

SECTION 05400 – COLD-FORMED METAL FRAMING

PART 1 - GENERAL

RELATED DOCUMENTS:

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

DESCRIPTION OF WORK:

Extent of lightgauge framing is shown on drawings.

Types of lightgauge metal framing units include the following:

- "C"-shaped steel studs.
- "C"-shaped steel joists.

SUBMITTALS:

Product Data: Submit manufacturer's product information and installation instructions for each item of cold-formed metal framing and accessories. Certify products manufactured in compliance with ASTM C 645, including requirements for minimum thickness.

Design Data: Submit copies of design data and structural calculations for selection of all studs and framing components sealed by an engineer registered in the state of North Carolina and employed by the manufacturer. Calculations shall support all member selection and connections, and shall include all wind and/or seismic bracing calculations.

It is the Contractor's responsibility to hire an engineer to calculate the required gage of metal studs and submit all specified data, calculations, etc. HOWEVER, the **minimum gage of stud shall be 18 gage.**

Certificate of Compliance: Submit certificate evidencing compliance of studs and components and installation with referenced standards.

Shop Drawings: Submit shop drawings for special components and installations not fully dimensioned or detailed in manufacturer's product data.

Include placing drawings for framing members showing size and gage designations, number, type, location and spacing. Indicate supplemental strapping, bracing, splices, bridging, accessories, and details required for proper installation.

QUALITY ASSURANCE:

Component Design: Calculate structural properties of studs and joists in accordance with American Iron and Steel Institute (AISI) "Specification for Design of Cold-Formed Steel Structural Members".

Design Criteria: Cold-formed metal framing shall be designed to withstand wind pressures as stated in Section 1609 of the 2012 North Carolina Building Code for a minimum wind velocity of 90 mph with 50-year mean recurrence interval, exposure category "C". Increased pressures for height variation and applicable shape factors shall be included. External pressure coefficients may be calculated based on effective wind area supported by each component (minimum area 10 square feet). No further reduction to the components and cladding pressures are allowed for strength or deflections calculations. The maximum allowable deflection for exterior studs shall be L/600 with deflection based on the section properties of the stud only.

Welding: Use qualified welders and comply with American Welding Society (AWS) D1.3, "Structural Welding Code - Sheet Steel."

DELIVERY, STORAGE AND HANDLING:

Protect metal framing units from rusting and damage as required in AISI's "Code of Standard Practice". Deliver to project site in manufacturer's unopened containers or bundles, fully identified with name, brand, type and grade. Store off ground in a dry ventilated space or protect with breathable waterproof coverings.

PART 2 - PRODUCTS

METAL FRAMING:

System Components: Manufacturers; standard load-bearing steel studs and joists of type, size, shape, and gage as indicated. With each type of metal framing required, provide manufacturer's standard, steel runners (tracks), blocking, lintels, clip angles, shoes, reinforcements, fasteners, and accessories for applications indicated, as needed to provide a complete metal framing system. Studs and joist to be of "C" configuration with a minimum 1-5/8 inch flange and minimum 1/2 inch return lip. Runner tracks to be unpunched with 1-1/4 inch flanges unless noted otherwise.

Materials and Finishes: Comply with ASTM C 955.

For 16 gage and heavier units, fabricate metal framing components of structural quality steel sheet with a minimum yield point of 50,000 psi; ASTM A 653.

For 18-gage (minimum gage allowed), fabricate metal framing components of commercial quality steel sheet with a minimum yield point of 33,000 psi; ASTM A 653.

Protective Coating: minimum CP 60: G60 (Z180)

Finish of installation accessories to match that of main framing components.

"C"-Shape Studs: Manufacturer's standard load-bearing steel studs of size and shape, indicated, with 1.625" or 2 1/2" flange and flange return lip.

Available Manufacturers: Subject to compliance with requirements, manufacturers offering "C"-shaped, load-bearing steel studs which may be incorporated in the work include, but are not limited to, the following:

ClarkDietrich Building Systems.
MarinoWare; Div. of Ware Industries, Inc.
The Steel Network, Inc.
United Metal Products, Inc.

Joists: Manufacturer's standard C-shape sections of size and shape gage indicated.

Available Manufacturers: Subject to compliance with requirements, manufacturers offering "C"-shaped steel joists which may be incorporated in the work include, but are not limited to, the following:

Manufacturer: Subject to compliance with requirements, provide "C"-shaped steel joists of one of the following:

ClarkDietrich Building Systems.
Ceco Corp.
Inryco/Milcor.
U.S. Gypsum.

Headers and Jambs: Manufacturer's proprietary shape used to form header beams and jambs, columns or posts, of web depths indicated, unpunched, with stiffened flanges.

Anchor Clips: Manufacturer's foundation connectors.

FABRICATION:

General: Framing components may be prefabricated into panels prior to erection. Fabricate panels plumb, square, true to line and braced against racking with joints welded. Perform lifting of prefabricated panels in a manner to prevent damage or distortion.

Fastenings: Attach similar components by welding. Attach dissimilar components by welding, bolting, or screw fasteners, as standard with manufacturer.

Wire tying of framing components is not permitted.

Fabrication Tolerances: Fabricate panels to a maximum allowable tolerance variation from plumb, level, and true to line of 1/8" in 10'-0".

PART 3 - EXECUTION

INSPECTION AND PREPARATION:

Pre-Installation Conference: Prior to start of installation of metal framing systems, meet at project site with installers of other work including door and window frames and mechanical and electrical work. Review areas of potential interference and conflicts, and coordinate layout and support provisions for interfacing work.

INSTALLATION:

Manufacturer's Instructions: Install metal framing systems in accordance with ASTM C 1007 and manufacturer's printed or written instructions and recommendations, unless otherwise indicated.

Runner Tracks: Install continuous tracks sized to match studs. Align tracks accurately to layout at base and tops of studs. Secure tracks as recommended by stud manufacturer for type of construction involved, except do not exceed 24" o.c. spacing for nail or power-driven fasteners, or 16" o.c. for other types of attachment. Provide fasteners at corners and ends of tracks.

Set studs plumb, except as needed for diagonal bracing or required for non-plumb walls or warped surfaces and similar requirements.

Where stud system abuts structural columns or walls, including masonry walls, anchor ends of stiffeners to supporting structure.

Install supplementary framing, blocking and bracing in metal framing system wherever walls or partitions are indicated to support fixtures, equipment, services, casework, heavy trim and furnishings, and similar work requiring attachment to the wall or partition. Where type of supplementary support is not otherwise indicated, comply with stud manufacturer's recommendations and industry standards in each case, considering weight or loading resulting from item supported.

Installation of Wall Stud System: Secure studs to top and bottom runner tracks by either welding or screw fastening at both inside and outside flanges. Provide for vertical structural movement at the attachment points for the stud system at floors and roof.

Frame wall openings larger than 2'-0" square with double stud at each jamb of frame except where more than 2 are either shown or indicated in manufacturer's instructions. Install runner tracks and jack studs above and below wall openings. Anchor tracks to jamb studs with stud shoes or by welding, and space jack studs same as full-height studs of wall. Secure stud system wall opening frame in manner indicated.

Frame both sides of expansion and control joints, with separate studs; do not bridge the joint with components of stud system.

Install horizontal stiffeners in stud system, spaced (vertical distance) at not more than 4'-6" o.c. Weld at each intersection.

Installation of Joists: Install level and plumb, complete with bracing and reinforcing as indicated on drawings. Provide not less than 1-1/2" end bearing.

Reinforce ends with end clips, steel hangers, steel angle clips, steel stud section, end grain wood block, or as otherwise recommended by joist manufacturer.

Where required, reinforce joists at interior supports with single short length of joist section located directly over interior support, snap-on shoe, 30% side-piece lapped reinforcement, or other method recommended by joist manufacturer.

Secure joists to interior support systems to prevent lateral movement of bottom flange.

Erection Tolerances: Bolt or weld wall panels (at both horizontal and vertical Junctures) to produce flush, even, true-to-line joints.

Maximum variation in plane and true position between prefabricated assemblies should not exceed 1/16 inch.

Field Painting: Touch-up shop-applied protective coatings damaged during handling and installation. Use galvanizing repair paint for galvanized surfaces.

END OF SECTION 05400

SECTION 05500 - METAL FABRICATIONS:

PART 1 - GENERAL

RELATED DOCUMENTS:

Drawings, General Conditions and Supplementary General Conditions and other Division-1 Specification Sections, apply to this Section.

DESCRIPTION OF WORK:

Definition: Metal fabrications include items made from iron and steel shapes, plates, bars, strips, tubes, pipes and castings which are not a part of structural steel or other metal systems specified elsewhere.

Extent of metal fabrications is indicated on drawings and schedules.

Types of work in this section include metal fabrications for:

- Loose bearing and leveling plates.
- Loose steel lintels.
- Miscellaneous framing and supports.
- Miscellaneous steel angles and trim.
- Steel Railings and Handrails.
- Pipe Bollards.

Structural steel is specified in another section within Division 5.

Concrete for Stair Pan Fill is specified in Division 3.

SYSTEM PERFORMANCES:

Structural Performances: Provide assemblies which, when installed, comply with the following minimum requirements for structural performance, unless otherwise indicated.

Treads and Platforms of Steel Stairs: Capable of withstanding a uniform load of 100 lbf per sq. ft. or a concentrated load of 300 lbf so located as to produce maximum stress conditions.

Handrails and Toprails: Capable of withstanding the following loads applied as indicated when tested per ASTM E 935.

Concentrated loads of 200 lbs applied at any point in any direction.

Uniform load of 50 lbf per linear ft. applied simultaneously in both vertical and horizontal directions.

Concentrated and uniform loads above need not be assumed to act concurrently.

Handrails Not Serving as Top Rails: Capable of withstanding the following loads applied as indicated:

Concentrated load of 200 lbs/ft applied at any point nonconcurrently, vertically downward or horizontally.

Uniform load of 50 lbs/ft per linear foot applied nonconcurrently, vertically downward or horizontally.

Concentrated and uniform loads above need not be assumed to act concurrently.

Infill Area of Guardrail Systems: Capable of withstanding a horizontal concentrated load of 200 lbs/ft applied to one sq. ft. at any point in the system including panels, intermediate rails balusters, or other elements composing the infill area.

Above load need not be assumed to act concurrently with uniform horizontal loads on top rails of railing systems in determining stress on guard.

Treads of Steel Stairs: Capable of withstanding a uniform load of 100 lbs per sq. ft. or a concentrated load of 300 lbs on a area of 4 sq. inches located in the center of the tread, whichever produces the greater stress.

Platforms of Steel Stairs: Capable of withstanding a uniform load of 100 lbs per sq. ft.

QUALITY ASSURANCE:

Shop Assembly: Preassemble items in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.

SUBMITTALS:

Product Data: Submit manufacturer's specifications, anchor details and installation instructions for products used in miscellaneous metal fabrications, including paint products and grout.

Shop Drawings: Submit shop drawings for fabrication and erection of miscellaneous metal fabrications. Include plans, elevations and details of sections and connections. Show anchorage and accessory items. Provide templates for anchor and bolt installation by others.

PART 2 - PRODUCTS:

MATERIALS:

Ferrous Metals:

Metal Surfaces, General: For fabrication of miscellaneous metal work which will be exposed to view, use only materials which are smooth and free of surface blemishes including pitting, seam marks, roller marks, rolled trade names and roughness.

Steel Plates, Shapes and Bars: ASTM A 36.

Structural Steel Sheet: Hot-rolled, ASTM A 570; or cold-rolled ASTM A 611, Class 1; of grade required for design loading.

Galvanized Structural Steel Sheet: ASTM A 446, of grade required for design loading. Coating designation as indicated, or if not indicated, G90.

Steel Pipe: ASTM A 53; Type and grade (if applicable) as selected by fabricator and as required for design loading; black finish unless galvanizing is indicated; standard weight (schedule 40), unless otherwise indicated.

Brackets, Flanges and Anchors: Cast or formed metal of the same type material and finish as supported rails, unless otherwise indicated.

Concrete Inserts: Threaded or wedge type; galvanized ferrous castings, either malleable iron, ASTM A 47, or cast steel, ASTM A 27. Provide bolts, washers and shims as required, hot-dip galvanized, ASTM A 153.

Aluminum Pipe: Extruded 6063-T6 1-1/2" schedule 40 pipe and 6064-T4 formed elbows.

Aluminum Pickets: Extruded 6063 T5 aluminum.

Grout:

Non-Shrink Non-Metallic Grout: Pre-mixed, factory-packaged, non-staining, non-corrosive, non-gaseous grout complying with CE CRD-C621. Provide grout specifically recommended by manufacturer for interior and exterior applications of type specified in this section.

Fasteners:

General: Provide zinc-coated fasteners for exterior use or where built into exterior walls. Select fasteners for the type, grade and class required.

Bolts and Nuts: Regular hexagon head type, ASTM A 307, Grade A.

Lag Bolts: Square head type, FS FF-B-561.

Machine Screws: Cadmium plated steel, FS FF-S-92.

Wood Screws: Flat head carbon steel, FS FF-S-111.

Plain Washers: Round, carbon steel, FS FF-W-92.

Masonry Anchorage Devices: Expansion shields, FS FF-S-325.

Toggle Bolts: Tumble-wing type, FS FF-B-588, type, class and style as required.

Lock Washers: Helical spring type carbon steel, FS FF-W-84.

Paint:

Shop Primer for Ferrous Metal: Manufacturer's or Fabricator's standard, fast-curing, lead-free, "universal" primer; selected for good resistance to normal atmospheric corrosion, for compatibility with finish paint systems indicated and for compatibility to provide a sound foundation for field-applied topcoats despite prolonged exposure.

FABRICATION, GENERAL:

Workmanship: Use materials of size and thickness indicated or, if not indicated, as required to produce strength and durability in finished product for use intended. Work to dimensions indicated or accepted on shop drawings, using proven details of fabrication and support. Use type of materials indicated or specified for various components of work.

Form exposed work true to line and level with accurate angles and surfaces and straight sharp edges. Ease exposed edges to a radius of approximately 1/32" unless otherwise indicated. Form bent- metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

Weld corners and seams continuously, complying with AWS recommendations. At exposed connections, grind exposed welds smooth and flush to match and blend with adjoining surfaces.

Form exposed connections with hairline joints, flush and smooth, using concealed fasteners wherever possible. Use exposed fasteners of type indicated or, if not indicated, Phillips flat- head (countersunk) screws or bolts.

Provide for anchorage of type indicated, coordinated with supporting structure. Fabricate and space anchoring devices to provide adequate support for intended use.

Cut, reinforce, drill and tap miscellaneous metal work as indicated to receive finish hardware and similar items.

Fabricate joints which will be exposed to weather in a manner to exclude water or provide weep holes where water may accumulate.

Shop Painting:

Apply shop primer to surfaces of metal fabrications except those which are galvanized or as indicated to be embedded in concrete or masonry, unless otherwise indicated, and in compliance with requirements of SSPC-PA1 "paint Application Specification No. 1" for shop painting.

Surface Preparation: Prepare ferrous metal surfaces to comply with minimum requirements indicated below for SSPC surface preparation specifications and environmental exposure conditions of installed metal fabrications:

LOOSE BEARING AND LEVELING PLATES:

Provide loose bearing and leveling plates for steel items bearing on masonry or concrete construction, made flat, free from warps or twists, and of required thickness and bearing area. Drill plates to receive anchor bolts and for grouting as required. Galvanize after fabrication for exterior and wet conditions.

LOOSE STEEL LINTELS:

Provide loose structural steel lintels for openings and recesses in masonry walls and partitions as shown. Weld adjoining members together to form a single unit where indicated. Provide not less than 8" bearing at each side of openings, unless otherwise indicated. **Galvanize** after fabrication for exterior and wet conditions.

MISCELLANEOUS FRAMING AND SUPPORTS:

Provide miscellaneous steel framing and supports which are not a part of structural steel framework, as required to complete work.

Fabricate miscellaneous units to sizes, shapes and profiles indicated or, if not indicated, of required dimensions to receive adjacent other work to be retained by framing. Except as otherwise indicated, fabricate from structural steel shapes, plates and steel bars, of welded construction using mitered joints for field connection. Cut, drill and tap units to receive hardware and similar items.

Equip units with integrally welded anchors for casting into concrete or building into masonry. Furnish inserts if units must be installed after concrete is placed.

Except as otherwise indicated, space anchors 24" o.c. and provide minimum anchor units of 1-1/4" x 1/4" x 8" steel straps.

Equip units with integrally welded anchors, plates, installation angles, etc. necessary for attaching units to steel structure where required.

MISCELLANEOUS STEEL ANGLES AND TRIM:

Provide structural steel shelf angles of sizes indicated for attachment to concrete framing. Provide slotted holes to receive 3/4" bolts, spaced not more than 6" from ends and not more than 24" o.c., unless otherwise indicated.

Furnish wedge-type concrete inserts, complete with fasteners, for attachment of shelf angles to cast-in-place concrete.

GATES FOR TRASH DUMPSTER

~~Fabricate 3 pairs of double leaf hinged gates fabricated from light gage steel tube frames with tube picket infill to design, dimensions, and details indicated. Provide gate leaves formed of steel tube sections of sizes and wall thickness indicated, but not less than that required supporting design loading. Provide powder coated galvanized steel hinges mounted on tube hinge posts (3 per leaf) capable of carrying the weight of the gates. Provide cane bolt and padlock hasp to secure gates together or to latch post.~~

STEEL RAILINGS AND HANDRAILS:

Fabricate steel pipe and square picket railings and handrails to design, dimensions, and details indicated. Provide railings and handrails members formed of pipe of sizes and wall thickness indicated, but not less than that required supporting design loading.

Structural Performances: Provide railing and handrail assemblies which, when installed, comply with the following minimum requirements for structural performance, unless otherwise indicated.

Handrails and Toprails: Capable of withstanding the following loads applied as indicated:

Concentrated load of 250 lbf applied at any point in any direction.

Uniform load of 75 lbf per linear ft. applied simultaneously in both vertical and horizontal directions.

Concentrated and uniform loads above need not be assumed to act concurrently.

Number of hand rails shall in all cases be two (one on each side of stairs and ramps whether or not shown in pairs on drawings, unless SPECIFICALLY called out on drawing to be a single rail).

Guards: Intermediate rails, balusters and panel fibers capable of withstanding a uniform load of 250 lbs per sq. ft. of gross area of guard, including any open areas, of which they are a part.

Above load need not be assumed to be acting concurrently with uniform horizontal loads on top rails of railing assembly in determining stress on guard supporting members.

Interconnect railing and handrail members by butt-welding or welding with internal connectors, at fabricator's option, unless otherwise indicated.

At tee and cross intersections provide coped joints.

At elbow bends provide mitered joints.

Close exposed ends of pipe by welding 3/16" thick steel plate in place or by use of prefabricated fittings.

Brackets, Flanges, Fittings and Anchors: Provide wall brackets, end closures, flanges, miscellaneous fittings and anchors for interconnections of pipe and attachment of railings and handrails to other work. Furnish inserts and other anchorage devices for connecting railings and handrails to concrete or masonry work.

Shop prime railings with manufacture's standard rust-prohibitive primer, compatible with finish coat of paint. Do not prime surfaces intended to receive field welded connections.

PIPE BOLLARDS:

Fabricate pipe bollards from Schedule 80 steel pipe. See plans for bollard details. Provide round top end cap as required for pipe diameter.

PART 3 - EXECUTION

PREPARATION:

Field Measurements: Take field measurements prior to preparation of shop drawings and fabrication, where possible. Do not delay job progress; allow for trimming and fitting where taking field measurements before fabrication might delay work.

Coordinate and furnish anchorages, setting drawings, diagrams, templates, instructions, and directions for installation of anchorages, such as concrete inserts, sleeves, anchor bolts and miscellaneous items having integral anchors, which are to be embedded in concrete or masonry construction. Coordinate delivery of such items to project site.

INSTALLATION:

General:

Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing miscellaneous metal fabrications to in-place construction; including threaded fasteners for concrete and masonry inserts, toggle bolts, through-bolts, lag bolts, wood screws and other connectors as required.

Cutting, Fitting and Placement: Perform cutting, drilling and fitting required for installation of miscellaneous metal fabrications. Set work accurately in location, alignment and elevation, plumb, level, true and free of rack, measured from established lines and levels. Provide temporary bracing or anchors in formwork for items which are to be built into concrete, masonry or similar construction.

Fit exposed connections accurately together to form tight hairline joints. Weld connections which are not to be left as exposed joints, but cannot be shop welded because of shipping size limitations. Grind exposed joints smooth and touch-up shop paint coat.

Field Welding: Comply with AWS Code for procedures of manual shielded metal-arc welding, appearance and quality of welds made, and methods used in correcting welding work.

Setting Loose Plates: Clean concrete and masonry bearing surfaces of any bond-reducing materials, and roughen to improve bond to surfaces. Clean bottom surface of bearing plates.

Set loose leveling and bearing plates on wedges, or other adjustable devices. After the bearing members have been positioned and plumbed, tighten the anchor bolts. Do not remove wedges or shims, but if protruding, cut-off flush with the edge of the bearing plate before packing with grout. Use metallic non-shrink grout in concealed locations where not exposed to moisture; use non-metallic non-shrink grout in exposed locations, unless otherwise indicated.

Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

Secure non-removable units to supporting members by welding where both materials are the same, otherwise fasten by bolting as indicated above.

Steel Railings and Handrails: Connect railing to stair assemblies as detailed on drawings. Grind smooth field welds and touch-up shop primer paint.

For concrete and solid masonry anchorage, use drilled-in expansion shield and either concealed hanger bolt or exposed lag bolt, as applicable. See drawings for wall mounted railing applications.

ADJUST AND CLEAN:

Touch-Up Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with same material as used for shop painting.

Apply by brush or spray to provide a minimum dry film thickness of 2.0 mils.

Touch-Up Painting: Cleaning and touch-up painting of field welds, bolted connections and abraded areas of the shop paint on miscellaneous metal is specified in Division 9 of these specifications.

End of SECTION 05500