

SECTION 05 12 00**STRUCTURAL STEEL****PART 1 GENERAL****1.01 SUMMARY**

A. This Section includes the following:

- 1 Structural steel.
- 2 Grout.

B. Related Sections include the following:

- 1 Division 01 Section "Quality Requirements" for independent testing agency procedures and administrative requirements.
- 2 Division 05 Section "Metal Fabrications" for steel lintels or shelf angles not attached to structural-steel frame and miscellaneous steel fabrications not defined as structural steel.

1.02 DEFINITIONS

A. Structural Steel: Elements of structural-steel frame, as classified by AISC's "Code of Standard Practice for Steel Buildings and Bridges," that support design loads.

1.03 PERFORMANCE REQUIREMENTS

A. Connections: Provide details of simple shear connections required by the Contract Documents to be selected or completed by structural-steel fabricator to withstand LRFD loads indicated and comply with other information and restrictions indicated.

1. Select and complete connections using schematic details if indicated and AISC's "Manual of Steel Construction, Specification for Structural Steel Buildings ANSI/AISC 360, latest Edition.

B. Construction: Type PR, partially restrained.

C. Construction: Type 2, simple framing.

1.04 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Show fabrication of structural-steel components.

- 1 Include details of cuts, connections, splices, camber, holes, and other pertinent data.
- 2 Include embedment drawings.
- 3 Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length, and type of each weld.
- 4 Indicate type, size, and length of bolts, distinguishing between shop and field bolts. Identify pretensioned and slip-critical high-strength bolted connections.

C. Welding certificates.

D. Qualification Data: For Installer and fabricator.

E. Mill Test Reports: Signed by manufacturers certifying that the following products comply with requirements:

- 1 Structural steel including chemical and physical properties.
- 2 Bolts, nuts, and washers including mechanical properties and chemical analysis.
- 3 Direct-tension indicators.

- 4 Tension-control, high-strength bolt-nut-washer assemblies.
- 5 Shear stud connectors.
- 6 Nonshrink grout.

F. Source quality-control test reports.

1.05 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified installer who participates in the AISC Quality Certification Program and is designated an AISC-Certified Erector, Category CSE.
- B. Fabricator Qualifications: A qualified fabricator who participates in the AISC Quality Certification Program and is designated an AISC-Certified Plant, Category Sbd.
- C. Welding: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code--Steel."
- D. Comply with applicable provisions of the following specifications and documents:
 - 1 AISC's "Code of Standard Practice for Steel Buildings and Bridges."
 - 2 AISC's "Seismic Provisions for Structural Steel Buildings" and "Supplement No. 2."
 - 3 AISC's Specification for Structural Steel Buildings—ANSI/AISC 360.
 - 4 AISC's "Specification for the Design of Steel Hollow Structural Sections."
 - 5 RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Store materials to permit easy access for inspection and identification. Keep steel members off ground and spaced by using pallets, dunnage, or other supports and spacers. Protect steel members and packaged materials from erosion and deterioration.
 - 1 Store fasteners in a protected place. Clean and relubricate bolts and nuts that become dry or rusty before use.
 - 2 Do not store materials on structure in a manner that might cause distortion, damage, or overload to members or supporting structures. Repair or replace damaged materials or structures as directed.

1.07 COORDINATION

- A. Furnish anchorage items to be embedded in or attached to other construction without delaying the Work. Provide setting diagrams, sheet metal templates, instructions, and directions for installation.

PART 2 PRODUCTS

2.01 STRUCTURAL-STEEL MATERIALS

- A. Channels, Angles-Shapes: ASTM A 36/A 36M.
- B. Plate and Bar: ASTM A 36/A 36M.
- C. Welding Electrodes: Comply with AWS requirements.

2.02 BOLTS, CONNECTORS, AND ANCHORS

- A. High-Strength Bolts, Nuts, and Washers: ASTM A 325 (ASTM A 325M), Type 1, heavy hex steel structural bolts; ASTM A 563 (ASTM A 563M) heavy hex carbon-steel nuts; and ASTM F 436 (ASTM F 436M) hardened carbon-steel washers.
 - 1. Finish: Plain.
- B. High-Strength Bolts, Nuts, and Washers: ASTM A 490 (ASTM A 490M), Type 1, heavy hex steel structural bolts; ASTM A 563 (ASTM A 563M) heavy hex carbon-steel nuts; and ASTM F 436 (ASTM F 436M) hardened carbon-steel washers, plain.

C. Unheaded Anchor Rods: ASTM F 1554, Grade 36.

- 1 Configuration: Straight.
- 2 Nuts: ASTM A 563 (ASTM A 563M) heavy hex carbon steel.
- 3 Plate Washers: ASTM A 36/A 36M carbon steel.
- 4 Washers: ASTM F 436 (ASTM F 436M) hardened carbon steel.
- 5 Finish: Plain.

D. Threaded Rods: ASTM A 36/A 36M.

- 1 Nuts: ASTM A 563 (ASTM A 563M) heavy hex carbon steel.
- 2 Washers: hardened ASTM A 36/A 36M carbon steel.
- 3 Finish: Plain.

2.03 GROUT

- A. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107, factory-packaged, nonmetallic aggregate grout, noncorrosive, nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.

2.04 FABRICATION

- A. Structural Steel: Fabricate and assemble in shop to greatest extent possible. Fabricate according to AISC's "Code of Standard Practice for Steel Buildings and Bridges" and AISC's "Specification for Structural Steel Buildings", Latest Edition.

- 1 Camber structural-steel members where indicated.
- 2 Identify high-strength structural steel according to ASTM A 6/ A 6M and maintain markings until structural steel has been erected.
- 3 Mark and match-mark materials for field assembly.
- 4 Complete structural-steel assemblies, including welding of units, before starting shop-priming operations.

- B. Thermal Cutting: Perform thermal cutting by machine to greatest extent possible.

1. Plane thermally cut edges to be welded to comply with requirements in AWS D1.1.

- C. Bolt Holes: Cut, drill, mechanically thermal cut, or punch standard bolt holes perpendicular to metal surfaces.

- D. Finishing: Accurately finish ends of columns and other members transmitting bearing loads.

- E. Cleaning: Clean and prepare steel surfaces that are to remain unpainted according to SSPCSP 2, "Hand Tool Cleaning].

- F. Holes: Provide holes required for securing other work to structural steel and for passage of other work through steel framing members.

- 1 Cut, drill, or punch holes perpendicular to steel surfaces. Do not thermally cut bolt holes or enlarge holes by burning.
- 2 Base-Plate Holes: Cut, drill, mechanically thermal cut, or punch holes perpendicular to steel surfaces.
- 3 Weld threaded nuts to framing and other specialty items indicated to receive other work.

2.05 SHOP CONNECTIONS

- A. High-Strength Bolts: Shop install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.

1. Joint Type: Snug tightened.

- B. Weld Connections: Comply with AWS D1.1 for welding procedure specifications, tolerances, appearance, and quality of welds and for methods used in correcting welding work.
 - 1. Assemble and weld built-up sections by methods that will maintain true alignment of axes without exceeding tolerances of AISC's "Code of Standard Practice for Steel Buildings and Bridges" for mill material.

2.06 SOURCE QUALITY CONTROL

- A. Owner will engage an independent testing and inspecting agency to perform shop tests and inspections and prepare test reports.
 - 1. Provide testing agency with access to places where structural-steel work is being fabricated or produced to perform tests and inspections.
- B. Correct deficiencies in Work that test reports and inspections indicate does not comply with the Contract Documents.
- C. Bolted Connections: Shop-bolted connections will be tested and inspected according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."
- D. Welded Connections: In addition to visual inspection, shop-welded connections will be tested and inspected according to AWS D1.1 and the following inspection procedures, at testing agency's option:
 - 1 Liquid Penetrant Inspection: ASTM E 165.
 - 2 Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration will not be accepted.
 - 3 Ultrasonic Inspection: ASTM E 164.
 - 4 Radiographic Inspection: ASTM E 94.
- E. In addition to visual inspection, shop-welded shear connectors will be tested and inspected according to requirements in AWS D1.1 for stud welding and as follows:
 - 1 Bend tests will be performed if visual inspections reveal either a less-than- continuous 360degree flash or welding repairs to any shear connector.
 - 2 Tests will be conducted on additional shear connectors if weld fracture occurs on shear connectors already tested, according to requirements in AWS D1.1.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify elevations of concrete- and masonry-bearing surfaces and locations of anchor rods, bearing plates, and other embedments, with steel erector present, for compliance with requirements.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

- A. Provide temporary shores, guys, braces, and other supports during erection to keep structural steel secure, plumb, and in alignment against temporary construction loads and loads equal in intensity to design loads. Remove temporary supports when permanent structural steel, connections, and bracing are in place, unless otherwise indicated.
 - 1. Do not remove temporary shoring supporting composite deck construction until cast-inplace concrete has attained its design compressive strength.

3.03 ERECTION

- A. Set structural steel accurately in locations and to elevations indicated and according to AISC's "Code of Standard Practice for Steel Buildings and Bridges" and "Specification for Structural Steel Buildings", Latest Edition.

B. Base and Bearing Plates: Clean concrete- and masonry-bearing surfaces of bond-reducing materials, and roughen surfaces prior to setting base and bearing plates. Clean bottom surface of base and bearing plates.

- 1 Set base and bearing plates for structural members on wedges, shims, or setting nuts as required.
- 2 Weld plate washers to top of base plate.
- 3 Snug-tighten anchor rods after supported members have been positioned and plumbed. Do not remove wedges or shims but, if protruding, cut off flush with edge of base or bearing plate before packing with grout.
- 4 Promptly pack grout solidly between bearing surfaces and base or bearing plates so no voids remain. Neatly finish exposed surfaces; protect grout and allow to cure. Comply with manufacturer's written installation instructions for shrinkage-resistant grouts.

C. Maintain erection tolerances of structural steel within AISC's "Code of Standard Practice for Steel Buildings and Bridges."

D. Align and adjust various members forming part of complete frame or structure before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that will be in permanent contact with members. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.

- 1 Level and plumb individual members of structure.
- 2 Make allowances for difference between temperature at time of erection and mean temperature when structure is completed and in service.

E. Splice members only where indicated.

F. Remove erection bolts on welded, architecturally exposed structural steel; fill holes with plug welds; and grind smooth at exposed surfaces.

G. Do not use thermal cutting during erection unless approved by Engineer. Finish thermally cut sections within smoothness limits in AWS D1.1.

H. Do not enlarge unfair holes in members by burning or using drift pins. Ream holes that must be enlarged to admit bolts.

3.04 FIELD CONNECTIONS

A. High-Strength Bolts: Shop install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.

1. Joint Type: Snug tightened.

B. Weld Connections: Comply with AWS D1.1 for welding procedure specifications, tolerances, appearance, and quality of welds and for methods used in correcting welding work.

- 1 Comply with AISC's "Code of Standard Practice for Steel Buildings and Bridges" and "Specification for Structural Steel Buildings", Latest Edition for bearing, adequacy of temporary connections, alignment, and removal of paint on surfaces adjacent to field welds.
- 2 Assemble and weld built-up sections by methods that will maintain true alignment of axes without exceeding tolerances of AISC's "Code of Standard Practice for Steel Buildings and Bridges" for mill material.

3.05 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to inspect field welds and high-strength bolted connections.

B. Bolted Connections: Shop-bolted connections will be tested and inspected according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

C. Welded Connections: Field welds will be visually inspected according to AWS D1.1.

1. In addition to visual inspection, field welds will be tested according to AWS D1.1 and the following inspection procedures, at testing agency's option:

- a. Liquid Penetrant Inspection: ASTM E 165.
- b. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration will not be accepted.
- c. Ultrasonic Inspection: ASTM E 164.
- d. Radiographic Inspection: ASTM E 94.

D. Correct deficiencies in Work that test reports and inspections indicate does not comply with the Contract Documents.

END OF SECTION

SECTION 05 40 00**COLD-FORMED METAL FRAMING PART 1****GENERAL****1.01 SECTION INCLUDES**

- A. Non-load bearing formed steel stud interior wall framing.

1.02 RELATED REQUIREMENTS

- A. Section 05 12 00 - Structural Steel: Structural framing.
- B. Section 06 10 00 - Rough Carpentry: Wood blocking.
- C. Section 07 90 05 - Joint Sealers.
- D. Section 09 21 16 - Gypsum Board Assemblies: Gypsum-based sheathing.

1.03 REFERENCE STANDARDS

- A. ASTM A 153/A 153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
- B. ASTM A 653/A 653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- C. 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.
- D. AWS D1.1/D1.1M - Structural Welding Code - Steel; American Welding Society.
- E. SSPC-Paint 20 - Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic"); Society for Protective Coatings.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordinate with work of other sections that is to be installed in or adjacent to the metal framing system, including but not limited to structural anchors, cladding anchors, utilities, insulation, and firestopping.

1.05 PERFORMANCE

- A. Design seismic loads shall be in accordance with Chapter 16 of the Pennsylvania Building Code and the provisions of ASCE-7.
- B. All non-axial load-bearing light gauge steel framing shall be designed to accommodate a minimum of 1/2 inch vertical deflection of primary structure and floor structure using VertiClip manufactured by The Steel Network or equal. Deflection clips shall be manufactured with ASTM 653 Prime Certified G60 galvanized material or better, 50 ksi-yield strength and 65 ksi ultimate strength. Deflection clips shall have a positive attachment to structure and stud material while allowing frictionless movement. Studs shall not be connected to friction fit deep leg runner combination, temporary or otherwise. Structural technical report and required connection shall be provided with Submittals.

1.06 SUBMITTALS

- A. See Section 01 30 00 - Submittals, for submittal procedures.
- B. Shop Drawings: Indicate component details, framed openings, and accessories or items required of related work.

- 1 Indicate stud and roof joist layout. Shop drawings shall include an erection plan, and wall sections coordinated with the Architectural Contract Drawings along with anchorage and connection details for all light gauge steel framing shown on the Contract Drawings.
- 2 Describe method for securing studs to tracks and for bolted framing connections. All connections shall be clearly detailed on the shop drawings.
- 3 Provide structural calculations for loadings, analysis and design of specially fabricated framing that have been stamped by a Professional Structural Engineer licensed in the State of Pennsylvania. Structural calculations shall be for all light gauge cold formed framing members including studs for brick, veneer, lintels at head of all openings, sills, jambs, tracks and all connections of members. Connection details to structural steel framing shall allow for deflection of structural steel framing.

C. Manufacturer's Installation Instructions: Indicate special procedures, conditions requiring special attention.

D. Calculations and shop drawings must be approved in writing by the Architect before work can begin.

1.07 QUALITY ASSURANCE

A. Calculate structural properties of framing members in accordance with requirements of AISI "Specification for the Design of Cold-Formed Steel Structural Members".

1.08 PROJECT CONDITIONS

A. Verify that field measurements are as indicated on the drawings.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Metal Framing, Connectors, and Accessories:

- 1 Dietrich Metal Framing: www.dietrichindustries.com.
- 2 MarinoWare: www.marinoware.com.
- 3 The Steel Network, Inc: www.SteelNetwork.com.

B. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 FRAMING SYSTEM

A. Provide primary and secondary framing members, bridging, bracing, plates, gussets, clips, fittings, reinforcement, and fastenings as required to provide a complete framing system.

B. Metal Framing Connectors and Accessories:

- 1 Same manufacturer as framing.
- 2 The Steel Network Inc: www.SteelNetwork.com.
- 3 Substitutions: See Section 01 60 00 - Product Requirements.

2.03 FRAMING MATERIALS

A. Studs and Track: ASTM C 955; studs formed to channel, "C", or "Sigma" shape with punched web; U-shaped track in matching nominal width and compatible height.

- 1 Gage and depth: As required to meet specified performance levels.
- 2 Galvanized in accordance with ASTM A 653/A 653M G90/Z275 coating.

2.04 ACCESSORIES

A. Bracing, Furring, Bridging: Formed sheet steel, thickness determined for conditions encountered; finish to match framing components.

- B. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20, Type I - Inorganic, complying with VOC limitations of authorities having jurisdiction.
- C. Water-Resistive Barrier: 60 minute water-resistive Kraft building paper.

2.05 FASTENERS

- A. Self-Drilling, Self-Tapping Screws, Bolts, Nuts and Washers: Hot dip galvanized per ASTM A 153/A 153M.
- B. Anchorage Devices: Power actuated.
- C. Welding: In conformance with AWS D1.1.

2.06 FABRICATION

- A. Shop fabricate metal framing to the greatest extent possible.
- B. Contractor shall note that Contract Documents are of a schematic nature and that all miscellaneous clips, braces, plates and other accessories necessary to complete this work are not shown on the Drawings and is the responsibility of the Contractor to design and furnish the work in accordance with code and structural requirements. Fabricate assemblies of framed sections of sizes and profiles required; with framing members fitted, reinforced, and braced to suit design requirements.
- C. Fit and assemble in largest practical sections for delivery to site, ready for installation.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that substrate surfaces are ready to receive work.

3.02 INSTALLATION OF STUDS

- A. Install components in accordance with manufacturers' instructions.
- B. Align floor and ceiling tracks with wall layout. Secure in place with fasteners at maximum 24 inches oc. Coordinate installation of sealant with floor and ceiling tracks.
- C. Place studs at 16 inches on center; not more than 2 inches from abutting walls and at each side of openings. Connect studs to tracks using clip and tie method.
- D. Construct corners using minimum of three studs. Install minimum double studs at wall openings, door and window jambs unless calculations indicate more are required.
- E. Install load bearing studs full length in one piece. Splicing of studs is not permitted.
- F. Install load bearing studs, brace, and reinforce to develop full strength and achieve design requirements.
- G. Coordinate placement of insulation in multiple stud spaces made inaccessible after erection.
- H. Install intermediate studs above and below openings to align with wall stud spacing.
- I. Provide deflection allowance in stud track, directly below horizontal building framing at non-load bearing framing.
- J. Install framing between studs for attachment of mechanical and electrical items, and to prevent stud rotation.
- K. Touch-up field welds and damaged galvanized surfaces with primer.

3.03 FRAMING ACCESSORY INSTALLATION

- A. Install accessories as required by structural design calculations. Provide appropriate fasteners in all predrilled holes backed by another framing member.
 - 1. Bridging Clip for Cold Rolled Channel Bridging: Secure to stud web by inserting tabs through web slots. Secure to channel with one screw.

3.04 TOLERANCES

- A. Maximum Variation from True Position: 1/8 inch.
- B. Maximum Variation of any Member from Plane: 1/8 inch.

END OF SECTION