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 1 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This Section includes the following:
   1. Exterior non-load-bearing curtain-wall framing.
   2. Exterior gypsum sheathing.
   3. Z-furring supporting metal siding.

B. Related Sections include the following:
   1. Division 6 Section "Rough Carpentry" for plywood wall sheathing.
   2. Division 7 Section " Fluid-Applied Air/Vapor Barrier Membrane" for membrane on sheathing.
   3. Division 7 Section "Building Insulation" for exterior insulation not covered in this Section.
   4. Division 9 Section "Gypsum Board Assemblies" for interior non-load-bearing metal-stud framing, ceiling-suspension assemblies, and acoustical insulation in interior walls.

C. Products installed, but not furnished, under this Section include the following:
   1. Division 7 Section "Building Insulation" for rigid insulation installed with z-furring.

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.
   1. Design Loads: .As follows:
      a. Wind Loads: 28 lbs./sq. ft. at corners and 24 lbs./sq. ft. in field of wall.
   2. Deflection Limits: Design framing systems to withstand design loads without deflections greater than the following:
      a.
      b. Exterior Non-Load-Bearing Framing: Horizontal deflection of 1/360 of the wall height.
   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.
   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 1/2 inch at floor framing assemblies and of 1 inch at roof framing assemblies.

B. Cold-Formed Steel Framing, General: Design according to AISI's "Standard for Cold-Formed Steel Framing - General Provisions."
   1. Headers: Design according to AISI's "Standard for Cold-Formed Steel Framing - Header Design."

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

1.05 SUBMITTALS

A. General: Submit in accordance with Section 01300.

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

C. Shop Drawings: Show layout, spacings, 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.
1. Design Data: For cold-formed metal framing and deflection brackets indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
a. Gages indicated are minimum allowable uncoated gage. Verify load capacity of manufacturer's product being furnished for Project.

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

E. 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.

F. 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. Vertical deflection clips.
5. Miscellaneous structural clips and accessories.

G. Research/Evaluation Reports: Evidence of cold-formed metal framing's compliance with building code in effect for Project, from a model code organization acceptable to authorities having jurisdiction.

1.06 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 this Project and whose work has resulted in construction with a record of successful in-service performance.

B. Engineering Responsibility: Preparation of Shop Drawings, design calculations, and other structural data by a qualified professional engineer.

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 this Project in material, design, and extent.

D. Welding: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code--Steel," and AWS D1.3, "Structural Welding Code--Sheet Steel."

E. AISI Specifications and Standards: Comply with AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members" and its "Standard for Cold-Formed Steel Framing - General Provisions."
1. CCFSS Technical Bulletin: "AISI Specification Provisions for Screw Connections."

1.07 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.

1.08 COORDINATION

A. Coordinate installation of z-furring and rigid insulation with application of air/vapor barrier provide in Division 7 Section "Fluid-Applied Air/Vapor Barrier System."

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Cold Formed Metal Framing:
   a. Dietrich Industries, Inc.
   b. MarinoWare; Div. of Ware Industries, Inc.
   c. Unimast, Inc.

2.02 MATERIALS

A. Steel Sheet: ASTM A 1003/A 1003M, Structural Grade, Type H, metallic coated, of grade and coating weight as follows:
1. Grade: As required by structural performance.
2. Coating: G60, A60, AZ50, or GF30.

B. Steel Sheet for Vertical Deflection Clips: ASTM A 653/A 653M, structural steel, zinc coated, of grade and coating as follows:
1. Grade: As required by structural performance.
2. Coating: G90.

2.03 EXTERIOR NON-LOAD-BEARING WALL FRAMING

A. Steel Studs: Manufacturer's standard C-shaped steel studs, of web depths indicated, punched, with stiffened flanges, and as follows:
1. Minimum Base-Metal Thickness: Not less than 0.0428 inch, 18 gage , including cripple studs, short stud infill, and structural steel infill.
2. Flange Width: 2 inches .
3. Sizes: As required for specified design requirements, but not less than indicated on Drawings.

B. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with unstiffened flanges, and as follows:
1. Minimum Base-Metal Thickness: Matching steel studs in material, gage, and finish.
2. Flange Width: Not less than 1-1/4 inches.

C. Vertical Deflection Clips: Manufacturer's standard bypass clips, capable of accommodating upward and downward vertical displacement of primary structure through positive mechanical attachment to stud web.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Dietrich Metal Framing; a Worthington Industries Company.
   b. MarinoWare, a division of Ware Industries.
   c. SCAFCO Corporation.
   d. The Steel Network, Inc.

D. 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 transfer them to the primary structure, and as follows:
   1. Minimum Base-Metal Thickness: Not less than steel studs in material, gage, and finish; gage as required to resist loading indicated.
   2. Flange Width: Not less than 1-1/2 inches to allow for 1/2-inch deflection at floor levels and not less than 3 inches (76 mm) to allow for 1-1/2 inches (38 mm) of deflection at roof levels.

E. Bridging:
   1. Minimum Base-Metal Thickness: Not less than steel studs in material, gage, and finish.
   2. Shape: Cold-formed channel section.
   3. Size: 1-1/2 inches web depth.

F. Deflection Brackets:
   1. VertiClip; Signature Industries; (919) 844-0789.
   2. Construction: Slotted galvanized steel angle with step bushing to prevent over tightening of fasteners.
   3. Vertical Deflection: 1-inch total travel.
   4. Series: SL, SDL, SLB, AND SLS as required by attachment condition.

2.04 Z-FURRING

A. Steel Sheet Components: Complying with ASTM C 645 requirements for metal and with ASTM A 653/A 653M, G40, hot-dip galvanized zinc coating.

B. Z-Shaped Furring: With slotted or nonslotted web, face flange of 1-1/4 inches, wall attachment flange of 7/8 inch, bare metal thickness of not less than 0.047 inch (18 gage), and depth required to fit insulation thickness indicated.

2.05 FRAMING ACCESSORIES

A. Fabricate steel-framing accessories from steel sheet, ASTM A 1003/A 1003M, Structural Grade, Type H, metallic coated, of same grade and coating weight used for framing members.

2.06 ANCHORS, CLIPS, AND FASTENERS

A. General: Provide required or indicated items fabricated from ASTM A 36/A 36M, zinc coated by hot-dip process according to ASTM A 123/A 123M. Provide galvanized fasteners for assemblies having galvanized major steel components.

B. 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.

C. Welding Electrodes: Comply with AWS standards.

2.07 MISCELLANEOUS MATERIALS

A. Galvanizing Repair Paint: SSPC-Paint 20 or DOD-P-21035.

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 C 1107, with fluid consistency and 30-minute working time.

C. Shims: Load bearing, high-density multimonomer plastic, nonleaching.

2.08 EXTERIOR WALL SHEATHING

A. Weather Resistant Gypsum Sheathing Board:

1. Type and Thickness: Type X, 5/8 inch thick.
2. Size: 48 by 96 inches.
3. Mold Resistance: ASTM 3273, rating of 10, does not support growth.
4. Products:
   a. Dens-Glass Gold; Georgia-Pacific Corporation.
   b. "Fiberock Brand Sheathing with Aqua Tough"; United States Gypsum Co.
   c. GlasRoc Sheathing; BPB America, Inc.

B. Sheathing Fasteners:
1. Fasteners for Gypsum Sheathing to Metal Framing: Steel drill screws, ASTM C 954, in length recommended by sheathing manufacturer for thickness of sheathing board to be attached, with organic-polymer or other corrosion-protective coating having a salt-spray resistance of more than 800 hours according to ASTM B 117.

PART 3 - EXECUTION

3.01 EXAMINATION

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

3.02 FRAMING INSTALLATION, GENERAL

A. Install cold-formed metal framing according to AISI's "Standard for Cold-Formed Steel Framing - General Provisions" and to manufacturer's written instructions, unless more stringent requirements are indicated.

B. Install cold-formed metal framing and accessories plumb, square, and true to line, with lateral bracing and bridging, 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. Use minimum of 2 self-tapping metal screws per connection, unless otherwise indicated. Locate fasteners per manufacturer's design requirements, but not less than the following minimum requirements for spacing and edge distances:
      1) Power-Actuated Fasteners: In concrete, minimum spacing 4 inches, minimum edge distance 3 inches. In structural steel, minimum spacing 1-1/2 inches, minimum edge distance 1/2 inch.
      2) Screws: Minimum spacing and edge distance 1/2 inch.

C. Install framing members in one-piece lengths, unless splice connections are indicated for track or tension members. Splicing of load bearing studs is prohibited.

D. 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 secured.

E. 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 and a maximum of 2 inches from abutting walls. Construct corners using minimum of three studs. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.

2. Align top and bottom tracks; locate as indicated, and secure track to substrates at spacing required on engineered Shop Drawings, but not more than 24 inches on center, using fastening methods specified in manufacturer's printed installation instructions for Project substrate types.
3. Install double studs at jambs of openings for doors, cased openings, and windows; install intermediate studs above and below openings to align with wall stud spacing.
4. Seat studs in track, square with track flange, with stud end maximum 1/16 inch from surface of track web.
5. Attach cross studs for attachment of fixtures; install framing between studs for attachment of mechanical and electrical items, and to prevent stud rotation.
6. Provide web stiffeners at locations indicated or required.

3.03 EXTERIOR NON-LOAD-BEARING WALL INSTALLATION

A. Install continuous tracks sized to match studs. Align tracks accurately and securely anchor to supporting structure as indicated.

B. Fasten flanges of studs as follows:
1. Framing Passing-By Structural Steel: Fasten both flanges of studs to top and bottom track.
2. Framing Coming Against Bottom of Structure: Fasten both flanges of studs to bottom track only. Do not fasten studs to deep-leg deflection tracks.
3. Stud Spacing: 24 inches

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

D. 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.
2. Connect vertical deflection clips to bypassing studs and anchor to primary building structure.

E. Install horizontal bridging in 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 12 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.
2. Flat Strap 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.

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 wall-framing system.
1. Provide additional studs for attachment of z-furring supporting metal siding at termination and corner locations.

3.04 EXTERIOR SHEATHING INSTALLATION, GENERAL

A. Do not use materials with defects that impair quality of sheathing or pieces that are too small to use with minimum number of joints or optimum joint arrangement.

B. Cut boards at penetrations, edges, and other obstructions of the work; fit tightly against abutting construction, except provide a 3/8-inch setback where non-load-bearing construction abuts structural elements.

C. Coordinate sheathing installation with flashing and joint-sealant installation so these materials are installed in sequence and manner that prevent exterior moisture from passing through completed assembly.

D. Do not bridge building expansion joints; cut and space edges of panels to match spacing of structural support elements.

E. Coordinate sheathing installation with installation of materials installed over sheathing so sheathing is not exposed to precipitation or left exposed at end of the workday when rain is forecast.

3.05 GYPSUM SHEATHING INSTALLATION

A. Comply with GA-253 and manufacturer's written instructions.

B. Apply fasteners so screw heads bear tightly against face of sheathing boards but do not cut into facing.

C. Horizontal Installation: Install sheathing with V-grooved edge down and tongue edge up. Interlock tongue with groove to bring long edges in contact with edges of adjacent boards without forcing. Abut ends of boards over centers of stud flanges and stagger end joints of adjacent boards not less than one stud spacing. Screw-attach boards at perimeter and within field of board to each steel stud at approximately 8 inches o.c. and set back a minimum of 3/8 inch from edges and ends of boards.

3.06 Z-FURRING AND RIGID INSULATION INSTALLATION

A. Install rigid insulation provided under Division 7 "Building Insulation" horizontally and hold in place with Z-furring members spaced 24 inches o.c., unless indicated otherwise.

B. Fasten Z-furring members securely through gypsum sheathing and air/vapor barrier into cold-formed steel framing. Screw fasteners into each stud.

C. Protect rigid insulation from exposure to sunlight by installing building paper provided in Division 6 Section "Rough Carpentry" to z-furring immediately.

3.07 FIELD QUALITY CONTROL

A. Testing: Owner may 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 promptly and in writing 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 galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.

B. Protect cutouts, corners, and joints in sheathing by filling with a flexible sealant or by applying tape recommended by sheathing manufacturer at time sheathing is applied.

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

END OF SECTION