SECTION 05400

COLD-FORMED METAL FRAMING

PART 1 - GENERAL

1.1 SUMMARY

A. **This Section includes** cold-formed, C-shaped load-bearing steel studs and miscellaneous framing including the following:

1. Cold-formed metal framing at exterior walls for support of:
   a. Masonry veneer system.
   b. Prefinished Metal Panel System over exterior sheathing
2. Miscellaneous cold-formed metal framing and bracing where required for bracing or support of other work.
3. Roof parapet furring and metal deck assemblies.

B. **Related Sections include:**

1. Section 04200 - Unit Masonry: Face brick veneer.
2. Section 07210 – Building Insulation
3. Section 07412 - Metal Wall Panels.
4. Section 09255 - Exterior Sheathing: Exterior sheathing attached to cold-formed metal framing.

1.2 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.

1.3 PERFORMANCE REQUIREMENTS

A. **Structural Performance:** Cold-formed metal framing shall be designed to comply with the requirements of all governing building codes, including all connections of cold-formed metal framing members and the connections of cold-formed metal framing members to supporting members and structural elements. Erect exterior wall and parapet cold-formed metal framing to withstand the following design loads under conditions involved.

1. Design Loads: Positive and negative wind loads determined in accordance with the International Building Code, 2003 Edition, and the referenced standard ASCE 7-02 for the parameters specified and the following criteria:
   a. Basic wind gust - V = 130 mph.
   b. Importance factor - = Category 2.
   c. Exposure - B.

2. Install 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.
3. Install framing system to accommodate deflection of primary building structure and construction tolerances, and to maintain clearances at openings.

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

1. Exterior Non-Load-Bearing Wall Framing:
   a. Masonry veneer wall system: Horizontal deflection of L/600 of the wall height
   b. All other cladded wall systems: Horizontal deflection of L/360 of the wall height unless otherwise required by the respective wall cladding manufacturers.

C. 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.

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

1.4 SUBMITTALS

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

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. For cold-formed metal framing indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional structural engineer responsible for their preparation. Engineer must be registered in the State of Louisiana.

C. Mill Certificates: Submit mill certificates signed by steel sheet producer or test reports from a qualified independent testing agency indicating steel sheet complies with requirements.

D. Welding Certificates: Submit 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.

1.5 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, licensed in the State of Louisiana, to prepare design calculations, Shop Drawings, and other structural data.

C. Mill Certificates: 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, and galvanized-coating thickness.

D. 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:

E. Coordination: Coordinate framing location and spacing with related work.

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

G. Preinstallation Conference: Conduct conference at Project site to comply with requirements of “Section 01314 - Project Meetings”.

H. Single Source Responsibility: A single company shall bear responsibility for engineering, fabricating, and installation of the exterior wall cold formed metal framing.

1.6 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. Approved Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the work include the following:

1. Clark Steel Framing Systems, Inc.
2. Dale/Incor.
3. Marino/Ware, Inc.
4. Unimast, Inc.

2.2 MATERIALS

A. Galvanized-Steel Sheet: ASTM A 446, zinc coated according to ASTM A 525, and as follows:

1. Coating Designation: G 90.
2. Deck: Grade A, 33,000 psi minimum yield strength.
3. Framing and Furring Members: Grade C, 40,000 psi minimum yield strength.

B. Steel Studs: Manufacturer's standard C-shaped steel studs of web depths indicated, with lipped flanges, and complying with the following:

1. Minimum Gauge Designation: 16 gage.
2. Uncoated-Steel Thickness: 0.0747 inch.
3. Flange Width: 1-5/8 inches.
4. Web: Punched.

C. Runner Channel: Manufacturer's standard U-shaped steel track, un-punched, of web depths indicated, with straight flanges, and complying with the following:

1. Minimum Gauge Designation: 14 gage.
2. Uncoated-Steel Thickness: 0.0747 inch.
3. Flange Width: Manufacturers standard deep flange where indicated, standard flange elsewhere.

D. Furring Hat Channel: Manufacturer's standard hat-shaped furring channel, un-punched, of sizes indicated, and complying with the following:

1. Minimum Gauge Designation: 14 gage.
2. Uncoated-Steel Thickness: 0.0747 inch.

2.3 NON-LOAD BEARING EXTERIOR 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 (18 gage).
    a. Where brick veneer is exterior finish, use 16 gage minimum unless otherwise noted or required.
2. Flange Width: Minimum 1 3/8 inches.

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: 0.0428 inch (18 gage).
2. Flange Width: Minimum 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: 0.0428 inch (18 gage).
2. Flange Width: Minimum 2 inches.

D. Double Deflection Tracks: Manufacturer's double, deep-leg, U-shaped steel tracks, consisting of nested inner and outer tracks; unpunched, with unstiffened flanges.

1. Outer Track: Of web depth to allow free vertical movement of inner track, with flanges designed to support horizontal and lateral loads.
2. Inner Track: Of web depth indicated.

E. Vertical Deflection Clips: Manufacturer's standard bypass or head clips, capable of accommodating upward and downward vertical displacement of primary structure.

2.4 ACCESSORIES

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

1. Provide supplementary framing, bracing, bridging, and reinforcement plates of manufacturer's standard thickness and configuration, unless otherwise indicated.

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

C. Cast-in-Place Anchor Bolts and Studs: ASTM A 307, Grade A (ASTM F 568, Property Class 4.6); carbon-steel hex-head bolts and studs; carbon-steel nuts; and flat, unhardened-steel washers. Zinc-coated by the hot-dip process according to ASTM A 153.

D. Expansion Anchors: 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 488 conducted by a qualified independent testing agency.

E. 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 10 times the design load, as determined by testing per ASTM E 1190 conducted by a qualified independent testing agency.

F. Mechanical Fasteners: Galvanized, self-drilling, self-threading steel drill screws.

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

G. Electrodes for Welding: Comply with AWS Code and as recommended by stud manufacturer.

H. Galvanizing Repair: Where galvanized surfaces are damaged, prepare surfaces and repair in accordance with procedures specified in ASTM A 780.

2.5 PREFABRICATION OPTION

A. **General:** Framing components may be prefabricated into assemblies before erection. Fabricate panels plumb, square, true to line, and braced against racking with joints welded. Perform lifting of prefabricated units to prevent damage or distortion.

B. **Fabricate units** in jig templates to hold members in proper alignment and position and to assure consistent component placement.

C. **Fastenings:** Attach similar components by welding. Attach dissimilar components by bolting or screw fasteners, as standard with manufacturer. Wire tying of framing components is not permitted.

D. **Fabrication Tolerances:** Fabricate units to a maximum allowable tolerance variation from plumb, level, and true to line of 1/8 inch in 10 feet.

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

B. **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.

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 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 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, unless splice connections are indicated for track or tension members.

F. **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.

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

H. **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.

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

J. **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 STUD WALL INSTALLATION

A. **Runner Channel Tracks:** Install continuous top and bottom tracks sized to match studs. Align tracks accurately and securely anchor at corners and ends, and at spacings recommended by the manufacturer, but not greater than the following:
1. Spacing: 24 inches for power-driven anchors.
2. Spacing: 32 inches for cast-in-place or expansion anchors.

B. **Studs:** Squarely seat studs against webs of top and bottom tracks. Fasten both flanges of studs to top and bottom track. Space studs 16 inches on centers unless otherwise indicated.
1. Set studs plumb, except as needed for diagonal bracing or required for non-plumb walls or warped surfaces and similar requirements.
2. Anchor studs abutting structural columns or walls, including masonry walls, to supporting structure as indicated.
3. Install headers over wall openings wider than the stud spacing. Locate headers above openings as indicated. Fabricate headers of compound shapes indicated or required to transfer load to supporting studs, complete with clip-angle connectors, web stiffeners, or gusset plates.

4. Frame wall openings with not less than a double stud at each jamb of frame as indicated or required by manufacturer.
5. Install runner tracks and jack studs above and below wall openings. Anchor tracks to jamb studs with clip angles or by welding, and space jack studs same as full-height wall studs.

C. Supplementary Framing: Install supplementary framing, blocking, and bracing in stud framing indicated to support work requiring attachment to framing.

1. Where type of supplementary support is not indicated, comply with stud manufacturer's recommendations and industry standards in each case, considering weight or load resulting from item supported.

D. Bridging: Install horizontal bridging in stud system, spaced in rows not more than 48 inches apart. Fasten at each stud intersection.

1. Bridging: Cold-rolled steel channel, clip angle fastened to webs of punched studs.

E. Complete System: Install miscellaneous framing and connections, including supplementary framing, web stiffeners, clip angles, continuous angles, anchors, and fasteners, to provide a complete and stable wall-framing system.

3.5 PARAPET INSTALLATION

A. Runner Channels: Install continuous tracks sized to match tube framing. Align tracks accurately and securely anchor to supporting structure as indicated.

B. Hot Channels: Squarely seat furring against face of tube panel supports. Fasten both flanges of channels unless otherwise indicated. Space channels as indicated.

3.6 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 indicated on Drawings but not less than 16 inches on center.

C. Set studs plumb, except as needed for diagonal bracing or required for non-plumb 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. Provide one of the following as recommended by manufacturer.

1. Install single deep-leg deflection tracks and anchor to building structure.
2. Install double deep-leg deflection tracks and anchor outer track to building structure.
3. 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: Cold-rolled steel channel, welded or mechanically fastened to webs of punched studs.

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.

3.7 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 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.

3.8 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. Touch-up Painting: Wire brush, clean, and paint scarred areas, welds, and rust spots on fabricated and installed prime-painted, cold-formed metal framing. Paint framing surfaces with same type of shop paint used on adjacent surfaces.

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

END OF SECTION