ITEM 04564.8001nn PREFABRICATED PEDESTRIAN SUPERSTRUCTURES

DESCRIPTION:

Under this item the Contractor is responsible for designing, detailing, fabricating and installing prefabricated bridge superstructure at the locations indicated on the Contract Plans. In addition, the Contractor is responsible for designing and detailing the reinforced concrete deck, steel shear connectors, stay in place (SIP) forms and bridge railing; and designing, detailing, fabricating and installing the lock-crimp wire mesh fencing in accordance with 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 Steel Trusses 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 556, Reinforcing Steel for Concrete Structures
Section 557, Superstructure Slabs
Section 564, Structural Steel
Section 568, Bridge and Culvert Railings

from the New York State Department of Transportation's Construction and Materials Specification, dated January 2, 2002.

MATERIALS:

Manufacturers offering prefabricated bridge 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

Prefabricated bridge superstructure materials shall conform to the following requirements:

1. Structure steel shapes: self -weathering ASTM A588M, minimum thickness shall be 8 mm.
2. Structural Tubing: self - weathering ASTM A847M, minimum thickness of closed structural tubular members shall be 6mm.
3. High strength bolts, Nut and washers: ASTM A325M. Type 3
4. Weld Material: Welding electrodes shall conform to the requirements of the N.Y.S.S.C.M. and ANSI/A WS D1.1, suitable for the steel intended service.

The Contractor's attention is directed to §106-01, Source of Supply and Quality Requirements, with regard to advising the Departmental Representatives of the sources of proposed materials.

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Materials for this work shall meet the requirements of the *New York State Steel Construction Manual* (NYSSCM), § 715-01 - Structural Steel, § 715-14 High Strength Bolts, Nuts and Washers, and modifications made herein.

Structural steel shall conform to ASTM A709 GR 345W, unless otherwise indicated on the contract plans.

Steel Sheet: ASTM A366M, A570M, OR A611, grade required for design loading.
Structural Tubing conforming to ASTM A500, Grade B, unless otherwise indicated on the contract plans.

Permanent corrugated metal forms for bridge slabs shall conform to §736-01.

Posts for the Fence shall conform to ASTM A500, Grade B. All other materials for the Fence shall conform with §710-23 of the Standard Specifications. Posts & Connections shall be painted in accordance with §710-23 of the Standard Specifications

Certified copies of the results of tests conducted by the manufacturer shall be furnished to the Engineer in accordance with the requirements of §715-01, Structural Steel.

For fabrication of work which will be exposed to view, only materials which are smooth and free of surface blemishes including pitting, seam marks, roller marks, rolled trade names, and roughness will be accepted. Remove such blemishes by grinding, or by welding and grinding, prior to cleaning, treating and application of surface finishes.

Fabricate and assemble structural assemblies in the shop to the greatest extent possible. Structural steel members shall be fabricated in accordance with the New York State Steel Construction Manual (NYSSCM.).

All painted parts shall comply with §572 of the Standard Specifications. Color shall be as specified on the contract documents.

Properly mark and match-mark materials for field assembly. Fabricate for delivery a sequence which will expedite erection and minimize field handling of materials. Where finishing is required, complete assembly, including welding of units, before start of finishing operations. Provide finish surfaces of members exposed in final structure free of markings, burrs, and other defects.

Welding electrodes shall conform to the requirements of AWS D1.1 for Tube Steel Welding and AWS D1.5 for Plate Steel Welding.

Non-shrink grout shall be pre-mixed non-shrinking, high strength grout. Compressive strength in 28 days shall be 35 MPa minimum, but in no case less than the specified strength of the adjacent concrete. Manufacturer shall provide evidence that the material meets the requirements of COE CRD-C 621 (588). Grout permanently exposed to view shall be nonoxidizing; metallic grout may be used in other locations. All surfaces to receive the grout shall be free from laitance, oil, grease, dust, loose particles or other foreign material and prepared in strict accordance with Manufacturers recommendations. If in the opinion of the Engineer the material is determined
to be unsuitable for Department work, the material will be rejected.

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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.

The prefabricated bridge superstructure shall be designed to be composite with the reinforced concrete deck.

All design and details shall be in conformance with the current New York State Department of Transportation Standard Specifications for Highway Bridges (NYSDOTSSHB, including current Interim AASHTO. Specifications) the AASHTO. Guide Specification for Design of Pedestrian Bridges and the current NYSSCM..

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 Pascal 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) exceed 37 square meters, the load may be reduced by the following equation:

$$w = 4{,}070 \times (0.25 + (4.572 / \sqrt{Area}))$$

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 Pascal.

B.)Vehicle Load

The loading shall conform to AASHTO. Standard H-10 Truck. In all cases, a single truck shall be positioned to produce the maximum load effect on the member being designed.

The 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.

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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.

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 NYSDOTSSHB, 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.

SHOP DRAWINGS:

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Three (3) legible, standard size prints, as defined in the NYSSCM, 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 Engineer in Charge. One (1) legible, standard size print and one (1) reproducible, together with one (1) copy of all design computations, shall be sent to the DCES for approval. Failure to submit drawings of the required size will be cause for their return without examination.

The DCES 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 DCES.

The DCES 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 micro cards and Manufacturer's Specifications shall be furnished to the DCES. 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 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 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 DCES. 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 NYSSCM. The Fabricator shall be AISC certified, Category 1. All welders shall be qualified in accordance with the NYSSCM..

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

Radiographic inspection will be required in accordance with the following provisions: Full penetration welds subject to tensile stress in bridge chords will be subject to radiographic inspection and shall meet the quality requirements in the NYSSCM, Section 16 (with all dimensions soft converted to metric). In lieu of this requirement the contractor may reinforce tension full penetration welds with side plates (fish plates) of a design approved by the DCES. Partial penetration welds shall not be allowed.

CONSTRUCTION DETAILS:

When the structure is delivered and prior to any erection work being performed, the Engineer-in-Charge (EIC) shall inspect and approve the bridge superstructure. Bridge superstructure not approved by the EIC shall be removed from the work site and replaced with superstructure acceptable to the EIC at no additional cost to the State. Erection of the Bridge superstructure shall conform to the requirements of the NYSSCM, Section 204.

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 DCES along with the proposed method of correction. The straightening of bends or warps shall be done in conformance with the NYSSCM.. Bent or damaged heat treated parts will be rejected.

When Picket Fence Pedestrian Railing and bridge handrail is specified, the Picket Fence Pedestrian Rail and bridge handrail shall be installed per the manufacturer's specifications.

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

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METHOD OF MEASUREMENT:

Measurement shall be taken as each prefabricated bridge superstructure actually installed and accepted by the engineer. The reinforced concrete deck and stay-in-place (SIP) forms and the bridge railing and wire mesh shall be paid for under their own separate items as shown on the contract plans.

BASIS OF PAYMENT:

General: The unit price bid for prefabricated bridge superstructure shall include the cost of designing, 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 Steel Truss".