

SECTION 05 4000

COLD-FORMED METAL FRAMING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS: The General Conditions, any Supplementary General Conditions and Division 1, General Requirements, are hereby made a part of this Section as fully as if repeated herein.

1.2 SCOPE

- A. The Contractor shall furnish all labor, materials, equipment and services necessary for and reasonably incidental to the furnishing and installation of all light gauge metal framing as shown on the drawings and/or called for in these Specifications.

1.3 SECTION INCLUDES

- A. Load-bearing steel stud system at exterior masonry walls.
- B. Load-bearing steel joists in lintel assemblies.
- C. Slotted channel framing for support of projection screens; MEP equipment; radiographic diagnostic equipment systems; owner-furnished exam lighting fixtures and injector equipment; RF shielded enclosures.

1.4 RELATED WORK

- A. Division 04 Section "Unit Masonry" for veneer masonry, masonry wall ties and other accessories.
- B. Division 05 Section "Structural Steel Framing."
- C. Division 06 Section "Sheathing" for exterior gypsum wall sheathing.
- D. Division 09 Section "Non-structural Metal Framing" for interior cold-formed metal framed wall and ceiling assemblies.
- E. Division 07 Section "Fluid-applied Vapor Permeable Air Barrier."

1.5 REFERENCES

- A. Work shall meet the requirements of the following standards:
 - 1. American Iron and Steel Institute - A.I.S.I. Design of Cold Formed Steel Design Manual - August 19, 1986 Edition.
 - 2. American Welding Society (A.W.S.)

- D.1.1 - Structural Welding Code
 - D.1.3 - Specifications for Welding Sheet in Structures
3. American Society for Testing and Materials (ASTM).
 - A 653 - Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process, Structural (Physical) Quality
 - A 924 - General Requirements for the Steel Sheet, Metallic-Coated by the Hot-Dip Process
 - A 780 - Practice for the Repair of Damaged Hot-Dip Galvanized Coatings
 - A 766 - Electrodeposited Coatings of Cadmium
 - C 955 - Load-Bearing (Transverse and Axial) Steel Studs, Runners (Track), and Bracing or Bridging for Screw Application of Gypsum Board and Metal Plaster Bases
 - C 1007 - Installation of Load Bearing (Transverse and Axial) Steel Studs and Related Accessories
 4. Brick Institute of America (BIA) Technical Notes
 - 28B - Brick Veneer Panel and Curtain Walls
 5. Federal Specifications:
 - FF-P-395 - Pin, Drive, Guided and Pin Drive, Power Actuated Fasteners for Power Actuated and Hand Actuated Fastening Tools
 - FF-S-325 - Shield, Expansion; Nail, Expansion; and Nail, Drive Screw (Devices, Anchoring Masonry)
 6. American Society of Civil Engineers
 - ASCE 7-05 - Minimum Design Loads for Buildings and Other Structures

B. The most stringent requirements shall govern in conflicts between specified codes and standards. All components and cladding shall be designed utilizing exposure "C".

1.6 DESIGN REQUIREMENTS

- A. Employ and pay for services of a Structural Engineer to provide engineering data required for submittals and to certify manufacturer's submitted products will meet design requirements.
- B. Design system to meet performance requirements and regulatory requirements.

1.7 PERFORMANCE REQUIREMENTS

- A. Framing: Exterior wall, diagnostic equipment and MEP support system assemblies shall meet the structural criteria indicated in the contract documents.
- B. Steel Studs: Steel studs shall be of a configuration and gage to provide sufficient stiffness, as controlled by the maximum allowable deflection, under full live load, dead load and wind load of L/600 when secured to masonry veneer and L/360 in all other areas.
- C. Exterior walls shall be considered for transverse and axial loading with/without diaphragm action of the sheathing.

- D. Spacing of exterior wall studs shall never be less than 16" o.c. to accommodate wall insulation. Provide multiple studs as required to satisfy all design requirements.
- E. Contractor shall coordinate spacing of studs and locations of wall openings with MEP drawings.
- F. Connections (member to member and member to structure) shall be thoroughly examined and designed.
- G. Wall bridging shall be designed to provide resistance to minor axis bending and rotation of all wall studs including multiple jamb studs.

1.8 SUBMITTALS

- A. Product Data: Catalog cuts showing materials and each component's dimensions and sectional properties.
- B. Shop Drawings: Indicate member sizes and spacings. Illustrate materials, shop coatings, steel thicknesses, details of fabrication, details of attachment to adjoining work, size, location, spacing of fasteners for attaching framing to itself, details of attachment to the structure, accessories and their installation, and critical installation procedures. Drawings may include plans, elevations, sections, and details.
 - 1. Shop and field assembly details including cutting and connections; Type and location of welding, bolting and fastening devices.
 - 2. If prefabricated framing is utilized, include individual panel drawings for each condition including configuration, dimensions, materials, attachments and panel location.
 - 3. Provide reinforcement details for holes cut through structural studs for each product.
- C. Certification: Statement from framing manufacturer certifying that materials conform to requirements of Contract Documents.
- D. Calculations: Engineering calculations shall be prepared verifying the assembly's ability to meet or exceed design requirements as required by local codes and authorities.

1.9 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacture of products specified in this Section with minimum 3 years documented experience.
- B. Installer: Welders shall be certified under provisions of AWS for structural welding and specific qualifications for sheet steel.
- C. Design Engineer: Registered Structural Engineer and licensed in the State of Project location, and experienced in the structural design of lightgauge framing systems.

1.10 SHOP DRAWINGS

- A. The Contractor shall submit the following for review:
 - 1. Shop drawings, together with complete erection drawings, indicating all fasteners and weld types, sizes and locations.
 - 2. Calculations sealed by a Structural Engineer registered in the state of the project for building components and connections required by the contract drawings and for all connections of the cold formed metal framing components to each other and to the building frame.
- B. Only shop drawings bearing the stamp of review of the Structural Engineers and Architects shall be used by the contractor for fabrication and erection.
- C. Shop and Erection Drawings shall not be reprints of the Contract Drawings. They shall, in the opinion of the Architect, be complete in all details and they shall locate, size, and mark all members. Details shall clearly indicate a manner of making all typical and special connections, amount of bearing, and shall accurately indicated the member's location relative to walls, spandrel sections, openings or other construction features. Erection drawings shall include a Field Weld Schedule, and sections and details covering all field welds required for the finished structure.
- D. Figured and field dimensions only shall be used; scaling drawings not permitted. The Contractor shall verify all dimensions and be responsible for coordinating same. Any conflict shall be referred to the Architect for decision prior to proceeding with fabrication of the work affected.
- E. The review of the Shop drawings is limited to design intent only. No responsibility for a detailed check of information is assumed by the Architect by virtue of such approval.

1.11 INSPECTION AND QUALITY CONTROL

- A. Contractor shall provide effective full time quality control over all fabrication and erection activities.
- B. As directed by Architect, owner's testing agency may inspect the maintenance of a quality control program including spot checking weldments and welding procedures in accordance with A.W.S. standards.
- C. Inspection by owner's testing agency is not intended to be comprehensive or complete. Full responsibility for quality control shall remain with the Contractor.
- D. The owner shall employ an inspection agency approved by the engineer to inspect the shop and field welding and screw connections of the stud components to themselves and to the metal supporting structure. The cost of all tests and inspections are to be borne by the owner.

1.12 REGULATORY REQUIREMENTS

- A. Conform to applicable provisions of the Building Code listed in section 01 4100.

1.13 DELIVERY, STORAGE AND HANDLING

- A. Protect metal framing units from rusting and damage.
- B. Deliver in manufacturer's unopened containers or bundles, color identified with metal thickness and grade of steel.
- C. Store off ground in a dry ventilated space or protect with suitable waterproof coverings.
- D. Handle and lift components and prefabricated panels in a manner to prevent, damage, distortion, and undue stress.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Lightgauge Metal Framing:
 - 1. Marino/Ware - A division of Ware Industries, Inc.
 - 2. Unimast Incorporated - US Gypsum
 - 3. Clarke/Cincinnati
 - 4. Dietrich Industries, Inc.
 - 5. Dale/Incor
- B. Slotted Channel Framing:
 - 1. Unistrut
 - 2. Kindorf
 - 3. B-Line

2.2 COLD-FORMED STEEL STUDS, JOISTS, AND LINTEL ASSEMBLIES

- A. Product Standard: ASTM C 955; "C" shaped load bearing framing members.
- B. All galvanized studs 12, 14, and 16 gauge and all joists shall be formed from steel that corresponds to the minimum requirements of ASTM A653, SQ, Grade 50, Class 1 with a minimum yield of 50,000 psi.
- C. All galvanized studs less than or equal to 18 gauge; all galvanized track, bridging, end closures and accessories shall be formed from steel that corresponds to the requirements of ASTM A653, CQ, Grade 33, with a minimum yield of 33,000 psi.
- D. All galvanized studs, joists, track, bridging and accessories shall be formed from steel having a G-60 galvanized coating meeting the requirements of ASTM A653.

- E. Galvanizing Repair Paint: High zinc-dust content paint for repair of damaged galvanized surfaces complying with ASTM A780-80.
- F. All unistrut framing shall be formed from galvanized steel conforming to ASTM A653, grade 33, G90.

2.3 PROPERTIES

- A. The physical and structural properties listed by MARINO /WARE shall be considered the minimum permitted for all lightgauge metal framing members. Specifically, the following minimum properties, calculated in accordance with the latest A.I.S.I. Specification shall be provided: Ix(in.4), Area (in.2), rx(in.), Fy(KSI), Resisting Moment (in.-lb). Follow ASTM A446-72, latest edition.
- B. All structural studs shall be configured such that the maximum web punching shall be one (1) inch diameter holes at 30 inches on center. All structural joists, lintel assemblies, rafters and trusses shall have no pre-punched holes.
- C. The physical and structural properties listed by Unistrut shall be considered the minimum permitted for all Unistrut framing members. Specifically, the following minimum properties, calculated in accordance with the latest A.I.S.I. Specification shall be provided: Ix(in.4), Area (in.2), rx(in.), Fy(KSI), Resisting Moment (in.-lb).

2.4 SUBSTITUTIONS

- A. The Architect must approve any substitutions in writing ten (10) days prior to bid date.

2.5 ACCESSORIES

- A. Provide standard steel runners (tracks), slip tracks, slide blocks, blocking, lintels, clip angles, shoes, reinforcements, and accessories.
- B. Accessories shall be as recommended by framing manufacturer for applications indicated and as required to provide complete and substantial framing system.
- C. Unistrut fittings shall be punch press made from hot rolled, pickled and oiled steel plates, strip or coil conforming to ASTM A36, A575, A576, or A635.

2.6 FASTENERS

- A. Fasteners shall be of sufficient size to ensure strength of connection. Minimum edge distance shall be 1/2" for all screws and pins and 1" for all bolts.
- B. Steel Drill Screws: Screws shall have rust inhibitive coating (cadmium or zinc plating, ASTM B 766) suitable for the installation in which they are being used.
- C. Power Actuated Drive Pins: In accordance with FF-P-395.

- D. Expansion Bolts: In accordance with FF-S-325, except lead, fiber, and plastic shields are not permitted.
- E. Unistrut nuts shall be of rectangular case hardened steel manufactured with toothed grooves to prevent any movement of the bolt and nut within the framing member.
- F. Unistrut bolts and screws shall meet or exceed the requirements of ASTM A307.

2.7 FINISH TOUCH-UP

- A. Zinc Rich Paint: In accordance with ASTM A 780.
- B. Prime Paint: Similar to that used by framing manufacturer.

2.8 FABRICATION

- A. Framing components may be prefabricated into panels for erection. Fabricate panels plumb, square, true to line and braced against racking.
- B. With each type of metal framing required, provide standard steel runners (tracks), blocking, lintels, clip angles, shoes, reinforcements, fasteners, and accessories recommended by the manufacturer and as shown on drawings for applications indicated and required to provide a complete and substantial metal framing system.
- C. Cut all framing components squarely or at an angle to fit squarely against abutting members. Hold members firmly in position until properly fastened. Wire tying of framing components in structural applications is not permitted. Torch cutting of load bearing studs is not permitted. Slicing of load bearing members is not permitted.
- D. Perform shop and field welding in accordance with AWS D1.1, AWS D1.3, and AISI Manual Section 4.2.
- E. Provide insulation equal to that specified elsewhere in all double jamb studs and double header members which will not be accessible to the insulation contractor. After fabrication and installation.

PART 3 - EXECUTION

3.1 VERIFICATION OF CONDITIONS

- A. Inspection: Prior to installation, inspect work of all other trades. Verify that all such work is complete and accurate to the point where this installation may properly commence in strict accordance with the contract documents and approved framing shop drawings.

3.2 DISCREPANCIES

- A. Immediately notify Architect of all discrepancies.
- B. Do not proceed with installation in areas of discrepancies until such discrepancy has been fully resolved.

3.3 INSTALLATION - STUD SYSTEM

A. General:

1. Erect framing and panels plumb, level and square in strict accordance with the approved shop drawings and ASTM C 1007.
2. Temporary bracing shall be provided until erection is completed.

- B. Runner Tracks: Install continuous tracks sized to match studs. Align tracks accurately to layout at base and tops of studs. Securely anchor abutting pieces of track to a common structural element of butt-welded or spliced together. Secure tracks to supporting structure as recommended by stud manufacturer for type of construction involved, except do not exceed 16" on center spacing for nail or power-driven fasteners, nor 12" on center for other types of attachment. Provide fasteners at corners and ends of tracks.

- C. Stud Placement: Secure Placement: Secure studs to top and bottom runner tracks by fastening at both inside and outside flanges by welding.

1. Set studs plumb, except as needed for diagonal bracing or required for non-plumb walls or warped surfaces and similar requirements. Where stud system is attached to the building frame, shim between frame and stud as required.
2. Where stud system abuts structural columns or walls, including masonry walls, anchor ends of stiffeners to supporting structure.
3. Provide double studs at panel intersections, corner, doors, windows, control joints, etc.

D. Reinforced Framing:

1. 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 recommendation and industry standards in each case, considering weight or loading resulting from item supported.
2. Frame wall openings larger than 2'-0" square with double stud at each jamb of frame except where more than 2 are either shown on the contract drawings or indicated in manufacturers instructions. Install runner tracks and jack studs above and below wall openings. Anchor tracks to jamb studs with stud shoe or by welding; space jack studs same as full-height studs of wall. Connect jamb studs together by straps or welds not more than 4'-0" o.c. vertically on both faces of studs.
3. Frame both sides of expansion and control joints with separate studs; do not bridge the joint with components of stud system.
4. Install horizontal stiffeners in stud system, space at not more than 4'-0" o.c. vertically.

Horizontal bracing shall consist of 1-1/2" wide by 16 gauge galvanized u-bracing attached to studs with 1" x 1" x 16 gauge clip angle and (4) - 10 gage Tek Screws.

5. Solid bridging is to be placed at each end of wall, adjacent to wall openings, and at other locations in the stud system as required by the contract documents. Solid bridging shall consist of full depth. 16 gauge galvanized track attached to studs with 1" x 1" x 16 gauge clip angles and (4) - 10 gage Tek Screws.

E. Holes that are field cut into steel framing members shall be within the limitations of the product and its design. Provide reinforcement where holes are cut through load bearing members in accordance with the manufacturer's recommendations for the product.

F. Align axially loaded members vertically to allow for full transfer of loads. Vertical alignment shall be maintained at floor / wall intersections unless alternate provisions for transfer are made.

3.4 INSTALLATION – JOISTS IN LINTEL ASSEMBLIES

A. Install level and plumb, complete with bracing and reinforcing as indicated on drawings. Provide not less than 1-1/2" end bearing and 3-1/2" bearing at intermediate supports. Provide full bearing surface shims as required for leveling.

B. Reinforce ends with end clip, steel hangers, steel angle clips, steel stud section, or as otherwise recommended by joist manufacturer.

C. Provide web stiffeners at reaction points, and at points concentrated loads.

D. Limitations for field cut holes shall be per paragraph 2.3.B above.

3.5 INSTALLATION - UNISTRUT

A. Installation shall be accomplished by a fully trained manufacturer authorized installer.

B. Set Strut System components into final position true to lines, level and plumb, in accordance with approved shop drawings.

C. Anchor material firmly in place. Tighten all connections to their recommended torques.

3.6 TOLERANCES

A. Vertical alignment (plumbness) of studs shall be within 1/960 (1/8 inch in 10 ft.) of the span.

B. Horizontal alignment (levelness) of walls shall be within 1/960 (1/8 inch in 10 ft.) of their respective lengths.

C. Spacing of the studs shall be more than 1/8 inch from the designed spacing, provided that the cumulative error does not exceed the requirements of the finishing material.

- D. Squareness of the prefabricated panels shall be not more than 1/8 inch out of square within the length of that panel.

3.9 INSPECTION

- A. Comply with inspection requirements of Section 01 4000, Quality Control Services.
- B. Inspect fabrication and installation for compliance with ASTM C 1007.
- C. Review Contractor's quality control program.
- D. Inspect shop and field welding of cold-formed metal framing components to each other and to structural metal framing, including compliance with AWS standards.

3.10 ADJUSTMENTS

- A. Finish Touch-Up: After installation, wire brush and clean scarred areas, welds, rust spots and other steel bared by fabrication and erection procedures.
- B. Touch-up surfaces using zinc rich paint on galvanized steel and paint equal to that used by the manufacturer on painted steel members.
- C. In areas where shop-painted surfaces are to be exposed, apply touch-up paint to blend into adjacent surfaces.

3.11 PROTECTION OF INSTALLED WORK

- A. Do not apply loads until bridging, bracing, strapping, and web reinforcement are securely in place.
- B. Do not overload the floor system during construction. Prevent concentrated floor or roof loads, such as stacking of heavy building materials, unless adequate additional means for carrying these loads are provided.
- C. If diaphragm rated components are used in lieu of bridging, then do not apply loading until their installation. If components on one side only, then the other flanges should be bridged with suitable bridging. Bridging may be removed or left in place when diaphragm rated components are installed.

3.12 CONTRACTOR'S RESPONSIBILITY

- A. Acceptance of the shop and field inspection done by the testing agency pertaining to the cold - formed metal framing, does not relieve the Contractor of his responsibility to insure that the project has the proper sizes, strength, fabrication and erection procedures and any other requirements of the Contract Documents.
- B. Submit copies of all daily reports indicating conformance and exceptions to contract

documents in a timely fashion to General Contractor for distribution to design consultants, owner, subcontractors and other interested parties.

- C. Final Report: The Inspection Agency shall prepare a written report that summarizes the work inspected during the course of the project. A discussion of all deviations from the contract documents and specifications, with their related impact on the final construction, shall be described in detail. The engineer of record shall review this final report, and recommend corrective measures (as deemed necessary) that must be made prior to final acceptance of the work. Prior to final payment, a written report certifying that the work meets the requirements of the contract documents, specifications, and all governing agencies shall be prepared, submitted, and approved by the Architect.

END OF SECTION