DIVISION 5 – METALS

SECTION 05 1200 – STRUCTURAL STEEL FRAMING

1. General: This section outlines the general requirements for structural steel framing.

2. Structural Steel Design Considerations:
   a. No bar joists shall be used for floor construction.
   b. Consideration must be made for effects of hanger loads from M/E/P systems, hung stairs, etc., on building structure.
   c. Exterior lintels shall be galvanized.
   d. Stainless steel should be considered for areas that are permanently exposed to the elements.
   e. For multi-story structures, design to a strict deflection limit. The fit & finish of architectural components, the long term durability and construction delays associated with elevated slab concrete that would need to be leveled (filled, patched, bushed, topped, etc.), the additional loading on the structure associated with increased concrete thickness needed to meet flatness / levelness standards, etc. should all be considered when determining acceptable deflections.
   f. Architecturally exposed welded connections shall be ground smooth; for materials indicated to be painted, the erector shall prime all exposed steel following grinding.

3. Performance Requirements:
   a. Connections: Provide details of connections required by the Construction Documents to be selected or completed by structural-steel fabricator to withstand ASD-service or LRFD loads indicated and comply with other information and restrictions indicated.
   b. Engineering Responsibility: Fabricator’s responsibilities include using an Illinois licensed structural engineer to prepare structural analysis data for structural-steel connections.

4. Quality Assurance:
   a. Installer Qualifications: A qualified installer who participates in the AISC Quality Certification Program and is designated an AISC-Certified Erector.
   b. Fabricator Qualifications: A qualified fabricator who participates in the AISC Quality Certification Program and is designated an AISC-Certified Plant.

d. Welding: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code--Steel."

e. Mockups: Build mockups of architecturally exposed structural steel to set quality standards for fabrication and installation.

i. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

f. Pre-Installation Conference Architect / Engineer shall coordinate requirements for pre-installation conference with NU Project Manager.

5. Delivery, Storage, and Handling:

a. Contractor shall 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.

b. Contractor shall store fasteners in a protected place. Clean and relubricate bolts and nuts that become dry or rusty before use.

c. Contractor shall 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.

6. Coordination: Contractor shall 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.

7. Products:


i. Camber structural-steel members where indicated.

ii. Identify high-strength structural steel according to ASTM A 6/ A 6M and maintain markings until structural steel has been erected.

iii. Mark and match-mark materials for field assembly.

iv. Complete structural-steel assemblies, including welding of units, before starting shop-priming operations.
b. Architecturally Exposed Structural Steel: Comply with fabrication requirements, including tolerance limits, of AISC's "Code of Standard Practice for Steel Buildings and Bridges" for structural steel identified as architecturally exposed structural steel.

   i. Fabricate with exposed surfaces smooth, square, and free of surface blemishes including pitting, rust, scale, seam marks, roller marks, rolled trade names, and roughness.

   ii. Remove blemishes by filling or grinding or by welding and grinding, before cleaning, treating, and shop priming.

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

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

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

f. Cleaning: Clean and prepare steel surfaces that are to remain unpainted.

g. Shear Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Use automatic end welding of headed-stud shear connectors according to AWS D1.1 and manufacturer's written instructions.

h. Steel Wall-Opening Framing: Select true and straight members for fabricating steel wall-opening framing to be attached to structural steel. Straighten as required to provide uniform, square, and true members in completed wall framing.

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

   i. Cut, drill, or punch holes perpendicular to steel surfaces. Do not thermally cut bolt holes or enlarge holes by burning.

   ii. Base-Plate Holes: Cut, drill, mechanically thermal cut, or punch holes perpendicular to steel surfaces.

   iii. Weld threaded nuts to framing and other specialty items indicated to receive other work.

8. 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.
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.

   i. Remove backing bars or runoff tabs, back gouge, and grind steel smooth.

   ii. 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.

   iii. Verify that weld sizes, fabrication sequence, and equipment used for architecturally exposed structural steel will limit distortions to allowable tolerances. Prevent weld show-through on exposed steel surfaces.

      1. Grind butt welds flush.

      2. Grind or fill exposed fillet welds to smooth profile. Dress exposed welds.

9. Shop Priming:

   a. Shop prime steel surfaces except the following:

      i. Surfaces embedded in concrete or mortar. Extend priming of partially embedded members to a depth of 2 inches (50 mm).

      ii. Surfaces to be field welded

      iii. Surfaces to be high-strength bolted with slip-critical connections

      iv. Surfaces to receive sprayed fire-resistive materials

      v. Galvanized surfaces

   b. Surface Preparation: Clean surfaces to be painted. Remove loose rust and mill scale and spatter, slag, or flux deposits.

   c. Priming: Immediately after surface preparation, apply primer according to manufacturer's written instructions and at rate recommended by SSPC to provide a dry film thickness of not less than 1.5 mils (0.038 mm). Use priming methods that result in full coverage of joints, corners, edges, and exposed surfaces.

      i. Stripe paint corners, crevices, bolts, welds, and sharp edges.

      ii. Apply two coats of shop paint to inaccessible surfaces after assembly or erection. Change color of second coat to distinguish it from first.

   d. Painting: Apply a 1-coat, nonasphaltic primer complying with SSPC-PS Guide 7.00, "Painting System Guide 7.00: Guide for Selecting One-Coat Shop Painting Systems," to provide a dry film thickness of not less than 1.5 mils (0.038 mm).
10. Galvanizing:
   a. Hot-Dip Galvanized Finish: Apply zinc coating by the hot-dip process to structural steel according to ASTM A 123/ A 123M.
      i. Fill vent holes and grind smooth after galvanizing.
      ii. Galvanize lintels and shelf angles attached to structural-steel frame and located in exterior walls.

11. Source Quality Control:
   a. Owner will engage an independent testing and inspecting agency to perform shop tests and inspections and prepare test reports.
      i. 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:
      i. Liquid Penetrant Inspection: ASTM E 165.
      ii. 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.
      iii. Ultrasonic Inspection: ASTM E 164.
      iv. 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:
      i. Bend tests will be performed if visual inspections reveal either a less-than- continuous 360-degree flash or welding repairs to any shear connector.
      ii. Tests will be conducted on additional shear connectors if weld fracture occurs on shear connectors already tested, according to requirements in AWS D1.1.
12. 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.

13. 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.
      i. Do not remove temporary shoring supporting composite deck construction until cast-in-place concrete has attained its design compressive strength.

14. Erection:
   c. 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.
   d. Splice members only where indicated.
   e. Remove erection bolts on welded, architecturally exposed structural steel; fill holes with plug welds; and grind smooth at exposed surfaces.
   f. Do not use thermal cutting during erection.
   g. Do not enlarge unfair holes in members by burning or using drift pins. Ream holes that must be enlarged to admit bolts.

15. 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.

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.

16. 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.

c. Welded Connections: Field welds will be tested and visually inspected.

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

17. Repairs And Protection:

a. Repair damaged galvanized coatings.

b. Provide touchup painting as required.

END OF SECTION
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DIVISION 5 – METALS

SECTION 05 3100 – STEEL DECKING

1. General: This section outlines the general requirements for steel decking.

2. Design Criteria:
   a. Composite metal deck shall be a minimum thickness of 20 gauge.
   b. Metal decking shall be provided with deck and flute closures, metal edge forms, etc. as required to contain the wet concrete during slab-on-deck placement.

3. Design Considerations:
   a. Edge of steel decking should be shown on structural drawings and coordinated with architectural drawings.

END OF SECTION
DIVISION 5 – METALS

SECTION 05 5000 – METAL FABRICATIONS

1. General: This section outlines the general requirements for metal fabrications.

2. Design Criteria:
   a. Except where it conflicts with fireproofing or welding, steel and miscellaneous metal materials shall be shop primed.
   b. Exterior lintels shall be galvanized.
   c. Exterior railings shall be stainless steel.
   d. Architecturally exposed welded connections shall be ground smooth.
      i. For materials indicated to be painted, the erector shall prime all exposed steel following grinding.

3. Bollards:
   a. Bollards shall be placed sufficiently far apart for bicycle traffic and close enough to prohibit automobile traffic.
   b. Provide removable bollards with handles on each side located in the direction of traffic.
   c. Place removable bollards in a removable concrete band with troweled joints to avoid expansion cracks. Tooled joints should be provided between bollards and not from the recessed sleeves. Concrete band is to be flush with its surroundings. A sealed expansion joint is to be provided between the concrete band and asphalt pavement or adjacent roadway.
   d. Provide a bank of additional receivers for the removable bollards, equal to the number of bollards. Locate out of the way of traffic. These may be located in lawn or mulched areas.
   e. Provide two 2-inch wide reflective strips located 2-inches down from the top of the bollard the second row 2-inches below the first strip.
   f. Northwestern shall provide a standard padlock for removable bollards.
   g. Acceptable Manufacturer:
      i. Cal-Pipe; Model SSP06000 removable, 6-inch, stainless steel bollard with Model ESR060 embedment sleeve.

END OF SECTION
DIVISION 5 – METALS

SECTION 05 5100 – METAL STAIRS AND RAILINGS

1. General: This section outlines the general requirements for metal fabrications.

2. Design Criteria:

   a. Exterior Railings:

      i. Exterior railings shall be stainless steel. Painted handrails are not permitted. Stainless steel, grade 316L is preferred.

      ii. The preferred base detail for exterior railings is to use base plates and fasteners.

      iii. If the condition requires an embedment of the bottom of the railing post, then an epoxy-based setting compound should be utilized. Por-Rok is not recommended.

      iv. Side attachment using Hilti anchorage systems is also recommended in lieu of embedding rail ends.

      v. When mild steel balusters are used, provide stainless steel ends welded to the mild steel for the embedded portion.

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DIVISION 5 – METALS

SECTION 05 7230 – STAIR TREADS AND NOSINGS

1. General: This section outlines the general requirements for stair treads and nosings.

2. Design Criteria:
   a. Stair Nosings: For interior and exterior public stairs, provide full length, non-slip nosings and treads.

END OF SECTION