SECTION 05400

COLD-FORMED METAL FRAMING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:
   1. Exterior non-load-bearing curtain-wall framing.
   2. Framing for parapets.
   3. Miscellaneous support framing at exterior ceilings and soffits, as detailed.
   4. Gypsum sheathing.

1.2 PERFORMANCE REQUIREMENTS

A. Design Responsibility: The contractor is required to provide the complete design and detailing of the wall and roof framing systems to resist specified loads within deflection limits specified where cold-formed metal framing is indicated. Where necessary or desirable, the contractor may substitute structural steel components for increased strength or stiffness. Such substitutions will be included in the design and detailing submittal and shall be provided at no additional cost to the Owner. Size limitations identified on the drawings pertain to both cold-formed metal framing and structural steel components. All design and detailing of structural steel and cold-formed metal framing is subject to approval by the Structural Engineer of record.

B. Structural Performance: Provide cold-formed metal framing capable of withstanding design loads within limits and under conditions indicated.
   1. Design Loads: As indicated on the 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: Horizontal deflection of 1/360 of the wall height for siding or EIFS, 1/600 of the wall height for masonry veneer.
      b. Exterior ceiling and soffit framing: Vertical deflection of 1/360 of the ceiling joist span.
   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 wall 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. Downward movement of 3/4 inch (19 mm).

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

1.3 SUBMITTALS

A. Product Data: For each type of cold-formed metal framing product and accessory indicated. Include structural data for all framing members and connectors as required to verify compliance with specified loadings.

B. 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. Include structural analysis calculations signed and sealed by the qualified professional engineer responsible for their preparation.
      a. Review of structural analysis calculations is for general conformance with requirements and completeness. The responsibility for correctness rests soley with the designer. The Architect reserves the authority to require resubmittal for observed deficiencies, or incompleteness.
   2. Include complete details for all member connections at openings and other discontinuities of the wall system.
   3. Specify connections to supports at top and bottom of wall including spacings at jambs of openings.

C. 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.

D. 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 (VertiClips).
   5. Miscellaneous structural clips and accessories.

E. LEED Documentation Submittals:
   1. Credit MR 2.1 and 2.2: Comply with Division 1 Section "Construction Waste Management."
   2. Credit MR 4.1 and 4.2: Product Data and certification letter indicating percentages by weight of post-consumer and pre-consumer recycled content for products having recycled content. Include statement indicating costs for each product having recycled content.
   3. Credit MR 5.1: Product Data indicating location of material manufacturer for regionally manufactured materials.
      a. Include statement indicating cost and distance from manufacturer to Project for each regionally manufactured material.

1.4 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.
   1. Provide seal of professional engineer on calculations and shop drawings.
   2. Same engineer shall provide on-site review of installation.

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. Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, qualified according to ASTM E 329 to conduct the testing indicated, as documented according to ASTM E 548.

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."

F. 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".

G. SSMA Section Properties: Provide cold-formed metal framing members with section properties that equal or exceed the properties indicated in SSMA's "Product Technical Information" publication.

1.5 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. 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. Dale Industries, Inc.
   2. Dietrich Industries, Inc.
   3. MarinoWare; Div. of Ware Industries, Inc.
   4. Unimast, Inc.

2.2 MATERIALS

A. Steel Sheet: ASTM A 446, structural steel, zinc coated, of grade and coating as follows:
   1. Grade: D (Fy=50 ksi) for 12, 14 and 16 gage material.
   2. Grade: A (Fy=33ksi) for18 and 20 gage material.
   3. Coating: G90 (Z275) for studs, G60 (Z180) for all other cold-formed metal framing.

2.3 EXTERIOR 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: 0.0428 inch (1.09 mm) (18 gage).
   2. Flange Width: 1-5/8 (41 mm).

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: Matching steel studs.
   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 to resist design loads.
      a. Provide stiffeners where required at jambs adjacent to openings.
   2. Flange Width: 2 inches minimum.

2.4 CEILING JOIST FRAMING

A. Ceiling Joists: 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: 0.0428 inch (1.09 mm) (18 gage).
   2. Flange Width: 1-5/8 inches (41 mm), minimum.

2.5 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. Stud kickers, knee braces, and girts.
   6. Joist hangers and end closures.

2.6 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. 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.

C. 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. Provide sizes as indicated on the drawings. Where sizes are not specified, provide the following, or larger:
   1. For fastening to concrete, provide .177 inch diameter fasteners with 1 7/16 inches embedment.
   2. For fastening to structural steel, provide .145 inch diameter fasteners with length adequate for the tip to penetrate the back side of the member.

D. Mechanical Fasteners: Corrosion-resistant-coated, self-drilling, self-threading steel drill screws.
   1. Head Type: Low-profile head beneath sheathing, manufacturer's standard elsewhere.
   2. Minimum size; No. 10-16 (D=0.19”), with length adequate for 3 threads to project through the connected members.

E. Vertical Deflection Clips: Manufacturer's standard bypass or head clips, capable of accommodating upward and downward vertical displacement of primary structure.
   1. Construction: Slotted galvanized steel angle with step bushing to prevent over tightening of fasteners.
   2. Vertical Deflection: 1-1/2 inches total travel.
   3. Product: Subject to compliance with requirements, provide VertiClip, by The Steel Network.
   4. Series: SL, SLT, SLB, AND SLS as required by attachment condition.

2.7 MISCELLANEOUS MATERIALS

A. Galvanizing Repair Paint: SSPC-Paint 20 or ASTM A 780.

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

C. Sill-Sealer Gaskets: Closed-cell neoprene foam, 1/4 inch (6.4 mm) thick, selected from manufacturer's standard widths to suit width of sill members indicated.

2.8 GYPSUM SHEATHING

A. Glass-Mat Gypsum Sheathing Board: ASTM C 1177/C 1177M.
   1. Type and Thickness: Type X, 5/8 inch (15.9 mm) thick.
   2. Size: Minimum 48 by 96 inches (1219 by 2438 mm).
   3. Product: Subject to compliance with requirements, provide "Dens-Glass Gold" by Georgia-Pacific Corp.

2.9 SHEATHING ACCESSORIES

A. Fasteners: 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

3.1 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 field-fabricated, cold-formed framing and securely anchor to supporting structure.
   1. Bolt 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 (1.6 mm).

C. Install 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. Cut framing members by sawing or shearing; do not torch cut.
   2. Fasten cold-formed metal framing members by screw fastening, as standard with fabricator. Wire tying of framing members is not permitted.
      a. Locate mechanical fasteners and install according to Shop Drawings, with screw penetrating joined members by not less than three exposed screw threads.
         1) Power-actuated fasteners: In concrete, minimum spacing = 4", minimum edge distance = 3". In structural steel, minimum spacing = 1 ½", minimum edge distance = ½".
         2) Screws: Minimum spacing and edge distance = ½".

D. Install framing members in one-piece lengths, unless splice connections are indicated for track or tension members.

E. 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.

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 multiple studs at openings, that are inaccessible on completion of framing work.

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

I. 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 (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.

3.2 EXTERIOR NON-LOAD-BEARING CURTAIN-WALL INSTALLATION

A. Place a minimum of one layer of sill sealer gaskets under base tracks of exterior wall framing. Install additional layers as needed to seal gap between foundation and base stud.

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

C. Fasten both flanges of studs to bottom track (allow top to slip), unless otherwise indicated. Space studs as follows:
   1. Stud Spacing: Not greater than 16 inches (406 mm).

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

E. 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.

F. Install horizontal bridging in curtain-wall studs, spaced in rows indicated on Shop Drawings but not more than 54 inches (1370 mm) 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.
   2. Bridging: Bridging may be either of the following:
      a. Bridging: Cold-rolled steel channel, welded or mechanically fastened to webs of punched studs.
      b. Bridging: Combination of flat, taut, steel sheet straps 2 inches width by .0346 inches thick 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.
         1) Locate stud track blocking at the first and last stud space of each wall and at a maximum intermediate spacing of 8 feet on center.

G. 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.

3.3 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 (38 mm).
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 (51 mm) from abutting walls, and as follows:
1. Joist Spacing: 16 inches (406 mm).

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 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.
1. Install web stiffeners to transfer axial loads of walls above.

F. Install bridging at each end of joists and at intervals indicated on Shop Drawings. Fasten bridging at each joist intersection as follows:
1. Bridging: Joist-track solid blocking of width and thickness indicated, secured to joist webs.

G. Secure joists to load-bearing interior walls to prevent lateral movement of bottom flange.

H. 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.

3.4 GYPSUM SHEATHING INSTALLATION

A. General: Install gypsum sheathing to comply with GA-253 and manufacturer's written instructions.

B. Cut boards at penetrations, edges, and other obstructions of the work; fit tightly against abutting construction, except provide a 3/8-inch (9-mm) 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 the sequence and manner that prevent exterior moisture from passing through completed exterior wall assembly.

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

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

F. Horizontal Installation: Install 48-inch- (1219-mm-) wide gypsum sheathing boards horizontally with vertical edges centered over flanges of steel studs. Abut ends and edges of each board with those of adjacent boards. Screw-attach boards at perimeter and within field of board to each steel stud at approximately 8 inches (200 mm) o.c. and set back a minimum of 3/8 inch (9 mm) from edges and ends of boards.

3.5 FIELD QUALITY CONTROL

A. Engineer of cold-form metal framing shall review on-site installation and provide written documentation that installation conforms to design intent. If corrective work is required, same engineer shall specify repair work necessary to provide conforming installation.

B. Remove and replace Work that does not comply with specified requirements.

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. 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