



SECTION 054000 - COLD-FORMED METAL FRAMING – T-44 SYSTEM

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: *Note to Specifier delete items not used.*

1. Load-bearing wall framing.
2. Floor joist framing.
3. Roof rafter framing.
4. Ceiling joist framing.
5. Exterior non-load bearing wall framing and Soffit framing (as needed).

B. Related Requirements:

1. Division 3 Section "Concrete" for associated requirements prior to and during integrated concrete placement in this system.
2. Division 5 Section "Metal Fabrications" for joist bearing angles, masonry shelf angles and connections.
3. Division 5 Section 052126 iSPAN Total Joist Composite Joist and Concrete Floor Framing System
4. Division 7 Section "Building Insulation" for batt insulation nested within structure elements.
5. Division 9 Section 092216 "Non-Load-Bearing Steel Framing" for interior non-load-bearing, metal stud framing and ceiling-suspension assemblies
6. Division 9 Section "Gypsum Board Shaft-Wall Assemblies" for interior non-load-bearing, metal-stud-framed, shaft-wall assemblies.
7. Professional engineering services by stamped CFS Engineer. Professional services of Design and Engineering coordination of wall panels, wall panel design, joist/deck/structural floor system and any truss or non-load bearing exterior elements (as required) to be procured from T-44 system provider.

1.2 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

1.3 PRECONSTRUCTION MEETINGS

- A. Preconstruction Conference: Conduct conference at Project site.

1.4 SUBMITTALS

- A. Product Data: For each type of cold-formed steel framing product and accessory.

Note to Specifier delete following paragraph if Sustainable Design is not a part of project requirements.

- B. LEED only - Sustainable Design Submittals (as needed):
 1. Documentation indicating percentages by weight of postconsumer and preconsumer recycled content.
 2. Provide data indicating material was produced within 500 miles (800 km) of the project location.
- C. Shop Drawings:
 1. Include layout, spacings, sizes, thicknesses, and types of cold-formed steel framing; fabrication; and fastening and anchorage details, including mechanical fasteners.
 2. Indicate reinforcing channels, opening framing, supplemental framing, strapping, bracing, bridging, splices, accessories, connection details, and attachment to adjoining work.
 3. CFS Engineered Shop drawings shall be stamped by a professional engineer registered in the jurisdiction of the project. Panel Shop drawings, Truss Shop Drawings and Joist/Floor System Shop Drawings will be reviewed for conformance with the overall CFS Engineered design by a professional engineer.
- D. Delegated-Design by CFS Specialty Structural Engineer. The design professional, individual or organization having responsibility for the design of the specialty items. This responsibility shall be in accordance with the state's statues and regulations governing the professional registration and certification of architects or engineers.
- E. Qualification Data: For testing agency.
- F. Welding certificates.

- G. Product Test Reports: For each listed product, for tests performed by manufacturer and witnessed by a qualified testing agency.
1. Steel sheet.
 2. Expansion anchors.
 3. Power-actuated anchors.
 4. Mechanical fasteners.
 5. Vertical deflection clips.
 6. Horizontal drift deflection clips
 7. Miscellaneous structural clips and accessories.
- H. Research Reports: For non-standard cold-formed steel framing, submit evaluation reports certified under an independent third-party inspection program administered by an agency accredited by IAS to ICC-ES AC98, IAS Accreditation Criteria for Inspection Agencies.

1.5 QUALITY ASSURANCE

- A. Provide certification of code compliance with the "Code Compliance Certification Program" implemented by the Steel Framing Industry Association (SFIA).
- B. Welding Qualifications: Qualify procedures and personnel according to the following:
1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
 2. AWS D1.3/D1.3M, "Structural Welding Code - Sheet Steel."
- C. 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.
- D. Comply with AISI S230 "Standard for Cold-Formed Steel Framing - Prescriptive Method for One and Two Family Dwellings."

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Protect cold-formed steel framing from corrosion, long term moisture staining, deformation, and other damage during delivery, storage, and handling.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Provide component products by Steel Framing Industry Association Members in good standing (listing found at http://www.archtest.com/certification/SFIA_SteelFraming_Intertek.aspx).

- iSPAN Systems
- NUCOR/VULCRAFT
- Allied Studco
- Clark-Dietrich

B. 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. All Steel Mid-Rise, 1360 Norton Rd, Columbus, OH 43228 design@allsteelmidrise.com; www.allsteelmidrise.com Tel: 833-MIDRISE (643-7473)

2.2 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified Specialty Structural Engineer to design cold-formed steel framing to the ASMR T-44 system.
- B. Structural Performance: Provide cold-formed steel framing capable of withstanding design loads within limits and under conditions indicated.
1. Design Loads: As indicated.
 2. Deflection Limits: Design framing systems to withstand design loads without horizontal and vertical deflections greater than those assigned to the indicated exterior wall systems, and including finish material.
 3. 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.
 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 determined by the exterior wall system.
 5. Design exterior non-load-bearing wall framing to accommodate horizontal deflection without regard for contribution of sheathing materials.

C. Cold-Formed Steel Framing Design Standards:

1. Floor and Roof Systems: AISI S210. Utilize iSPAN TOTALJOIST and deck system. Corridor deck by Nucor/Vulcraft. C-Joists at roof only to be determined by design engineer.
2. Wall Studs: AISI S211.
3. Headers: AISI S212.
4. Lateral Design: AISI S213.

CI. AISI Specifications and Standards: Unless more stringent requirements are indicated, comply with AISI S100 and AISI S200.

CII. Fire-Resistance Ratings: Comply with ASTM E 119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Indicate design designations from UL's "Fire Resistance Directory" or from the listings of another qualified testing agency.

2.3 COLD-FORMED STEEL FRAMING, GENERAL

- A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.
- B. Steel Sheet: ASTM A 1003/A 1003M, Structural Grade, Type H, metallic coated, of grade and coating weight as follows:
 1. Grade: As required by structural performance.
 2. Coating: As determined by project location and climate conditions. G60 minimum.

2.4 LOAD-BEARING WALL FRAMING

- A. Steel Studs: Manufacturer's standard C-shaped steel studs, of web depths indicated, punched, with stiffened flanges, with minimum base metal thickness, flange width and section properties required to meet design requirements.
- B. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with straight flanges, and matching properties of steel studs
- C. Steel Single, Double-L or Back-to Back Headers: Manufacturer's standard L or C shapes used to form header beams, of web depths required, and with minimum base metal thickness, flange width and section properties required to meet design requirements.

2.5 EXTERIOR NON LOAD-BEARING WALL FRAMING

- A. Steel Studs: Manufacturer's standard C-shaped steel studs, of web depths indicated, punched, with stiffened flanges, with minimum base metal thickness, flange width and section properties required to meet design requirements.
- B. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with straight flanges, and matching properties of steel studs
- 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.
- 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.
- E. U-Channel: Manufacturer's standard length and per design requirements.
- 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.

2.6 FLOOR JOIST FRAMING

- A. Steel Joists: iSPAN TOTALJOIST and where excepted at roof level only other Manufacturer's standard C-shaped steel joists, of web depths indicated, [**unpunched,**][**punched,**]
[**punched, with enlarged service holes,**] with stiffened flanges, and with minimum base metal thickness, flange width and section properties required to meet design requirements.
- B. Steel Joist Track: Manufacturer's standard U-shaped steel joist track, of web depths required, unpunched, with unstiffened flanges, and with minimum base metal thickness, flange width and section properties required to meet design requirements.

2.7 ROOF-RAFTER FRAMING

- A. Steel Rafters: Manufacturer's standard C-shaped steel sections, of web depths indicated, with stiffened flanges, and as follows: with minimum base metal thickness, flange width and section properties required to meet design requirements.

- 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 and per design requirements.

2.8 CEILING JOIST FRAMING

- A. Steel Ceiling Joists: Manufacturer's standard C-shaped steel sections, of web depths indicated, [unpunched,] [punched with enlarged service holes,] [punched with standard holes,] with stiffened flanges, and with minimum base metal thickness, flange width and section properties required to meet design requirements.

2.9 SOFFIT FRAMING (as needed)

- A. Exterior Soffit Frame: Manufacturer's standard C-shaped steel sections, of web depths indicated, with stiffened flanges, and with minimum base metal thickness, flange width and section properties required to meet design requirements.

2.10 CORRIDOR FLOOR FRAMING

- A. Corridor decking : Clear-span per NUCOR/VULCRAFT (**per engineering requirements, additional description needed**)
- B. Bearing angle: 3x3 structural steel ledger angle fastened (**per engineering requirements, additional description needed**)

2.11 FRAMING ACCESSORIES

- A. 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.
- B. Provide accessories of manufacturer's standard thickness and configuration, required by design requirements.

2.12 ANCHORS, CLIPS, AND FASTENERS

- A. SSE shall include the following anchors, clips and fasteners required by the design requirements:
 1. Steel Shapes and Clips.
 2. Anchor Bolts.
 3. Expansion Anchors: corrosion-resistant ASTM E 488
 4. Power-Actuated Anchors if allowed by Structural Engineer of Record.
 5. Mechanical Fasteners, head type: ASTM C 1513 corrosion-resistant coated, self-drilling/tapping low-profile head beneath sheathing, manufacturer's standard elsewhere.
 6. Welding Electrodes per AWS standards.

2.13 MISCELLANEOUS MATERIALS

- A. Galvanizing Repair Paint: ASTM A780.
- 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/C 1107M, with fluid consistency and 30-minute working time.
- D. 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.
- E. 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, if needed or required.

2.14 FABRICATION

- A. Fabricate cold-formed steel 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 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.
 - a. Comply with AWS D1.3/D1.3M 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 no fewer than three exposed screw threads.
 - 4. Fasten other materials to cold-formed steel framing by welding, bolting, pneumatic pin fastening, 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: Fabricate assemblies level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet and as follows:
 - 1. 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.
 - 2. Squareness: Fabricate each cold-formed steel framing assembly to a maximum out-of-square tolerance of 1/8 inch.

- D. Built-up members, headers, corners inaccessible in the field shall be insulated in the factory
- E. All hot rolled structural steel shall be primed, unless noted otherwise
- F. Required exterior sheathing shall be factory applied, screw type and spacing per design requirements
- G. CFS flat strap shearwall bracing shall be connected flat and under tension to ensure a flat installation to the studs.
- H. Structural Steel Braced Frames for shear to be installed per design requirements and approved Braced Frame shop drawings.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine supporting substrates and abutting structural framing, cast in place concrete walls, foundation walls, masonry walls, heavy "red-iron" structural steel framing and other supporting elements for compliance with requirements for installation tolerances and other conditions affecting performance of the Work. Supporting concrete/masonry shall be brought to +/- 1/4" in ten feet levelness and flatness.
- B. 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 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.
- D. Install sealer gaskets at the underside of wall bottom track or rim track and at the top of foundation wall or slab at stud or joist locations if required per detail.

3.3 INSTALLATION, GENERAL

- A. Cold-formed steel framing may be shop or field fabricated for installation, or it may be field assembled.

- B. Install cold-formed steel framing according to AISI S200 and to manufacturer's written instructions unless more stringent requirements are indicated.
- C. Install shop- or field-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 1/4 inch.
- D. Install cold-formed steel 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 steel framing members by welding, screw fastening, clinch fastening, or riveting. Wire tying of framing members is not permitted.
 - a. Comply with AWS D1.3/D1.3M 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 joints with cold-formed steel framing. Independently frame both sides of joints.
- H. Install insulation in shop assembly, specified in Section 07210 "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 over web penetrations that exceed size of manufacturer's approved or standard punched openings.
- J. 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 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 LOAD-BEARING WALL INSTALLATION

- A. Install continuous top and bottom tracks sized to match studs. Align tracks accurately and securely anchor at corners and ends, and at spacings as indicated on shop drawings.
- B. Squarely seat studs against top and bottom tracks with gap not exceeding of 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 as indicated on shop drawings.
- 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 according to AISI S200, Section C1. 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 as indicated on Shop Drawings. Fasten jamb members together to uniformly distribute loads.
 - 2. 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.
- 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, 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 vertically as indicated on Shop Drawings. Fasten at each stud intersection.
- J. 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.
- 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.

3.5 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.

3.6 JOIST INSTALLATION

- A. Install perimeter joist track sized to match joists. Align and securely anchor or fasten track to supporting structure at corners, ends, and spacings indicated on Shop Drawings. Follow specifications in associated iSPAN Total Joist requirements.

- 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 indicated on Shop Drawings.
 - 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 from abutting walls, and indicated on Shop Drawings, unless there is a distribution track member.
- D. Frame openings with built-up joist headers consisting of joist and joist track, 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 indicated on Shop Drawings.
- 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.

3.7 FIELD QUALITY CONTROL

- A. Testing: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.
- B. Field and shop welds will be subject to testing and inspecting. Typical fastener locations and counts per details will be subject to inspecting.
- 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.
- F. CFS Engineer to perform field walkthrough and issue Observation Reports mid-project and at Substantial Completion to review for conformance with design intent.

3.8 REPAIRS AND PROTECTION

- A. 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.
- B. Provide final protection and maintain conditions, in a manner acceptable to ensure that cold-formed steel framing is without damage or deterioration at time of Substantial Completion.

END OF SECTION 054000