SECTION 05400

COLD-FORMED METAL FRAMING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. Section includes: Work of this Section consists of installing all materials furnished under this Section, including all equipment, labor, services, and incidental items required to complete work as shown on Drawings and specified in this Section.

1. Light gage steel framing, including cross-bridging, bracing and anchoring to the building structure, complete in all respects.
2. Light gage steel framing for miscellaneous framing and supports.

B. Related Sections:

1. 04200 "Unit Masonry".
2. 05500 "Metal Fabrications"; for masonry shelf angles and connections.
3. 09255 "Gypsum Board Assemblies"; for gypsum board and interior metal-stud framing and ceiling-suspension assemblies.

1.03 PERFORMANCE REQUIREMENTS

A. AISI Specifications: Calculate structural characteristics of cold-formed metal framing according to AISI's Load and Resistance Factor Design Specification for Cold-Formed Steel Structural Members and Center for Cold-Formed Steel Structures (CCFSS) Technical Bulletin, Vol. 2, No. 1, February 1993 AISI Specification Provisions for Screw Connections.

B. Structural Performance: Engineer, fabricate, and erect cold-formed metal framing with following minimum physical and structural properties:

1. Design framing systems to withstand design loads without deflections greater than following:

   a. Lateral deflection of L/720 of wall height.

2. Design framing systems to provide for movement of framing members without damage or overstressing, sheathing failure, connection failure, undue strain on fasteners and anchors, or other detrimental effects when subject to maximum ambient temperature change (range) of 120 deg. F.
3. Engineering responsibility: Engage fabricator who assumes undivided responsibility for engineering cold-formed metal framing by employing qualified professional engineer to prepare design calculations, shop drawings, and other structural data.

1.04 SUBMITTALS

A. Product Data: Submit for each type of cold-formed metal framing, accessory, and product specified.

B. Shop Drawings:

1. Show layout, spacing, sizes, thicknesses, and types of cold-formed metal framing, fabrication, fastening and anchorage details, including mechanical fasteners.
2. Show reinforcing channels, opening framing, supplemental framing, strapping, bracing, bridging, splices, accessories, connection details, and attachments to other units of work.
3. For cold-formed metal framing indicated to comply with certain design loadings, include structural analysis data sealed and signed by licensed structural engineer who was responsible for its preparation and is registered in State of Maine.

1.05 QUALITY ASSURANCE

A. Qualifications:

1. Installer: Engage experienced Installer who has completed cold-formed metal framing similar in material, design, and extent to that indicated for this Project and with record of successful in service performance.
2. Professional Engineer: Professional engineer legally authorized to practice in jurisdiction where Project is located and experienced in providing engineering services of kind indicated that have resulted in installation of cold-formed metal framing similar to this Project in material, design, and extent and that have record of successful in-service performance.

B. Welding Standards:

1. Comply with applicable provisions of AWS D1.1 Structural Welding Code-Steel and AWS D1.3 Structural Welding Code-Sheet Steel.
2. Certify that each welder has satisfactorily passed AWS qualification tests for welding processes involved and, if pertinent, has undergone recertification within past 6 months.

1.06 DELIVERY, STORAGE AND HANDLING

A. Protect cold-formed metal framing from corrosion, deformation, and other damage during delivery, storage and handling.

B. Store cold-formed metal framing, protect with waterproof covering, and ventilate to avoid condensation.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Cold-Formed Metal Framing: Alabama Metal Industries Corp., Dale Industries Inc., Incor Plant Dale Industries, Marino\Ware Div. (Ware Industries, Inc.), Unimast Inc., United States Steel, Western Metal Lath Co.

2.02 MATERIALS

A. Galvanized-Steel Sheet:

1. ASTM A446 (ASTM A446M), zinc-coated according to ASTM A525 (ASTM A525M).
2. Coating Designation – Masonry Construction: G90, (Z 275).
3. Grade: Grade A, 33,000 psi minimum yield strength, 20 percent elongation.

B. Steel Studs: Manufacturer's standard C-shaped steel studs of web depths indicated, with lipped flanges, and complying with following:

1. Design Uncoated-Steel Thickness: Min. 0.0474 in.
2. Flange Width: Min. 1-5/8 in.
3. Web: Unpunched.

C. Steel Track: Manufacturer's standard U-shaped steel track, unpunched, of web depths indicated, with straight flanges, and complying with following:

1. Design Uncoated-Steel Thickness: Matching steel studs.
2. Flange Width: Standard flange elsewhere.

D. Framing Accessories:

1. Fabricate steel framing accessories of same material and finish used for framing members, with 33,000 psi minimum yield strength.
2. Provide accessories of manufacturer's standard thickness and configuration, unless otherwise indicated, as follows:

a. Supplemental framing.
b. Bracing, bridging, and solid blocking.
c. Web stiffeners.
d. Gusset plates.
e. Deflection track and vertical slide clips.
f. Stud kickers and girts.
g. Reinforcement plates.

E. Anchors, Clips, and Fasteners:

1. Steel Shapes and Clips: ASTM A36 (ASTM A36M), zinc-coated by hot-dip process according to ASTM A123.
2. Power-Actuated anchors: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with capability to sustain, without failure, load equal to 10 times design load, as determined by testing per ASTM E1190 conducted by qualified independent testing agency.
3. Mechanical Fasteners:

a. Corrosion-resistant-coated, self-drilling self-threading steel drill screws.
b. Head-Type: Low-profile head beneath sheathing, manufacturer's standard elsewhere.

4. Welding Electrodes: Comply with AWS standards.

F. Miscellaneous Materials:

1. Galvanizing Repair Paint: SSPC-Paint 20 with dry film containing min. 94 percent zinc duct by weight.
2. Nonmetallic, Nonshrink Grout: Premixed, nonmetallic, noncorrosive, nonstaining grout containing selected silica sands, portland cement, shrinkage-compensating agents, plasticizing and water-reducing agents, complying with ASTM C1107, with fluid consistency and 30-minute working time.
3. Thermal Insulation for Inaccessible Voids Created During Framing Installation: ASTM C665, Type I, unfaced mineral-fiber blankets produced by combining glass fibers with thermosetting resins.

2.03 FABRICATION

A. General:

1. Fabricate cold-formed metal framing and accessories plumb, square, true to line, and with connections securely fastened, according to manufacturer's recommendations and requirements of this Section.
2. Fabricate framing assemblies in jig templates.
3. Cut framing members by sawing or shearing; do not torch-cut.

B. Assembly:

1. Fasten cold-formed metal framing members by welding or screw fastening, as standard with fabricator; do not wire-tie framing members.
2. Comply with AWS requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
3. Locate mechanical fasteners and install according to cold-framed metal framing manufacturer's instructions with screw penetrating joined members by not less than three exposed screw threads.
4. Fasten other materials to cold-formed metal framing by welding, bolting, screw-fastening, according to manufacturer's recommendations.
5. Reinforce, stiffen, and brace framing assemblies to withstand handling, delivery, and erection stresses.
6. Lift fabricated assemblies to prevent damage or distortion.

C. Fabrication Tolerances: Fabricate assemblies to maximum allowable tolerance variation from plumb, level, and true to line of 1/8 in. in 10 ft. and as follows:

1. Spacing:

a. Space individual framing members max. +/- 1/8 in. for plan location.
b. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finished materials.

2. Squareness: Fabricate each cold-formed metal framing assembly to maximum out- of-square tolerance of 1/8 in.

PART 3 - EXECUTION

3.01 INSTALLATION

A. General:

1. Cold-formed metal framing may be shop- or field-fabricated for installation, or it may be field-assembled.
2. Install cold-formed metal framing and accessories plumb, square, true to line, and with connections securely fastened, according to manufacturer's recommendations and requirements of this Section.
3. Cut framing members by sawing or shearing; do not torch-cut.
4. Fasten cold-formed metal framing members by welding or screw-fastening, as standard with fabricator.
5. Do not wire-tie framing members.
6. Comply with AWS requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.

7. Locate mechanical fasteners and install according to cold-formed metal framing manufacturer's instructions with screw penetrating joined members min. 3 exposed screw threads.
8. Install framing members in one-piece lengths, unless spice connections are indicated for track or tension members.
9. Provide temporary bracing and leave in place until framing is permanently stabilized.
10. Do not bridge building expansion and control joints with cold-formed metal framing; independently frame both sides of joints.
11. Install insulation in built-up exterior framing members, such as headers, sills, boxed joists, and double studs, inaccessible on completion of framing work.
12. Fasten reinforcement plate over web penetrations that exceed size of manufacturer's standard punched openings.

B. Erection Tolerances:

1. Install cold-formed metal framing to maximum allowable tolerance variation from plumb, level, and true to line of 1/8 in. in 10 ft. and as follows:

   a. Space individual framing members max. +/- 1/8 in. from plan location.
   b. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.

3.02 REPAIRS AND PROTECTION

A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on fabricated and installed cold-formed metal framing with galvanizing repair paint according to ASTM A780 and manufacturer's instructions.

B. Protect gypsum sheathing that will be exposed to weather for more than one month as follows:

1. Protect cutouts, corners, and joints in sheathing by filling with flexible sealant or by applying tape recommended by sheathing manufacturer at time sheathing is applied.
2. Provide final protection and maintain conditions in manner acceptable to manufacturer and installer to ensure cold-formed metal framing is without damage or deterioration at Substantial Completion.

END OF SECTION 05400

SECTION 05500

METAL FABRICATIONS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. Section Includes: Work of this Section consists of installing all materials furnished under this Section, including all equipment, labor, services, and incidental items required to complete work as shown on Drawings and specified in this Section.

1. Loose steel lintels with shop-applied galvanized and primed coating.
2. Miscellaneous framing and supports with shop-applied galvanized coating for following items of work in other Sections to Include:

   a. Steel framing and supports for mechanical and electrical equipment.
   b. Applications where framing and supports are not specified in other Sections.

3. Removable custom steel plates to cover existing utility trench.

B. Related Sections:

1. 09900 "Painting"; for field-applied finish coatings to shop-primed metal fabrications.

C. Products Furnished by Not installed as Work of this Section:

1. 04200, "Unit Masonry"; for installation of lintels and top of wall bracing.

1.03 SYSTEM PERFORMANCE

A. Design Criteria:

1. Structural Performance of Handrails and Railing System: Design, engineer, fabricate, and install handrails and railing systems to comply with requirements of ASTM E985 for structural performance based on testing performed in accordance with ASTM E894 and E935.
2. Structural Performance:

   a. Design engineer, fabricate, and install mandated metal fabrications to withstand mandated structural loads without exceeding allowable design working stress of materials involved, including anchors and connections.
   b. Apply each load to produce maximum stress in each respective component of each metal fabrication.

3. All stairs, walkways and service platforms shall be constructed in accordance with OSHA requirements.

1.04 SUBMITTALS

A. Product Data: Submit manufacturer's specifications, anchor details, and installation instructions for products used in miscellaneous metal fabrications, including shop-applied paint products and grout.

B. Shop Drawings:

1. Submit shop drawings for fabrication and erection of miscellaneous metal fabrications.
2. Include plans, elevations, and details of sections and connections.
3. Show anchorage and accessory items.
4. Provide templates for anchor and bolt installation by others.
5. Where materials or fabrications are indicated to comply with certain requirements for design loadings include structural computations, materials properties, and other information needed for structural analysis.
6. Provide shop drawings signed and sealed by registered professional engineer licensed in State of Maine.

1.05 QUALITY ASSURANCE

A. Qualifications:

1. Fabricator: Firm experienced in successfully producing metal fabrications similar to that indicated in this Project, with sufficient production capacity to provide required units without causing delay in work.
2. Installer: Arrange for installation of metal fabrications specified in this Section by same firm that fabricated them.
3. Welding and Welders:

a. Qualify welding processes and welding operators in accordance with AWS D1.1, Structural Welding Code – Steel; D1.3, Structural Welding Code – Sheet Steel; and D1.2, Welding Code – Aluminum.
b. Certify each welder has satisfactorily passes AWS qualification tests for welding processes involved and, if pertinent, has undergone recertificaton.

4. Engineer: Professional engineer licensed to practice in jurisdiction where Project is located and experienced in providing engineering services of kind indicated that have resulted in successful installation of metal fabrications similar in material, design, and extent to that indicated for Project.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Ferrous Metals:

1. Metal Surfaces – General: For fabrication of miscellaneous metal work which will be exposed to view, use only materials which are smooth and free of surface blemishes including pitting, seam marks, roller marks, rolled trade names, and roughness.
2. Steel Plates, Shapes, and Bars: ASTM A36.
3. Steel Tubing: Cold-formed, ASTM A500, Grade A, unless otherwise indicated or required for design loading.
4. Steel Tubing: Hot-formed, ASTM A501, for exterior installations and where indicated, provide with hot-dip galvanized coating per ASTM A53.
5. Steel Pipe: ASTM A53, finish, type and weight class as follows:

a. Galvanized finish for exterior installations and where indicated.
b. Type S: Grade A, standard weight, Schedule 40, unless otherwise indicated, or another grade or weight or both, required by structural loads.

6. Slotted Channel Framing:

a. Cold-formed metal channels with flanged edges returned toward web and with 9/16 in. wide slotted holes in webs at 2 in. o.c.
b. Channel Size – Width and Depth: 1-5/8 in.
c. Metal and Thicknesses: Galvanized steel complying with ASTM A653, Structural Quality, Grade 33, with G90 coating; 0.108 in. nominal thickness.
d. Finish: Rust-inhibitive, baked –on, acrylic enamel.
e. Product: Unistrut Corp. Model Metal Channel Framing System.

7. Brackets, Flanges and Anchors: Cast or formed-metal of same type material and finish as supported rails, unless otherwise indicated.
8. Concrete Inserts:

a. Threaded or wedge-type; galvanized ferrous castings, either malleable iron, ASTM A47, or cast steel, ASTM A27.
b. Provide bolts, washers and shims as required, hot-dip galvanized, ASTM A153.

9. Welding Rods and Bare Electrodes: Select according to AWS Specification for metal alloy welded.

B. Nonshrink Nonmetallic Grout:

1. Premix, factory packaged, nonstaining, noncorrosive, nongaseous grout complying with CE CRD-C621.
2. Provide grout specifically recommended by manufacturer for interior and exterior applications of type specified in this Section.
3. Product: W.R. Bonsal Co. Model Bonsal Construction Grout, Euclid Chemical Co. Model Euco N-S Grout, Master Builders Model Masterflow 713, W.R. Meadows Inc. Model Sealtight 588 Grout, Stonhard Inc. Model Stoncrete NM1, U.S. Grout Corp. Model Five Star Grout.

C. Fasteners:

1. General:

a. Provide hot-dipped galvanized fasteners.
b. Select fasteners for type, grade, and class required.

2. Bolts and Nuts: Regular hexagon-head-type, ASTM A307, Grade A, with hex nuts per ASTM A 563 and flat washers.
3. Machine Screws: Cadmium plated steel, ASME B18.6.3.
4. Plain Washers: Round, carbon-steel, ASME B18.22.1.
5. Drilled-In Expansion Anchors: Comply with FS FF-S-325, Group III (anchors, expansion, nondrilling), Type I (internally threaded tubular expansion anchor); and machine bolts complying with FS FF-B-575, Grade 5.
6. Lock Washers: Helical, spring type, carbon-steel, ASME B18.21.1.

D. Shop-Applied Steel Finishes:

1. Galvanized Coating – No Field-Applied Finish:

a. Provide hot-dipped galvanized coating consisting of high-grade zinc and other earthly materials, including min. 0.05 percent nickel for improved appearance and weather-resistance.
b. Coating Thickness: Min. 3.4 mils per ASTM A123, and as required by applicable standards for other items.
c. Steel Products: ASTM A123.
d. Steel Hardware: ASTM A153.
e. Assembled Steel Products: ASTM A123.

2. Galvanized and Primed Coating –Field-Applied Finish:

a. Provide hot-dipped galvanized coating consisting of high-grade zinc and other earthly materials, including min. 0.05 percent nickel for improved appearance and weather-resistance.
b. Coating Thickness: ASTM A123, and as required by applicable standards for other items.
c. Steel Products: ASTM A123.
d. Steel Hardware: ASTM A153.
e. Assembled Steel Products: ASTM A123.
f. Apply two-component epoxy universal primer by galvanizer within 12 hrs. after application of galvanized coating and force cure dry in oven capable of reaching 130 to 150 deg. F to max. 3.0 mil DFT.
g. Field-Applied Finish: Refer to Section 09900 for materials, preparation of surfaces, and application of coatings.

3. Shop Primers – Ferrous Metal:

a. Manufacturer's or fabricator's standard, fast curing, lead-free, universal primer; selected for good resistance to normal atmospheric corrosion, compatible with finish paint systems indicated, and capable of providing sound foundation for field-applied topcoats subject to prolonged exposure.
b. Comply with performance requirements of FS TT-P-645.

4. Galvanizing Repair Paint: ASTM A780, for touching up field-welds and galvanized coating damages using 95 percent organic zinc-rich paint applied to min. 6 mil DFT.

2.02 FABRICATION

A. General:

1. Form metal fabrication from materials of size, thickness, and shapes indicated, but not less than that needed to comply with performance requirements indicated.
2. Work to dimensions indicated or accepted on shop drawings, using proven details of fabrication and support.
3. Use type of materials indicated or specified for various components of each metal fabrication.
4. Form exposed work true to line and level with accurate angles and surfaces and straight edges.

5. Allow for thermal movement resulting from following maximum change (range) in ambient temperature in 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 heat gain and nighttime sky heat loss.
6. Temperature Change (Range): 100 deg. F.
7. Shear and punch metals cleanly and accurately; remove burrs.
8. Ease exposed edges to radius of approximately 1/32 inch.
9. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.
10. Remove sharp or rough areas on exposed traffic surfaces.
11. Welding:

    a. Weld corners and seams continuously complying with AWS recommendations.
    b. Exposed connections: Grind exposed welds smooth and flush to match and blend with adjoining surfaces.

12. Exposed Connections:

    a. Form exposed-connections with hairline joints, flush and smooth, using concealed fasteners wherever possible.
    b. Use exposed fasteners of type indicated, if not indicated, Phillips flat-head (countersunk) screws or bolts.

13. Anchorage:

    a. Provide for anchorage of type indicated; coordinate with supporting structure.
    b. Fabricate and space anchoring devices to provide adequate support for intended use.

14. Shop Assembly:

    a. Preassemble items in shop to greatest extent possible to minimize field splicing and assembly.
    b. Disassemble units only as necessary for shipping and handling limitations.
    c. Use connections that maintain structural value of joined pieces.
    d. Clearly mark units for reassembly and coordinated installation.
    e. Cut, reinforce, drill, and tap miscellaneous metalwork as indicated to receive finish hardware, screws, and similar items.

15. Fabricate joints that will be exposed to weather to exclude water, or provide weep holes where water may accumulate.

B. Steel Lintels

1. Provide loose structural steel lintels for openings and recesses in new masonry walls and partitions as required. Provide steel lintels for new openings in existing masonry walls as required.
2. Weld adjoining members together to form a single unit.
3. Provide min. 8 inches bearing at each side of openings, unless otherwise indicated.
4. Finish: Shop-applied galvanized and primed coating; refer to Section 09900 for application of field-applied finish to exposed surfaces and edges after installation.

C. Miscellaneous Framing and Supports:

1. Provide miscellaneous steel framing and supports which are not part of structural steel framework, as required to complete Work.
2. Fabricate miscellaneous units to sizes, shapes, and profiles indicated or if not indicated, of required dimensions to receive adjacent other work to be retained by framing.
3. Except as otherwise indicated, fabricate from structural steel shapes, plates and steel bars of welded construction using mitered joints for field connection.
4. Cut, drill, and tap units to receive hardware and similar items.
5. Equip units with integrally welded anchors for casting into concrete or building into masonry.
6. Furnish inserts if units must be installed after concrete is placed.
7. Except as otherwise indicated, anchor 24 in. o.c. and provide anchor units min. 1-1/4 in X 1/4 in. X 8 in. steel strap.
8. Finish: Shop-applied galvanized coating – no field applied finish.

D. Removable Custom Steel Plates:

1. Finish: Shop-applied galvanized and prime coating; refer to Section 09900 for application of field-applied finish to exposed surfaces and edges after installation.

PART 3 - EXECUTION

3.01 INSTALLATION

A. General:

1. Fastening to In-Place Construction:

a. Provide anchorage devices and fasteners where necessary for securing miscellaneous metal fabrications to in-place construction.
b. Include threaded fasteners for concrete and masonry inserts, toggle bolts, through bolts, lag bolts, wood screws, and other connectors as required.

2. Cutting, Fitting, and Placement:

a. Perform as required for installation of miscellaneous metal fabrications.
b. Set work accurately in location, alignment, and elevation, level, true, and free of rack measured from established lines and levels.
c. Provide temporary bracing or anchors in formwork from items which are to be build into concrete, masonry, or similar construction.
d. Fit exposed connections accurately together to form tight hairline joints.
e. Weld connections which are not to be left as exposed joints but cannot be shop welded because of shipping size limitations.
f. Grind exposed joints smooth and touchup shop-paint coat.

3. Field Welding: Comply with AWS Code for procedures of manual shielded metal-arc-welding, appearance and quality of welds made, and methods used in correcting welding work.

3.02 ADJUSTING AND CLEANING

A. Touchup Painting:

1. Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material as used for shop painting.

2. Apply by brush or spray to provide a minimum 2.0-mil dry film thickness.

B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and apply galvanizing repair paint to comply with ASTM A 780.

END OF SECTION 05500