

ITEM 08564.80nn M - PREFABRICATED PEDESTRIAN-BICYCLE SUPERSTRUCTURES

DESCRIPTION:

Under this item the Contractor is responsible for designing, detailing, fabricating and installing prefabricated bridge superstructures at the locations indicated on the Contract Plans.

The Contractor is hereby advised that compliance with the requirements of this specification is likely to necessitate modifications to the standard design and configurations of the prefabricated bridge superstructures offered as stock items by various firms, such as those hereinafter named.

Examine Contract Documents for requirements that affect Work of this Section. Other specification Sections that directly relate to Work of this Section include, but are not limited to:

Section 715-01, Structural Steel

Section 715-143, High Strength Bolts, Nuts and Washers

MATERIALS:

All materials for this work shall meet the requirements of the New York State Steel Construction Manual (N.Y.S.S.C.M.), and modifications made herein.

Manufacturers offering prefabricated superstructures which meet the basic geometric requirements indicated on the Contract Plans (span, width and camber) include, but are not limited to, the following:

Continental Bridge Company,
8301 State Highway 29 North,
Alexandria, Minnesota 56308

Steadfast Bridge Company,
P.O. Box 806,
Fort Payne, Alabama 35967

Wheeler Consolidated
3340 Republic Avenue
P.O. Box 26100
St Louis Park, MN 55426

Prefabricated bridge superstructure material shall conform to the following requirements:

1. Structural Steel Shapes: self-weathering ASTM A588 M, minimum thickness shall be 8 mm.
2. Structural Tubing: self-weathering ASTM A847 M, minimum thickness of closed structural

ITEM 08564.80nn M - PREFABRICATED PEDESTRIAN-BICYCLE SUPERSTRUCTURES

tubular members shall be 6 mm.

3. High Strength Bolts, Nuts and Washers: ASTM A325 M. Type 3

4. Weld Material: Welding electrodes shall conform to the requirements of the N.Y.S.S.C.M. and ANSI/AWS D1.1, suitable for the steel and intended service.

For Steel fabrication work which will be exposed to view, use only materials which are smooth and free of surface blemishes including pitting, seam marks, roller marks, rolled trade names and roughness. Remove such blemishes by grinding, or a combination of welding and grinding. Provide finish surfaces of members exposed in final structure free of markings, burrs and other defects.

Certified copies of test results conducted by the manufacturer shall be furnished to the Deputy Chief Engineer Structures (D.C.E.S.) in accordance with the requirements of subsection 715-01, Structural Steel.

Properly mark and match-mark materials for field assembly. Fabricate for delivery sequence which will expedite erection and minimize field handling of materials.

DESIGN:

The services of a professional engineer licensed to practice in New York State shall be engaged to design and detail the prefabricated bridge superstructure. These services shall include any required consultation for interpreting the plans and for the resolution of problems which may arise during the performance of the work.

All design and details shall be in conformance with the current New York State Department of Transportation Standard Specifications for Highway Bridges (N.Y.S.D.O.T.S.S.H.B, including current Interim A.A.S.H.T.O. Specifications) the A.A.S.H.T.O. Guide Specification for Design of Pedestrian Bridges and the current N.Y.S.S.C.M..

Span length and clear width between main (Truss) members shall be as indicated on the Contract Plans.

For purposes of this specification, live load design criteria shall be applied as follows:

A.) Pedestrian Live Load

For main (Truss) members, the structure shall be designed for a pedestrian live load of 4,070

ITEM 08564.80nn M - PREFABRICATED PEDESTRIAN-BICYCLE SUPERSTRUCTURES

Pascals applied to the deck area. This load shall be applied to those areas of the walkway so as to produce the maximum stress in the member being designed. If the bridge walkway area to which the pedestrian live load is applied (deck influence area) exceeds 37 square meters, the load may be reduced by the following equation:

$$w = 4,070 (.25 + (4.572/\sqrt{\text{Area}}))$$

where w is the design pedestrian load (Pascals) and Area is the deck influence area (sq. meters), which is that deck area over which the influence surface for structural effects is different from zero. However in no case shall the pedestrian live load be less than 3,112 Pascals.

For secondary members, bridge decks and supporting floor systems, including secondary stringers, floor beams and their connections to main supporting members shall be designed for a live load of 4,070 Pascals, with no reduction allowed.

B.) Vehicle Load

The following loads conforming to the A.A.S.H.T.O. Standard H-Truck shall be used. In all cases, a single truck shall be positioned to produce the maximum load effect on the member being designed.

Clear deck width from 1.830 m to 3.048 m: M4.5 Truck (H-5) 44.482 kN
Clear deck width over 3.048 m: M9 Truck (H-10) 88.964 kN

Deck widths of less than 1.830 m need not be designed for a maintenance vehicle load. The maintenance vehicle live load shall not be placed in combination with the pedestrian live load. Impact shall not be applied to any of these loadings. Longitudinal Force, LF, shall equal zero.

The structure shall be designed to resist a wind load of 3,590 Pascals, applied horizontally at right angles to the longitudinal axis of the structure. The wind load shall be applied to the projected vertical area of all superstructure elements, including exposed truss members on the leeward truss. For open truss bridges, where wind can readily pass through the trusses, bridges may be designed for a minimum horizontal load of 1,675 Pascals on the full vertical projected area of the bridge, as if enclosed. Wind on Live Load, WL, shall equal zero.

Members shall be designed so that both the vertical deflection due to the service pedestrian live load and horizontal deflection due to lateral wind load do not exceed 1/500 of the span length. Superstructure camber shall be limited to 0% minimum, 7 1/2% maximum, of the span length.

ITEM 08564.80nn M - PREFABRICATED PEDESTRIAN-BICYCLE SUPERSTRUCTURES

Vibrational characteristics of the bridge shall be checked in design. The fundamental frequency of the pedestrian bridge without live load should be greater than 3.0 Hz. to avoid the first harmonic. If the fundamental frequency cannot satisfy this limitation, or if the second harmonic is a concern, a dynamic performance evaluation should be made. In lieu of such evaluation the bridge may be proportioned so that the fundamental frequency shall be greater than:

$$f \geq 2.86 \ln (800 / W)$$

where \ln is the natural log and W is the weight (kilonewtons) of the supported structure, including dead load and an allowance for actual pedestrian live load. Alternatively, the minimum supported structure weight (W) shall be greater than:

$$W \geq 800 e^{(-0.35 f)}$$

where f is the fundamental frequency (Hz.).

Allowable fatigue stress ranges for steel members shall be determined from Article 10.3 of the N.Y.S.D.O.T.S.S.H.B., except that the allowable fatigue stress ranges for Redundant Load Path structures may be used, regardless of the actual degree of member redundancy. Fatigue sensitive details should be avoided and out of plane bending details should be eliminated. Fillet welds should only be used to transfer shear and Complete Penetration Groove Welds (CPGW) or Slip Critical Bolted Connections should be used to transfer moment. All field connections for the truss and floor system shall be through the use of high strength bolts, except the connection of the truss to the bearings which will utilize fillet welds.

The vertical truss members and the floor beams and their connections in half-through truss spans shall be proportioned to resist a lateral force applied at the top of the truss verticals that is not less than $0.01/K$ times the average design compressive force in the two adjacent top chord members; where K is the design effective length factor for the individual top chord members supported between the truss verticals. In no case shall the value for $0.01/K$ be less than 0.003 when determining the minimum lateral force, regardless of the K -value used to determine the compressive capacity of the top chord. This lateral force shall be applied concurrently with these members' primary forces. End posts shall be designed as a simple cantilever to carry its applied axial load combined with a lateral load of 1.0 % of the axial load, applied at the upper end.

The top chord shall be considered as a column with elastic lateral supports at the panel points. The critical buckling force of the column, so determined, shall be based on using not less than 2.0 times the maximum design group loading in any panel in the top chord.

Welded tubular connections shall be designed in accordance with the Steel Welding Code - Steel ANSI/AWS D1.1. Gusset plate attachment to tubular members shall be by bolted connection, slotted tubes with all-around welding of gusset plate will not be permitted.

ITEM 08564.80nn M - PREFABRICATED PEDESTRIAN-BICYCLE SUPERSTRUCTURES

SHOP DRAWINGS:

Six (6) legible, standard size prints, as defined in the N.Y.S.S.C.M., Section 2, of each working drawing, stamped and signed by the New York State Professional Engineer, together with three (3) copies of all design computations, shall be submitted to the D.C.E.S. for approval. Failure to submit drawings of the required size will be cause for their return without examination.

The D.C.E.S. shall be allowed the longest of the following time durations to examine design computations and drawings:

1. Ten working days.
2. Two working days for each drawing of a set of working drawings, plus one working day for every four (4) design computation sheets.

Any design computation sheet written on both sides will be considered as two (2) design computation sheets. All time for examination shall begin upon receipt of all pertinent information by the D.C.E.S..

The D.C.E.S. comments shall be indicated on the returned copies. Should the proposed design not be approved, the reasons shall be indicated with the return of the material. The Contractor shall then submit a revised design and drawings for approval, subject to the same terms as the first submission. Resubmission shall not be considered legitimate reason to request an extension of time under Subsection 108-04, Extension of Time.

Final reproducible shop drawings and Manufacturer's Specifications shall be furnished to the D.C.E.S.. All work shall be done in accordance with the approved working drawings. The Contractor shall have approved working drawings prior to the start of any superstructure fabrication. The Contractor shall bear all cost damages which may result from the ordering of any materials or equipment, or the use of any preparatory labor prior to the start of any to the approval of the design and working drawings.

All connections shall be clearly shown, in detail, on shop drawings. Substitution of sections or modifications of details, or both, and reasons therefore, shall be submitted prior to shop drawings for review. Submitted substitutions must be clearly identified and noted as such. Reviewed substitutions, modifications and necessary changes in related portions of the work shall be coordinated by the fabricator and shall be accomplished at no additional cost to the State.

Provide drawings, templates and directions for installation and setting of anchor bolts and bearing

ITEM 08564.80nn M - PREFABRICATED PEDESTRIAN-BICYCLE SUPERSTRUCTURES

plate assemblies to be installed by other trades. Each prefabricated bridge superstructure shall include all hardware necessary for complete installation including bearing devices.

INSPECTION:

Personnel from the New York State Department of Transportation Metals Engineering Unit will hold a prefabrication conference at the fabrication plant. An inspector, from an inspection agency assigned by the state, will be in attendance. During fabrication the inspector will make visits to the plant and will generally perform inspection prior to material shipment. The inspector shall submit his written determinations of the work to the D.C.E.S.. These determinations will be taken into account at the time of field inspection at the project site. All work done while the inspector is refused access to the fabrication plant will be automatically rejected. All material shipped to the project site will be subject to inspection by the Engineer-in-Charge. All material furnished for this work will be accepted at the work site only when accompanied by the Manufacturer's certification that all material used and all fabrication work done, meets the requirements of this specification.

FABRICATION:

The ordering of material and preparation for fabrication, shop assembly, including welding and testing of all structural steel and other metal parts shall conform to the requirements of the N.Y.S.S.C.M.. The Fabricator shall be AISC certified, Category 1. All welders shall be qualified in accordance with AWS D1.1, pertaining to procedures involving tubular steel.

The Contractor shall be responsible for all errors of detailing, fabrication and for the correct fitting of structural steel members.

All steel superstructure surfaces having permanent contact with the glulamated railing system, shall be painted brown at the manufacturing plant, in order to prevent accelerated corrosion of the weathering steel.

Radiographic inspection will be required in accordance with the following provisions: Butt welds subject to tensile stress in bridge chords will be subject to radiographic inspection and shall meet the quality requirements in the N.Y.S.S.C.M., Section 16 (with all dimensions soft converted to metric). In lieu of this requirement the contractor may reinforce tension butt welds with side plates (fish plates) of a design approved by the D.C.E.S..

CONSTRUCTION DETAILS:

When the structure is delivered and prior to any erection work being performed, the Engineer-in-Charge (E.I.C.) shall inspect and approve the bridge superstructure. Bridge superstructures not approved by the E.I.C. shall be removed from the work site and replaced with a superstructure

ITEM 08564.80nn M - PREFABRICATED PEDESTRIAN-BICYCLE SUPERSTRUCTURES

acceptable to the E.I.C. at no additional cost to the State. Erection of the bridge superstructure shall conform to the requirements of the N.Y.S.S.C.M..

Establish required leveling and plumbing measurements at mean operating temperature of structure. Make allowances for the difference between temperature at time of erection and mean temperature at which the structure will be when in service. Where parts cannot be assembled or fitted properly as a result of errors in fabrication or of deformation due to handling or transportation, such condition shall be immediately reported to the D.C.E.S. along with the proposed method of correction. The straightening of bends or warps shall be done in conformance with the N.Y.S.S.C.M.. Bent or damaged heat treated parts will be rejected.

A representative of the manufacturer of the prefabricated structure shall be present when the bridge is delivered and installation commences to ensure proper installation.

METHOD OF MEASUREMENT:

Measurement shall be taken as each Prefabricated Pedestrian-Bicycle Bridge Superstructure actually installed and accepted by the engineer.

BASIS OF PAYMENT:

General: The unit price bid for each Prefabricated Pedestrian-Bicycle Bridge Superstructure shall include the cost of furnishing all engineering, labor, materials and equipment necessary to complete the work. The price bid shall also include, but not limited to, transportation and storage of materials; bolting and welding both in the shop and in the field.

Additional work: The requirements of Subsection 564-5.02, Additional Work, shall apply with the following modification:

Where the phrase "price bid for structural steel" appears, it shall be replaced by "price bid for Prefabricated Pedestrian-Bicycle Bridge Superstructure".

Note: nn denotes serialized pay item, see § 101-53