

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 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:

1. Load-bearing wall framing.
2. Exterior non-load-bearing wall framing.
3. Floor joist framing.
4. Roof rafter framing.
5. Ceiling joist framing.

- B. Related Sections include the following:

1. Division 5 Section "Metal Fabrications" for masonry shelf angles and connections.
2. Division 7 Section "Building Insulation"
3. Division 9 Section "Non-Structural Metal Framing" for interior non-structural metal stud framing and ceiling-suspension assemblies.
4. Division 9 Section "Gypsum Board Assemblies" for interior non-load-bearing metal-stud framing and ceiling-suspension assemblies.
5. Division 9 Section "Gypsum Board Shaft-Wall Assemblies" for interior non-load-bearing, metal-stud-framed, shaft-wall assemblies.

1.3 REFERENCES

- A. Refer to the latest editions for each of the following references:

1. ASTM A780 – Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings.
2. ASTM A924 – Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process
3. ASTM A1003 – Standard Specification for Steel Sheet, Carbon, Metallic- and Nonmetallic-Coated Cold-Formed Framing Members.
4. ASTM B633 – Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel.
5. ASTM C955 – Standard Specification for Load-Bearing (Transverse and Axial) Steel Studs, Runners (Tracks), and Bracing or Bridging for Screw Application of Gypsum Panel Products and Metal Plaster Bases
6. ASTM C1002 – Standard Specification for Steel Self-Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs

7. ASTM C1007 – Standard Specification for Installation of Load Bearing (Transverse and Axial) Steel Studs and Accessories
8. ASTM C1513 – Standard Specification for Steel Tapping Screws for Cold-Formed Steel Framing Connections
9. AISC – Manual of Steel Construction, Load Resistance Factor Design
10. AISI S100 – North American Specification for the Design of Cold-Formed Steel Structural 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 required by local code and as indicated on the Construction Documents
 2. Deflection Limits: Design framing systems to withstand deflection limits per the requirement of the finish material or as specified by the architect or engineer of record.
 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 framing system to maintain clearances at openings, to allow for construction tolerances, and to accommodate live load deflection of primary building structure.
- B. Cold-Formed Steel Framing, General: Design according to AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members"
 1. Walls: Design according to AISI's "North American Standard for Cold-Formed Steel Framing - Wall Stud Design."
 2. Headers: Design according to AISI's "North American Standard for Cold-Formed Steel Framing - Header Design."
 3. Design exterior non-structural wall framing to accommodate horizontal deflection without regard for contribution of sheathing materials.
 4. Roof Trusses: Design according to AISI's "North American Standard for Cold-Formed Steel Framing - Truss Design."

1.5 SUBMITTALS

- A. Product Data: For each type of cold-formed metal framing product and accessory indicated.
- B. Fabrication Shop Drawings prepared by American Panel Tec:
 1. Erection drawings depicting floor plan and layout of shop fabricated wall panels, floor panels, and/or trusses.
 2. Shop Details of each individual wall panel, floor panel, or truss.
 3. Fabrication details indicating shop welds and connections.
- C. Engineering Shop Drawings:

1. Engineering Shop Drawings shall be prepared by an Engineer licensed in the State of the Project.
2. Show layout, spacing, sizes, thicknesses, and types of cold-formed metal framing.
3. Show fastening and anchorage, including mechanical fasteners.
4. Show reinforcing channels, opening framing, supplemental framing, strapping, bracing, bridging, splices, accessories, connection details, and attachment to adjoining work.

D. Structural Calculations:

1. Provide structural calculations prepared by an Engineer licensed in the State of the Project.
2. Calculations shall include: design criteria; engineering analysis depicting stress and deflection requirements for each framing application; selection of framing components, accessories and welded connection requirements; and attachments to structure and adjacent framing components.

E. Welding certificates.

1.6 QUALITY ASSURANCE

- A. Prefabricated Cold Formed Steel Panel Manufacturer Qualifications: An experienced Fabricator with a minimum of 5 years experience, who has completed cold-formed metal framing similar in material, design, and extent to that indicated for the project and whose work has resulted in construction with a record of successful in-service performance. Fabricator shall provide a strict Quality Assurance Program in the factory during all phases of the fabrication in order to insure conformance with construction documents.
- B. Engineering Responsibility: Preparation of Engineered Shop Drawings, design calculations, and other structural data by a qualified professional engineer.
- 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.
- E. Product Tests: Mill certificates or data from a qualified independent testing agency indicating steel sheet complies with requirements, including base-metal thickness, yield strength, tensile strength, total elongation, chemical requirements, and metallic-coating thickness.
- F. Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code--Steel," and AWS D1.3, "Structural Welding Code--Sheet Steel."
- G. Fire-Test-Response Characteristics: Where indicated, provide cold-formed metal 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.
- H. AISI Specifications and Standards: Comply with AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members" and its "North American Standard for Cold-Formed Steel Framing - General Provisions."

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

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Protect cold-formed metal framing from corrosion, deformation, and other damage during delivery, storage, and handling per requirements of AISI's "Code of Standard Practice".

PART 2 - PRODUCTS

2.1 PREFABRICATED COLD FORMED STEEL ASSEMBLIES

- A. Acceptable Prefabricated Cold Formed Steel Panel Manufacturer with a minimum of 5 years experience manufacturing panels similar to or exceeding project design, size and requirements: Substitutions not permitted.
 1. American Panel Tec; 1640 New Market Avenue, South Plainfield, NJ 07080.
Tel: (732) 968-0555; Design@AmericanPanelTec.com ; www.AmericanPanelTec.com
- B. Acceptable Component 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. Allied Studco.
 2. California Expanded Metal Products Company.
 3. Clark Western.
 4. Dietrich Metal Framing; a Worthington Industries Company.
 5. MarinoWare; a division of Ware Industries.
 6. The Steel Network.
 7. Super Stud Building Products, Inc.
 8. Members in good standing of Steel Stud Manufacturer's Association (SSMA)

2.2 MATERIALS

- A. Steel Sheet: ASTM A 1003/A 1003M, Metallic coated, of grade and coating weight as follows:
 1. Grade: ST33H (ST230H)
 2. Grade: ST50H (ST340H)
 3. Grade: As required by structural performance
 4. Coating: G60 (Z180), A60 (ZF180), AZ50 (AZ150), or GF30 (ZGF90)
 5. Coating: G90 (Z275) or equivalent
- B. Steel Sheet for Vertical Deflection, Drift Clips: ASTM A 1003/A1003 M, structural steel, zinc coated, of grade and coating as follows:
 1. Grade: 50 (340), Class 1 or 2, As required by structural performance.
 2. Coating: G60 (Z180).

2.3 LOAD-BEARING WALL FRAMING

- A. Steel Studs: Manufacturer's standard C-shaped steel studs, of web depths indicated, punched, with stiffened flanges, and as follows:
1. Minimum Base-Metal Thickness: 18 Gauge - 0.0428 inch (1.09 mm), 16 Gauge - 0.0538 inch (1.37 mm), 14 Gauge - 0.0677 inch (1.72 mm) 12 Gauge - 0.0966 inch (2.45 mm).
 2. Flange Width: 1-5/8 inches (41 mm), 2 inches (51 mm), 2-1/2 inches (63 mm), 3 inches (76 mm), 3 1/2 inches (89 mm).
 3. Web Depth: 2 1/2 inches (64 mm), 3 5/8 inches (92 mm), 4 inches (102 mm), 6 inches (152.4 mm), 8 inches (203 mm), 10 inches (254 mm), 12 inches (305 mm), 14 inches (355.6 mm), 16 inches (406.4 mm).
 4. Section Properties: Refer to Drawings.
- B. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with straight flanges, and as follows:
1. Minimum Base-Metal Thickness: 18 Gauge - 0.0428 inch (1.09 mm), 16 Gauge - 0.0538 inch (1.37 mm), 14 Gauge - 0.0677 inch (1.72 mm) 12 Gauge - 0.0966 inch (2.45 mm).
 2. Flange Width: 1-1/4 inches (32 mm), unless noted otherwise
 3. Web Depth: 2 1/2 inches (64 mm), 3 5/8 inches (92 mm), 4 inches (102 mm), 6 inches (152.4 mm), 8 inches (203 mm), 10 inches (254 mm), 12 inches (305 mm), 14 inches (355.6 mm), 16 inches (406.4 mm). Track web size to match stud web size.
- C. Steel Box or Back-to-Back Headers: Manufacturer's standard C-shapes used to form header beams, of web depths indicated, punched, with stiffened flanges, and as follows:
1. Minimum Base-Metal Thickness: 18 Gauge - 0.0428 inch (1.09 mm), 16 Gauge - 0.0538 inch (1.37 mm), 14 Gauge - 0.0677 inch (1.72 mm) 12 Gauge - 0.0966 inch (2.45 mm).
 2. Flange Width: 1-5/8 inches (41 mm), 2 inches (51 mm), 2-1/2 inches (63 mm), 3 inches (76 mm), 3 1/2 inches (89 mm).
 3. Section Properties: Refer to Drawings.

2.4 EXTERIOR NON-LOAD-BEARING WALL FRAMING

- A. Steel Studs: Manufacturer's standard C-shaped steel studs, of web depths indicated, punched, with stiffened flanges, and as follows:
1. Minimum Base-Metal Thickness: 18 Gauge - 0.0428 inch (1.09 mm), 16 Gauge - 0.0538 inch (1.37 mm), 14 Gauge - 0.0677 inch (1.72 mm) 12 Gauge - 0.0966 inch (2.45 mm).
 2. Flange Width: 1-5/8 inches (41 mm), 2 inches (51 mm), 2-1/2 inches (63 mm), 3 inches (76 mm), 3 1/2 inches (89 mm).
 3. Web Depth: 2 1/2 inches (64 mm), 3 5/8 inches (92 mm), 4 inches (102 mm), 6 inches (152.4 mm), 8 inches (203 mm), 10 inches (254 mm), 12 inches (305 mm), 14 inches (355.6 mm), 16 inches (406.4 mm).
 4. Section Properties: Refer to Drawings.
- B. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with unstiffened flanges, and as follows:
1. Minimum Base-Metal Thickness: 18 Gauge - 0.0428 inch (1.09 mm), 16 Gauge - 0.0538 inch (1.37 mm), 14 Gauge - 0.0677 inch (1.72 mm) 12 Gauge - 0.0966 inch (2.45 mm).

2. Flange Width: 1-1/4 inches (32 mm), unless noted otherwise
 3. Web Depth: 2 1/2 inches (64 mm), 3 5/8 inches (92 mm), 4 inches (102 mm), 6 inches (152.4 mm), 8 inches (203 mm), 10 inches (254 mm), 12 inches (305 mm), 14 inches (355.6 mm), 16 inches (406.4 mm). Track web size to match stud web size.
- C. Vertical Deflection Clips: Manufacturer's standard clips, capable of accommodating upward and downward vertical displacement of primary structure through positive mechanical attachment to stud web.
1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Dietrich Metal Framing; a Worthington Industries Company.
 - b. MarinoWare, a division of Ware Industries.
 - c. The Steel Network, Inc.
- D. 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 transfer them to the primary structure. Install a continuous row of bridging, composed of 1-1/2 inch cold-rolled u-channel or flat strap secured to each stud not more than 12 inches (305 mm) from top of wall.
1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Dietrich Metal Framing; a Worthington Industries Company.
 - b. Marino Ware, a division of Ware Industries.
 - c. The Steel Network, Inc.
 2. Minimum Base-Metal Thickness: 18 Gauge - 0.0428 inch (1.09 mm), 16 Gauge - 0.0538 inch (1.37 mm), 14 Gauge - 0.0677 inch (1.72 mm) 12 Gauge - 0.0966 inch (2.45 mm).
 3. Flange Width: Refer to Drawings.
- E. U-Channel: Manufacturer's standard length.
1. Size: 1-1/2 inches (38.1 mm).
 2. Minimum Base-Metal Thickness: 0.0538 inch (1.37 mm).
- F. Drift Clips: Manufacturer's standard bypass or head clips, capable of isolating wall stud from upward and downward vertical displacement and lateral drift of primary structure.

2.5 FLOOR JOIST FRAMING

- A. Steel Joists: Manufacturer's standard C-shaped steel joists, of web depths indicated, with stiffened flanges, and as follows:
1. Minimum Base-Metal Thickness: 18 Gauge - 0.0428 inch (1.09 mm), 16 Gauge - 0.0538 inch (1.37 mm), 14 Gauge - 0.0677 inch (1.72 mm) 12 Gauge - 0.0966 inch (2.45 mm).
 2. Flange Width: 1-5/8 inches (41 mm), 2 inches (51 mm), 2-1/2 inches (63 mm).
 3. Section Properties: Refer to Drawings.

- B. Steel Joist Track: Manufacturer's standard U-shaped steel joist track, of web depths indicated, unpunched, with unstiffened flanges, and as follows:
 - 1. Minimum Base-Metal Thickness: 18 Gauge - 0.0428 inch (1.09 mm), 16 Gauge - 0.0538 inch (1.37 mm), 14 Gauge - 0.0677 inch (1.72 mm) 12 Gauge - 0.0966 inch (2.45 mm).
 - 2. Flange Width: 1-1/4 inches (31.8 mm), 2 inches (51 mm), 2-1/2 inches (63 mm).

2.6 ROOF-RAFTER FRAMING

- A. Steel Rafters: Manufacturer's standard C-shaped steel sections, of web depths indicated, unpunched, with stiffened flanges, and as follows:
 - 1. Minimum Base-Metal Thickness: 20 Gauge - 0.0329 inch (0.84 mm), 18 Gauge - 0.0428 inch (1.09 mm), 16 Gauge - 0.0538 inch (1.37 mm), 14 Gauge - 0.0677 inch (1.72 mm) 12 Gauge - 0.0966 inch (2.45 mm).
 - 2. Flange Width: 1-5/8 inches (41 mm), 2 inches (51 mm), 2-1/2 inches (63 mm).
 - 3. Section Properties: Refer to Drawings.
- B. Built-up Members: Built-up members of manufacturer's standard C-shaped steel section with stiffened flanges, nested into a U-shaped steel section joist track, with unstiffened flanges; unpunched; of web depths indicated; and as follows:
 - 1. Minimum Base-Metal Thickness: 20 Gauge - 0.0329 inch (0.84 mm), 18 Gauge - 0.0428 inch (1.09 mm), 16 Gauge - 0.0538 inch (1.37 mm), 14 Gauge - 0.0677 inch (1.72 mm) 12 Gauge - 0.0966 inch (2.45 mm).
 - 2. Flange Width: 1-5/8 inches (41 mm), 2 inches (51 mm), 2-1/2 inches (63 mm).

2.7 FRAMING ACCESSORIES

- A. Fabricate steel-framing accessories from steel sheet, ASTM A 1003/A 1003M, Structural Grade, Type H or Type L, metallic coated, of same grade and coating weight used for framing members.
- 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. Anchor clips.
 - 5. End clips.
 - 6. Foundation clips.
 - 7. Gusset plates.
 - 8. Stud kickers, knee braces, and girts.
 - 9. Joist hangers and end closures.
 - 10. Hole reinforcing plates.
 - 11. Backer plates.

2.8 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/A 123M.
- B. Anchor Bolts: ASTM F 1554, Grade [36] [55], threaded carbon-steel bolts and carbon-steel nuts; and flat, hardened-steel washers; zinc coated by hot-dip process according to ASTM A 153/A 153M, Class C or mechanically deposition according to ASTM B 695, Class 50.
- C. 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.
- D. 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.
- E. Mechanical Fasteners: ASTM C 1513, corrosion-resistant-coated, self-drilling, self-tapping steel drill screws.
 - 1. Head Type: Low-profile head beneath sheathing, manufacturer's standard elsewhere.
- F. Welding Electrodes: Comply with AWS standards.

2.9 MISCELLANEOUS MATERIALS

- A. Galvanizing Repair Paint: SSPC-Paint 20 or DOD-P-21035.
- B. 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.
- C. 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, with fluid consistency and 30-minute working time.
- D. Shims: Load bearing, high-density multimonomer plastic, nonleaching.
- E. Sealer Gaskets: Closed-cell neoprene foam, 1/4 inch (6.4 mm) thick, selected from manufacturer's standard widths to match width of bottom track or rim track members.

2.10 FABRICATION

- A. Fabricate cold-formed metal framing and accessories plumb, square, and true to line, and with connections securely fastened, according to referenced AISI's specifications and standards, manufacturer's written instructions, and requirements in this Section.
 - 1. Fabricate framing assemblies using jigs or templates.
 - 2. Cut framing members by sawing or shearing; do not torch cut.

3. Fasten cold-formed metal framing members by welding, screw fastening. 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. Touch up all welds with Zinc rich paint.
 - c. Locate mechanical fasteners and install according to Shop Drawings, with screw penetrating joined members by not less than three exposed screw threads.
 4. Fasten other materials to cold-formed metal framing by welding, bolting, or screw fastening, according to Shop Drawings.
- B. Reinforce, stiffen, and brace framing assemblies to withstand handling, delivery, and erection stresses. Lift fabricated assemblies to prevent damage or permanent distortion.
- C. Fabrication Tolerances: Fabrication shall only proceed after the fabricator has received approved drawings. 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:
1. Spacing: 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.
 2. Squareness: Fabricate each cold-formed metal framing assembly to a maximum out-of-square tolerance of 1/8 inch (3 mm).
 3. Install continuous top and bottom tracks: provide 14 Gauge track with typical wall studs of 14 Gauge or greater, and 16 Gauge track with typical wall studs of 16 Gauge or less (unless approved design is more stringent). Align tracks accurately and securely anchor at corners and ends, and at spacings as follows:
 - a. Anchor Spacing: As shown on Shop Drawings.
 4. Built up members: shall be welded together with 3/4" length weld at a maximum spacing of 24" o.c., unless otherwise indicated more stringent on the design documents.
- D. All built-up members inaccessible in the field shall be insulated in the factory.
- E. All hot rolled structural steel shall be painted, unless noted otherwise.
- F. Required exterior sheathing shall be factory applied, screw type and spacing per the specification and drawings.
- G. Cold formed steel flat strap shearwall bracing shall be rolled and flattened prior to application and connected to the wind posts under tension to insure it laying flat against the studs.

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.
 1. 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.
- C. Install load bearing shims or grout between the underside of wall bottom track or rim track and the top of foundation wall or slab at stud or joist locations to ensure a uniform bearing surface on supporting concrete or masonry construction as required.
- D. Install sealer gaskets to isolate the underside of wall bottom track or rim track and the top of foundation wall or slab at stud or joist locations as required.

3.3 INSTALLATION, GENERAL

- A. Cold-formed metal framing shall be shop fabricated for installation.
- B. Install cold-formed metal framing according to AISI's "North American Standard for Cold-Formed Steel Framing - General Provisions" and to manufacturer's written instructions unless more stringent requirements are indicated.
- C. Install shop fabricated, cold-formed framing and securely anchor to supporting structure.
 - 1. 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 (1.6 mm).
- D. Install cold-formed metal framing and accessories plumb, square, and true to line, and with connections securely fastened.
 - 1. Cut framing members by sawing or shearing; do not torch cut.
 - 2. Fasten cold-formed metal framing members by welding, screw fastening. 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, and complying with requirements for spacing, edge distances, and screw penetration.
- 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, specified in Division 7 Section "Building 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 per approved engineering design 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 (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.

3.4 PREFABRICATED COLD FORMED STEEL PANEL INSTALLATION

- A. Panels shall be unloaded by crane, using a spreader bar and nylon slings. Handling with a lull is not recommended.
- B. Layout is made prior to the start of erection by the panel installer using the approved panel layout shop drawings provided and the axis lines and benchmarks provided by the GC, CM, or Owner.
- C. Panels are to put in place and temporarily braced. Panels are to be shimmed as required in conditions wherein the gap under the track is greater than 1/8" at each stud. Shims shall be made of steel or Korolath plastic shims (or approved equal).
- D. Install connections as per the engineering documents.
- E. All headers and beams supported by cold formed steel wall panels shall be welded or screwed into place.
- F. Any alterations to the prefabricated panels for whatever reasons must be reported to the panel manufacturer. Repairs to the panels must be made by a qualified mechanic or a representative of the panel fabricator. Repairs or modifications to the panels must be approved by the design engineer.

3.5 LOAD-BEARING WALL INSTALLATION

- A. Install continuous top and bottom tracks: provide 14 Gauge track with typical wall studs of 14 Gauge or greater, and 16 Gauge track with typical wall studs of 16 Gauge or less (unless approved design is more stringent). Align tracks accurately and securely anchor at corners and ends, and at spacings as follows:
 - 1. Anchor Spacing: As shown on Shop Drawings.
- B. Squarely seat studs against top and bottom tracks with gap not exceeding of 1/8 inch (3 mm) between the end of wall framing member and the web of track. Fasten both flanges of studs to top and bottom tracks. Space studs as follows:

1. Stud Spacing: As indicated.
 - C. Set studs plumb, except as needed for diagonal bracing or required for non-plumb walls or warped surfaces and similar configurations.
 - D. Align studs vertically where floor framing interrupts wall-framing continuity. Where studs cannot be aligned, continuously reinforce track to transfer loads.
 - E. Align floor and roof framing over studs. Where framing cannot be aligned, continuously reinforce track to transfer loads.
 - F. Anchor studs abutting structural columns or walls, including masonry walls, to supporting structure as indicated.
 - G. 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.
 1. Frame wall openings with not less than a double stud at each jamb of frame or as indicated on Shop Drawings. Fasten jamb members together to uniformly distribute loads.
 2. Install runner tracks and cripple studs above and below wall openings. Anchor tracks to jamb studs and space cripple studs same as full-height wall studs.
 - H. 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.
 1. If type of supplementary support is not indicated or included in the scope of work, comply with stud manufacturer's written recommendations and industry standards in each case, considering weight or load resulting from item supported.
 - I. Install horizontal bridging in stud system, spaced as indicated on Shop Drawings. Fasten at each stud intersection.
 1. Bridging: Steel channel, welded to webs of punched studs for framing members up to 6 inches (150 mm) deep.
 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 for framing members over 6 inches (150 mm) deep.. Fasten flat straps to stud flanges and secure solid blocking to stud webs or flanges.
 - J. Install steel sheet diagonal bracing straps as per design, terminate at and fasten to reinforced posts. Anchor posts at ends of bracing straps to structure.
 - K. 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.
- 3.6 EXTERIOR NON-LOAD-BEARING WALL INSTALLATION
- A. Install continuous top and bottom tracks: provide 14 Gauge track with typical wall studs of 14 Gauge or greater, and 16 Gauge track with typical wall studs of 16 Gauge or less (unless approved design is more stringent). 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 follows:
 - 1. Stud Spacing: As indicated.
- 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.
 - 1. Install single-leg deflection tracks and anchor to building structure.
 - 2. Connect vertical deflection clips to studs and anchor to building structure.
 - 3. Connect drift clips to cold formed metal framing and anchor to building structure.
- E. Install horizontal bridging in wall studs, spaced in rows indicated on Shop Drawings but not more than 48 inches (1220 mm) apart. Fasten at each stud intersection.
 - 1. Top Bridging for Single Deflection Track: Install row of horizontal bridging within 12 inches (305 mm) 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.
 - a. Install solid blocking at centers indicated on Shop Drawings.
 - 2. Bridging: Steel channel, welded to webs of punched studs.
 - 3. 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 wall-framing system.

3.7 JOIST INSTALLATION

- A. Install perimeter joist track sized to match joists unless approved design is more stringent. 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: 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 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 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.
 - 2. Bridging: Combination of flat, taut, steel sheet straps of width and thickness indicated and joist-track solid blocking of width and thickness indicated. Fasten flat straps to bottom flange of joists and secure solid blocking 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.

3.8 FIELD QUALITY CONTROL

- A. Refer to Structural Drawings and General Structural Notes for Inspection Requirements.
- B. Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.
- C. Testing agency will report test results promptly and in writing to Contractor and Architect.
- D. Remove and replace work where test results indicate that it does not comply with specified requirements.
- E. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.9 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 A780 and manufacturer's written instructions.
- B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure that cold-formed metal framing is without damage or deterioration at time of Substantial Completion.

END OF SECTION 05400