

## SECTION 05 40 00 - COLD-FORMED METAL FRAMING

## PART 1 - GENERAL

## 1.1 SUMMARY

## A. Section Includes:

1. Cold-formed metal framing for [**walls**] [**floors**] [**roofs**] [**ceilings**] [**and**] [**soffits**].
2. Custom curved metal framing for curved [**walls,**] [**vaults,**] [**domes,**] [**arches,**] [**reflectors,**] [**and**] [**curved headers**].

## B. Related Requirements:

1. Section 04 20 00 "Unit Masonry" for veneer wall ties fastened to metal framing.
2. Section 06 10 53 "Miscellaneous Rough Carpentry" for wood blocking and nailers fastened to metal framing.
3. Section 06 16 00 "Sheathing" for exterior wall sheathing and roof sheathing.
4. Section 07 21 00 "Thermal Insulation" for insulation installed within metal framing.
5. Section 09 21 16 "Gypsum Board Shaft Wall Assemblies" for shaft wall metal framing.
6. Section 09 22 16 "Non-Structural Metal Framing" for gypsum board partitions and ceilings metal framing.
7. Section [ ] "[ ]" for exterior finishes applied to metal framing.
8. Section [ ] "[ ]" for interior finishes applied to metal framing.

## 1.2 DEFINITIONS

- A. Arch Assemblies: An assembly of curved and straight framing members including track or stud or both to form a curved-in-elevation framing member.
- B. Curved Headers: An assembly of curved framing members including track or stud or both to form a curved-in-plan framing member.

## 1.3 REFERENCE STANDARDS

## A. American Iron and Steel Institute:

1. AISI S100 - North American Specification for the Design of Cold-Formed Steel Structural Members.
2. AISI S200 - North American Standard for Cold-Formed Steel Framing - General Provisions.
3. AISI S210 - North American Standard for Cold-Formed Steel Framing - Floor and Roof System Design.
4. AISI S211 - North American Standard for Cold-Formed Steel Framing - Wall Stud Design.
5. AISI S212 - North American Standard for Cold-Formed Steel Framing - Header Design.
6. AISI S213 - North American Standard for Cold-Formed Steel Framing - Lateral Design.

## B. ASTM International:

1. ASTM A 780 - Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings.

2. ASTM A 1003/A 1003M - Standard Specification for Steel Sheet, Carbon, Metallic- and Nonmetallic-Coated for Cold-Formed Framing Members.
3. ASTM C 955 - 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.
4. ASTM C 1513 - Standard Specification for Steel Tapping Screws for Cold-Formed Steel Framing Connections.
5. ASTM E 329 - Standard Specification for Agencies Engaged in Construction Inspection and/or Testing.

C. American Welding Society:

1. AWS D1.1/D1.1M - Structural Welding Code - Steel.
2. AWS D1.3/D1.3M - Structural Welding Code - Sheet Steel.

D. Green Seal:

1. GS GC-03 - Anti-Corrosive Paints.

E. SSPC: The Society for Protective Coatings:

1. SSPC Paint 20 - Zinc-Rich Primers (Type I - Inorganic and Type II - Organic).

F. Steel Stud Manufacturers Association:

1. SSMA Product Technical Information.

#### 1.4 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at **[Project site] [electronic meeting] [other mutually agreeable means]**.
- B. Conduct preinstallation meeting to verify project requirements **[and fabricator's installation instructions]**.

#### 1.5 ACTION SUBMITTALS

A. Product Data: Submit for each product and accessory. Indicate the following:

1. Material.
2. Finish.
3. Size.
4. Construction.
5. Structural capacity.

B. LEED Submittals:

1. Credit MR 4 Recycled Content: Submit documentation of total recycled material content separated by postconsumer and preconsumer recycled content. Indicate cost of products having recycled content.
2. Credit MR 5 Local and Regional Materials: Submit documentation indicating location where products were extracted, harvested or recovered, as well as manufactured. Indicate each distance of each location from project site in **miles (kilometers)**.

3. Credit IEQ 4.1 Low Emitting Materials - Sealants and Adhesives: Submit documentation indicating VOC content for each sealant and adhesive.
4. Credit IEQ 4.2 Low Emitting Materials - Paints and Coatings: Submit documentation indicating VOC content for each interior paint and coating.

C. Shop Drawings:

1. Submit [**2D dimensioned drawings**] [**3D model**] [**other media as appropriate**] with placement details. Include the following:
  - a. Framing layout, size, metal thickness [**and each factory fabricated panel**].
  - b. Framing marks used to identify location of each framing member.
  - c. Fastening, welding, and anchorage details.
  - d. Framed openings.
  - e. Reinforcing, bridging, bracing, movement joints, and attachment to adjacent construction.
  - f. Connections to supporting structure.

D. Delegated-Design Submittal: For cold-formed metal framing [**signed and sealed by professional engineer**], suitable for submission to authority having jurisdiction.

1. Include shop drawings as specified in this section.
2. Include structural design calculations.
3. Indicate magnitude and location of loads applied to supporting structure.

## 1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For installer, manufacturer, and fabricator.

B. Product Certificates: For each type of listed product indicating materials and structural properties.

1. Anchors.
2. Fasteners.
3. Deflection clips.

C. Mill Certificates: For sheet steel used to manufacturer framing members including metal thickness, [coating type and thickness,] yield strength, tensile strength, and total elongation.

D. Welding Certificates: For welders and procedures.

E. Product Test Reports: For representative curved framing members, for tests performed by a qualified independent testing agency.

1. Indicate allowable structural capacity of framing members used for structural design.
2. Indicate restrictions on interpolation and extrapolation of testing results to other curved framing configurations.

F. Manufacturer's Installation Instructions: For each product and accessory.

G. Fabricator's Installation Instructions:

1. Parts listing (packing list).
2. Framing documents showing stud and track name, orientation, and direction.
3. Starting and ending coordinates for each component.

## 1.7 QUALITY ASSURANCE

## A. Qualifications:

1. Installer Qualifications: Company experienced in performing work of this section who has specialized in installation of work similar to that required for this project.
2. Manufacturer Qualifications: Company experienced in manufacturing products specified in this section with capacity to produce and deliver required products without causing delay in work [**and current member of Steel Stud Manufacturers Association**].
3. Fabricator Qualifications: Company experienced in [curving] [and] [factory assembling] metal framing for field erection with demonstrated ability to fabricate products within specified tolerances.
4. Professional Engineer Qualifications: Structural engineer experienced in design of Work specified as delegated design and licensed [**at Project location**] [**in State of** [\_\_\_\_\_]] and employed by [**manufacturer**] [**or**] [**fabricator**].
5. Testing Agency Qualifications: Qualified according to ASTM E 329 for testing indicated.
6. Welder and Welding Procedure Qualifications: AWS D1.3/D1.3M qualified within previous 12 months.

## B. Product Sources:

1. Furnish cold-formed metal framing products from single manufacturer.
2. Furnish curved cold-formed metal framing products from single fabricator.

C. Mockups: Build mockups to set quality standard for fabrication and installation. [**Accepted mockups may remain as part of Project.**] Build the following mockups [as indicated on Drawings].

1. Typical exterior wall panel.
2. Typical curved wall panel.

## 1.8 DELIVERY, STORAGE, AND HANDLING

## A. Delivery and Acceptance:

1. Verify components are bundled, banded and delivered in fabricator's packaging[, **unless factory fabricated as panels**].
2. Unpack and inspect metal products. Report damage and missing components immediately.

## B. Storage and Handling:

1. Store materials protected from exposure to harmful environmental conditions and at temperature and humidity conditions instructed by the manufacturer.

## C. Packaging Waste Management:

1. Remove packaging materials from site and dispose of at appropriate recycling facilities.
2. Collect and separate for disposal [**wood spacers**] [**wood pallets**] [**metal strapping**] and other recyclable packaging materials.
3. Store collected packaging materials in [**appropriate onsite bins**] [\_\_\_\_\_] for recycling.

## PART 2 - PRODUCTS

## 2.1 MANUFACTURERS

## A. Manufacturer List: Furnish products by one of the following:

1. Allsteel & Gypsum Products Inc.
2. California Expanded Metal Products Co.
3. ClarkWestern Building Systems Inc.
4. Consolidated Fabricators, Corp.
5. Craco Manufacturing, Inc.
6. Custom Stud, Inc.
7. Design Shapes in Steel.
8. Dietrich Industries, Inc.
9. Frametek Steel Products
10. Marino\Ware.
11. MBA Building Supplies, Inc.
12. Olmar Supply Inc.
13. Quail Run Building Materials, Inc.
14. SCAFCO Corporation.
15. Southeastern Stud & Components, Inc.
16. Steel Construction Systems.
17. Steeler Inc.
18. Telling Industries, LLC.
19. The Formetal Co., Inc.
20. The Steel Network.
21. United Metal Products, Inc.
22. United Steel Manufacturing.
23. [\_\_\_\_\_].

## 2.2 PERFORMANCE / DESIGN CRITERIA

## A. Delegated Design: Engage a qualified professional engineer to design cold-formed metal framing.

## B. Structural Performance: Provide cold-formed metal framing capable of withstanding design loads and condition indicated below:

1. Design Loads: As indicated on Drawings.
2. Floor and Roof Loads: Design [\_\_\_\_\_] to resist [**live**] and [**dead**] loads with [**1/360**] [**1/240**] [\_\_\_\_\_] maximum deflection.
  - a. Live Loads: [As indicated on Drawings.]
  - b. Floor Live Loads: [\_\_\_\_\_] psf ([\_\_\_\_\_] kPa).
  - c. Roof Live Loads: Minimum [\_\_\_\_\_] psf ([\_\_\_\_\_] kPa).
  - d. Roof Snow Loads: As calculated in accordance with [**applicable code**] [**and**] [**ASCE 7**] with [\_\_\_\_\_] psf ([\_\_\_\_\_] kPa) ground snow load and exposure [\_\_\_\_\_] , and snow importance factor [\_\_\_\_\_] , with allowance for drifting.
  - e. Dead Loads: Actual weight of materials incorporated into Work.
3. Wind Loads: Design and size components to withstand positive and negative wind loads acting normal to plane of wall, including increased loads at building corners [**and roof edges**] with [**1/720**] [**1/360**] [**1/240**] [\_\_\_\_\_] maximum deflection..

- a. Design Wind Load: As calculated in accordance with **[applicable code]** **[and]** **[ASCE 7]** with **[\_\_\_\_\_]** mph (**[\_\_\_\_\_]** km/hr) basic wind speed, exposure **[\_\_\_\_\_]**, and wind importance factor **[\_\_\_\_\_]**.
  - b. Design Wind Load: To design pressure of **[\_\_\_\_\_]** psf (**[\_\_\_\_\_]** kPa).
4. Seismic Loads: Design and size components to withstand seismic loads and sway displacement as calculated in accordance with **[applicable code]** **[and]** **[ASCE 7]**.
- a. Seismic Design Category: **[\_\_\_\_\_]**.
  - b. Seismic Relative Displacement: **[\_\_\_\_\_]**.
  - c. Occupancy Category: **[\_\_\_\_\_]**.
- C. Thermal Movement: Design to provide for movement of components without damage, failure of joint seals, undue stress on fasteners, or other detrimental effects when subject to seasonal and cyclic day/night temperature range.
1. Temperature Range: **120 deg F (67 deg C)**, ambient, minimum.
- D. Tolerances and Movement: Design system to accommodate construction tolerances, deflection of building structural members, and clearances of intended openings.
- E. Design Standards: Comply with the following.
1. Floor and Roof Systems: AISI S210.
  2. Wall Studs: AISI S211.
  3. Headers: AISI S212.
  4. Lateral Design: AISI S213.
- F. Cold-Formed Metal Framing: Comply with the following:
1. AISI S100.
  2. AISI S200.
  3. ASTM C 955.
  4. SSMA Product Technical Information.

### 2.3 COLD FORMED METAL FRAMING

- A. Steel Sheet: ASTM A 1003/A 1003M; Structural Grade, Type H, **[metallic coated:]** **[painted metallic coated:]**
1. Grade: **[ST33H (ST230H)]** **[ST50H (ST340H)]** **[As required by performance requirements]**.
  2. Coating: **[G60 (Z180)]** **[G90 (Z275)]**.
- B. Studs: Steel sheet, formed to C-shape, **[solid]** **[punched]** **[\_\_\_\_\_]** web, **[smooth faces]** **[knurled faces]**.
1. 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)]**.
  2. Web Depth: **[As indicated on Drawings]** **[As required by structural performance]** **[\_\_\_\_\_ inches (\_\_\_\_\_ mm)]**.
  3. Flange Width: **[1-1/4 inches (31 mm)]** **[1-3/8 inches (34 mm)]** **[1-5/8 inches (41 mm)]** **[2 inches (51 mm)]** **[2-1/2 inches (63 mm)]**, minimum.
  4. Section Properties:

- a. Section Modulus: [\_\_\_\_\_].
  - b. Moment of Inertia: [\_\_\_\_\_].
  - c. Allowable Bending Moment: [\_\_\_\_\_].
- C. Joists, [**Rafters,**] [**Girts,**] [**and,**] [**Purlins**]: Steel sheet, formed to C-shape, [**solid**] [**punched**] [\_\_\_\_\_] web, [**smooth faces**] [**knurled faces**].
1. 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)**].
  2. Web Depth: [**As indicated on Drawings**] [**As required by structural performance**] [\_\_\_\_\_] inches ([\_\_\_\_\_] mm).
  3. Flange Width: [**1-5/8 inches (41 mm)**] [**2 inches (51 mm)**] [**2-1/2 inches (63 mm)**], minimum.
  4. Section Properties:
    - a. Section Modulus: [\_\_\_\_\_].
    - b. Moment of Inertia: [\_\_\_\_\_].
    - c. Allowable Bending Moment: [\_\_\_\_\_].
- D. Track: Steel sheet, formed to channel shape; same nominal width as studs, tight fit.
1. 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)**].
  2. Track Flange Width: [**1-1/4 inches (32 mm)**] [**1-1/2 inches (38 mm)**] [**2 inches (51 mm)**], minimum.
  3. Joist, [**Rafter,**] [**Girts,**] [**and,**] [**Purlin**] Track Flange Width: [**1-1/4 inches (32 mm)**] [**1-1/2 inches (38 mm)**] [**2 inches (51 mm)**], minimum.
- E. Deflection Track: As specified for stud track; to accommodate [\_\_\_\_\_] inches ([\_\_\_\_\_] mm) maximum deflection.
1. Single Deflection Track: Extended flange width [**with slots**] [**without slots**] to retain studs at maximum and minimum deflection.
  2. Double Deflection Track: Outer track with extended flange width to retain studs at maximum and minimum deflection and inner track with minimum **1 inch (25 mm)** flange width.
- F. Furring Channel: Hat shaped.
1. Metal Thickness: [**0.0329 inch (0.84 mm)**] [**0.0428 inch (1.09 mm)**] [**0.0538 inch (1.37 mm)**].
  2. Channel Depth: [**As indicated on Drawings**] [**1-1/2 inches (38 mm)**] [**7/8 inches (22 mm)**].
- G. Vertical Deflection Clips: [**Bypass**] [**Head**] type capable of transferring wind loads to building structure while accommodating vertical displacement of building structure.
- H. Bracing, Furring, Bridging: Formed sheet steel, [thickness determined by performance requirements] [\_\_\_\_\_] inch ([\_\_\_\_\_] mm) thick].
- I. Plates, Gussets, Clips: Formed sheet steel, [thickness determined by performance requirements] [\_\_\_\_\_] inch ([\_\_\_\_\_] mm) thick].
- 2.4 FABRICATION - GENERAL
- A. Fabricate cold-formed metal framing square, planar, and true to line with secure connections in accordance with AISI standards and manufacturer's instructions.

1. Cut framing by sawing or shearing.
2. Secure framing members by fastening or welding.
3. Reinforce and brace fabrications to permit shipping, handling, and installation without permanent distortion.
4. Label each framing member to match identification marks shown on shop drawings.

B. Fabrication Tolerances: Fabricate panels with the following maximum allowable tolerances.

1. Framing Spacing within Panel: Plus or minus **1/8 inch (3 mm)** from indicated location.
2. Square: **1/4 inch (6 mm)** maximum deviation in length of panel diagonal dimensions.
3. Warp: **1/4 inch in 10 feet (1:480)** and **1/4 inch (6 mm)** maximum deviation from plane along panel diagonal.
4. Overall Dimension: Plus or minus **1/8 inch (3 mm)** in each dimension.

## 2.5 FABRICATION - CURVED COLD-FORMED METAL FRAMING

A. Fabricators: Furnish curved cold-formed metal framing fabricated by one of the following:

1. Radius Track Corporation: 3340 Winpark Drive, Minneapolis, MN 55427; Telephone: (888) 872-3487, (763) 795-8885; Fax: (763) 795-8884; E-mail: [info@radiustrack.com](mailto:info@radiustrack.com); website: [www.radiustrack.com](http://www.radiustrack.com).

B. Custom form components by computer controlled bending, crimping, or rolling of metal framing and track to produce uniform curves indicated on Drawings or 3D models using uninterrupted, continuous metal profiles with structural capacity to meet performance requirements.

1. Curve Type: [**Standard bend**] [**Curve - Leg in**] [**Curve - Leg out**] [**Curved angle - Leg in**] [**Curved angle - Leg out**] [**Custom as indicated on Drawings**].
2. Compound Shapes: Combinations of several of the above curves, including S-bends.
3. Fabricator to determine curve type to meet design intent.
4. Arc Radius: [        ] feet ([        ] mm).
5. Arc Length along Radius: [        ] feet ([        ] mm).
6. Cut Lengths:
  - a. Furnish as stock lengths to be field cut to length required.
  - b. Furnish shop cut to length required.
7. Splices:
  - a. Maximum Spacing: [**10 feet (3050 mm)**] [**20 feet (6100 mm)**] [**30 feet (9150 mm)**].
  - b. Splices not permitted.
8. Markings:
  - a. Factory mark curved components to correspond with packing list and assembly documents.
  - b. Factory mark track indicating stud locations.

C. Factory assemble the following custom curved framing assemblies to greatest extent possible:

D. Furnish custom curved framing assemblies for the following:

1. Complex Surfaces Framing Assembly: [**As indicated on Drawings**] [        ].
2. Structural Dome Framing Assembly:



- a. Diameter: [ ] feet ([ ] mm).
  - b. Height: [ ] feet ([ ] mm).
3. In-Fill Dome Framing Assembly:
- a. Diameter: [ ] feet ([ ] mm).
  - b. Height: [ ] feet ([ ] mm).
4. [Roof] [Wall] Sheathing: Plywood as specified in Section 06 16 00 "Sheathing;" pre-cut to match framing curvature.
5. Structural Curved-in-Plan Header:
- a. Radius: [ ] feet ([ ] mm).
  - b. Arc Length Along Radius: [ ] feet ([ ] mm).
6. Structural Curved-in-Elevation Arch Assembly:
- a. Radius: [ ] feet ([ ] mm).
  - b. Arc Length Along Radius: [ ] feet ([ ] mm).
- E. Fabrication Tolerances:
- 1. Radius: Plus or minus 1/8 inch in 16 feet (1:1536).
  - 2. Radius Uniformity: Plus or minus 1/16 in 32 inches (1:512).
  - 3. Arc Length: Plus or minus 1/8 inch (3 mm).
  - 4. Plane: Plus or minus 1/4 inch (6 mm).
  - 5. Tangent Points: 1/16 within 16 inches (1:256).
  - 6. Ellipses, Splines, and Other Multiple Radius Curves: Same as above for single radius curves.

## 2.6 ACCESSORIES

- A. Shop Primer: Manufacturer's standard coil coating applied over metallic coating.
- B. Touch-Up Primer:
  - 1. Shop Primed Surfaces: Match shop primer.
  - 2. Galvanized Surfaces: [SSPC Paint 20] [ASTM A 780].
  - 3. Anti-Corrosive Paints: Maximum volatile organic compound content in accordance with GS GC-03.
- C. Fasteners: ASTM C 1513, self-drilling, self-tapping screws, corrosion resistant treated.
- D. Anchors: [Power actuated,] [drilled expansion bolts,] [screws with sleeves,] [and] [ ].
- E. Welding Electrodes: AWS D1.1/D1.1M and AWS D1.3/D1.3M.
- F. 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.

## 2.7 SOURCE QUALITY CONTROL

- A. Testing: Owner will engage a qualified independent testing and inspecting agency to perform shop tests and inspections required by ICC IBC and to prepare test reports for Contractor and Architect for the following:
  - 1. Framing materials.
  - 2. Welding materials.
  - 3. Shop welds.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Site Verification of Conditions:
  - 1. Verify that site conditions are acceptable for installation.
  - 2. Correct unsatisfactory conditions prior to installation.

### 3.2 PREPARATION

- A. Install sealer gaskets where indicated on Drawings and the following:
  - 1. Underside of wall bottom track.
  - 2. Underside of rim track.
  - 3. Top of foundation at stud and joist locations.

### 3.3 INSTALLATION - GENERAL

- A. Install cold-formed metal framing in accordance with AISI S200, manufacturer's instructions, and approved shop drawings.
- B. Install shop fabricated framing assemblies and anchor to supporting structure.
  - 1. Install assemblies plumb, level, square, and true to line and located as indicated on Drawings.
  - 2. Align adjacent panels to maintain uniform plane and joints between assemblies.
- C. Install cold-formed metal framing and accessories plumb, level, square, and true to line; located as indicated on Drawings, and with connections securely fastened.
  - 1. Cut framing by sawing or shearing.
  - 2. Secure framing members by fastening or welding.
  - 3. Reinforce and brace framing as required to meet performance requirements for completed installation.
- D. Install framing members in single piece lengths unless splice connections are indicated.
- E. Install insulation, specified in Section 07 21 00 "Thermal Insulation," in built-up framing members that are not accessible when framing is complete.
- F. Touch up welds and damaged framing coatings with touch up primer to match shop applied coatings.

## G. Installation Tolerances:

1. Position: Plus or minus **1/8 inch (3 mm)** from plan location.
2. Plumb: Plus or minus **1/8 inch in 10 feet (1:960)**.
3. Level: Plus or minus **1/8 inch in 10 feet (1:960)**.
4. Plane: Plus or minus **1/4 inch in 25 feet (1:1270)**.
5. Joint Alignment: Plus or minus **1/8 inch (3 mm)** between adjacent panels.

## 3.4 INSTALLATION - WALLS

- A. Install top and bottom track in position and alignment required to produce completed framing configuration indicated on Drawings. Anchor track to substrate at maximum **24 inches (610 mm)** on center.
- B. Position studs in runners, spaced maximum **[12 inches (305 mm)] [16 inches (406 mm)] [24 inches (610 mm)]** on center.
- C. Locate studs maximum **2 inches (51 mm)** from door frames and abutting construction.
- D. Seat load bearing studs against top and bottom track with maximum **1/8 inch (3 mm)** gap between stud and track.
- E. Use double studs on both sides of openings in partitions.
- F. Install structural headers over openings. Attach track to header. Install studs from header to top runner.
- G. Install horizontal track as header above openings in partitions. Install studs from header to top runner.
- H. Install supplementary framing, blocking, and bracing required to support other components attached to framed wall.
- I. **[Screw attach] [Weld]** framing components at intersections.

3.5 INSTALLATION - **[JOIST] [RAFTER] [GIRT] [PURLIN]** FRAMING

- A. Install perimeter track, aligned and anchored to supporting substrate. Anchor track to substrate at maximum **24 inches (610 mm)** on center.
- B. Install framing bearing on supporting frame, level, straight, and plumb; adjust to final position, brace, and reinforce. Fasten framing to both flanges of track.
  1. Install framing over supporting substrate with a minimum end bearing of **1-1/2 inches (38 mm)**.
  2. Reinforce ends and bearing points of framing with web stiffeners, end clips, framing hangers, steel clip angles, or steel-stud sections as indicated on shop drawings.
- C. Framing Spacing: **[12 inches (305 mm)] [16 inches (406 mm)] [19.2 inches (488 mm)] [24 inches (610 mm)]** [As indicated].
- D. Frame openings with built-up headers to support interrupted framing.
- E. Install bridging at spacing indicated on shop drawings. Fasten bridging to framing.
- F. Fasten bottom flange of framing to load bearing walls.

## 3.6 INSTALLATION - CURVED FRAMING

## A. Curved Walls:

1. Install top and bottom curved track, vertically aligned. Anchor track to substrate at maximum **24 inches (610 mm)** on center.
2. Install stud framing according to shop drawings and assembly documents.
3. Fasten stud framing to both flanges of top and bottom tracks. Do not fasten stud framing to single deflection track.

## B. Vaults:

1. Install straight track at spring line on both sides of vault.
2. Install curved stud framing spanning width of vault.
3. Stud Framing:
  - a. Space studs at maximum **[8 inches (203 mm)] [12 inches (305 mm)] [16 inches (406 mm)] [24 inches (610 mm)] [\_\_\_\_\_] inches ([\_\_\_\_\_] mm)** on center.
4. Studs and Supplemental Framing:
  - a. Space studs at maximum **[32 inches (813 mm)] [48 inches (1220 mm)] [\_\_\_\_\_] inches ([\_\_\_\_\_] mm)** on center.
  - b. Install hat channels longitudinally, spaced maximum **[12 inches (305 mm)] [16 inches (406 mm)] [24 inches (610 mm)] [\_\_\_\_\_] inches ([\_\_\_\_\_] mm)** on center.
5. **[Screw attach] [Weld]** framing components at intersections.

## C. Domes:

1. Install curved track at base of dome to receive stud ribs and curved track headers. Secure track to perimeter tension ring in accordance with approved shop drawings.
2. Install single-piece length stud ribs and compression ring for arch length.
3. Space studs at maximum **[16 inches (406 mm)] [24 inches (610 mm)] [\_\_\_\_\_] inches ([\_\_\_\_\_] mm)** on center.
4. **[Screw attach] [Weld]** framing components at intersections.

## D. Curved Headers:

1. Install stud and track framing assembled into curved-in-plan, load-bearing curved headers as indicated on shop drawings.
2. Space studs at maximum **[16 inches (406.4 mm)] [24 inches (610 mm)] [\_\_\_\_\_] inches ([\_\_\_\_\_] mm)** on center along length of box beams.
3. **[Screw attach] [Weld]** framing components at intersections, both sides.

## E. Arch Assemblies:

1. Install stud and track framing assembled into curved-in-elevation, load-bearing arch assemblies as indicated on shop drawings.
2. Space studs at maximum **[16 inches (406.4 mm)] [24 inches (610 mm)] [\_\_\_\_\_] inches ([\_\_\_\_\_] mm)** on center along length of arch assemblies.
3. **[Screw attach] [Weld]** framing components at intersections, both sides.

## F. Knife Edge Assemblies:

1. Install angle framing, brackets, and miscellaneous sheet metal assembled into curved knife edge assemblies as indicated on shop drawings.
2. Space brackets at maximum [**16 inches (406.4 mm)**] [**24 inches (610 mm)**] [**[ ] inches ([ ] mm)**] on center along length of arch assemblies.
3. [**Screw attach**] [**Weld**] framing components at intersections, both sides.

### 3.7 CLEANING

- A. On completion and verification of installation, remove rubbish, tools and equipment.
- B. Waste Management:
  1. Collect cold-formed metal framing surplus, scrap, and waste.
  2. Clean collected materials of dirt, debris and other surface contamination.
  3. Store collected materials in [**appropriate onsite bins**] [ ] for recycling.

### 3.8 FIELD QUALITY CONTROL

- A. Testing: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections required by ICC IBC and to prepare test reports for Contractor and Architect for the following:
  1. Framing materials.
  2. Welding materials.
  3. Field welds.

END OF SECTION