

MICHIGAN
DEPARTMENT OF TRANSPORTATION

SPECIAL PROVISION
FOR
PREFABRICATED STEEL PEDESTRIAN BRIDGE, TYPE 1

STR:MJF

1 of 10

APPR:JAB:REL:04-05-21
FHWA:APPR:04-12-21

a. Description. This work consists of designing, fabricating, furnishing, and erecting a steel pedestrian bridge as defined herein. Perform this work in accordance with the plans, bridge manufacturer's recommended installation procedures, the standard specifications and as contained herein.

The following definitions apply when used herein and on the plans:

Checker. A Professional Engineer licensed in the State of Michigan who is employed by the same company as the Designer and is responsible for verifying and checking the design and working drawings developed by or under supervision of the Designer.

Designer. The individual who is a Professional Engineer licensed in the State of Michigan, is employed by a company that is a subcontractor to the Contractor and is responsible for the design and working drawings required herein.

AASHTO Load and Resistance Factor Design (LRFD). The latest *AASHTO LRFD Bridge Design Specifications*, which the design must satisfy unless otherwise specified herein.

AASHTO Pedestrian. The latest *AASHTO LRFD Guide Specifications for the Design of Pedestrian Bridges*, which the design must satisfy unless otherwise specified herein.

AASHTO Signs. The latest *AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals*, which the design must satisfy unless otherwise specified herein.

Manufacturer. The individual or legal entity that performs part of the work through a contract agreement with the Contractor. This includes an individual or legal entity that owns the patent, product trademark, product copyright or product name for the pedestrian bridge. This includes an individual or legal entity that supplies materials for construction of pedestrian bridge. This includes an individual or legal entity that fabricates components of the pedestrian bridge through a licensing agreement with the owner of the patent, product trademark, product copyright or product name.

Primary Member. The Engineer will consider all elements in the truss, floor beams, stringers, cover plates, bearing stiffeners, and any other elements defined on the plans as primary members. All other elements will be considered as secondary members.

b. Materials. Provide materials in accordance with the following:

Structural Steel.....707

Fencing	808
Steel Reinforcement	905
High Strength Bolts and Hardware	906
Anchor Bolts, Nuts and Washers	908
Elastomeric Bearings.....	914

Use epoxy coated steel reinforcement.

Weathering steel is permitted but must be shop cleaned and coated in accordance with section 716 of the Standard Specifications for Construction. The structure may be hot-dip galvanized in accordance with *AASHTO M111* in lieu of painting, if permitted on the plans.

Use tubular members in accordance with *ASTM A500* or *ASTM A847*.

Ensure members designated to be fracture critical by the Designer are considered fracture critical regardless of the direction of stress. Steel material, including splices, for fracture critical members (FCM) must satisfy the *ASTM* specified by the Designer and include supplemental requirements for toughness for FCM, furnished to Zone 2.

Acceptance of fabricated elements will be based on "Fabrication Inspection" per the *Materials Quality Assurance Procedures Manual*. Acceptance of bolts, nuts, and washers will be based on "Test" per the *MQAP* manual.

c. Manufacturer Qualifications. Manufacturers are required to have the following qualifications:

1. Minimum 5 years of documented experience fabricating the type of structure shown on the plans. Ensure this information is available at the Engineer's request; and

2. *American Institute of Steel Construction (AISC)* - Bridge Quality Management System (QMS) certifications and endorsements:

- A. Certified Bridge Fabricator - Intermediate (IBR)

- B. If the structure includes FCM the fabricator must have the Fracture Critical Endorsement (FCE)

- C. If the structure is to be coated the fabricator must have the *AISC* Sophisticated Paint Endorsement (SPE) or the *Society of Protective Coatings (SSPC)*-QP 3, Certification Standard for Shop Application of Complex Protective Coating Systems.

d. Design.

1. Department Responsibility. The Department will provide the following information on the plans:

- A. Horizontal alignment;

- B. Vertical profile;

- C. Required span length of the bridge;

- D. Required clear path width;
- E. Minimum low structure elevation;
- F. Designed substructure upon which the pedestrian bridge will be constructed;
- G. Unfactored dead load and live load reactions upon which the substructure detailed on the plans is based;
- H. Unfactored horizontal loads from the superstructure upon which the substructure detailed on the plans is based;
- I. Minimum low temperature grade for the elastomeric bearings;
- J. The truss type;
- K. Color of the urethane protective coat (if applicable);
- L. Type of bridge deck and minimum bridge deck thickness; and
- M. Height above the bridge deck, the mesh size, and the coating requirements for any pedestrian fencing.

2. Designer Responsibility. The Designer is responsible for the structural design of the pedestrian bridge superstructure, deck and bearings. Perform the design in accordance with the specific *AASHTO* articles referenced and to all other applicable *AASHTO* articles, except as specified herein. Design the pedestrian bridge to meet the following criteria:

A. Live Load. Design the bridge for a pedestrian live load of 90 pounds per square foot and a vehicle live load of:

(1) Design decks for a patch load of 1000 pounds over a 4 inch by 4 inch area.

(2) Minimum 1 thousand pounds-force (kip) per square foot concentrated load for a clear path width of less than 7 feet-0 inches or when vehicle access is prevented by permanent physical methods (bollards, gates, etc.).

(3) H5 for a clear path between 7 feet-0 inches and 10 feet-0 inches inclusive.

(4) H10 for a clear path width greater than 10 feet-0 inches.

B. Redundancy. Provide redundancy for truss bridges using any of the following or a combination thereof. Ensure the damaged structure is capable of supporting the unfactored dead load of the structure and an unfactored live load of 40 pounds per square foot.

(1) Provide a third line of truss where possible.

(2) Use stitched built-up components designed to support the entire component load with any one element assumed to be broken. Ensure the joints and splices of the

stitched built-up components are designed to transmit the component load with any one element of the component assumed to be broken.

(3) Use a 3D refined analysis to demonstrate that the failure of any tension component of a two truss system or any other component designated by the Department as being a FCM will not cause the collapse of the entire structure. Submit the 3D refined analysis methodology to the Engineer for approval.

C. Deflections. Limit live load deflections to the limits specified in *AASHTO Pedestrian*.

D. Fatigue. Design details subjected to fatigue loadings in accordance with *AASHTO Pedestrian*.

E. List FCM in design calculations and shop drawings.

If the selected pedestrian bridge results in dead load or live load reactions or horizontal superstructure loads that exceed the reactions used in the design of the substructure and reported on the plans, or if the location of the centerline of bearing on the substructure changes from the location detailed on the plans the Designer is responsible for the redesign of the substructure using the geotechnical information included on the plans and in the Reference Information Document (RID).

A clear span of the selected pedestrian bridge less than the clear span detailed on the plans will not be permitted.

3. Field Splices. Design field splices using high strength bolts. Limit the longitudinal spacing of field splices to no less than 60 feet.

4. Bearings. Design elastomeric bearings in accordance with *AASHTO LRFD*. The elastomeric bearings may be either plain, fiber reinforced, or steel reinforced.

5. Bridge Railing. Provide a bridge railing in accordance with the specific *AASHTO* articles referenced and to all other applicable *AASHTO* articles and meeting the minimum height requirements for the type of facility carried by the bridge.

6. Pedestrian Fence. Design the pedestrian fence connections in accordance with the specific *AASHTO* articles referenced and to all other applicable *AASHTO* articles. Ensure that the minimum height requirements included on the plans are met.

7. Bridge Deck. Design the bridge deck in accordance with *AASHTO LRFD* using the material type specified on the plans.

e. Submittals. Submit complete design calculations, working drawings, erection plan, notes, and material specifications for the proposed pedestrian bridge to the Engineer for review prior to fabrication in accordance with subsection 707.03.A of the Standard Specifications for Construction. Do not start fabrication until approval has been received from the Engineer. The Engineer will require 14 calendar days for each review cycle and revisions may be required following each review. No extension of time or additional compensation will be granted due to delays in preparing the final working drawings, calculations and material specifications or securing approval from the Engineer. An exception may be granted for an extension of time only in the

case that the Engineer's review of a submittal exceeded 14 calendar days and if it can be shown that such a delay impacts the final project completion date.

Include detailed design calculations, working drawings, erection plan, notes and material specifications in every submittal. Ensure all submittals are in a portable document format (PDF) file submitted to the Engineer. Hard copies of submittals will not be accepted. A submittal set, indicating revisions to be made, will be returned following each review. Revise and furnish the final detailed design calculations, working drawings, erection plan, notes and material properties. Ensure the Designer's seal is clearly visible on the calculations, working drawings and erection plan for each submittal.

1. Calculations. Provide detailed design calculations on 8.5 by 11 inch sheets. Provide design calculations and explanatory notes that are legible and that demonstrate the design criteria have been met. Include the following information:

- A. Department's project designations (structure number, control section, and job number);
- B. Page numbers;
- C. Date of preparation;
- D. Initials of the Designer and Checker;
- E. Design assumptions and notes;
- F. Design loads;
- G. Department approval block in the title block; and
- H. Material specifications.

Include example hand calculations using design criteria for project specific sections which illustrate conformance with computer programs, if requested by the Engineer.

2. Working Drawings. Prepare working drawings on 11 inch by 17 inch sheets including borders. Provide a title block in the lower right hand corner of each sheet. Include the sheet number, drawing date, project location, fabricator name, location the pedestrian bridge will be fabricated, the Department's project designations (control section and job number) within all title blocks and a revision box.

Include all details, dimensions, quantities and cross sections on the working drawings necessary to construct the pedestrian bridge for full or part-width construction including, but not limited to the following items:

A. Plan and elevation sheets showing the following:

(1) Elevation view of the pedestrian bridge must include the following minimum information:

(a) Proposed vertical profile that the geometry of the pedestrian bridge is

based on;

(b) Proposed span length of the bridge. The span length is measured along the construction centerline of the facility carried for pedestrian bridges over a waterway. The span length is measured perpendicular to the centerline of the facility crossed for all other cases;

(c) Required beam seat elevations at each substructure;

(d) Proposed low structure elevation; and

(e) Fixity of the bearings at each substructure.

(2) Plan view of the pedestrian bridge must include the following minimum information:

(a) North arrow;

(b) Proposed horizontal alignment that the geometry of the pedestrian bridge is based on;

(c) Proposed station on the construction centerline at each reference line;

(d) Proposed plan grade elevation at each reference line;

(e) Location of the construction centerline;

(f) Proposed out to out fascia elevation;

(g) Proposed clear path width; and

(h) Location of the point of minimum under clearance.

(3) Typical cross sections showing the following minimum information:

(a) Location of the construction centerline.

(b) Location of the plan grade.

(c) Proposed out to out fascia elevation.

(d) Proposed clear path width.

(e) Proposed cross slope.

(f) Spacing of the proposed support elements.

B. Detail sheets showing the following:

(1) Nominal member sizes and dimensions;

(2) Lifting points and details;

(3) Location and details of both shop and field splices;

(4) Any modifications to the proposed substructure resulting from changes in the magnitude or location of the superstructure reactions; and

(5) Architectural treatments.

C. General notes including, but not limited to, the following:

(1) Material specifications;

(2) Welding requirements; and

(3) Coating requirements.

3. Erection Plan. Prepare detailed written instruction for the installation of the pedestrian bridge. The instructions must include as a minimum:

(A) Weight of the sections to be lifted into place;

(B) Proper lifting instructions; and

(C) Field splicing procedures.

4. Notice of Beginning Work. Follow subsection 707.03.B of the Standard Specifications for Construction for shop inspection requirements.

Provide an inspection and maintenance manual for the pedestrian bridge in an PDF file. The inspection and maintenance manual must include as a minimum:

A. A list of fatigue sensitive details on the structure, and the recommended frequency of inspection for the details;

B. The recommended frequency for routine inspections of the structure; and

C. The recommended maintenance activities to be completed on the structure, and the recommended time from installation of the structure at which the maintenance should be done. This must include as a minimum:

(1) Cleaning and coating the structural steel;

(2) Overlaying the bridge deck if a concrete deck is used;

(3) Sealing the bridge deck if a timber deck is used; and

(4) Replacing the bridge deck.

The Engineer may request additional, specific information be included in the inspection and maintenance manual once the working drawings have been submitted. Submit the inspection

and maintenance manual to the Engineer within 30 calendar days after approval of the working drawings and erection plan and prior to shipping the bridge to the project site. Revise the inspection and maintenance manual within 30 calendar days of erection of the bridge if modifications to the pedestrian bridge are deemed necessary during the fabrication, handling, shipping and erection of the bridge.

f. Fabrication and Welding. Ensure all fabrication is in accordance with subsection 707.03 of the Standard Specifications for Construction except as modified herein. Department quality assurance inspection will be in accordance with subsections 707.03.A and 707.03.B of the Standard Specifications for Construction.

Weld connections to tubular members in accordance with *AWS D1.1/D1.1M Structural Welding Code - Steel* (as modified by 20SP-707A - Structural Steel and Aluminum Construction), hereafter called *AWS D1.1*. Weld connections to non-tubular members in accordance with *AASHTO/AWS D1.5/D1.5M Bridge Welding Code* (as modified by 20SP-707A - Structural Steel and Aluminum Construction), hereafter called *AWS D1.5*.

Gas metal arc welding (GMAW) is not permitted for welding FCM or for welding connections to FCM.

All connections to tubular members defined as primary members will be 100 percent tested as follows:

1. Visual testing (VT) inspection.
2. Penetrant testing (PT) inspection is required on all weld terminations for complete joint penetration (CJP) and partial joint penetration (PJP) welds.
3. Test partial penetration groove welds and fillet welds using magnetic particle testing (MT).
4. Ultrasonic testing (UT) inspection is required for all complete joint penetration groove welds regardless of the direction of stress. Submit UT procedures and acceptance criteria for welds connecting material less than 5/16 inches thick to the Engineer for approval prior to use.

Personnel qualified as Level II or Level I (working under the direct supervision of the NDT Level II) in accordance with the *ASNT*, recommended Practice No. SNT-TC-1A must perform all tests. Ensure an *AWS Certified Weld Inspection (CWI)* inspects all welds. Ensure testing personnel provide certifications to the Engineer before beginning work.

Ensure shop welders, tack welders, and welding operators are qualified in accordance with AWS in addition to being tested by the Engineer in accordance with subsection 707.03.D.10.c of the Standard Specifications for Construction.

All welds that join at least one plate designated as fracture critical must be considered fracture critical welds, regardless of the direction of stress. All gusset plates and connection material, including connection plates and angles, for the connection of at least one FCM, must be considered FCM. This includes stiffener plates used as a connection plate.

Field welding is prohibited.

The fabricator may splice the trusses if the chords are greater than 40 feet long. Obtain the Engineer's approval for the location of optional splices.

Pre-assemble the pedestrian bridge in accordance with subsection 707.03.D.14 of the Standard Specifications for Construction prior to shipping.

Fabricate steel sole plates in accordance with subsection 707.03.D.17 of the Standard Specifications for Construction.

g. Construction. Construct the pedestrian bridge in accordance with subsection 707.03.D of the Standard Specifications for Construction and with the approved erection working plan. The Contractor is responsible for the proper handling, lifting, storage, transporting and erection of all elements so that they may be placed without damage.

Store, lift and/or move elements in a manner to prevent torsion and other undue stress. Apply equal loads to all lifting devices. Support elements in a manner that will minimize warping.

Inspect each element visually for evidence of damage or defect before, during and after critical operations and as often as necessary to ensure adequate quality control. Immediately bring all such evidence of damage or defect to the attention of the Engineer. The extent and frequency of inspection by the Engineer for quality assurance is the Engineer's prerogative. Elements may be inspected at any time during construction as deemed necessary by the Engineer to monitor compliance with this special provision. Ensure prior to shipment and upon arrival at the erection site, each element is inspected for damage. During transport, ensure the elements are fully secured against shifting. Upon arrival at the erection site, ensure each element is again inspected.

If any damage has occurred during shipment, immediately notify the Engineer. Erection of such damaged elements into the structure cannot proceed without authorization from the Engineer.

Make shop and field repairs to the coating in accordance with subsection 716.03.D of the Standard Specifications for Construction. Repair damaged galvanized surfaces in accordance with subsection 716.03.E of the Standard Specifications for Construction.

Develop a method of construction that is also consistent with the overall design. The Contractor is solely responsible for design, fabrication, assembly and operation of all equipment to be used for handling and erecting elements.

No extra payment will be made to the Contractor for any cost incurred in modifying the permanent structure due to temporary loading induced by the Contractor's handling and erection equipment or his erection scheme.

h. Measurement and Payment. The completed work, as described, will be measured as a lump sum and paid for at the contract price using the following pay items:

Pay Item	Pay Unit
Steel Pedestrian Bridge, Type 1, Furn and Fab (Structure Identification).....	Lump Sum
Steel Pedestrian Bridge, Type 1, Erect (Structure Identification).....	Lump Sum

1. **Steel Pedestrian Bridge, Type 1, Furn and Fab (Structure Identification)** includes the design, furnishing all materials, fabrication, complete shop assembly, shop cleaning, galvanizing, shop coating, and shipping. All costs associated with the aesthetic details shown on the plans are included in the pay item **Steel Pedestrian Bridge, Type 1, Furn and Fab (Structure Identification)**.

Steel Pedestrian Bridge, Type 1, Furn and Fab (Structure Identification) includes the design, furnishing all materials, fabrication, and shipping of the elastomeric bearings and position dowels required for the project.

Steel Pedestrian Bridge, Type 1, Furn and Fab (Structure Identification) includes the design of the bridge deck.

Steel Pedestrian Bridge, Type 1, Furn and Fab (Structure Identification) includes the design of the connection of the pedestrian fence to the pedestrian bridge.

No extension of time or additional compensation will be granted due to obtaining the proper AISC certifications and/or endorsements required for this project.

The Department will not pay for welding and submittal of MDOT Welder Qualification test specimen costs or confirming welder test specimens requested by the Engineer. The Department will cut, machine, and test specimens without charge, except the Contractor is responsible for all costs associated with testing additional specimens if the first test specimens fail. All fracture critical welder qualification costs will be at the Contractor's expense.

2. **Steel Pedestrian Bridge, Type 1, Erect (Structure Identification)** includes the erection of the entire pedestrian bridge including bearings and anchor bolts or position dowels and for the manufacturer to provide an onsite technical representative to assist with erection questions if requested by the Contractor or Engineer.

Construction of the bridge deck will be included in other pay items in the contract.

Installation of the pedestrian fence will be included in other pay items in the contract.