SECTION 054000 - COLD-FORMED METAL FRAMING

1. GENERAL
   * + 1. RELATED DOCUMENTS
          1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
       2. SUMMARY
          1. Section Includes:

Load-bearing wall framing.

Exterior non-load-bearing wall framing.

Floor joist framing.

Roof rafter framing.

Exterior Soffit framing.

* + - * 1. Related Requirements:

Section 055000 "Metal Fabrications" for masonry shelf angles and connections.

Section 092116.23 "Gypsum Board Shaft Wall Assemblies" for interior non-load-bearing, metal-stud-framed, shaft-wall assemblies.

Section 092216 "Non-Structural Metal Framing" for interior non-load-bearing, metal-stud framing and ceiling-suspension assemblies.

* + - 1. ACTION SUBMITTALS
         1. Product Data: For each type of cold-formed steel framing product and accessory.
         2. Shop Drawings:

Include spacings, sizes, thicknesses, and types of cold-formed steel framing; fabrication; and fastening and anchorage details, including mechanical fasteners.

Indicate reinforcing channels, opening framing, supplemental framing, strapping, bracing, bridging, splices, accessories, connection details, and attachment to adjoining work.

* + - * 1. Delegated-Design Submittal: For cold-formed steel framing structural design.
      1. INFORMATIONAL SUBMITTALS
         1. Qualification Data: For 3rd party manufacturing facility testing agency.
         2. Welding certificates.
         3. Manufacturing Facility Inspection Certification: For each stud and track framing product, submit current certification that manufacturing facility has been inspected by a 3rd party International Accreditation Service (IAS) accredited agency.
      2. QUALITY ASSURANCE
         1. Manufacturing Facility Inspection Agency Qualifications: Qualified according to IAS *Accreditation Criteria for Inspection Agencies* (AC98), and has demonstrated compliance with ISO/IEC Standard 17020:2012, *Conformity assessment - Requirements for the operation of various types of bodies performing inspection* for testing indicated.
         2. Product Tests: Mill certificates or data from a qualified independent testing agency, or in-house testing with calibrated test equipment, indicating steel sheet complies with requirements, including base-metal thickness, yield strength, tensile strength, total elongation, chemical requirements, and metallic-coating thickness.
         3. Welding Qualifications: Qualify procedures and personnel according to the following:

AWS D1.1/D1.1M, "Structural Welding Code - Steel."

AWS D1.3/D1.3M, "Structural Welding Code - Sheet Steel."

* + - 1. DELIVERY, STORAGE, AND HANDLING
         1. Protect cold-formed steel framing from corrosion, moisture staining, deformation, and other damage during delivery, storage, and handling.

1. PRODUCTS
   * + 1. MANUFACTURERS
          1. Basis-of-Design Product: Subject to compliance with requirements, provide Super Stud Building Products Inc.; or a comparable product by one of the following:

Super Stud Building Products, Inc.

Super Stud Building Products South, LLC.

ClarkDietrich Building Systems, Inc.

Marino\WARE.

* + - 1. PERFORMANCE REQUIREMENTS
         1. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design cold-formed steel framing.
         2. Structural Performance: Provide cold-formed steel framing capable of withstanding design loads within limits and under conditions indicated.

Design Loads: As indicated on Structural Drawings, and in accordance with Applicable Building Code.

Deflection Limits: For deflection calculations, wind pressures may be reduced in accordance with International Building Code (IBC) table 1604.3, footnote f. Design framing systems to withstand design loads without deflections greater than the following:

Exterior Load-Bearing and Exterior Non-Load-Bearing Wall Framing: Horizontal deflection depending upon type of cladding supported:

Brick or Stone or Masonry Veneer: l/600 of wall height.

Stucco or Portland Cement Plaster or Tile or Thin Brick: 1/360 of wall height.

Exterior Insulation and Finish System (EIFS): 1/240 of the wall height.

Aluminum composite metal (ACM) or similar metal panel systems: 1/180 of the wall height.

Interior Load-Bearing Wall Framing: Horizontal deflection of 1/240 of the wall height under a horizontal load of 5 lbf/sq. ft.

Floor Joist Framing: Vertical deflection of 1/360 for live loads and l/240 for total loads of the span.

Roof Rafter Framing: Vertical deflection of 1/240 of the horizontally projected span for live loads.

Design framing systems to provide for movement of framing members located outside the insulated building envelope 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.

Design framing system to maintain clearances at openings, to allow for construction tolerances, and to accommodate live and snow load deflection of primary building structure as follows:

Upward and downward movement of 1/2 inch.

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

* + - 1. COLD-FORMED STEEL FRAMING, GENERAL
         1. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.
         2. Steel Sheet: ASTM A 1003/A 1003M, Structural Grade, Type H, metallic coated, of grade and coating weight as follows:

Grade: for 33 and 43 mil thickness: ST33H. For 54 mil and greater thickness:ST50H.

Coating: ASTM A653 G60 standard. Heavier galvanizing is permitted.

* + - * 1. Steel Sheet for Vertical Deflection Clips: ASTM A 653/A 653M, structural steel, zinc coated, of grade and coating as follows:

Grade: 50.

Coating: G90.

* + - 1. LOAD-BEARING AND EXTERIOR NON-LOAD-BEARING WALL FRAMING
         1. Steel Studs: Manufacturer's standard C-shaped steel studs, of web depths indicated, punched, with stiffened flanges, and as follows:

Minimum Base-Metal Thickness: 0.0329 inch. (33 mil, structural 20 gauge)

Flange Width: 1-5/8 inches.

* + - * 1. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with straight flanges, and as follows:

Minimum Base-Metal Thickness: 0.0329 inch.

Flange Width: 1-5/8 inches.

* + - * 1. Steel Box or Back-to-Back or L-Headers: Manufacturer's standard C-shapes or L-shapes used to form header beams, of web depths indicated, **unpunched**, with stiffened flanges, and as follows:

Minimum Base-Metal Thickness: 0.0329 inch.

Flange Width: 1-5/8 inches minimum for C-shapes, and top flange width minimum 2 inches for L-shapes.

Holes in header members greater than ¼ inch are not permitted without an approved design.

* + - * 1. Vertical Deflection Clips: Manufacturer's standard bypass and head-of-wall clips, capable of accommodating 1.5 inch upward and downward vertical displacement of primary structure (with total vertical movement of 3 inches) through positive mechanical attachment to stud web. Minimum deflection clip thickness: 97 mil (12 gauge).

Basis-of-Design Product: Subject to compliance with requirements, provide Super Stud Building Products, Inc.; or comparable product by one of the following:

Super Stud Building Products, Inc.

Simpson Strong-Tie, Inc.

The Steel Network.

* + - * 1. 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 loads and transfer them to the primary structure, and as follows:

Minimum Base-Metal Thickness: 0.0428 inch (43 mil, 18 gauge).

Flange Width: 1 inch plus the design gap, or 1.5 inches, whichever is greater.

* + - * 1. Drift Clips (where indicated on drawings): Manufacturer's standard bypass or head clips, capable of isolating wall stud from upward and downward vertical displacement and lateral drift of primary structure through positive mechanical attachment to stud web and structure.
      1. FLOOR JOIST FRAMING
         1. Steel Joists: Manufacturer's standard C-shaped steel joists, of web depths indicated, with stiffened flanges, and as follows:

Minimum Base-Metal Thickness: 0.0428 inch (43 mil, 18 gauge).

Flange Width: 1-5/8 inchesminimum.

* + - * 1. Steel Joist Track: Manufacturer's standard U-shaped steel joist track, of web depths indicated, unpunched, with unstiffened flanges, and as follows:

Minimum Base-Metal Thickness: Matching steel joists.

Flange Width: 1-1/4 inches minimum.

* + - 1. ROOF-RAFTER FRAMING
         1. Steel Rafters: Manufacturer's standard C-shaped steel sections, of web depths indicated, with stiffened flanges, and as follows:

Minimum Base-Metal Thickness: 0.0329 inch (33 mil, structural 20 gauge).

Flange Width: 1-5/8 inchesminimum.

* + - 1. EXTERIOR SOFFIT FRAMING
         1. Exterior Soffit Framing: Manufacturer's standard C-shaped steel sections, of web depths indicated, with stiffened flanges, and as follows:

Minimum Base-Metal Thickness: 0.0329 inch (33 mil, structural 20 gauge).

Flange Width: 1-5/8 inchesminimum.

* + - 1. FRAMING ACCESSORIES
         1. 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. Provide accessories of manufacturer's standard thickness and configuration, unless otherwise indicated, as follows:

Supplementary framing.

Bracing, bridging, and solid blocking.

Web stiffeners.

Anchor clips.

End clips.

Foundation clips.

Gusset plates.

Joist hangers and end closures.

Hole reinforcing plates.

Backer plates.

* + - 1. ANCHORS, CLIPS, AND FASTENERS
         1. Steel Shapes and Clips: ASTM A 36/A 36M, zinc coated by hot-dip process according to ASTM A 123/A 123M.
         2. Anchor Bolts: ASTM F 1554, Grade 36 minimum, threaded carbon-steel bolts and carbon-steel nuts; and flat, hardened-steel washers; zinc coated.
         3. Expansion Anchors: Fabricated from corrosion-resistant materials, with allowable load or strength design capacities calculated according to ACI 318 greater than or equal to the design load, as determined by testing per ASTM E 488 conducted by a qualified testing agency.
         4. Power-Actuated Anchors: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with allowable load capacities calculated according to ICC-ES AC70, greater than or equal to the design load, as determined by testing per ASTM E 1190 conducted by a qualified testing agency.
         5. Mechanical Fasteners: ASTM C 1513, corrosion-resistant-coated, self-drilling, self-tapping, steel drill screws.

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

* + - * 1. Welding Electrodes: Comply with AWS standards.
      1. MISCELLANEOUS MATERIALS
         1. Galvanizing Repair Paint must comply with one of the following: SSPC-Paint 20, MIL-P-21035B, or ASTM A 780.
         2. Cement Grout: Portland cement, ASTM C 150, Type I; and clean, natural sand, ASTM C 404. Mix at ratio of 1 part cement to 2-1/2 parts sand, by volume, with minimum water required for placement and hydration.
         3. 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/C 1107M, with fluid consistency and 30-minute working time.
         4. Shims: Load bearing, high-density multimonomer plastic, and nonleaching; or of cold-formed steel of same grade and coating as framing members supported by shims.
         5. Sealer Gaskets: Closed-cell neoprene foam, 1/4 inch thick, selected from manufacturer's standard widths to match width of bottom track or rim track members.
      2. FABRICATION
         1. Fabricate cold-formed steel framing and accessories plumb, square, and true to line, and with connections securely fastened, according to code-referenced American Iron and Steel Institute (AISI) specifications and standards, manufacturer's written instructions, and requirements in this Section.

Fabricate framing assemblies using jigs or templates.

Cut framing members by sawing or shearing; do not torch cut.

Fasten cold-formed steel framing members by welding, screw fastening, clinch fastening, pneumatic pin fastening, or riveting as standard with fabricator. Wire tying of framing members is not permitted.

Comply with AWS D1.3/D1.3M requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.

Locate mechanical fasteners and install according to Shop Drawings, with screw penetrating joined members by no fewer than three exposed screw threads.

Fasten other materials to cold-formed steel framing by welding, bolting, pneumatic pin fastening, or screw fastening, according to Shop Drawings.

* + - * 1. Reinforce, stiffen, and brace framing assemblies to withstand handling, delivery, and erection stresses. Lift fabricated assemblies to prevent damage or permanent distortion.
        2. Fabrication Tolerances: Fabricate assemblies level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet (1:960) and as follows:

Spacing: 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.

Squareness: Fabricate each cold-formed steel framing assembly to a maximum out-of-square tolerance of 1/8 inch.

1. EXECUTION
   * + 1. EXAMINATION
          1. Examine supporting substrates and abutting structural framing for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
          2. Proceed with installation only after unsatisfactory conditions have been corrected.
       2. PREPARATION
          1. Before sprayed fire-resistive materials are applied, attach continuous angles, Z-Furring, supplementary framing, or tracks to structural members indicated to receive sprayed fire-resistive materials.
          2. 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. Install load bearing shims or grout between the underside of load-bearing wall bottom track and the top of foundation wall or slab at locations with a gap larger than 1/4 inch to ensure a uniform bearing surface on supporting concrete or masonry construction.
          4. Install sealer gaskets at the underside of wall bottom track or rim track at the top of foundation wall or slab at stud or joist locations.
       3. INSTALLATION, GENERAL
          1. Cold-formed steel framing may be shop or field fabricated for installation, or it may be field assembled.
          2. Install cold-formed steel framing according to ASTM C1007 and to manufacturer's written instructions unless more stringent requirements are indicated.
          3. Install shop- or field-fabricated, cold-formed framing and securely anchor to supporting structure.

Screw, 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.

* + - * 1. Install cold-formed steel framing and accessories plumb, square, and true to line, and with connections securely fastened.

Cut framing members by sawing or shearing; do not torch cut.

Fasten cold-formed steel framing members by welding, screw fastening, clinch fastening, or riveting. Wire tying of framing members is not permitted.

Comply with AWS D1.3/D1.3M requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.

Locate mechanical fasteners and install according to Shop Drawings, and complying with requirements for spacing, edge distances, and screw penetration.

* + - * 1. Install framing members in one-piece lengths unless splice connections are indicated for track or tension members.
        2. 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.
        3. Do not bridge building expansion joints with cold-formed steel framing. Independently frame both sides of joints.
        4. Install insulation, specified in Section 072100 "Thermal 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. xx
        5. Erection Tolerances: Install cold-formed steel 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:

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.

* + - 1. LOAD-BEARING WALL INSTALLATION
         1. Install continuous top and bottom tracks sized to match studs. Align tracks accurately and securely anchor at corners and ends, and anchor at spacings to match stud spacing, or as shown on Shop Drawings.
         2. Squarely seat studs against top and bottom tracks with gap not exceeding 1/8 inch between the end of wall framing member and the web of track. Fasten both flanges of studs to top and bottom tracks. Space studs at maximum 16” on center, or as indicated on approved shop drawings.
         3. Set studs plumb, except as needed or required for nonplumb walls or curved surfaces and similar configurations.
         4. Align studs vertically where floor framing interrupts wall-framing continuity. Where studs cannot be aligned, continuously reinforce track to transfer loads.
         5. Align floor and roof framing over studs according to AISI S200, Section C1. Where framing cannot be aligned, continuously reinforce track to transfer loads.
         6. Anchor studs abutting structural columns or walls, including masonry walls, to supporting structure as indicated.
         7. Install headers over wall openings wider than 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.

Frame wall openings with not less than a double stud at each jamb of frame as indicated on Shop Drawings. Fasten jamb members together to uniformly distribute loads.

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.

* + - * 1. Install supplementary framing, blocking, and bracing in stud framing indicated to support fixtures, equipment, services, casework, heavy trim, furnishings, and similar work requiring attachment to framing. If type of supplementary support is not indicated, comply with stud manufacturer's written recommendations and industry standards in each case, considering weight or load resulting from item supported.
        2. Install horizontal bridging in stud system, spaced vertically as indicated on Shop Drawings. Fasten at each stud intersection.

Bridging: Cold-rolled steel channel, welded or mechanically fastened to webs of punched studs with a minimum of two screws into each flange of the clip angle for framing members up to 8 inches deep.

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.

* + - * 1. Where required for overall structural shear wall lateral bracing, Install steel sheet diagonal bracing straps to both stud flanges, terminate at and fasten to reinforced top and bottom tracks. Fasten clip-angle connectors to multiple studs at ends of bracing and anchor to structure.
        2. 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.
      1. EXTERIOR NON-LOAD-BEARING WALL INSTALLATION
         1. Install continuous tracks sized to match studs. Align tracks accurately and securely anchor to supporting structure as indicated.
         2. Fasten both flanges of studs to top and bottom track unless otherwise indicated. Space studs at maximum 24” on center, or as indicated on approved shop drawings.
         3. Set studs plumb, except as needed or required for nonplumb walls or curved surfaces.
         4. Isolate non-load-bearing steel framing from building structure to prevent transfer of vertical loads while providing lateral support.

Install single deep-leg deflection tracks and anchor to building structure.

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

Connect drift clips to cold-formed metal framing and anchor to building structure.

* + - * 1. Install horizontal bridging in wall studs, spaced vertically in rows indicated on Shop Drawings. Fasten at each stud intersection.

Top Bridging for Single Deflection Track: Install row of horizontal bridging within 24 inches of top single deflection track. Install a combination of bridging and stud or stud-track solid blocking of width and thickness matching studs, secured to stud webs or flanges. At bridging line, install solid blocking at each end of bridging straps, and at a maximum spacing of 120 inches on center.

Bridging: Cold-rolled steel channel, welded or mechanically fastened to webs of punched studs.

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. At bridging line, install solid blocking at each end of bridging straps, and at a maximum spacing of 120 inches on center.

* + - * 1. Install miscellaneous framing and connections, including stud kickers, web stiffeners, clip angles, continuous angles, anchors, and fasteners, to provide a complete and stable wall-framing system.
      1. JOIST INSTALLATION
         1. 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.
         2. 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, or use end stiffeners for joist/track connection where attachment to one flange is not accessible.

Install joists over supporting frame with a minimum end bearing of 1-1/2 inches.

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.

* + - * 1. Space joists not more than 2 inches from abutting walls. Joist spacing shall be as indicated on approved shop drawings, but not more than 24 inches.
        2. Frame openings with built-up joist headers consisting of joist and joist track, or another combination of connected joists if indicated.
        3. At bearing walls and interior supports, provide web stiffeners and solid blocking as required or indicated on Shop Drawings, to transfer both vertical and lateral forces from walls above.
        4. Install bridging at intervals indicated on Shop Drawings. Fasten bridging at each joist intersection as follows:

Bridging: Joist-track or proprietary solid blocking of width and thickness indicated, secured to joist webs.

Bridging: Combination of flat, taut, steel sheet straps of width and thickness indicated and joist-track or proprietary solid blocking of width and thickness indicated. Fasten flat straps to bottom flange of joists and secure solid blocking to joist webs. At bridging line, install solid blocking at each end of bridging straps, and at a maximum spacing of 120 inches on center.

* + - * 1. Secure joists to load-bearing interior walls to prevent lateral movement of bottom flange.
        2. 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.
      1. REPAIRS AND PROTECTION
         1. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on fabricated and installed cold-formed steel framing with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.
         2. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure that cold-formed steel framing is without damage or deterioration at time of Substantial Completion.

END OF SECTION 054000