

SECTION 05410
COLD-FORMED METAL FRAMING

PART 1 - GENERAL

1.01 PROVISIONS INCLUDED

- A. The general provisions of the Contract, including General and Supplementary General Conditions, and Division 1 General Requirements, apply to work specified in this Section.

1.02 SUMMARY

- A. This Section includes the following:
 - 1. Exterior non-load-bearing wall framing.
 - 2. Exterior parapets.
 - 3. Exterior soffits.
- B. Related Work Specified in Other Sections:
 - 1. Masonry shelf angles and connections: Section 05500, "Metal Fabrications"
 - 2. Drywall stud framing and ceiling-suspension assemblies: Section 09250, "Gypsum Board Assemblies"

1.03 DEFINITIONS

- A. Minimum Uncoated Steel Thickness: Minimum uncoated thickness of cold-formed framing delivered to the Project site shall be not less than 95 percent of the thickness used in the cold-formed framing design. Lesser thicknesses shall be permitted at bends due to cold forming.
- B. Producer: Entity that produces steel sheet coil fabricated into cold-formed members.

1.04 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Provide cold-formed metal framing capable of withstanding design loads within limits and under conditions indicated in this Article.
- B. Design Loads: In accordance with provisions of Maine Building Code/BOCA "National Building Code" 1999 edition, and as follows:
 - 1. Dead Loads: Weights of materials and construction.
 - 2. Snow Loads: 49 psf plus drifting; minimum per Section 1608.6
 - 3. Wind Loads on Vertical Elements (Acting Normal to the Surface): 25 psf minimum, and 38 psf at salient corners, per Section 1609.8.

4. Wind Loads on Soffits (Acting Normal to the Surface): 35 psf acting inward and outward.
- C. Deflection Limits: Design framing systems to withstand design loads without deflections greater than the following:
1. Exterior non-load-bearing studs supporting masonry veneer: Lateral deflection of $1/600$ of the wall height, or $3/8$ inch, whichever is less.
 2. Exterior non-load-bearing studs supporting metal panels or exterior insulation and finish system (EIFS): Lateral deflection of $1/360$ of the wall height, but not more than $1/2$ inch.
 3. Exterior soffits: Lateral deflection of $1/360$ of the span, but not more than $1/2$ inch.
- D. Design framing systems to provide for movement of framing members without damage or overstressing, sheathing failure, connection failure, undue strain on fasteners and anchors, or other detrimental effects when subject to a maximum ambient temperature change (range) of 120 deg F (67 deg C).
- E. Design framing system to maintain clearances at openings, to allow for construction tolerances, and to accommodate live load deflection of primary building structure as follows:
1. Upward and downward movement of $3/4$ inch (19 mm).
- F. Design exterior non-load-bearing curtain-wall framing to accommodate horizontal deflection without regard for contribution of sheathing materials.

1.05 SUBMITTALS

- A. Product data for each type of cold-formed metal framing, accessory, and product specified.
- B. Shop drawings in the form of elevations at scale of $1/8" = 1'-0"$ showing layout, spacings, sizes, thicknesses, and types of cold-formed metal framing. At larger scale show fabrication, fastening and anchorage details, including mechanical fasteners. Show reinforcing channels, opening framing, supplemental framing, strapping, bracing, bridging, splices, accessories, connection details, and attachments to other units of Work.
- C. Calculations: Submit structural analysis, including data used as a basis for calculations and calculations, sealed and signed by the qualified professional engineer responsible for their preparation demonstrating that cold-formed framing assemblies will meet the specified performance requirements.
1. Calculate structural properties as specified in Article 1.04, Performance Requirements.
 2. Require design to include double runner at head, or slotted connections, or other method of accommodating deflection, if engineering calculations indicate it is needed.

D. Quality Assurance Submittals:

1. Mill certificates signed by steel sheet producer indicating steel sheet complies with requirements.
2. Welding Certificates: Copies of certificates for welding procedures and personnel.
3. Qualification Data: For firms and persons specified in the "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.
4. Product Test Reports: From a qualified independent testing agency evidencing compliance with requirements of the following based on comprehensive testing of current products:
 - a. Expansion anchors.
 - b. Powder-actuated anchors.
 - c. Mechanical fasteners.
 - d. Vertical deflection clips.
 - e. Miscellaneous structural clips and accessories.

1.05 QUALITY ASSURANCE

- A. Installer Qualifications: Engage an experienced Installer who has completed cold-formed metal framing similar in material, design, and extent to that indicated for this Project and with a record of successful in-service performance.
- B. Engineering Responsibility: Engage a qualified professional engineer to prepare design calculations, Shop Drawings, and other structural data.
- C. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in the state of Maine and who is experienced in providing engineering services for installations of cold-formed metal framing that were similar to those required for this Project in material, design, and extent, and that have a record of successful in-service performance.
- D. Mill certificates signed by steel sheet producer indicating steel sheet complies with requirements, including uncoated steel thickness, yield strength, tensile strength, total elongation, chemical requirements, ductility, and galvanized-coating thickness.
- 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. Certify that each welder has satisfactorily passed AWS qualification tests for welding processes involved and, if pertinent, has undergone recertification.
- F. Fire-Test-Response Characteristics: Where metal framing is part of a fire-resistance-rated assembly, provide framing identical to that of assemblies tested for fire resistance per ASTM E 119 by a testing and inspecting agency acceptable to authorities having jurisdiction.

1. Fire-Resistance Ratings: Indicated by design designations from UL's "Fire Resistance Directory."
- G. AISI Specifications: Comply with AISI's "Specification for the Design of Cold-Formed Steel Structural Members and the following for calculating structural characteristics of cold-formed metal framing[.][:]
1. CCFSS Technical Bulletin: "AISI Specification Provisions for Screw Connections."
- H Preinstallation Conference: Prior to start of installation of metal framing systems, meet at project site with installers of work that has to be coordinated with metal framing, such as door frames, window and curtain wall frames, mechanical and electrical work. Review areas of potential interference and conflicts and coordinate layout of framing and support for penetrating work. Conduct conference and prepare coordination drawings in accordance with requirements of Division 1 Section, "Project Management and Coordination."
- J Mock-Ups: Provide steel framing component of brick veneer mock up specified in Section 04810, of metal wall panels specified in Section 07416, and of EIFS mock-up specified in Section 07820.
- 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 a waterproof covering, and ventilate to avoid condensation.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. Dietrich Industries, Inc.
 2. Marino Ware; Div. Of Ware Industries, Inc.
 3. Super Stud Building Products, Inc.

2.02 MATERIALS

- A. Galvanized-Steel Sheet: ASTM A A653/A 653M, structural steel, zinc coated, of grade and coating as follows:
 1. Grade: 33 (230) for minimum uncoated steel thickness of 0.0478 inch (1.21 mm) and less; 40 (275) or 50 (340), Class 1 or 2 for minimum uncoated steel thickness of 0.0538 inch (1.37 mm) and greater.

2. Coating Designation: G 90 (Z 275); framing members which are installed in interior wall assemblies for their entire length may be G 60 (Z 180)

2.03 NON-LOAD BEARING CURTAIN-WALL FRAMING

- A. Steel Studs: Manufacturer's standard C-shaped steel studs of web depths indicated, with lipped flanges, and complying with the following:
 1. Minimum Uncoated-Steel Thickness: As required by design, but not less than 0.0478 inch (1.21 mm).
 2. Flange Width: As required by design, but not less than 1-5/8 inches (41 mm).
 3. Web: Punched.
- B. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with unstiffened flanges, complying with ASTM C 955, and as follows:
 1. Minimum Uncoated-Steel Thickness: 0.0359 inch (0.91 mm).
 2. Flange Width: 1-1/4 inches (32 mm).
- C. Single Deflection Track: Manufacturer's single, deep-leg, U-shaped steel track; unpunched, with unstiffened flanges, of web depth to contain studs while allowing free vertical movement, with flanges designed to support horizontal and lateral loads, and as follows:
 1. Minimum Uncoated-Steel Thickness: As required by design, but not less than 0.0359 inch (0.91 mm).
 2. Flange Width: As required by design, but not less than 2 inches (50 mm).
- D. Vertical Deflection Clip: Manufacturer's standard clips, capable of accommodating upward and downward vertical displacement of primary structure.

2.04 SOFFIT JOIST FRAMING

- A. Steel Joists: Manufacturer's standard C-shaped steel joists, of web depths indicated, punched, with stiffened flanges, complying with ASTM C 955, and as follows:
 1. Minimum Uncoated-Steel Thickness: 0.0359 inch (0.91 mm).
 2. Flange Width: 1-5/8 inches (41 mm).
- B. Steel Joist Track: Manufacturer's standard U-shaped steel joist track, of web depths indicated, unpunched, with unstiffened flanges, complying with ASTM C 955, and as follows:
 1. Minimum Uncoated-Steel Thickness: 0.0359 inch (0.91 mm).
 2. Flange Width: As required by the design, but not less than 1-1/4 inches (32 mm).

2.05 FRAMING ACCESSORIES

- A. Fabricate steel-framing accessories of the same material and finish used for framing members, with a minimum yield strength of 33,000 psi (230 MPa).
- B. Provide accessories of manufacturer's standard thickness and configuration, unless otherwise indicated, as follows:
 - 1. Supplementary framing.
 - 2. Bracing, bridging, and solid blocking.
 - 3. Web stiffeners.
 - 4. End clips.
 - 5. Foundation clips.
 - 6. Gusset plates.
 - 7. Stud kickers, knee braces, and girts.
 - 8. Joist hangers and end closures.
 - 9. Hole reinforcing plates.
 - 10. Backer plates.

2.06 ANCHORS, CLIPS, AND FASTENERS

- A. Steel Shapes and Clips: ASTM A 36 (ASTM A 36M), zinc coated by the hot-dip process according to ASTM A 123.
- B. Anchor Bolts: ASTM F 1554, Grade 36, threaded carbon-steel hex-headed bolts and carbon-steel nuts; and flat, hardened-steel washers; zinc coated by hot-dip process according to ASTM A 153/A 153M, Class C.
- C. Expansion Anchors: Fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load equal to 4 times the design load, as determined by testing per ASTM E 488 conducted by a qualified independent testing agency.
- D. Powder-Actuated Anchors: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load equal to 5 times the design load, as determined by testing per ASTM E 1190 conducted by a qualified independent testing agency.
- E. Mechanical Fasteners: Corrosion-resistant coated, self-drilling, self-threading steel drill screws. Provide low-profile head beneath sheathing, manufacturer's standard elsewhere.
- F. Welding Electrodes: Comply with AWS standards.

2.07 MISCELLANEOUS MATERIALS

- 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. Galvanizing Repair Paint: ASTM A780.

- C. Thermal Insulation: ASTM C 665, Type I, unfaced mineral-fiber blankets produced by combining glass or slag fibers with thermosetting resins.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine supporting substrates and abutting structural framing for compliance with requirements for installation tolerances and other conditions affecting performance. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

- A. Lay out wall and openings before beginning work. Where location and size of opening is based on masonry modules, lay out cold-formed metal framing in coordination with the masonry subcontractor.
- B. Before sprayed fire-resistive coatings are applied, attach continuous angles, supplementary framing, or tracks to structural members indicated to receive sprayed fire-resistive coatings.
- C. After sprayed fire-resistive coatings have been applied, remove only as much of the coating as needed to complete installation of cold-formed framing without reducing thickness of fire-resistive coating below that required to obtain fire-resistance rating indicated. Protect remaining fire-resistive materials from damage.
- D. Grout bearing surfaces uniform and level to ensure full contact of bearing flanges or track webs on supporting concrete or masonry construction.

3.03 ERECTION TOLERANCES

- A. Erection Tolerances: Install cold-formed metal framing to a maximum allowable tolerance variation from plumb, level, and true to line of 1/8 inch in 10 feet (1:960) and as follows:
 1. Space individual framing members no more than plus or minus 1/8 inch (3 mm) from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.
 2. Align holes in stud webs to permit straight runs of piping and conduit.
 3. Maintain plumbness, levelness and location so that masonry veneer and similar cladding can be installed to tolerances specified in other section for such finish materials.

3.04 INSTALLATION, GENERAL

- A. Install cold-formed metal framing according to ASTM C 1007, unless more stringent requirements are indicated.

- B. Install cold-formed metal framing and accessories plumb, square, true to line, and with connections securely fastened, according to manufacturer's recommendations and the requirements of this Section.
 - 1. Cut framing members by sawing or shearing; do not torch cut.
 - 2. Fasten cold-formed metal framing members by welding or screw fastening, as standard with fabricator. Wire tying of framing members is not permitted.
 - a. Comply with AWS D1.3 requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
 - b. Locate mechanical fasteners and install according to Shop Drawings, with screw penetrating joined members by not less than three exposed screw threads.
- C. Install framing members in one-piece lengths, unless splice connections are indicated for track or tension members.
- D. Construct openings for doors, windows, and louvers in accordance with approved shop drawings.
- E. Install temporary bracing and supports and leave in place until entire integrated supporting structure has been completed and permanent connections to framing are secured.
- F. Do not bridge building expansion and control joints with cold-formed metal framing. Independently frame both sides of joints.
- G. Install insulation in built-up exterior framing members, such as headers, sills, boxed joists, and double studs, that will be inaccessible after framing work has been completed.
- H. Fasten hole reinforcing plate over web penetrations that exceed size of manufacturer's standard punched openings.

3.05 NONLOAD-BEARING CURTAINWALL INSTALLATION

- A. Install continuous tracks sized to match studs. Align tracks accurately and securely anchor to supporting structure as indicated.
- B. Fasten both flanges of studs to top and bottom track, unless otherwise indicated. Space studs no farther apart than 16 inches (406 mm); closer if required by the design.
- C. Set studs plumb, except as needed for diagonal bracing or required for inclined walls, curved surfaces, or similar non-plumb construction.
- D. Isolate steel framing from building structure to prevent transfer of vertical loads while providing lateral support.
 - 1. Install single deep-leg deflection tracks and anchor to building structure.
 - 2. Where studs are indicated to span from floor to ceiling, install deflection track at top, standard track at bottom, and anchor to building structure.

3. Connect vertical deflection clips to bypassing studs and anchor to primary building structure.
- E. Install horizontal bridging in curtainwall studs, spaced in rows not more than 48 inches (1219 mm) apart. Fasten at each stud intersection.
1. Top Bridging for Single Deflection Track: Install row of horizontal bridging within 12 inches (300 mm) of single deflection track. Install a combination of flat, taut, steel sheet straps of width and thickness indicated and stud or stud-track solid blocking of width and thickness matching studs. Fasten flat straps to stud flanges and secure solid blocking to stud webs or flanges.
 2. Bridging: Combination of flat, taut, steel-sheet straps of width and thickness indicated and stud-track solid blocking of width and thickness to match studs. Fasten flat straps to stud flanges and secure solid blocking to stud web flanges.
- F. Install miscellaneous framing and connections, including stud kickers, web stiffeners, clip angles, continuous angles, anchors, fasteners, and stud girts, to provide a complete and stable curtainwall-framing system.
- G. Frame wall openings larger than 2 feet square with double stud at each jamb of frame except where more than two are either shown or indicated in manufacturer's instructions. Install runner tracks and jack studs above and below wall openings. Anchor tracks to jamb studs with stud shoes or by welding, and space jack studs same as full-height studs of wall.

3.06 SOFFIT FRAMING

- A. Install perimeter joist track sized to match soffit joists. Align and securely anchor or fasten track to supporting structure at corners, ends, and spacings indicated on Shop Drawings.
- B. Install joists bearing on supporting framing, level, straight, and plumb, adjust to final position, brace, and reinforce. Fasten joists to both flanges of joist track.
1. Install joists over supporting framing with a minimum end bearing of 1-1/2 inches (38 mm).
 2. Reinforce ends of joists with web stiffeners, end clips, joist hangers, steel clip angles, steel-stud sections as indicated on Shop Drawings.
- C. Space joists as required by design, but not more than 16 inches (406 mm) apart on center.
- D. Install joist reinforcement at interior supports with single, short length of joist section located directly over interior support, with lapped joists of equal length to joist reinforcement, or as indicated on Shop Drawings.
- E. Install cold-rolled steel channel bridging at each end of joists and at intervals indicated on Shop Drawings. Fasten bridging at each joist intersection by welding or mechanically fastening to bottom flange of joists.

- F. Secure joists as required to prevent lateral movement of bottom flange.
- G. Install miscellaneous joist framing and connections, including web stiffeners, closure pieces, clip angles, continuous angles, hold-down angles, anchors, and fasteners, to provide a complete and stable joist-framing assembly.

3.07 FIELD QUALITY CONTROL

- A. Testing: Owner will engage a qualified independent testing agency to perform field quality-control testing.
- B. Field and shop welds will be subject to inspection and testing.
- C. Testing agency will report test results to Contractor and Architect.
- D. Remove and replace Work that does not comply with specified requirements.
- E. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of corrected Work with specified requirements.

3.08 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 A 780 and the manufacturer's instructions.
- B. Protect cold-formed metal framing from damage and deterioration until the time of Substantial Completion.

END OF SECTION 05410