

SECTION: 05 42 00

COLD-FORMED METAL JOIST FRAMING

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes cold-formed steel framing elements.
Work includes:
 - 1) Steel roof joists system.
 - 2) Steel floor joist systems.
 - 3) Fasteners and connectors for framing.

- B. Related Sections
 - 1) Section 03 00 00 – Concrete
 - 2) Section 04 00 00 – Masonry
 - 3) Section 05 10 00 – Structural Metal Framing
 - 4) Section 05 20 00 – Metal Joists
 - 5) Section 05 40 00 – Cold-Formed Metal Framing
 - 6) Section 05 50 00 – Metal Fabrications
 - 7) Section 06 10 00 – Rough Carpentry
 - 8) Section 07 00 00 – Thermal And Moisture Protection
 - 9) Section 09 00 00 – Finishes

1.2 REFERENCES

- A. Reference standards:
 - 1) ASTM:
 - a) ASTM A90 / A90M-13 - Standard Test Method for Weight (Mass) of Coating on Iron and Steel Articles with Zinc or Zinc-Alloy Coatings.
 - b) ASTM A370-16 - Standard Test Methods and Definitions for Mechanical Testing of Steel Products.
 - c) ASTM A653 / A653M-15e1 - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
 - d) ASTM A780 / A780M-09 (2015) - Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings.
 - e) ASTM A924 / A924M-16ae1 - Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process.
 - f) ASTM A1003 / A1003M-15 - Standard Specification for Steel Sheet, Carbon, Metallic- and Nonmetallic-Coated for Cold-Formed Framing Members.
 - g) ASTM A1008 / A1008M-16 - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable.
 - h) ASTM A1011 / A1011M-15 - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength.
 - i) ASTM B633-15 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel.
 - j) ASTM C955-15e1 - 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.
 - k) ASTM C1007-11a (2015) - Standard Specification for Installation of Load Bearing (Transverse and Axial) Steel Studs and Related Accessories.
 - l) ASTM C1513-13 - Standard Specification for Steel Tapping Screws for Cold-Formed Steel Framing Connections.

- 2) American Welding Society (AWS)
 - a) AWS D1.1 "Structural Welding Code - Steel."
 - b) AWS D1.3 "Structural Welding Code - Sheet Steel."
- 3) Light Gauge Steel Engineers Association Field Installation Guide
- 4) American Iron and Steel Institute (AISI)
 - a) D100-13 – Cold-Formed Steel Design Manual, 2013 Edition
 - b) AISI S100-12 - North American Specification for the Design of Cold-Formed Steel Structural Members, 2012 Edition
 - c) AISI-S200-12 – North American Standard for Cold-Formed Steel Framing – General Provisions.
 - d) AISI-S201-12 – North American Standard for Cold-Formed Steel Framing – Product Data.
 - e) AISI-S210-07 (2012) – North American Standard for Cold-Formed Steel Framing – Floor and Roof System Design.
- 5) ASCE 7-16 – Minimum Design Loads and Associated Criteria for Buildings and Other Structures.

1.3 PERFORMANCE REQUIREMENTS

- A. Calculate structural properties per AISI S100-16 - Specifications for the Design of Cold-Formed Steel Structural Members, 2012.
- B. Design system components per AISI reference. Provide for movement of components due to thermal variations without damage, failure, or excessive stress on components.
- C. Design exterior wall system for environmental loads as outlined in the ASCE 7 latest edition to provide for movement of components without damage, failure of joint seals, undue stress on fasteners, or other detrimental effects when subject to seasonal or cyclic day/night temperature ranges.
- D. Design system to accommodate construction tolerances, deflection of building structural members, and clearances of intended openings.
- E. Maximum Allowable Deflection:
 - 1) Live Load: Floor joist vertical deflection less than or equal to Length/480.
 - 2) Live Load: Roof joist vertical deflection less than or equal to Length/360.
 - 3) Total Load: Floor joist vertical deflection less than or equal to Length/360.
 - 4) Total Load: Roof joist vertical deflection less than or equal to Length/240.
- F. Horizontal Assemblies:
 - 1). Maximum Allowable Deflection: $L/360$ of span under total design loads.
- G. Structural Performance: Design, fabricate, and erect cold-formed steel wall panels to withstand specified design loads within limits and under conditions required.
 - 1) Design Loads: As specified.
 - 2) Design framing systems to provide for movement of framing members without damage or over-stressing, sheathing failure, connection failure, undue strain on fasteners and anchors, or other detrimental effects when subject to a maximum ambient temperature change (range) of 120 deg F (67 deg C).

1.4 SUBMITTALS

- A. Submit documentation in accordance with Section: 01 30 00
- B. Product Data: Manufacturer's data sheets on each product to be used, including:
 - 1) Preparation instructions and recommendations.
 - 2) Storage and handling requirements and recommendations.
 - 3) Installation methods.
- C. Structural Calculations:
 - 1) All submittals shall be sealed by a professional engineer registered in the province of

the Project Location. Engineer shall have a minimum of 5 years experience with projects of similar scope.

- 2) Description of design criteria.
- 3) Selection of framing components, accessories and welded connection requirements.
- 4) Verification of attachments to structure and adjacent framing components.

D. Shop Drawings:

- 1) Submit shop drawings prepared by the manufacturer showing plans, sections, layouts, profiles and product component locations, including anchorage, bracing, fasteners, accessories and finishes.
- 2) Show connection details with screw types and locations, weld lengths and locations, and other fastener requirements.
- 3) Where pre-fabricated panels are to be provided, provide drawings depicting panel configurations, dimensions and locations.

E. Welder's Certificates: Submit manufacturer's certificates, certifying welders employed on Work, verifying AWS qualifications within the previous 12 months.

F. Verification Samples - For each finish product specified, two samples, minimum size 6 inches (150 mm) square, representing actual product, color, and patterns.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this Section with minimum 5 years documented experience.

B. Fabricator Qualifications: Fabrication shall be performed in a quality controlled manufacturing environment by a cold-formed steel panel fabricator with experience fabricating Cold-Formed Steel Floor/Roof Panels equal in material, design, and scope to the wall systems required for this Project.

C. Installer Qualifications: Installer experienced in performing work of this Section who has specialized in installation of work similar to that required for the project.

D. Pre-installation Meetings: Conduct pre-installation meeting to verify project requirements, substrate conditions, and manufacturer's installation instructions.

E. Welding Standards:

- 1) Comply with applicable provisions of AWS D1.1 "Structural Welding Code--Steel"
- 2) Comply with applicable provisions of AWS D1.3 "Structural Welding Code--Sheet Steel."
- 3) Qualify welding processes and welding operators in accordance with AWS "Standard Qualification Procedure."

F. Mock-Up: Provide a mock-up for evaluation of surface preparation techniques and application workmanship. Do not proceed with work until material, details and workmanship are approved by Architect.

1.6 DELIVERY, STORAGE AND HANDLING

A. Deliver materials in manufacturer's unopened containers or bundles, fully identified by name, brand, type and grade. Exercise care to avoid damage during unloading, storing and erection.

B. Store products in manufacturer's unopened packaging until ready for installation.

C. Store materials protected from exposure to rain, snow or other harmful weather conditions, at temperature and humidity conditions per the recommendations of AISI OSP section F3.

- D. Protect all components and accessories from corrosion, deformation, damage and deterioration when stored at job site. Keep all component and accessories free of dirt and other foreign matter.
- E. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

1.7 PROJECT CONDITIONS

- A. During construction, adequately distribute all loads applied to floor/roof framing so as not to exceed the carrying capacity of any single element.
- B. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

PART 2 PRODUCTS

2.1 MANUFACTURERS

VanderWal Homes & Commercial Group Inc.

4427 VanderWal Drive

Petrolia, ON N0N 1R0

P. 1-877-251-6875

F. 1-866-873-0360

E. info@trusses.ca

Website: <http://www.trusses.ca>

Service Area

- Alberta · British Columbia · Manitoba · New Brunswick · Newfoundland ·
- Northwest Territories · Nova Scotia · Nunavut Territory · Ontario ·
- Prince Edward Island · Quebec · Saskatchewan · Yukon Territory ·

Products

- Cold-Formed Steel Trusses · Cold-Formed Steel Wall Panels · Cold-Formed Steel Floors Systems ·

2.2 COMPONENTS

- A. System components:
 - 1) Bailey Metal Products Ltd. - Lightweight Steel Framing – Wall Stud & Floor Joist
 - 2) Steelform Building Products Inc. - Regular "C" Section Joists
 - 3) Steelform Building Products Inc. - MegaJoists Floor Joists
- B. Provide manufacturer's standard cold-formed steel members, bracing, bridging, blocking, reinforcements, fasteners and accessories with each type of steel framing required, as recommended by the manufacturer for the applications indicated and as needed to provide a complete cold-formed steel wall assembly.

2.3 MATERIALS

- A. Steel Sheet: ASTM A1003, Structural Grade, Type H, 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.

2.4 STRUCTURAL JOIST FRAMING

- A. Steel Joists: Manufacturer's cold-formed steel joists, of web depths indicated, punched, with stiffened flanges, and as follows:
 - 1) Minimum Base-Metal Thickness:
 - a) 20 gauge, 0.0329 inch (0.84 mm).
 - b) 18 gauge, 0.0428 inch (1.09 mm).
 - c) 16 gauge, 0.0538 inch (1.37 mm).
 - d) 14 gauge, 0.0677 inch (1.72 mm).
 - e) 12 gauge, 0.0966 inch (2.45 mm).
 - 2) Flange Width:
 - a) 1-1/4 inches (32 mm).
 - b) 1-5/8 inches (41 mm).
 - c) 2 inches (51 mm).
 - d) 2-1/2 inches (64 mm)
 - e) 3 inch (76 mm)
 - 3) Web Depth:
 - a) 3 5/8 inch (92 mm) 362 depth.
 - b) 4 inch (102 mm) 400 depth.
 - c) 6 inch (152.4 mm) 600 depth.
 - d) 8 inch (203 mm) 800 depth.
 - e) 10 inch (254 mm) 1000 depth.
 - f) 12 inch (305 mm) 1200 depth.
 - g) 14 inch (355.6 mm) 1400 depth.
 - 4) Section Properties: Refer to Drawings.
- B. Steel Track: Manufacturer's cold-formed steel track, of web depths indicated, unpunched, with straight flanges, and as follows:
 - 1) Minimum Base-Metal Thickness:
 - a) 20 gauge, 0.0329 inch (0.84 mm).
 - b) 18 gauge, 0.0428 inch (1.09 mm).
 - c) 16 gauge, 0.0538 inch (1.37 mm).
 - d) 14 gauge, 0.0677 inch (1.72 mm).
 - e) 12 gauge, 0.0966 inch (2.45 mm).
 - 2) Flange Width:
 - a) 1-1/4 inches (32 mm).
 - b) 2 inches (51 mm).
 - c) 3 inches (76 mm).
 - 3) Web Depth:
 - a) 3 5/8 inch (92 mm) 362 depth.
 - b) 4 inch (102 mm) 400 depth.
 - c) 6 inch (152.4 mm) 600 depth.
 - d) 8 inch (203 mm) 800 depth.
 - e) 10 inch (254 mm) 1000 depth.
 - f) 12 inch (305 mm) 1200 depth.
 - g) 14 inch (355.6 mm) 1400 depth.
 - 4) Section Properties: Refer to Drawings.

2.5 FRAMING CONNECTORS

- A. Framing Connectors: Steel-framing accessories fabricated from steel sheet, ASTM A1003/A1003M-15, 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, unless otherwise indicated, as follows:

- 1) Solid Blocking (JB).
- 2) Utility Angles (UA).
- 3) Gusset Plates (GP).
- 4) Rigid Clips (RCC).
- 5) Bridge Clips (BR).
- 6) Breakaway Clips (BA).
- 7) U-Flex Track.
- 8) SIMPSON Strong-Tie Connectors

C. Vertical Deflection Clips: Manufacturer's standard clips, capable of accommodating upward and downward vertical displacement of primary structure through positive mechanical attachment to joist. Refer to Structural Drawings for anticipated deflection of primary structural elements.

2.6 ANCHORS, CLIPS AND FASTENERS

- A. Steel Shapes and Clips: ASTM A36/A36M-14, zinc coated by hot-dip process according to ASTM A123/A123M-15.
- B. Expansion Anchors: Fabricated from corrosion-resistant materials, with capability to sustain design loads, as determined by testing per ASTM E488/E488M-15. Refer to Structural Drawings.
- C. Powder-Actuated Anchors: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with capability to sustain design loads, as determined by testing per ASTM E1190-11. Refer to Structural Drawings.
- D. Mechanical Fasteners: ASTM C1513-13, corrosion-resistant-coated, self-drilling, self-tapping steel drill screws. Refer to Structural Drawings.
- E. Welding Electrodes: Comply with AWS standards.

2.7 MISCELLANEOUS MATERIALS

- A. Galvanizing Repair Paint: SSPC-Paint 20 or DOD-P-21035.
- B. Cement Grout: Portland cement, ASTM C150/C150M-16e1, Type I; and clean, natural sand, ASTM C404-11.
Mix at ratio of 1 part cement to 2-1/2 parts sand, by volume, with minimum water required for placement and hydration. Refer to Structural Drawings.
- 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 C1107/C1107M-14a, with fluid consistency and 30-minute working time. Refer to Structural Drawings.
- D. Shims:
 - 1) Load bearing, hardwood blocks.
 - 2) Load bearing, structural steel plates.
 - 3) Load bearing, high-density multimonomer plastic, nonleaching.

2.8 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) For all pre-fabricated framing assemblies, fabricate panels using jigs or templates.
 - 2) Cut framing members by sawing or shearing; do not torch cut.
 - 3) Fasten cold-formed metal framing members by welds, screw fasteners, clinch fasteners, or rivets 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.
 - 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 elements and assemblies to withstand handling, delivery, and erection stresses. Lift fabricated assemblies to prevent damage or permanent distortion.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine structure, substrates and installation conditions. Do not proceed with cold-formed steel joist installation until unsatisfactory conditions have been corrected.
- B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.
- C. Installation constitutes acceptance of existing conditions and responsibility for satisfactory performance.

3.2 FASTENING

- A. Provide framing anchors as indicated or accepted on the engineering design drawings or erection drawings. Anchor framing securely to support structure.
- B. Field Welding: Per AWS D1.3, and the following:
 - 1) Stud-to-track connections: 1/2 inch (13 mm) fillet weld, full length of inside flange dimension, inside each flange of stud onto track web.
 - 2) Other connections: Flat, plug, butt, or seam.
 - 3) Minimum Steel Thickness for Welded Connections: 18 gauge.
- C. Field Fastening: Minimum 2 self-tapping metal screws per connection, unless otherwise indicated.

3.3 INSTALLATION, GENERAL

- A. General Erection Requirements:
 - 1) Install cold-formed framing in accordance with requirements of ASTM C1007-11a (2015).
 - 2) Install in compliance with applicable sections of the AISI Standard for Cold-Formed Steel Framing General Provisions.
 - 3) Provide for erection stresses. Provide temporary bracing as construction activities progress.
 - 4) Erect components in full-length single piece. Splicing of components is prohibited.
 - 5) Brace and reinforce assemblies as indicated or required for full design strength.
- B. Joist Framing Installation:
 - 1) Handle and lift prefabricated panels in a manner so as not to cause distortion in any member.
 - 2) Anchor runner track securely to the supporting structure as shown on the erection drawings.
 - 3) Butt all track joints. Securely anchor abutting pieces of track to a common structural element, or splice together.
 - 4) Align and plumb joists, and securely attach to the flanges except when vertical movement is specified.
 - 5) Attach joist blocking in a manner to prevent joist rotation. Space blocking rows according to manufacturer's recommendations.
 - 6) Frame openings to include headers and support framing as shown in the drawings.

- 7) Place joists at maximum 610 mm (24 inches) on center; not more than 50 mm (2 inches) from abutting walls, and at each side of openings. Connect joists to rim tracks using mechanical fastener method.
 - 10) Attach cross studs or blocking to joists for attachment of wall framing.
 - 11) Install framing between joists for attachment of mechanical and electrical items, and to prevent joist rotation.
 - 12) Touch-up field welds and damaged galvanized and primed surfaces with primer.
- C. Provide proper lifting equipment, including spreader bar, suited to sizes and types of panels and framing elements required, applied at lift points recommended by supplier/panel fabricator. Exercise care to avoid damage to joist members during erection and to keep horizontal bending of the panels and framing to a minimum.
- D. Provide framing anchors as indicated or accepted on the engineering design drawing or erection drawings. Anchor joist framing securely to support structure.
- E. Install prefabricated floor/roof panels in one-piece lengths, unless splice connections are indicated.
- F. DO NOT cut members of prefabricated floor/roof panels without prior approval of panel supplier.
- G. Provide installation bracing and leave in place until joists are permanently stabilized.
- H. Erection Tolerances: Install joist framing to a maximum allowable tolerance variation from plumb, level, and true to line of 1/8 inch in 10 feet (1:960).

3.4 REPAIRS AND PROTECTION

- A. Joist Repairs: Contact floor joist/roof joist supplier and request repair details for any damage to the framing material. Damage to individual joist members resulting from the improper shipping, handling or storage of the panels must be repaired prior to panel installation.
- B. Joist Panel Repairs: Contact floor joist/roof joist panel manufacturer and request repair details for any damage to the panels. Damage to panel sections resulting from the improper shipping, handling or storage of the panels must be repaired prior to panel installation.
- C. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on fabricated and installed cold-formed steel framing with galvanizing repair paint according to ASTM A780/A780M-09 (2015) and the manufacturer's instructions.

END OF SECTION