SECTION 054000 - 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 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:
   1. Exterior curtain-wall framing.
   2. Flat strap blocking at openings.
   3. Exterior weather-resistant gypsum sheathing.
   4. Insulation of inaccessible framing voids.

B. Related Sections include the following:
   1. Division 07 Section "Cold-Formed Metal Roof Trusses."
   2. Division 07 Section "Spray-In-Place Rigid Urethane Foam Insulation" for spray-applied foam insulation applied in headers and designated locations.
   3. Division 07 Section "Fluid-Applied Air/Vapor Barrier System" for membrane on sheathing.
   4. Division 09 Section "Gypsum Board Assemblies" for interior non-load-bearing metal-stud framing, shaft wall assemblies, 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 Curtain-Wall Framing: Horizontal deflection of 1/360 of the wall height. Design shall be based upon stud properties only.
   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 3/4-inch for floor framing and floor assemblies and 1 inch for roof framing and roof 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.

1.5 SUBMITTALS

A. General: Submit in accordance with Division 01 Section "Submittal Procedures." A complete submittal shall be provided and shall include; erection and piece drawings. Shop drawings will not be reviewed as partial submittals. Incomplete submittals will not be reviewed..

B. Product Data: For each type of cold-formed metal framing product and accessory indicated. Include manufacturer’s specifications, finish and installation instructions.

C. Shop Drawings: Show layout, spacings, sizes, thicknesses, and types of cold-formed metal framing; fabrication, spacing 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 uncoated gage. Verify load capacity of manufacturer's product being furnished for Project.
2. Sizes, gages and fastenings for all built-up members including but not limited to headers and jambs.
3. Type, size, quantity, locations and spacings of anchorages and self drilling screws.
4. Details of attachment to structure and adjacent work.
5. Supplemental strapping, bracing, splices, bridging, hat channels and other accessories required for proper installation.
6. Locations and layouts for flat strap blocking locations to attach siding and trim including, door, window and lover opening, roof rakes, accent trim locations, and miscellaneous conditions and terminations. Meet with Contractor, and window, siding and trim installers to coordinate locations and requirements.
7. Critical installation procedures.

D. Design Data for Information: 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.
1. Gages indicated are minimum allowable uncoated gage. Verify load capacity of manufacturer's product being furnished for Project.

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. Welding Certificates: If welding is included in framing design, submit copies of certificates for welding procedures and personnel.

I. Installation of Cold-Formed Metal Framing Report: Submit copy of engineer's report of completed framing installation that is ready to receive gypsum sheathing.

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.
   1. Design exterior steel stud wall systems including all necessary stiffeners and bracing connections and anchorage required for a complete structural system. Design shall include verification of framing design such that pull out loads under wind or seismic loads will not be exceeded for sheathing and cladding material attachment.
      a. Design Wind Pressures: Design wind pressures calculated in accordance with ASCE 7-02 for Components and Cladding, shall be used in the design of the exterior cold-formed steel framing system. Design shall be based upon stud properties only. Utilize wind speed, importance factor and exposure indicated in Structural Drawing General Notes.
      b. Slip Track Tolerances: Where non-bearing cold-formed steel framing abuts the structure, provide a slip joint capable of accommodating the upward and downward vertical movement of the structure. Slip joint gaps shall allow for 1-inch live load deflection of the supporting member at perimeter roof supporting structural steel frame.
   2. Professional Engineer responsible for design of cold-formed framing shall review the installation and submit a correspondence indicating compliance with the design. Review shall include all work. Discrepancies noted shall be corrected and reviewed by the Engineer prior to the submittal of the correspondence.

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. Fire-Test-Response Characteristics: Where metal framing is part of a fire-resistance-rated assembly, provide framing identical to that of assemblies tested for 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.

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. Comply with AISI's "Standard for Cold-Formed Steel Framing - Header Design."
   2. CCFSS Technical Bulletin: "AISI Specification Provisions for Screw Connections."

F. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination."

G. Inspection of Cold-Formed Metal Framing: Prior to applying gypsum sheathing, engineer responsible for the design of framing shall inspect framing installation for compliance.

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.

1.8 COORDINATION

A. Coordinate installation of cold-formed metal framing with application of spray-applied foam insulation applied in headers and designated locations.

B. Coordinate with Contractor, and window, siding and trim installers for flat strap blocking requirements.

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. Clark Western Building Systems, Inc.
      b. Dietrich Metal Framing; a Worthington Industries Company.
      c. MarinoWare; Div. of Ware Industries, Inc.
   2. Glass-Mat Gypsum Sheathing Board:
      a. Dens-Glass Gold; Georgia-Pacific Corporation.
      b. GlasRoc Sheathing; CertainTeed Corporation.
      c. Expended Exposure Sheathing e²xp; National Gypsum Company.

2.2 MATERIALS

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

2.3 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 0.0329 inch, 20 gage, including cripple studs, short stud infill, and structural steel infill.
   2. Flange Width: 1-5/8 inches.
   3. Sizes: As indicated on Drawings. Increase gage if higher structural properties are required.

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 2 inches to allow for 3/4-inch deflection at floor levels and not less than 3 inches to allow for 1 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. Product: VertiClip; Signature Industries; (919) 844-0789.
   2. Construction: Slotted galvanized steel angle with step bushing to prevent over tightening of fasteners.
   3. Vertical Deflection: Capable of 1-1/2 inches total travel at floor levels and 3-inches total travel at roof levels.
   4. Series: SL, SDL, SLB, AND SLS as required by attachment condition.

2.4 FRAMING ACCESSORIES

A. Miscellaneous Framing Components: 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, with a minimum yield strength of 33,000 psi.

B. Flat Strap Blocking: Fabricate from steel sheet, ASTM A 1003/A 1003M, Structural Grade, Type H, metallic coated, of same grade and coating weight used for framing members.
   1. Width: 8 inches.

2.5 ANCHORS, CLIPS, AND FASTENERS

A. General: Provide required or indicated items; provide galvanized fasteners for assemblies having galvanized major steel components.

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.

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.

2.6 MISCELLANEOUS MATERIALS

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

B. Fiberglass Insulation. Fiberglass insulation installed in enclosed locations that are inaccessible after assembly of metal framing shall comply with requirements of Division 07 Section "Building Insulation."

C. Spray Closed Cell Foam Insulation: Foam insulation indicated to be installed in headers and other locations indicated

2.7 EXTERIOR SHEATHING

A. Glass-Mat Gypsum Wall Sheathing: ASTM C 1177; moisture- and mold-resistant core and facers.
   1. Type and Thickness: Type X, 5/8 inch thick.
   2. Moisture- and Mold-Resistance: ASTM D3273, rating of 10.
   3. Size: 48 by maximum available lengths.

B. Gypsum Sheathing Fasteners for 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

3.1 EXAMINATION

A. Examine supporting substrates and abutting structural framing, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 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 referenced standards, 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 two 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 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 16 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.

G. Insulate voids in exterior framing with fiberglass insulation that will be inaccessible after erection of framing. Coordinate locations including framing headers and other framing cavity locations indicated to receive spray-foam insulation.

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.

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.

G. Install an additional framing member 8 inches either side of door and window jambs as required to provide continuous support and attachment of flat strap blocking; apply flat strap blocking to framing members around perimeter of rough openings for windows, doors, along gable rakes and similar conditions and terminations to facilitate installation of siding and trim.

3.4 EXTERIOR 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 setback where 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 tight against but flush with surface of sheathing boards. Do not cut into facing.

E. 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.

F. 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.

3.5 FIELD QUALITY CONTROL

A. Testing: Engineer responsible for designing cold-formed metal framing shall perform field quality-control testing.
   1. Professional Engineer responsible for design of cold-formed framing shall review the installation and submit a correspondence indicating compliance with the design. Review shall include all work. Discrepancies noted shall be corrected and reviewed by the Engineer prior to the submittal of the correspondence.

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.

3.6 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 054000