05 SECTION 05 4000

COLD-FORMED METAL FRAMING

PART 1. GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:

1. Exterior non-load-bearing curtain-wall framing.

B. Related Sections include the following:

1. Division 5 Section “Metal Fabrications” for masonry shelf angles and connections.

1.3 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.

1.4 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide cold-formed metal framing capable of withstanding design loads within limits and under conditions indicated.

1. Design Loads: Based on the governing Building Code for the wind speed designated on plan for components and cladding.

2. Deflection Limits: Design framing systems to withstand design loads without deflections greater than the following:

(a) Exterior Non-Load-Bearing Curtain-Wall Framing: Horizontal deflection of 1/600 of the wall height at masonry/stone veneer or 1/240 of the wall height at other veneer.

3. 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 of 120 deg. F (67 deg C).

4. 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:

(a) Upward and downward movement of ½ inch.

B. Design exterior non-load-bearing curtain-wall framing to accommodate horizontal deflection without regard for contribution of sheathing materials.

1.5 SUBMITTALS

A. Product Data: For each type of cold-formed metal framing product and accessory indicated.

B. Shop Drawings: Show layout, spacing, sizes, thicknesses, and types of cold-formed metal framing; fabrication; and fastening and anchorage details, including mechanical fasteners. Show reinforcing channels, opening framing, supplemental framing, strapping, bracing, bridging, splices, accessories, connection details, and attachment to adjoining Work.

C. Welding Certificates: Copies of certificates for welding procedures and personnel.

D. Qualification Data: For firms and persons specified in “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.

E. Product Test Reports: From a qualified testing agency indicating that each of the following complies with requirements, based on comprehensive testing of current products:

1. Expansion anchors.

2. Power-actuated anchors.

3. Mechanical fasteners.

4. Miscellaneous structural clips and accessories.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who has completed cold-formed metal framing similar in material, design, and extent to that indicated for the Project and whose work has resulted in construction 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 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 cold-formed metal framing that are similar to those indicated for the Project in material, design, and extent.

D. Design wall system 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.

E. Design system to accommodate construction tolerances, deflection of building structural members, and clearances of intended openings.

F. 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.

G. Welding: Qualify procedures and personnel according to AWS D11.1, “Structural Welding Code – Steel.” And AWS D1.3, “Structural Welding Code – Sheet Steel.”

H. Fire-Test-Response Characteristics: Where metal framing is part of a fire-resistance-rated assembly, provide framing identical to that of assemblies tested for a fire resistance per ASTM E 119 by a testing and inspecting agency acceptable to authorities having jurisdiction.

1. Fire-Resistance Ratings: Indicated by GA File Numbers in GA-600, “Fire Resistance Design Manual,” or by design designations from UL’s “Fire Resistance Directory” or from the listings of another testing and inspecting agency.

I. AISI Specifications: Comply with AISI’s “Specification for the Design of Cold-formed Steel Structural Members” for “Load and Resistance Factor Design Specification for 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.”

J. Pre-installation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section “Project Meetings.”

1.7 DELIVERY, STORAGE AND HANDLING

A. Protect cold-formed metal framing from corrosion, deformation, and other damage during delivery, storage, and handling. Deliver to project site in manufacturer’s unopened containers or bundles, fully identified with name, brand, type and grade.

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

PART 2. PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering cold-formed metal framing that may be incorporated into the Work include, but are not limited to, the following:

1. Dietrich Industires, Inc.

2. MarinoWare; Div. Of Ware Industires, Inc.

3. Wheeling Corrugating Co.

2.2 MATERIALS

A. Steel Sheet: ASTM A653/A 653M, structural steel, zinc coated, of grade and coating as follows:

1. Grade: As required by structural performance.

2. Grade 33 (23) for minimum uncoated steel thickness of .0451 inch (1.15mm) and less; 50 (34), Class 1 or 2, for minimum uncoated steel thickness of .0566 inch (1.44mm) and greater.

3. Coating: G90.

2.3 NON-LOAD-BEARING CURTAIN-WALL FRAMING

A. Steel Studs: Manufacturer's standard C-shaped steel studs, of web depths indicated, punched, with stiffened flanges, complying with ASTM C955, and as follows:

1. Minimum Uncoated Thickness: 0.0451 inch (1.44mm)

2. Minimum Flange Width: 1 – 5/8 inches (41mm)

B. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with unstiffened flanges, complying with ASTM C955, and as follows:

1. Minimum Uncoated-Steel Thickness: 0.0451 inch (0.88mm)

2. Minimum Flange Width: 1-1/4 inches (32mm)

C. Single Deflection Track: Manufacturers 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: 0.0451 inch (1.15mm)

2. Minimum Flange Width: 2 inches (51)

2.4 FRAMING ACCESSORIES

A. Fabricate steel-framing accessories of the same material and finish used for framing members, with minimum yield strength of 33,000 psi.

B. Provide accessories of manufacturer's standard thickness and configuration, unless otherwise indicated, as follows:

1. Bracing, bridging, standard steel runners (tracks), lintels, clip angles, shoes, reinforcements, fasteners, stud kickers, knee braces, girts, solid blocking, and accessories as recommended by manufacturer for applications indicated, as needed to provide a complete metal framing system.

2.5 ANCHORS, CLIPS, AND FASTENERS

A. Steel Shapes and Clips: ASTM A 36/A 36M, zinc coated by hot-dip process according to ASTM A 123.

B. Anchor Bolts: ASTM F1554, 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 5 times design load, as determined by testing per ASTM E 488 conducted by a qualified independent testing agency.

D. Power-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 10 times 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.

1. Head Type: Low-profile head beneath sheathing, manufacturer's standard elsewhere.

F. Welding Electrodes: Comply with AWS standards.

2.6 MISCELLANEOUS MATERIALS

A. Galvanizing Repair Paint: ASTM A 780.

B. Nonmetallic, Nonshrink Grout: Premixed, nonmetallic, noncorrosive, nonstaining grout containing selected silica sands, portland cement, shrinkage-compensating agents, and plasticizing and water reducing agents, complying with ASTM C1107, with fluid consistency and 20-minute working time.

2.7 FABRICATION

A. Framing components may be prefabricated into panels prior to erection. Fabricate cold-formed metal framing and accessories plumb, square, and true to line, and with connections securely fastened, according to manufacturer's written recommendations and requirements in this Section:

1. Fabricate framing assemblies using jigs of templates. Perform lifting of prefabricated panels in a manner to prevent damage or distortion.

2. Cut framing members by sawing or shearing; do not torch cut. Wire tying of framing components is not permitted.

3. Fasten cold-formed metal framing members by welding. Wire tying of framing members is not permitted. Comply with AWS D1.3 requirements and procedures for welding, appearance, and quality of welds, and methods used in correcting welding work.

4. 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 D 1.3 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.

5. Fasten other materials to cold-formed metal framing by welding, bolting, or screw fastening, according to Shop Drawings.

B. Reinforce, stiffen, and brace framing assemblies to withstand handling, delivery, and erection stresses. Lift fabricated assemblies to prevent damage or permanent distortion.

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

1. Spacing: Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.

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

PART 3. EXECUTION

3.1 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.

3.2 PREPARATION

A. Pre-Installation Conference: Prior to start of installation of metal framing systems, meet at project site with installers of other work including door and window frames and mechanical and electrical work. Review areas of potential interference and conflicts, and coordinated layout and support provisions for interfacing work.

B. Before sprayed fire-resistive materials are applied, attach continuous angles, supplementary framing, or tracks to structural members indicated to receive sprayed fire-resistive materials.

C. After applying sprayed fire-resistive materials, remove only as much of these materials as needed to complete installation of cold-formed framing without reducing thickness of fire-resistive materials below that are 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.

3.3 INSTALLATION, GENERAL

A. Cold-formed metal framing may be shop or field fabricated for installation, or it may be field assembled.

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

C. Install shop- or field- fabricated, cold-formed framing and securely anchor to supporting structure.

1. Bolt or weld wall panels at horizontal and vertical junctures to produce flush, even, true-to-line joints with maximum variation in plane and true position between fabricated panels not exceeding 1/16 inch.

D. Install cold-formed metal framing and accessories plum, square, and true to line, and with connections securely fastened, according to manufacturer’s written recommendations and requirements in 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.

E. Install framing members in one-piece lengths. Splicing of studs is not permitted.

F. Construct corners using minimum of three studs. Install double studs at wall openings, door and window jambs.

G. Install temporary bracing and supports to secure framing and support loads comparable in intensity to those for which structure was designed. Maintain braces and supports in place, undisturbed, until entire integrated supporting structure has been completed and permanent connections to framing are secure.

H. Do not bridge building expansion and control joints with cold-formed metal framing. Independently frame both sides of joints.

I. Install insulation in built-up exterior framing members, such as headers, sills, boxed joists, and multiple studs at openings, that are inaccessible on completion of framing work

J. Fasten hole-reinforcing plate over web penetrations that exceed size of manufacturer's standard punched openings.

K. 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.

L. Provide deflection allowance in stud track, directly below horizontal building framing at non-load bearing framing.

M. Erection Tolerances: Install cold-formed metal framing level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet and as follows:

1. Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.

3.4 NON-LOAD-BEARING CURTAIN-WALL 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 as follows:

1. Stud spacing: 16 inches on center; not more than 2 inches from abutting walls and at each side of openings. Connect studs to tracks using fastener method.

C. Set studs plumb, except as needed for diagonal bracing or required for nonplumb walls or warped surfaces and similar requirements.

D. Where stud system abuts structural columns or walls, including masonry walls, anchor ends of stiffeners to supporting structure.

E. Frame wall openings larger than 2'-0" square with double stud at each jamb of frame except where more than 2 are either shown or indicated in manufacturer's instructions. Install runner tracks and jack studs above and below wall openings. Anchor tracks to jamb stud shoes or by welding, and space jack studs same as full-height studs of wall. Secure stud system wall opening frame in manner indicated.

F. Frame both sides of expansion and control joints, with separate studs; do not bridge the joint with components of stud system.

G. Isolate non-load-bearing 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.

H. Install horizontal bridging in curtain-wall studs, spaced in rows indicated on Shop Drawings but not more than 48 inches apart. Fasten at each stud intersection.

1. Top Bridging for Single Deflection Track: Install row of horizontal bridging within 18 inches 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.

(a) Install solid blocking at 4' – 0" o.c.

2. Bridging: Cold-rolled steel channel, welded or mechanically fastened to webs of punched studs.

3. 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 webs or flanges.

I. 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 curtain-wall-framing system.

J. Coordinate placement of insulation in multiple stud spaces made inaccessible after erection.

K. Install intermediate studs above and below openings to align with wall stud spacing.

3.5 REPAIRS AND PROTECTION

A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on fabricated and installed cold-formed metal framing with galvanized repair paint according to ASTM A 780 and manufacture written instructions.

B. Field Painting: Touch-up shop-applied protective coatings damaged during handling and installation. Use compatible primer for prime coated surface.

C. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer that ensure cold-formed metal framing is without damage or deterioration at time of Substantial Completion.

END OF SECTION