SECTION 05400 - 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.
   2. Weather-resistant sheathing.

B. Related Sections include the following:
   1. Division 6 Section Rough Carpentry for plywood sheathing.
   2. Division 7 Section "Fluid-Applied Air/Vapor Barrier Membrane" for membrane on exterior gypsum sheathing.
   3. Division 9 Section "Gypsum Board Assemblies" for interior non-load-bearing metal-stud framing and ceiling-suspension assemblies.

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: As indicated on Structural Drawings.
   2. Deflection Limits: Design framing systems to withstand design loads without deflections greater than the following:
      a. Exterior Non-Load-Bearing Curtain-Wall Framing:
         1) Walls with Masonry Veneer: Horizontal deflection of 1/600 of the wall height.
         2) Walls with Metal Siding only (with no masonry veneer): Horizontal deflection of 1/240 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 1-1/2 inches at roof assemblies.

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

1.5 SUBMITTALS

A. General: Submit in accordance with Section 01330.

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 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 gage. Verify load capacity and performance 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.

H. Installation Inspection Report: Submit report of completed work inspection, for each area that is completed and ready to turn over for application of the air/vapor barrier system.

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 this 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 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: Comply with AISI's "Specification for the Design of Cold-Formed Steel Structural Members" for calculating structural characteristics of cold-formed metal framing:

1. CCFSS Technical Bulletin: "AISI Specification Provisions for Screw Connections."

F. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination."

G. Installation Inspection: Contractor and Installer shall inspect completed light gage metal framing and sheathing installation for compliance with installation specifications and details and submit a report for each area that is completed and ready to turn over for application of the air/vapor barrier system. Report shall include the following:
1. All required framing and bracing is installed in exterior walls to receive sheathing and other components of the exterior skin of the building.
2. Verify proper attachment and spacing of anchors in top and bottom tracks to meet design loading requirements.
3. At deflection track locations, verify that studs are not screwed to the track, permitting proper free sliding of studs in the track.
4. Sheathing has proper uniform gap at deflection tracks to permit full deflection. Verify sheathing edges are not screwed to the deflection track.
5. Verify sheathing attachment screw quantity and spacing per board is correct.
6. Verify screw head penetration is at the proper location to be in compliance with the sheathing manufacturer's requirements.

1.7 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

2.1 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.

2. Weather-Resistant Gypsum Sheathing Board:
   a. GlasRoc Sheathing; CertainTeed Corporation.
   b. Dens-Glass Gold; Georgia-Pacific Corporation.
   c. Fiberock Brand Sheathing with Aqua Tough; United States Gypsum Co.

2.2 MATERIALS

A. Steel Sheet: ASTM A 653/A 653M, structural steel, zinc coated, of grade and coating as follows:
   1. Grade: As required by structural performance.
   2. Coating: G60.
   3. Use for all framing.

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 C 955, and as follows:
   1. Minimum Uncoated-Steel Thickness: Not less than 0.0428 inch (18 gage) , including cripple studs, short stud infill, and structural steel infill, to provide proper screw engagement for masonry anchor attachment. Minimum 0.0329 inch (20 gage) for walls that are metal siding only.
   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, complying with ASTM C 955, and as follows:
   1. Minimum Uncoated-Steel Thickness: Not less than steel studs in material, gage, and finish.
   2. Flange Width: Not less than 1-1/4 inches.

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: Not less than steel studs in material, gage, and finish; gage as required to resist loading indicated.
   2. Flange Width: Not less than 3-inches to allow for 1-1/2 inches of deflection at roof levels.

D. Bridging:
   1. Minimum Uncoated-Steel 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.

E. 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: 3-inches total travel at roof levels.
   4. Series: SL, SDL, SLB, AND SLS as required by attachment condition.

2.4 EXTERIOR SOFFIT FRAMING

A. Exterior Soffit Framing: Manufacturer's standard C-shaped steel sections, of web depths indicated, unpunched, with stiffened flanges, complying with ASTM C 955, and as follows:
1. Minimum Uncoated-Steel Thickness: Not less than 0.0329 inch (20 gage).
2. Flange Width: 1-5/8 inches, minimum.

2.5 FRAMING ACCESSORIES

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

2.6 ANCHORS, CLIPS, AND FASTENERS

A. General: Provide required or indicated items; 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.

2.7 MISCELLANEOUS MATERIALS

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

2.8 EXTERIOR WALL AND SOFFIT SHEATHING

A. 5/8” Plywood.

PART 3 - EXECUTION

3.1 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.

3.2 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, 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.

C. Install framing members in one-piece lengths, unless splice connections are indicated for track or tension members. Splicing of load bearing components and curtain wall 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. Do not bridge building expansion and control joints with cold-formed metal framing. Independently frame both sides of joints.

F. Erection Tolerances: Install cold-formed metal framing level, plumb, and true to line to a maximumallowable 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.

3.3 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 bottom track only, unless otherwise indicated. Do not fasten studs to deep-leg deflection tracks. Space studs as follows:
   1. Stud Spacing: 16 inches, unless otherwise indicated.

C. Set studs plumb, except as needed for diagonal bracing or required for

nonplumb walls or warped surfaces and similar requirements.

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

E. Install horizontal bridging in curtain-wall studs, spaced in rows indicated on Shop Drawings but not more than 54 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. 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 curtain-wall-framing system.

3.4 EXTERIOR SOFFIT FRAMING (JOIST) INSTALLATION

A. Install perimeter joist track sized to match 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 frame, level, straight, and plumb; adjust to final position, brace, and reinforce. Fasten joists to both flanges of joist track.
   1. Install joists over supporting frame with a minimum end bearing of 1-1/2 inches.
   2. Reinforce ends and bearing points of joists with web stiffeners, end clips, joist hangers, steel clip angles, or steel-stud sections as indicated on Shop Drawings.

C. Space joists not more than 2 inches from abutting walls, and as follows:
   1. Joist Spacing: As indicated.

D. Frame openings with built-up joist headers consisting of joist and joist track, nesting joists, or another combination of connected joists if indicated.

E. Install bridging at each end of joists and at intervals indicated on Shop Drawings. Fasten bridging at each joist intersection as follows:

F. Secure joists to load-bearing framing 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.

H. For exterior soffits, install framing to resist wind uplift.

I. Touch-up field welds and galvanize surface with primer.

3.5 EXTERIOR SHEATHING INSTALLATION

A. 5/8” Plywood.

B. 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.

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

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

E. Apply fasteners so screw heads bear tight against but flush with surface of sheathing boards. Do not cut into facing.

F. Do not bridge building expansion joints and deflection joints with sheathing; cut and space edges to match spacing of structural support elements. Do not screw edges of sheathing to deflection track.

G. Horizontal Installation: 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.

3.6 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 05400