

## Work Type Definition: Bridge and Structure Design and Structural Metals Inspection



*MUST be qualified under Minnesota Department of Transportation Prequalification Program - Work Type 3.1 Bridge and Structure Design and/or 4.1 Structural Metals Inspection*

### I. Description

#### A. Bridge and Structure Design

Bridge Preliminary Design involves design, production, and/or review of professionally engineered preliminary bridge plans upon which final design can be based. Bridge preliminary design may include surveys, boring information from foundation report, horizontal and vertical controls, structure type, hydraulic analysis when necessary, and aesthetic features.

Bridge Final Design involves design, production, and/or review of professionally engineered bridge plans which conform to acceptable design standards and which meet the specific requirements of MnDOT, the American Association of State Highway and Transportation Officials (AASHTO), the American Railway Engineering and Maintenance-of-Way Association (AREMA), and/or the Federal Highway Administration (FHWA).

Bridge Studies involve report preparation of specific bridge related issues.

Bridge Design projects are categorized by level and include the following Project Types:

##### 1. Level 1 – Major or Specialty Structure Design:

Refer to Section 1.3.3 of the MnDOT LRFD Bridge Design Manual for the definition of major or specialty bridges. These structure types may include, but are not limited to, the following:

- a. Segmental post tensioned concrete box girder bridges;
- b. Steel box girder bridges;
- c. Steel truss or steel arch bridges;
- d. Cast-in-place concrete arch bridges;
- e. Cable stayed bridges.

The following design activities may be required for any major or specialty structure type:

- a. Designs for both new construction and bridge renovation or rehabilitation;
- b. Development of construction specifications and special provisions;
- b. Significant construction staging;
- c. Bridge preliminary and final design services;
- d. Development of contractor-style cost estimates;
- e. Bridge ratings and rating manuals for Level 1 structures, some field investigation, and other related work.

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### 2. Level 2 – Complex Structure Design:

- a. Curved structural steel girder bridges;
- b. Straight, skewed structural steel girder bridges designed using system analysis;
- c. Prestressed concrete beam bridges with a curved deck;
- d. Post tensioned concrete box girders supported on falsework during construction;
- e. Rigid frames;
- f. Bridges with complex geometry;
- g. Railroad bridges;
- h. Drilled shaft or other challenging foundation component design.

The following activities may be required for any complex structure type:

- a. Designs for both new construction and bridge renovation or rehabilitation;
- b. Significant construction staging;
- c. Development of special provisions;
- d. Bridge preliminary and final design services;
- e. Development of contractor-style cost estimates;
- f. Ratings for Level 2 structures, some field investigation, and other related work.

### 3. Level 3 – Average Structure Design

- a. Multiple span bridges;
- b. Structural steel girder bridges designed using line-girder analysis;
- c. Prestressed concrete beam bridges;
- d. Substructures supported on typical foundations (pile or spread footings).
- e. Continuous concrete slab bridges

The following activities may be required for any average structure type:

- a. Designs for both new construction and bridge renovation;
- b. Moderate construction staging;
- c. Bridge preliminary and final design services;
- d. Ratings for Level 3 structures, some field investigation, and other related work.

### 4. Level 4 – Bridge and Structure Studies

a. This work involves evaluation of new or in-place structures (includes bridges, retaining walls, earthen or MSE walls, culverts, and other miscellaneous structures) and the preparation of studies and reports relating to the structures' design, construction, and/or maintenance issues.

b. Studies include but are not necessarily limited to:

- 1. Field investigations;
- 2. Structural, mechanical, and/or electrical analysis;
- 3. Development of contractor-style cost estimates;
- 4. Structure life expectancy estimates;
- 5. Development of design and construction specs for non-standard projects;
- 6. Historical considerations.
- 7. Bridge Ratings

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### **B. Structural metals inspection**

Fabrication inspection of minor and major structural metal components (as defined below) and verification that materials and fabrication methods conform to the standards and specifications listed below.

1. Minor structural components are defined as:

a. Bridges: Bearing assemblies, sole plates, expansion joint devices, shear connectors, ballast plates, diaphragms for bridges (except curved steel bridges), pile and appurtenances, drainage systems, guardrail connections, railings, fencing, conduit systems, and protection angles.

b. Electric lighting, traffic signs, and signal systems.

c. Pedestrian Bridges.

d. Any other system or component that is designated by the Engineer as a minor structural component.

2. Major structural components will mean all components other than minor structural components.

### **II. Standards and specifications**

**A. Standards and specifications required for a bridge or structure project may include, but are not limited to, the following:**

1. MnDOT LRFD Bridge Design Manual;
2. AASHTO LRFD Bridge Design Specifications;
3. MnDOT Road Design Manual;
4. AASHTO A Policy on Geometric Design of Highways and Streets.

**B Standards and specifications required for a structural metals inspection project may include, but are not limited to, the following:**

1. MnDOT Standard Specifications for Construction
2. Design Plan, Special Provisions and Approved Shop Drawings
3. American Welding Society (AWS) D1.5 Bridge Welding Code (Major Structural Components)
4. AWS D1.1 Structural Welding Code-Steel (Minor Structural Components)
5. Supplier's (Fabricator, Galvanizer, Paint shop, Blaster) Quality Control Plan
6. Bridge Details Manual Parts I and II
7. AASHTO Manual for Bridge Evaluation;
8. AREMA Manual for Railway Engineering.

### **III. Provided by Hennepin County**

**A. Information to be supplied by Hennepin County for a bridge or structure design project may include, but is not limited to, the following:**

1. Approved bridge preliminary plan;
2. Foundation geotechnical report;
3. Bridge survey;
4. Geometric layouts;
5. Road plans;
6. MnDOT design manuals and standards;
7. Hydraulic reports.

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**B. Information to be supplied by Hennepin County for a structural metals inspection project may include the following:**

1. Design Plan;
2. Special Provisions;
3. Approved Shop Drawings.

#### **IV. Provided by consultant**

**A. Deliverables to be supplied by the consultant for a bridge or structure design project may include, but are not limited to, the following:**

1. Bridge construction plans and documents; may include ratings or related work products.

Deliverables may include, but are not limited to, some or all of the following:

- a. Certified final bridge construction plans, including non-standard special provisions, 100% complete and ready for construction contract bidding, and meeting all project specific requirements;
- b. Final reports, which may require certification, and meeting all project specific requirements;
- c. Bridge preliminary plans, 100% complete, as the basis for final bridge plan design and preparation;
- d. Computations and electronic design files in a format using Microstation or InRoads
- e. Quantity calculations;
- f. Cost estimates and construction documents, including special provisions.

2. Consultant must check/verify bridge plans for conformance to MnDOT LRFD Bridge Design Manual and the consultant's documented Quality Management Plan (QMP). In some cases, this requires a complete, independent analysis. Consultant's QMP must address their methods of verifying their work, including review submittals, comments from previous submittals, and final deliverables. The project specific QMP must be developed in accordance with State's current QMP Manual, located at:

<http://www.dot.state.mn.us/design/qmp/index.html>.

**B. Deliverables to be supplied by the consultant for a structural metals inspection project may include the following, but are not limited to:**

1. Daily Progress Reports emailed to contact person.
2. Nonconformance Reports (NCR's)
3. Mill Test Reports and Purchase Orders demonstrating material traceability (domestic origin).
4. Supplier QC Reports
5. Checklists verifying Clean Environment Development Facility (CEDF) requirements have been met.
6. Shipping invoices; copy of signed inspection tags; copies of correspondence. G. Heat Numbers per MnDOT 2471.3C2.
7. Dry Film Thicknesses (DFT's)/Environmentals from painter and/or galvanizer.
8. All Non Destructive Testing (NDT) Reports; other miscellaneous related documents; E.G. Radiographic films, etc.
9. Copies of signed inspection tags
10. Copies of correspondence
11. Certificates of compliance
12. Final inspection report package, including all required elements listed above.