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## SECTION 054000 - COLD-FORMED METAL FRAMING

### TIPS:

To view non-printing **Editor's Notes** that provide guidance for editing, click on MasterWorks/Single-File Formatting/Toggle/Editor's Notes.

To read **detailed research, technical information about products and materials, and coordination checklists**, click on MasterWorks/Supporting Information.

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

### 1.2 SUMMARY

A. Section Includes:

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

B. Related Requirements:

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

2. Section 092116.23 "Gypsum Board Shaft Wall Assemblies" for interior non-load-bearing, metal-stud-framed, shaft-wall assemblies.
3. Section 092216 "Non-Structural Metal Framing" for interior non-load-bearing, metal-stud framing and ceiling-suspension assemblies.

### 1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at [**Project site**] <**Insert location**>.

### 1.4 ACTION SUBMITTALS

- A. Product Data: For each type of cold-formed steel framing product and accessory, submit the following information:
  1. Manufacturer's product data, including manufacturer's technical data sheet.
  2. ICC-ES Reports.
  3. Material Safety Data Sheets.
- B. Sustainable Design Submittals:
  1. Product Data: For recycled content, indicating postconsumer and preconsumer recycled content and cost.
- 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. Where prefabricated or prefinished panels are to be provided, depict panel configurations, dimensions, and locations
- D. Delegated-Design Submittal: For cold-formed steel framing.
  1. Submit structural calculations as follows:
    - a. Structural calculations prepared by manufacturer for approval. Submittal shall be sealed by a professional engineer registered in the State in which Project is located.
    - b. Description of design criteria.
    - c. Engineering analysis depicting stress and deflection requirements for each framing application.
    - d. Selection of framing components, accessories, and weld connection requirements.
    - e. Verification of attachments to structure and adjacent framing components.

### 1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For testing agency.

- B. Welding certificates.
- C. Product Test Reports: For each listed product, for tests performed by [**manufacturer and witnessed by a qualified testing agency**] [**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.
- D. Research Reports: For non-standard cold-formed steel framing, from ICC-ES.

#### 1.6 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Qualified according to ASTM E 329 for testing indicated.
- B. 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.
- C. 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."
- D. Comply with AISI S230 "Standard for Cold-Formed Steel Framing - Prescriptive Method for One and Two Family Dwellings."
- E. Mockups: Build mockups [**to set quality standards for materials and execution**] [**to set quality standards for fabrication and installation**] [**for preconstruction testing**].
  - 1. Build mockup of typical **<Insert description>** as shown on Drawings.
  - 2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
  - 3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

#### 1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials in manufacturer's original packaging with identification labels intact and in sizes to suit the Project.
- B. Protect cold-formed steel framing from corrosion, moisture staining, deformation, and other damage during delivery, storage, and handling.

## C. Packaging Waste Management:

1. Separate waste materials for **[reuse]** **[and]** **[recycling]** in accordance with Section 017419.
2. Remove packaging materials from site and dispose of at appropriate recycling facilities.
3. Collect and separate for disposal **[paper]** **[plastic]** **[polystyrene]** **[corrugated cardboard]** packaging material **[in appropriate onsite bins]** for recycling.
4. Fold metal and plastic banding; flatten and place in designated area for recycling.
5. Remove pallets from site **[and return to supplier or manufacturer]**.

## PART 2 - PRODUCTS

## 2.1 MANUFACTURERS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide Marino\WARE **[Standard Cold Formed Light Gauge Structural Steel Framing]** **[or]** **[Marino\WARE proprietary StudRite Steel Framing (with continuous triangular lip reinforced knockouts)]** **<product name or designation>** or comparable product by one of the following:
1. CEMCO; California Expanded Metal Products Co.
  2. ClarkDietrich Building Systems.
  3. Telling Industries.
  4. **<Insert manufacturer's name>**.
- B. Source Limitations: Provide components and materials specified in this section from a single manufacturer.

## 2.2 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design cold-formed steel framing.
- B. Structural Performance: Provide cold-formed steel framing capable of withstanding design loads within limits and under conditions indicated.
1. Design Loads: **[As indicated]** **<Insert design loads>**.
  2. Deflection Limits: Design framing systems to withstand **[design loads]** without deflections greater than the following:
    - a. Exterior Load-Bearing Wall Framing: Horizontal deflection of **[1/240]** **[1/360]** **[1/600]** **[1/720]** of the wall height.
    - b. Interior Load-Bearing Wall Framing: Horizontal deflection of **[1/240]** **[1/360]** of the wall height under a horizontal load of **5 lbf/sq. ft. (239 Pa)**.
    - c. Exterior Non-Load-Bearing Framing: Horizontal deflection of **[1/240]** **[1/360]** **[1/600]** **[1/720]** **<Insert ratio>** of the wall height.
    - d. Floor Joist Framing: Vertical deflection of **[1/360]** **[1/480]** for live loads and 1/240 for total loads of the span.

- e. Roof Rafter Framing: Vertical deflection of [1/120] [1/240] [1/360] of the horizontally projected span for live loads.
  - f. Ceiling Joist Framing: Vertical deflection of [1/120] [1/240] [1/360] of the span for live loads and 1/240 for total loads of the span.
  - g. Gypsum Board: 1/360 of span under total design loads.
  - h. Exterior Insulation Finish Systems: 1/360 of span under total design loads.
  - i. Plaster or Stucco: 1/360 of span under total design loads.
  - j. Brick Veneer: 1/600 of span under total design loads.
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 (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 as follows:
    - a. Upward and downward movement of [1/2 inch (13 mm)] [3/4 inch (19 mm)] [1 inch (25 mm)] [1-1/2 inches (38 mm)].
  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.
  2. Wall Studs: AISI S211.
  3. Headers: AISI S212.
  4. Lateral Design: AISI S213.
- D. AISI Specifications and Standards: Unless more stringent requirements are indicated, comply with AISI S100 and AISI S200.
- E. 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] <Insert value> percent.
- B. Steel Sheet: ASTM A 1003/A 1003M, Structural Grade, Type H, metallic coated, of grade and coating weight as follows:
1. Grade: [ST33H (ST230H)] [ST50H (ST340H)] [As required by structural performance] <Insert grade>.

2. Metallic Coating, Minimum: [**G60 (Z180)**] [**A60 (ZF180)**] [**AZ50 (AZ150)**] [**GF30 (ZGF90)**].
- C. Steel Sheet for [**Vertical Deflection**] [**Drift**] Clips: ASTM A 653/A 653M, structural steel, zinc coated, of grade and coating as follows:
1. Grade: [**33 (230)**] [**50 (340), Class 1**] [**As required by structural performance**].
  2. Coating: [**G60 (Z180)**] [**G90 (Z275)**].

## 2.4 LOAD-BEARING WALL FRAMING

- A. Basis-of-Design Product: Subject to compliance with requirements provide Marino\WARE; [**StudRITE**] [**Standard**] [**As indicated on Drawings**].
- B. 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: [**0.0329 inch (0.84 mm)**] [**0.0428 inch (1.09 mm)**] [**0.0538 inch (1.37 mm)**] [**0.0677 inch (1.72 mm)**] [**0.0966 inch (2.45 mm)**] [**0.1180 inch (3.00 mm)**].
  2. Flange Width: [**1-3/8 inches (35 mm)**] [**1-5/8 inches (41 mm)**] [**2 inches (51 mm)**] [**2-1/2 inches (63 mm)**] [**3 inches (76.2 mm)**] [**3-1/2 inches (89 mm)**].
  3. Web Depth: [**2-1/2 inches (63 mm)**] [**3-1/2 inches (89 mm)**] [**3-5/8 inches (92 mm)**] [**4 inches (102 mm)**] [**5-1/2 inches (140 mm)**] [**6 inches (152.4 mm)**] [**7-1/4 inches (184 mm)**] [**8 inches (203 mm)**] [**9-1/4 inches (235 mm)**] [**10 inches (254 mm)**] [**11-1/2 inches (292 mm)**] [**12 inches (305 mm)**] [**13-1/2 inches (342.9 mm)**] [**14 inches (355.6 mm)**] [**16 inches (406.4 mm)**].
  4. Section Properties: [**Section properties per manufacturer's published tables**] [**33 ksi (for 33 and 43 mil)**] [**50 ksi (for 54 mil and heavier)**].
- C. 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: [**0.0329 inch (0.84 mm)**] [**0.0428 inch (1.09 mm)**] [**0.0538 inch (1.37 mm)**] [**0.0677 inch (1.72 mm)**] [**0.0966 inch (2.45 mm)**] [**0.1180 inch (3.00 mm)**] [**Matching steel studs**].
  2. Flange Width: [**1-1/4 inches (32 mm)**] <Insert dimension if manufacturer's standard width is insufficient>.
  3. Web Depth: [**2-1/2 inches (63 mm)**] [**3-1/2 inches (89 mm)**] [**3-5/8 inches (92 mm)**] [**4 inches (102 mm)**] [**5-1/2 inches (140 mm)**] [**6 inches (152.4 mm)**] [**7-1/4 inches (184 mm)**] [**8 inches (203 mm)**] [**9-1/4 inches (235 mm)**] [**10 inches (254 mm)**] [**11-1/2 inches (292 mm)**] [**12 inches (305 mm)**] [**13-1/2 inches (342.9 mm)**] [**14 inches (355.6 mm)**] [**16 inches (406.4 mm)**] [**Matching steel studs**].
- D. Steel Box or Back-to-Back Headers: Manufacturer's standard C-shapes used to form header beams, of web depths indicated, unpunched, with stiffened flanges, and as follows:
1. Minimum Base-Metal Thickness: [**0.0329 inch (0.84 mm)**] [**0.0428 inch (1.09 mm)**] [**0.0538 inch (1.37 mm)**] [**0.0677 inch (1.72 mm)**] [**0.0966 inch (2.45 mm)**].

2. Flange Width: [1-3/8 inches (35 mm)] [1-5/8 inches (41 mm)] [2 inches (51 mm)] [2-1/2 inches (63 mm)].
3. Section Properties: [Section properties per manufacturer's published tables] [33 ksi (for 33 and 43 mil)] [50 ksi (for 54 mil and heavier)].

E. Steel Single- or Double-L Headers: Manufacturer's standard L-shapes used to form header beams, of web depths indicated, and as follows:

1. Minimum Base-Metal Thickness: [0.0329 inch (0.84 mm)] [0.0428 inch (1.09 mm)] [0.0538 inch (1.37 mm)] [0.0677 inch (1.72 mm)] [0.0966 inch (2.45 mm)].
2. Top Flange Width: [1-1/2 inches (38 mm)] [1-5/8 inches (41 mm)] [2 inches (51 mm)] [2-1/2 inches (63 mm)].
3. Section Properties: [Section properties per manufacturer's published tables] [33 ksi (for 33 and 43 mil)] [50 ksi (for 54 mil and heavier)].

## 2.5 EXTERIOR NON-LOAD-BEARING WALL FRAMING

A. Basis-of-Design Product: Subject to compliance with requirements, provide MarinoWARE; [StudRITE] [Standard] [As indicated on Drawings]

B. 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: [0.0329 inch (0.84 mm)] [0.0428 inch (1.09 mm)] [0.0538 inch (1.37 mm)] [0.0677 inch (1.72 mm)] [0.0966 inch (2.45 mm)] [0.1180 inch (3.00 mm)].
2. Flange Width: [1-3/8 inches (35 mm)] [1-5/8 inches (41 mm)] [2 inches (51 mm)] [2-1/2 inches (63 mm)] [3 inches (76.2 mm)] [3-1/2 inches (89 mm)].
3. Web Depth: [2-1/2 inches (63 mm)] [3-1/2 inches (89 mm)] [3-5/8 inches (92 mm)] [4 inches (102 mm)] [5-1/2 inches (140 mm)] [6 inches (152.4 mm)] [7-1/4 inches (184 mm)] [8 inches (203 mm)] [9-1/4 inches (235 mm)] [10 inches (254 mm)] [11-1/2 inches (292 mm)] [12 inches (305 mm)] [13-1/2 inches (342.9 mm)] [14 inches (355.6 mm)] [16 inches (406.4 mm)].
4. Section Properties: [Section properties per manufacturer's published tables] [33 ksi (for 33 and 43 mil)] [50 ksi (for 54 mil and heavier)] <Insert minimum allowable calculated section modulus, moment of inertia, and allowable moment>.

C. 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: [0.0329 inch (0.84 mm)] [0.0428 inch (1.09 mm)] [0.0538 inch (1.37 mm)] [0.0677 inch (1.72 mm)] [0.0966 inch (2.45 mm)] [0.1180 inch (3.00 mm)] [Matching steel studs].
2. Flange Width: [1-1/4 inches (32 mm)] <Insert dimension if manufacturer's standard width is insufficient>.
3. Web Depth: [2-1/2 inches (63 mm)] [3-1/2 inches (89 mm)] [3-5/8 inches (92 mm)] [4 inches (102 mm)] [5-1/2 inches (140 mm)] [6 inches (152.4 mm)] [7-1/4 inches (184 mm)] [8 inches (203 mm)] [9-1/4 inches (235 mm)] [10 inches (254 mm)] [11-1/2 inches (292 mm)] [12 inches (305 mm)] [13-1/2 inches (342.9 mm)] [14 inches (355.6 mm)] [16 inches (406.4 mm)] [Matching steel studs].

- D. Vertical Deflection Clips: Manufacturer's standard [**bypass**] [**head**] clips, capable of accommodating upward and downward vertical displacement of primary structure through positive mechanical attachment to stud web. [**Anticipated deflection of primary structural elements as indicated on the drawings.**]
1. Basis-of-Design Product: Subject to compliance with requirements, provide Marino\WARE; WSC Slid Clips, [**WSC362**] [**WSC600**] [**WSC800**] [**WSC1000**] [**WSC1200**] [**WSC Outrigger**] [**3T1000 Deflex**] [**6T1000 Deflex**] or comparable product by one of the following:
    - a. ClarkDietrich Building Systems.
    - b. Simpson Strong-Tie Co., Inc.
    - c. <**Insert manufacturer's name**>.
- E. 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:
1. Basis-of-Design Product: Subject to compliance with requirements, provide Marino\WARE; Deep Leg Track, Slotted Slip Track or comparable product by one of the following:
    - a. ClarkDietrich Building Systems.
    - b. Simpson Strong-Tie Co., Inc.
    - c. <**Insert manufacturer's name**>.
  2. Minimum Base-Metal Thickness: [**0.0428 inch (1.09 mm)**] [**0.0538 inch (1.37 mm)**] [**0.0677 inch (1.72 mm)**] [**0.0966 inch (2.45 mm)**] [**0.1180 inch (3.00 mm)**].
  3. Flange Width: [**1-1/2 inch (38 mm)**] plus the design deflection for one-story structures] [**and**] [**1 inch (25 mm)**] plus twice the design deflection for other applications] <**Insert dimension**>.
- F. Double Deflection Tracks: Manufacturer's double, deep-leg, U-shaped steel tracks, consisting of nested inner and outer tracks; unpunched, with unstiffened flanges.
1. Basis-of-Design Product: Subject to compliance with requirements, provide Marino\WARE; Deep Leg Track, Slotted Slip Track or comparable product by one of the following:
    - a. ClarkDietrich Building Systems.
    - b. Simpson Strong-Tie Co., Inc.
    - c. <**Insert manufacturer's name**>.
  2. Outer Track: Of web depth to allow free vertical movement of inner track, with flanges designed to support horizontal loads and transfer them to the primary structure, and as follows:
    - a. Minimum Base-Metal Thickness: [**0.0428 inch (1.09 mm)**] [**0.0538 inch (1.37 mm)**] [**0.0677 inch (1.72 mm)**] [**0.0966 inch (2.45 mm)**] [**0.1180 inch (3.00 mm)**].



- b. Flange Width: **[1-1/2 inch (38 mm) plus the design deflection for one-story structures] [and] [1 inch (25 mm) plus twice the design deflection for other applications] <Insert dimension>**.
3. Inner Track: Of web depth indicated, and as follows:
- a. Minimum Base-Metal Thickness: **[0.0428 inch (1.09 mm)] [0.0538 inch (1.37 mm)] [0.0677 inch (1.72 mm)] [0.0966 inch (2.45 mm)] [0.1180 inch (3.00 mm)]**.
  - b. Flange Width: **<Insert dimension equal to sum of outer deflection track flange width plus 1 inch (25 mm)>**.
- G. 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 through positive mechanical attachment to stud web and structure.

## 2.6 FLOOR JOIST FRAMING

- A. Steel Joists: Manufacturer's standard cold-formed steel joists, of web depths indicated, punched, with enlarged service holes, with stiffened flanges, and as follows:
- 1. Basis-of-Design Product: Subject to compliance with requirements, provide Marino\WARE; **[JoistRITE] [Standard]** or comparable product by one of the following:
    - a. **<Insert manufacturer's name>**.
  - 2. Minimum Base-Metal Thickness: **[0.0329 inch (0.84 mm)] [0.0428 inch (1.09 mm)] [0.0538 inch (1.37 mm)] [0.0677 inch (1.72 mm)] [0.0966 inch (2.45 mm)] [0.1180 inch (3.00 mm)]**.
  - 3. 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)]**, minimum.
  - 4. Minimum Joist Depth: **[9 inches (203 mm)] [9-1/4 inches (235 mm)] [10 inches (254 mm)] [11-1/4 inches (286 mm)] [12 inches (305 mm)] [14 inches (355.6 mm)]**
  - 5. Section Properties: **[Section properties per manufacturer's published tables] [33 ksi (for 33 and 43 mil)] [50 ksi (for 54 mil and heavier)]**.
- B. Steel Joist Track: Manufacturer's standard cold-formed steel joist track, of web depths indicated, unpunched, with unstiffened flanges, and as follows:
- 1. Basis-of-Design Product: Subject to compliance with requirements, provide Marino\WARE; **[JoistRITE] [Standard]** or comparable product by one of the following:
    - a. **<Insert manufacturer's name>**.
  - 2. Minimum Base-Metal Thickness: **[0.0329 inch (0.84 mm)] [0.0428 inch (1.09 mm)] [0.0538 inch (1.37 mm)] [0.0677 inch (1.72 mm)] [0.0966 inch (2.45 mm)] [0.1180 inch (3.00 mm)] [Matching steel joists]**.
  - 3. Flange Width: **1-1/4 inches (32 mm)**, minimum.

## 2.7 ROOF-RAFTER FRAMING

- A. Steel Rafters: Manufacturer's standard cold-formed steel joists used as rafters, of web depths indicated, punched with enlarged holes, with stiffened flanges, and as follows:
1. Basis-of-Design Product: Subject to compliance with requirements, provide Marino\WARE; **[JoistRITE]** **[Standard]** or comparable product by one of the following:
    - a. **<Insert manufacturer's name>**.
  2. Minimum Base-Metal Thickness: **[0.0329 inch (0.84 mm)] [0.0428 inch (1.09 mm)] [0.0538 inch (1.37 mm)] [0.0677 inch (1.72 mm)] [0.0966 inch (2.45 mm)] [0.1180 inch (3.00 mm)] [Matching steel joists]**.
  3. 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)]**, minimum.
  4. Section Properties: **[Section properties per manufacturer's published tables] [33 ksi (for 33 and 43 mil)] [50 ksi (for 54 mil and heavier)]**.

## 2.8 CEILING JOIST FRAMING

- A. Steel Ceiling Joists: Manufacturer's standard cold-formed steel joists, of web depths indicated, punched with enlarged service holes, with stiffened flanges, and as follows:
1. Basis-of-Design Product: Subject to compliance with requirements, provide Marino\WARE; **[JoistRITE]** **[Standard]** or comparable product by one of the following:
    - a. **<Insert manufacturer's name>**.
  2. Minimum Base-Metal Thickness: **[0.0329 inch (0.84 mm)] [0.0428 inch (1.09 mm)] [0.0538 inch (1.37 mm)] [0.0677 inch (1.72 mm)] [0.0966 inch (2.45 mm)] [0.1180 inch (3.00 mm)] [Matching steel joists]**.
  3. 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)]**, minimum.
  4. Minimum Joist Depth: **[9 inches (203 mm)] [9-1/4 inches (235 mm)] [10 inches (254 mm)] [11-1/4 inches (286 mm)] [12 inches (305 mm)] [14 inches (355.6 mm)]**
  5. Section Properties: **[Section properties per manufacturer's published tables] [33 ksi (for 33 and 43 mil)] [50 ksi (for 54 mil and heavier)]**.

## 2.9 SOFFIT FRAMING

- A. Exterior Soffit Frame: Manufacturer's standard C-shaped steel sections, of web depths indicated, with stiffened flanges, and as follows:
1. Minimum Base-Metal Thickness: **[0.0329 inch (0.84 mm)] [0.0428 inch (1.09 mm)] [0.0538 inch (1.37 mm)] [0.0677 inch (1.72 mm)] [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)]**, minimum.
  3. Section Properties: **[Section properties per manufacturer's published tables] [33 ksi (for 33 and 43 mil)] [50 ksi (for 54 mil and heavier)]**.

## 2.10 FRAMING ACCESSORIES

- A. Basis-of-Design Product: Subject to compliance with requirements, provide Marino\WARE; FrameRITE Connectors or comparable product by one of the following:
1. <Insert manufacturer's name>.
- B. 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.
- C. 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. Utility angles.
  5. Rigid clips.
  6. Anchor clips.
  7. End clips.
  8. Foundation clips.
  9. Gusset plates.
  10. Stud kickers and knee braces.
  11. Joist hangers/Bridle hangers.
  12. Hole reinforcing plates.
  13. Backer plates.
  14. U-Flex track.
  15. Katz blocking.
  16. BridgeRite clips
  17. Breakaway clips.

## 2.11 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**] [**Grade 55**], threaded carbon-steel [**hex-headed bolts**] [**headless, hooked bolts**] [**headless bolts, with encased end threaded,**] and carbon-steel nuts; and flat, hardened-steel washers; zinc coated by [**hot-dip process according to ASTM A 153/A 153M, Class C**] [**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.
- 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 and as indicated on drawings.

- 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.

## 2.12 MISCELLANEOUS MATERIALS

- A. Galvanizing Repair Paint: SSPC-Paint 20 or MIL-P-21035B.
- 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, 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 (6.4 mm) thick, selected from manufacturer's standard widths to match width of bottom track or rim track members.

## 2.13 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 (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 steel framing assembly to a maximum out-of-square tolerance of **1/8 inch (3 mm)**.

## 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 of the Work.
- 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 (6 mm)** 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.

### 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 **1/16 inch (1.6 mm)**.
- 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, 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.
- 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 (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 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 follows:
1. Anchor Spacing: [**24 inches (610 mm)**] [**32 inches (813 mm)**] [**To match stud 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: [**12 inches (305 mm)**] [**16 inches (406 mm)**] [**19.2 inches (488 mm)**] [**24 inches (610 mm)**] [**As indicated**].
  2. Stud Spacing: [**300 mm**] [**400 mm**] [**600 mm**] [**As indicated**].
- C. Set studs plumb, except as needed for diagonal bracing or required for nonplumb 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 [**48 inches (1220 mm)**] [**as indicated**] [**as indicated on Shop Drawings**]. Fasten at each stud intersection.
1. 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 **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. Fasten flat straps to stud flanges and secure solid blocking to stud webs or flanges.
  3. Bridging: Proprietary bridging bars installed according to manufacturer's written instructions.

- 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 EXTERIOR NON-LOAD-BEARING WALL INSTALLATION

- A. Install continuous tracks sized to match studs. Align tracks accurately and securely anchor to supporting structure as indicated.
- B. Fasten both flanges of studs to **[ top and ]** bottom track unless otherwise indicated. Space studs as follows:
  - 1. Stud Spacing: **[ 12 inches (305 mm) ] [ 16 inches (406 mm) ] [ 19.2 inches (488 mm) ] [ 24 inches (610 mm) ] [As indicated].**
  - 2. Stud Spacing: **[ 300 mm ] [ 400 mm ] [ 480 mm ] [ 600 mm ] [As indicated].**
- C. Set studs plumb, except as needed for diagonal bracing or required for nonplumb 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 deep-leg deflection tracks and anchor to building structure.
  - 2. Install double deep-leg deflection tracks and anchor outer track to building structure.
  - 3. Connect vertical deflection clips to **[bypassing] [infill]** studs and anchor to building structure.
  - 4. Connect drift clips to cold-formed metal framing and anchor to building structure.
- E. Install horizontal bridging in wall studs, spaced vertically 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) ] [ 18 inches (450 mm) ]** of 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.
    - a. Install solid blocking at **[ 96-inch (2440-mm) centers ] [centers indicated] [centers indicated on Shop Drawings].**
  - 2. Bridging: Cold-rolled steel channel, welded or mechanically fastened 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.
  - 4. Bridging: Proprietary bridging bars installed according to manufacturer's written instructions.



- F. 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.

### 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.
- 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: [**12 inches (305 mm)**] [**16 inches (406 mm)**] [**19.2 inches (488 mm)**] [**24 inches (610 mm)**] [**As indicated**].
  2. Joist Spacing: [**300 mm**] [**400 mm**] [**480 mm**] [**600 mm**] [**As indicated**].
- 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 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.

### 3.7 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.
- 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.

### 3.8 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 manufacturer and Installer, that ensure that cold-formed steel framing is without damage or deterioration at time of Substantial Completion.

END OF SECTION 054000