

# Tnemec 394 Public Bid Long Form Specification

## PART 1 GENERAL

### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

### 1.2 SUMMARY

- A. This Section includes structural steel.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
  - 1. Division 1 Section "Testing Laboratory Services" for independent testing agency procedures and administrative requirements.
  - 2. Division 5 Section "Steel Deck" for field installation of shear connectors.
  - 3. Division 5 Section "Metal Fabrications" for loose steel bearing plates and miscellaneous steel framing.
  - 4. Division 9 Section "Painting" for surface preparation and priming requirements.

### 1.3 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Engineer structural steel connections required by the Contract Documents to be selected or completed by the fabricator to withstand design loadings indicated.
- B. Engineering Responsibility: Engage a fabricator who utilizes a qualified professional engineer to prepare calculations, Shop Drawings, and other structural data for structural steel connections.
- C. IMLC Goals for Use of Recycled Content Materials: Engage a mill/fabricator/supplier that will incorporate no less than 25% of the building materials (made up on no less than 20% by weight) as post-consumer recycled material or no less than 40% by weight as post-industrial recycled material, all based on practical competitive pricing practices.

### 1.4 SUBMITTALS

- A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.
- B. Product Data for each type of product specified.
- C. Shop Drawings detailing fabrication of structural steel components.
  - 1. Include details of cuts, connections, splices, camber, holes, and other pertinent data.
  - 2. Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length, and type of each weld.
  - 3. Indicate type, size, and length of bolts, distinguishing between shop and field bolts. Identify high-strength bolted slip-critical, direct-tension, or tensioned shear/bearing connections.
  - 4. Include Shop Drawings signed and sealed by a qualified professional engineer responsible for their preparation. Shop drawings shall be stamped by a professional Structural Engineer licensed in the Commonwealth of Massachusetts.
- D. Qualification data for firms and persons specified in the "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

- E. Mill test reports signed by manufacturers certifying that their products, including the following, comply with requirements.
  - 1. Structural steel, including chemical and physical properties.
  - 2. Bolts, nuts, and washers, including mechanical properties and chemical analysis.
  - 3. Shop primers.
  - 4. Non-shrink grout.
  - 5. Use of recycled content materials: Percentages by weight and type of recycled material installed shall be quantified, recorded, and submitted to the Architect.

## 1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Engage an experienced Installer who has completed structural steel work similar in material, design, and extent to that indicated for this Project and with a record of successful in-service performance.
- B. Fabricator Qualifications: Engage a firm experienced in fabricating structural steel similar to that indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to fabricate structural steel without delaying the Work.
  - 1. Fabricator must participate in the AISC Quality Certification Program and be designated an AISC-Certified Plant as follows:
    - a. Category: Category I, conventional steel structures.
- C. Comply with applicable provisions of the following specifications and documents:
  - 1. AISC's "Specification for Structural Steel Buildings Allowable Stress Design and Plastic Design."
  - 2. AISC's "Specification for Allowable Stress Design of Single-Angle Members."
  - 3. AISC's "Seismic Provisions for Structural Steel Buildings."
  - 4. ASTM A6 "Specification for General Requirements for Rolled Steel Plates, Shapes, Sheet Piling, and Bars for Structural Use."
  - 5. Research Council on Structural Connections' (RCSC) "Specification for Structural Joints Using ASTM A325 or A490 Bolts."
  - 6. Research Council on Structural Connections' (RCSC) "Load and Resistance Factor Design Specification for Structural Joints Using ASTM A325 or A490 Bolts."
- D. Professional Engineer Qualifications: A professional engineer who is legally authorized to practice in the jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for projects with structural steel framing that are similar to that indicated for this Project in material, design, and extent.
- E. Welding Standards: Comply with applicable provisions of AWS D1.1 "Structural Welding Code-Steel."
  - 1. Present evidence that each welder has satisfactorily passed AWS qualification tests for welding processes involved and, if pertinent, has undergone re-certification.

## 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver structural steel to Project site in such quantities and at such times to ensure continuity of installation.
- B. Store materials to permit easy access for inspection and identification. Keep steel members off ground by using pallets, platforms, or other supports. 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 or damage to members or supporting structures. Repair or replace damaged materials or structures as directed.

## 1.7 SEQUENCING

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

## PART 2 PRODUCTS

### 2.1 MATERIALS

- A. Structural Steel Shapes, Plates, and Bars: As follows:
  - 1. Carbon Steel: ASTM A572 (wide flanges)
  - 2. Carbon Steel: ASTM A 36 (all others).
- B. Cold-Formed Structural Steel Tubing: ASTM A500, Grade B.
- C. Steel Pipe: ASTM A53, Type E or S, Grade B.
  - 1. Weight Class: Standard.
  - 2. Finish: Black, except where indicated to be galvanized.
- D. Carbon-Steel Castings: ASTM A27, Grade 65-35, medium- strength carbon steel.
- E. Shear Connectors: ASTM A108, Grade 1015 through 1020, headed-stud type, cold-finished carbon steel, AWS D1.1, Type B.
- F. Anchor Rods, Bolts, Nuts, and Washers: As follows:
  - 1. Unheaded Rods: ASTM A36.
  - 2. Headed Bolts: ASTM A307, Grade A; carbon-steel, hex-head bolts; and carbon-steel nuts.
  - 3. Washers: ASTM A36.
- G. High-Strength Bolts, Nuts, and Washers: ASTM A325, Type 1, heavy hex steel structural bolts, heavy hex carbon-steel nuts, and hardened carbon-steel washers.
  - 1. Finish: Plain, uncoated.
  - 2. Direct-Tension Indicators: ASTM F 959, Type 325.
    - a. Finish: Plain, uncoated.
- H. Welding Electrodes: Comply with AWS requirements.

### 2.2 PRIMER

- A. Primer: Aromatic Polyurethane Mio/Zinc-filled Primer conforming to the following performance criteria:
  - 1. Slip Critical Primer conforming to AISC static fatigue Class B.
  - 2. Compatible with spray-on fireproofing at 18, 25, and 40+ pounds density fireproofing and must pass UL 263/ASTM E 119 for use under Monokote and Isolatek materials. Also, meets the ambient bond requirements for use in dry conditions in accordance with ASTM E 736, and is compatible with Intumescent fireproofing coatings.
  - 3. Adhesion (ASTM D 4541): No less than 1150 PSI
  - 4. Impact (ASTM D 2794): No visible cracking or delamination of film after 160 inch-pounds direct and indirect impact.
  - 5. Humidity (ASTM 4585): No blistering, cracking, or delamination of the film as well as no more than 1% rusting on the plane after 5000 hours exposure.
  - 6. Salt Spray (ASTM B 117): No cracks, delamination, with no more than 3% rusting on the plane and no more than 1/64<sup>th</sup> inch creepage from the scribe after 10,250 hours exposure.
  - 7. Can be applied over SSPC-SP 3/7 or 6.

**Manufacturers:**

**TNEMEC COMPANY**

Dupont

Keeler and Long

Hempel

- B. Galvanizing Repair Paint: High-zinc-dust-content paint for regalvanizing welds and repair painting galvanized steel, with dry film containing not less than 83%-93% minimum zinc dust by weight, and complying with Tnemec 90G-1K97

## 2.3 GROUT

- A. Nonmetallic, Shrinkage-Resistant Grout: Premixed, nonmetallic, non-corrosive, non-staining grout containing selected silica sands, Portland cement, shrinkage compensating agents, plasticizing and water-reducing agents, complying with ASTM C 1107, of consistency suitable for application, and a 30-minute working time.

## 2.4 FABRICATION

- A. Fabricate and assemble structural steel in shop to greatest extent possible. Fabricate structural steel according to AISC specifications referenced in this Section and in Shop Drawings.
  - 1. Camber structural steel members where indicated.
  - 2. Mark and match-mark materials for field assembly.
  - 3. Fabricate for delivery a sequence that will expedite erection and minimize field handling of structural steel.
  - 4. Complete structural steel assemblies, including welding of units, before starting shop-priming operations.
  - 5. Comply with fabrication tolerance limits of AISC's "Code of Standard Practice for Steel Buildings and Bridges" for structural steel.
- B. Thermal Cutting: Perform thermal cutting by machine to greatest extent possible.
  - 1. Plane thermally cut edges to be welded.
- C. Finishing: Accurately mill ends of columns and other members transmitting loads in bearing.
- D. 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 printed instructions.
- E. Steel Wall Framing: Select true and straight members for fabricating steel wall framing to be attached to structural steel framing. Straighten as required to provide uniform, square, and true members in completed wall framing.
- F. Welded Door Frames: Build up welded doorframes attached to structural steel framing. Weld exposed joints continuously and grind smooth. Plug-weld fixed steel bar stops to frames. Secure removable stops to frames with countersunk, cross-recessed head machine screws, uniformly spaced not more than 10 inches o.c., unless otherwise indicated.
- G. Holes: Provide holes required for securing other work to structural steel framing and for passage of other work through steel framing members, as shown on Shop Drawings.
  - 1. Cut, drill, or punch holes perpendicular to metal surfaces. Do not flame-cut holes or enlarge holes by burning. Drill holes in bearing plates.
  - 2. Weld threaded nuts to framing and other specialty items as indicated to receive other work.

## 2.5 SHOP CONNECTIONS

- A. Shop install and tighten high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A325 or A490 Bolts."
- B. Shop install and tighten high-strength bolts according to RCSC's "Load and Resistance Factor Design Specification for Structural Joints Using ASTM A325 or A490 Bolts."
  - 1. Bolts: ASTM A325 high-strength bolts, unless otherwise indicated.
  - 2. Connection Type: Slip-critical, direct-tension, or tensioned shear/bearing connections as indicated.

- C. Weld Connections: Comply with AWS D1.1 for procedures, appearance and quality of welds, and methods used in correcting welding work.
  - 1. Assemble and weld built-up sections by methods that will maintain true alignment of axes without warp.

## 2.6 SHOP PRIMING

- A. Shop prime steel surfaces, except the following:
  - 1. Surfaces embedded in concrete or mortar. Extend priming of partially embedded members to a depth of 2 inches.
  - 2. Surfaces to be field welded.
  - 3. Galvanized surfaces.
- B. Surface Preparation: Clean surfaces to be painted. Remove loose rust, loose mill scale, and spatter, slag, or flux deposits. Prepare surfaces according to SSPC specifications as follows:
  - 1. SSPC-SP 3 "Power Tool Cleaning" or SSPC-SP 7 Brush Off Blasting
  - 2. SSPC-SP 6 Commercial Blast Clean for Architecturally Exposed steel or steel in wet environment
- C. Priming: Immediately after surface preparation, apply primer according to manufacturer's instructions and at rate recommended by SSPC to provide a dry film thickness between 2.5-3.5 mils DFT. Use priming methods that result in full coverage of joints, corners, edges, and exposed surfaces.
  - 1. Stripe paint corners, crevices, bolts, welds, and sharp edges.
  - 2. Apply 2 coats of shop paint to inaccessible surfaces after assembly or erection.
  - 3. Apply a 1-coat, Tnemec 46-465 primer for embedded materials complying with SSPC's "Painting System Guide No. 7.00" to provide a dry film thickness of not less than 8.0-10.0 mils DFT.

## 2.7 GALVANIZING

- A. Hot-Dip Galvanized Finish: Apply zinc coating by the hot-dip process to structural steel indicated for galvanizing according to ASTM A123.

## 2.8 SOURCE QUALITY CONTROL

- A. Owner will engage an independent testing and inspecting agency to perform shop inspections and tests and to prepare test reports.
  - 1. Testing agency will conduct and interpret tests and state in each report whether test specimens comply with or deviate from requirements.
  - 2. Provide testing agency with access to places where structural steel Work is being fabricated or produced so required inspection and testing can be accomplished.
- B. Correct deficiencies in or remove and replace structural steel that inspections and test reports indicate do not comply with specified requirements.
- C. Additional testing, at Contractor's expense, will be performed to determine compliance of corrected Work with specified requirements.
- D. Shop-bolted connections will be tested and inspected according to RCSC's "Specification for Structural Joints Using ASTM A325 or A490 Bolts."
- E. In addition to visual inspection, shop-welded connections will be inspected and tested according to AWS D1.1 and the inspection procedures listed below, at testing agency's option.
  - 1. Liquid Penetrate Inspection: ASTM E165.
  - 2. Magnetic Particle Inspection: ASTM E709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration will not be accepted.
  - 3. Radiographic Inspection: ASTM E94 and ASTM E 142; minimum quality level "2-2T."
  - 4. Ultrasonic Inspection: ASTM E164.

- F. In addition to visual inspection, shop-welded shear connectors will be inspected and tested according to requirements of AWS D1.1 for stud welding and as follows:
  - 1. Bend tests will be performed when visual inspections reveal either less than a continuous 360° flash or welding repairs to any shear connector.
  - 2. Tests will be conducted on additional shear connectors when weld fracture occurs on shear connectors already tested, according to requirements of AWS D1.1.

## PART 3 EXECUTION

### 3.1 EXAMINATION

- A. Before erection proceeds, and with the steel erector present, verify elevations of concrete and masonry bearing surfaces and locations of anchorages for compliance with requirements.
- B. Do not proceed with erection until unsatisfactory conditions have been corrected.

### 3.2 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-in-place concrete has attained its design compressive strength.

### 3.3 ERECTION

- A. Set structural steel accurately in locations and to elevations indicated and according to AISC specifications referenced in this Section.
- 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. Tighten anchor bolts 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 prior to packing with grout.
  - 3. Pack grout solidly between bearing surfaces and plates so no voids remain. Finish exposed surfaces, protect installed materials, and allow curing.
    - a. Comply with manufacturer's instructions for proprietary grout materials.
- 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. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.
  - 1. Level and plumb individual members of structure.
  - 2. Establish required leveling and plumbing measurements on mean operating temperature of structure. Make allowances for difference between temperature at time of erection and mean temperature at which structure will be when completed and in service.
- E. Splice members only where indicated.
- F. Do not use thermal cutting during erection.
- G. Do not enlarge unfair holes in members by burning or by using drift pins. Ream holes that must be enlarged to admit bolts.

### 3.4 FIELD CONNECTIONS

- A. Install and tighten high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A325 or A490 Bolts."
- B. Weld Connections: Comply with AWS D1.1 for procedures, appearance and quality of welds, and methods used in correcting welding work.
  - 1. Comply with AISC specifications referenced in this Section 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 warp.

### 3.5 FIELD QUALITY CONTROL

- A. Owner will engage an independent testing and inspecting agency to perform field inspections and tests and to prepare test reports.
  - 1. Testing agency will conduct and interpret tests and state in each report whether tested Work complies with or deviates from requirements.
- B. Correct deficiencies in or remove and replace structural steel that inspections and test reports indicate do not comply with specified requirements.
- C. See Section 01410 "Testing Laboratory Services" for testing requirements.

### 3.6 CLEANING

- A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint. Apply paint to exposed areas using same material as used for shop painting.
  - 1. Apply by brush or spray Tnemec 394 to provide a minimum dry film thickness of 2.5-3.5 mils DFT.
- B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and apply galvanizing repair paint Tnemec Series 90G-1K97.

Specifier Note: This product guide specification is written according to the Construction Specifications Institute (CSI) Format, including *Master Format*, *Section Format*, and *Page Format*, contained in the *CSI Manual of Practice*.

The section must be carefully reviewed and edited by the Architect to meet the requirements of the project and local building code. Coordinate this section with other specification sections and the drawings.

Delete all "Specifier Notes" when editing this section.

Specifier Notes: This section covers Tnemec high-performance coating systems for commercial facilities.

This specification is only a guide listing various coating system options for various environments and should not be used as a final specification. Additional coating systems not listed in this specification are available, and may be more appropriate for your coating application. To finalize this specification, please contact [www.rightergroup.com](http://www.rightergroup.com)

Most coatings specified contain organic solvents. Consult Righter Group for compliance to local VOC regulations.