoid bolts and screws.
 6. [Exterior Items: Provide for bolted field joints.]
- D. Welding:
1. Weld fabrication in accordance with AWS D1.1/D1.1M for ferrous fabrications [and AWS D1.6 for stainless steel fabrications].
 2. Weld corners and seams continuously.
 3. Maintain shape and profile of item welded.
 4. Prevent heat blisters, run-through, and surface distortions.
 5. Watertight Welds: Make continuous, free of voids, or cracks.
 6. At visually exposed connections, grind welds smooth and flush to match and blend with adjoining surfaces
 7. Field welding of interior items or exterior items encased in concrete will be permitted; field welding of exposed exterior items will not be permitted.
- E. Bolted and Screwed Connections:
1. Use bolts for field connections only, and then only as noted. Countersink heads; finish smooth and flush.
 - a. Provide washers under heads and nuts bearing on wood.
 - b. Draw nuts tight and prevent loosening of permanent connections by nicking threads.
 - c. Use beveled washers where bearing is on sloped surfaces.

2. Where necessary to use screws for permanent connections in ferrous metal, use flat head type, countersink, fill screw slots, and finish smooth and flush.
3. Evenly space exposed heads.

2.04 FACTORY APPLIED FINISHES - STEEL

- A. Prime paint all steel items.
 1. Exceptions: Galvanize items to be embedded in concrete or masonry.
 2. Exceptions: Do not prime surfaces in direct contact with concrete, where field welding is required, and items to be covered with sprayed fireproofing.
- B. Prepare surfaces to be primed in accordance with SSPC-SP2.
- C. Clean surfaces of rust, scale, grease, and foreign matter prior to finishing.
- D. Prime Painting: One coat.
- E. Galvanizing of Structural Steel Members: Galvanize after fabrication to ASTM A123/A123M requirements. Provide minimum 1.7 ounce per square foot galvanized coating.
- F. Galvanizing of Non-structural Items: Galvanize after fabrication to ASTM A123/A123M requirements.

2.05 FACTORY APPLIED FINISHES - ALUMINUM

- A. Exterior Aluminum Surfaces: Class I natural anodized.
- B. Interior Aluminum Surfaces: Class I natural anodized.
- C. Class I Natural Anodized Finish: AAMA 611 AA-M12C22A41 Clear anodic coating not less than 0.7 mils thick.

2.06 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

3.01 EXAMINATION

- A. Examine areas to receive work and verify that:
 1. Field conditions and dimensions are acceptable and are ready to receive items.
 2. At stud or furred conditions, solid blocking or backing has been provided complete with spacer washers welded on.
- B. Do not start installation until unsatisfactory conditions have been corrected.

3.02 PREPARATION

- A. Clean and strip primed steel items to bare metal where site welding is required.
- B. Supply setting templates to the appropriate entities for steel items required to be cast into concrete.

3.03 INSTALLATION

- A. Install items plumb and level, accurately fitted, free from distortion or defects.
- B. Install items plumb, true, rigid, and neatly trimmed out.
- C. Provide for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.
- D. Do not tighten fastener through finish alone without spacer washers.
- E. Field weld components indicated on Drawings or reviewed Shop Drawings.
- F. Perform field welding in accordance with AWS D1.1.
- G. Bolt field joints on exterior items; do not weld, unless specifically indicated otherwise..
- H. After erection, prime welds, abrasions, and surfaces not shop primed or galvanized, except surfaces to be in contact with concrete.
- I. Protect dissimilar metals from contact with each other or with other materials causing corrosion.
- J. Fasten work tightly to prevent rattle or vibration except where expansion-contraction tolerances are required.
- K. Obtain approval of University's Representative prior to site cutting or making adjustments not scheduled.
- L. Protect metal from damage to surface, profile, and shape.
- M. Touch-Up Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint. Paint exposed areas with same material used for shop painting. Apply by brush or spray to provide a minimum dry film thickness of 2.0 mils.
- N. For Galvanized Surfaces: Clean field welds, bolted connections and abraded areas and apply galvanizing repair paint.

3.04 ERECTION TOLERANCES

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

3.05 CLEANING

- A. Remove protective devices only when items will be safe from other construction operations or removal is required to permit related work.
- B. Clean prime coated items as required for finish painting.
- C. [After erection, thoroughly clean surfaces of foreign or deleterious matter such as dirt, mud, oil, or grease that would impair bonding of fireproofing or concrete.]

END OF SECTION