***ADD THE FOLLOWING SECTION TO DIVISION II – CONSTRUCTION DETAILS***

**SECTION 580 – PREFABRICATED STEEL PEDESTRIAN BRIDGE**

**DESCRIPTION**

**580.01.01 GENERAL**

A. The work shall consist of furnishing, designing, fabricating, transporting, and erecting prefabricated steel pedestrian bridge superstructure, including bearings and anchorages, as shown in the plans and described herein.

B. The intended usage is[choose all that apply]: *pedestrian; bicycle; occasional slow moving maintenance or emergency vehicles; other.*

C. These specifications shall be regarded as minimum standards for design and construction.

D. Substructures and concrete bridge deck are not included in this item.

**MATERIALS**

**580.02.01 GENERAL**

A. All members of the truss and deck system shall be fabricated from square/rectangular hollow structural sections (HSS), with the exception that floor beams may be wide flange (W) shapes. Open ends of end posts and floor beams shall be capped. Open shaped (non-tubular) stringers will be allowed only when the Contractor warranties the stringer design for 50% overload.

B. Steel material shall be atmospheric corrosion resistant high-strength (Fy=50,000 psi) low-alloy material meeting ASTM A588, A606, A709 and/or A847 with a minimum corrosion index of 5.8 per ASTM G101.

C. Where water collection inside of structural tubing is possible during construction or service, weep holes shall be provided at low points.

D. Non-shrink grout, when applicable, shall meet ASTM C-1107, 7000 psi minimum.

E. Materials not specified shall conform to applicable ASTM or AASHTO specifications.

**580.02.02 STEEL SURFACE TREATMENT**

A. All steel shall be as specified below [CHOOSE ONE OF THE FOLLOWING – UNPAINTED AND SELF-WEATHERING OR PAINTED]:

1. ***Unpainted and self-weathering.*** All exposed surfaces, defined as those surfaces seen from the deck and from along side the structure, shall be blast cleaned in accordance with Society for Protective Coatings specification SSPC-SP7, Brush Off Blast Cleaning, latest edition.

1. ***Painted.***
   1. The paint system shall be a three coat system suitable for the intended use as recommended by the paint manufacturer and approved by the Engineer.
   2. Application shall be in accordance with the recommendations of the paint manufacturer.
   3. Applicator shall be certified by the paint manufacturer for the approved paint system.
   4. Color of the finish coat shall be determined by the Engineer.
   5. All painted surfaces shall be blast cleaned in accordance with Steel Structures Painting Council Surface Preparation Specifications No. 7, latest edition, (SSPC-SP10) Near White Blast Cleaning.
   6. Painted bridges shall be configured such that all surfaces and connections are either fully sealed or allow access for adequate paint coverage.
   7. Sealing shall be accomplished by welding except that long continuous seams may be sealed with caulk prior to painting.
   8. All surfaces shall be painted, with the exception of expansion joint cover plates, teflon surfaces, bolted connections, and faying surfaces.
   9. All painted structures shall be placed at ground level for a minimum of 48 hours for Owner to pre-inspect and approve prior to erecting. Contractor is responsible to secure the pre-inspection storage location.
   10. After installation contractor shall make provisions for inspection of areas where paint may have been damaged during installation, including connection points, lifting locations, etc.
   11. Touch up paint shall be provided to paint outer surfaces of bolted splices and areas of damaged paint.

**580.02.03 HARDWARE**

A. All hardware (other than type 3 high strength) shall be hot-dip galvanized in accordance with ASTM A153.

B. Expansion bearings shall include teflon or stainless steel sliding surfaces in accordance with AASHTO requirements or elastomeric pads. Consideration of dead load rotation is required in all cases.

**580.02.04 HANDRAILS**

A. Handrails shall be not be required.

**580.02.05 DECKING**

A. The bridge deck shall be as specified below [CHOOSE ONE OF THE FOLLOWING FOUR]:

1. ***Transverse Douglas Fir planks.*** Planks shall be nominal 3” (minimum) Coastal Region Douglas Fir, graded as Select Structural in accordance with the Western Wood Products Association (WWPA) or the West Coast Lumber Inspection Bureau (WCLIB). Treatment shall be as per the American Wood Preservers Association (AWPA) Standard P5. The preservative utilized shall be Ammoniacal Copper Zinc Arsenate (ACZA) to a total absorption of 0.40 pounds per cubic foot of wood. Planks shall be placed tight together with no gaps. To resist warping forces, deck tie-down systems shall be designed to resist an uplift force of 500 lbs per plank per tie-down location, assuming wet service conditions. Deck tie-downs shall be provided at plank ends and intermediate points as required such that tie-down spacing does not exceed actual plank thickness multiplied by 50. Edge tie-downs shall be made with a continuous steel angle member above the planks.

1. ***Transverse Ipe wood planks.*** Ipe wood (Tabebuia spp.-lapacho group) shall be nominal 2-inch (minimum), all heartwood (no sapwood), clear (no knots), straight grained, with no worm holes, shall be surfaced 4 sides and eased 4 edges, and be air dried to no more than 20% moisture content prior to installation. Planks shall be placed tight together with no gaps. To resist warping forces, deck tie-down systems shall be designed to resist an uplift force of 500 lbs per plank per tie-down location, assuming wet service conditions. Deck tie-downs shall be provided at plank ends and intermediate points as required such that tie-down spacing does not exceed actual plank thickness multiplied by 50. Edge tie-downs shall be made with a continuous steel angle member above the planks. Material shall be untreated. Ends of members shall be sealed with a clear aqueous wax water sealer. Sealing products shall be suitable for the intended application and applied in accordance with the manufacturers recommendations.

1. ***Dowel-laminated panel-lam.*** Panel-lams shall be nominal 4” (minimum)Coastal Region Douglas Fir. Preservative treatment of timber shall be by the pressure process in accordance AWPA Standards and AASHTO Designation M 133. Preservative shall be Copper Naphthenate in AWPA P9 Type A Hydrocarbon Solvent. Unless otherwise directed by the Engineer the material shall be graded prior to treatment. Material shall be accepted after treatment on the basis of its condition prior to treatment, on the basis of inspection of the treatment procedure substantiated by plant records, on the condition of the material after treatment and on absorption, penetration and visual inspection. So far as practicable all adazing, boring, chamfering, framing, gaining, mortising, surfacing, general framing and so forth shall be done prior to treatment. If cut after treatment, coat cut surfaces according to AWPA M4. All Douglas Fir and other species that are difficult to penetrate shall be incised prior to treatment. Panel-lams shall be shop fabricated with ring-shank dowels in a press capable of simultaneously driving all the dowels with equal force. Panels shall be interconnected with shiplap joints. Panels placed longitudinally shall be continuous over as many floor beams as is practical. A wear course of 2” asphalt shall be included. The deck shall have edge strips to contain the wear course.

1. ***Normal weight reinforced concrete.*** The bridge shall be furnished with 20 gauge (minimum) stay-in-place galvanized metal decking with steel side and end dams suitable for placing a separate concrete bridge deck. Metal decking shall be secured with fasteners or welds as recommended by the decking manufacturer. Metal forms shall be designed for the dead load of wet concrete and a construction live load of either 20 psf or a 200 lb point load. Dead load deflection due to wet concrete shall be limited to L/180 and 3/4".

**CONSTRUCTION**

**580.03.01 GENERAL**

A. The construction requirements shall consist of design, shop drawing submittal and approval, fabrication, delivery and installation of prefabricated steel pedestrian bridge in accordance with these special provisions.

**580.03.02 MANUFACTURER QUALIFICATIONS**

A. The Contractor’s Bridge Manufacturer shall be currently certified by the American Institute of Steel Construction to have the personnel, organization, experience, capability, and commitment to produce fabricated structural steel for Major Steel Bridges as set forth in the AISC Certification Program.

Pre-approved Prefabricated Steel Pedestrian Bridge Manufacturers:

|  |  |  |
| --- | --- | --- |
| Wheeler Lumber, LLC  9330 James Avenue South  Bloomington, MN 55431  (800) 328-3986  [www.wheeler-con.com](http://www.wheeler-con.com) |  | Big R Manufacturing, LLC  PO Box 1290  Greely, CO 80632  (970) 356-9600  [www.bigrmfg.com](http://www.bigrmfg.com) |
|  |  |  |
| Contech Engineered Solutions  8301 State Hwy 29 N  Alexandria, MN 56308  (800) 328-2047  [www.conteches.com](http://www.conteches.com) |  | Echo Bridge, Inc  PO Box 89  Elmira, NY 14902  (607) 734-9456  [www.echobridgeinc.com](http://www.echobridgeinc.com) |
|  |  |  |
| Excel Bridge Manufacturing  12001 Shoemaker Avenue  Santa Fe Springs, CA 90670  (800) 548-0054  [www.excelbridge.com](http://www.excelbridge.com) |  | The Ohio Bridge Corp/US Bridge  PO Box 757  Cambridge, OH 43725  (740) 432-6334  www.usbridge.com |
|  |  |  |
| Arizona Structure Technologies 1945West Broadway Road  Phoenix, AZ 85041  (602) 288-1471  [www.azst.net](http://www.azst.net) |  | Stinger Bridge & Iron  4248 N. Hwy 87  Coolidge, AZ 85128  (520) 723-5383  [www.stingerbridgeandiron.com](http://www.stingerbridgeandiron.com) |

B. Written request by the Contractor for acceptance of any proposed Bridge Manufacturer who is not pre-approved must be presented to the Engineer for approval and shall include the following:

1. Proof of AISC certification
2. Proof of a minimum ten (10) years experience in fabricating steel pedestrian bridges.
3. Representative design calculations
4. Representative drawings
5. Splicing and erection procedures
6. Welding process
7. References and list of projects

C. The Engineer will evaluate and verify the accuracy of the submittal. If the Engineer determines that the qualifying criteria have not been met, the Contractor's proposed Bridge Manufacturer shall be rejected.

* + 1. **SHOP DRAWINGS**

A. The Contractor’s Bridge Manufacturer shall design the prefabricated bridges and prepare shop drawings in accordance with these minimum requirements. All calculations and shop drawings shall be sealed by a Professional Engineer licensed in the State of Nevada.

B. Unless otherwise noted, the Contractor shall submit to the Engineer, for approval six (6) sets of checked drawings. The Contractor shall prepare and submit shop drawings and structural calculations for approval at least fifteen (15) days before the intended start of fabrication and no material shall be fabricated until the plans have been fully approved by the Engineer. Shop drawings shall be unique drawings prepared to illustrate the specific portion of the work to be done. All relative design information including but not limited to governing codes, design parameters, member sizes, bridge reactions, shop and field connection details, deck details, paint system, dimensions related to substructures and general notes shall be clearly specified on the drawings. Shop drawings shall be accurately prepared by skilled drafters to be complete in every respect. Drawings shall have cross-referenced details and sheet numbers.

C. The Engineer reserves the right to refuse prints of shop drawings which are not clear and legible. The shop drawings as approved by the Engineer shall become a part of the contract (this contradicts subsection 101.75 of the new USS); provided, however, that any substitution of sections contemplated by the shop drawings different from sections shown on the plans shall be made only when approved by the Engineer and in such case, additional costs resulting from such substitution shall be borne by the Contractor.

D. After approval, there shall be no deviation from the shop drawings or changes made thereon without the prior approval of the Engineer.

E. Approval of shop drawings shall be understood to be an acceptance of the character and sufficiency of the details and not a check of any dimensions. Checking shop drawings is intended as a means of facilitating the work and avoiding errors, but it is expressly understood that it will not relieve the Contractor from the responsibility in regard to errors or omissions on said shop drawings.

* + 1. **DESIGN CRITERIA**

A. Design shall be governed by the current design specifications of the American Association of State Highway and Transportation Officials (AASHTO), supplemented with the current edition of American Institute of Steel Construction (AISC) including the Design Specification for Steel Hollow Structural Sections, further supplemented with the current edition of American Welding Society (AWS) D1.1 Structural Welding Code, as modified and further supplemented herein.

B. Structural members shall be designed in accordance with recognized engineering practices and principles.

C. In addition to dead load, pedestrian load, and wind load as specified by AASHTO, the bridge shall be designed to accommodate the following loads:

1. Point Load: 1000 lbs plus impact, applied at a single point.
2. Vehicle Load:
   1. AASHTO H-5 vehicle for clear deck width of 10 feet or less.
   2. AASHTO H-10 vehicle for clear deck width greater than 10 feet.

D. When pedestrian usage is specified, the following shall apply:

1. The vibration design for this bridge shall be a level one design.
2. For level one design, the frequency of the first harmonic for the unloaded bridge shall be no less than 3.0 Hz except when the weight of the structure with no live load exceeds 180 x exp(-0.35xFreq).
3. Peak acceleration shall, in all cases, be computed based on a constant force of 92 pounds and a damping ratio of 0.01.
4. Peak acceleration of the truss and of deck systems may be computed independently without consideration of a combined effect.
5. Peak acceleration in deck systems shall be computed with consideration of the combined effect of longitudinal components and floor beams.

E. Wind deflections of the truss, as measured at deck level, shall be limited to L/500. Deflections in planks due to point or truck load shall be limited to L/300 or 0.1". Impact shall be included in deflection checks as applicable.

F. Deflection of the truss due to uniform live load shall be limited to L/500. The load may be reduced based on loaded area to no less than 65 psf. Deflections in longitudinal deck members due to uniform live load shall be limited to L/500.

* + 1. **BRIDGE AND TRUSS**

A. The truss type shall be [CHOOSE ONE]: parallel chord with vertical ends; parallel chord with sloped ends; bow truss (bowstring truss, truss arch); bowstring arch (tied arch, with vertical hangers only); lenticular; [OTHER] with a web member style [CHOOSE ONE]:of Pratt; of Howe; of Vierendeel; of Warren, (with verticals / without verticals / with or without verticals); of crossed diagonals, (with verticals / without verticals / with or without verticals); as depicted in the Plans.

B. Pratt or Howe style trusses with an odd number of bays shall have crossed diagonals in the middle bay. Any crossed diagonals shall be of equal dimension. Unless specified otherwise, multiple spans or bridges within a project shall have a consistent style, multi-span bridges shall maintain a constant depth, and any bridge depiction shown in the Plans is conceptual only.

C. Overhead (portal) bracing is to be used only when required.

D. Span lengths, deck widths, and any geometry limitations of the bridge or truss are as shown on the Plans.

E. The bridge shall be cambered to offset the calculated dead load deflection and provide a maximum of a 5% grade. Multiple span bridges shall follow a smooth continuous profile after dead load deflection, and when a percentage camber is specified, the camber is computed as a percentage of the total bridge length and applied at the midpoint of the entire bridge.

* + 1. **FIELD SPLICE**

A. Field splices shall be fully bolted slip critical connections, utilizing tension indicating washers. Tack welding of high strength hardware is prohibited.

B. Splices not immediately at or adjacent to panel points shall be designed for 100% of the member bending moment capacity for primary compression members, and 75% for bracing members or tension members subject to load reversal, including slip resistance, and slip resistance shall further meet the same AASHTO required strength as with other failure modes.

C. Splices for truss members, bracing, and floor beams, when used, shall be made with ASTM A325 or A490 high strength bolts. Type 3 bolts shall be used when the truss is required to be of weathering steel. Other splices shall be made with the above mentioned material or ASTM A307.

* + 1. **HORIZONTAL SAFETY RAIL SYSTEM**

A. The horizontal safety rail system shall prevent a sphere with a diameter of 4” from passing through, up to a minimum height of 54”. The horizontal safety rail system shall also include a 6” toe plate. The horizontal safety rails shall be placed on the inside of the truss and shall be designed to carry a horizontal or vertical 200 lb point load on each rail.

* + 1. **WELDING**

A. Welding and weld qualification tests shall conform to the provisions of AWS D1.1. The flux core arc welding (FCAW) process, utilizing E80 electrodes with similar weathering characteristics as the base material, shall be used. Welding operators shall be properly accredited experienced operators. Each operator have certification of satisfactorily passing AWS standard qualification test(s) for the 3G and/or 4F position(s), evidence of experience and skill in welding structural steel, and have demonstrated the ability to make acceptable welds of the type required.

B. Nondestructive weld testing is required. Testing will be performed by a qualified ASNT Level II Technician or greater and paid for by the Contractor. All welds are to be 100% visually inspected. Ten percent (10%) of all fillet and partial penetration welds shall be magnetic particle tested. For arch type bridges, 100% of end of top chord to bottom chord connections shall be tested. Full penetration shop welds shall be Ultrasonic tested in accordance with AWS D1.1; Section 6. Base material certifications are to be supplied by the material suppliers. Inspection test results shall be available on request.

* + 1. **CONNECTIONS AND ANCHORS**

A. Self-tapping and self-drilling screws are not acceptable for any portion of the structure, except where specified otherwise.

B. Wood members shall be attached with carriage bolts. All wood connections shall be made with locking hardware.

C. Cover plates shall be provided to cover expansion gaps. Cover plates shall fit tight to the top of the abutment backwall without any bridge weight bearing on the backwall. Plate thickness shall accommodate joint size and weight of vehicles.

D. Anchors shall be of the drilled type, installed with a chemical adhesive system, except that when design forces exceed the strength of typical chemical systems, cast-in-place anchors may be used. Anchor systems shall be designed and supplied by the Contractor. Anchor bolts shall conform to ASTM A307, A193, or F1554.

* + 1. **DELIVERY**

A. The Contractor shall coordinate with the Bridge Manufacturer in the delivery and erection schedule.

B. Delivery to the job site will be by trucks by means of good haul roads unless specified otherwise.

C. The Contractor shall provide detailed, written instruction procedures for proper lifting and splicing of bridge components as recommended by the Bridge Manufacturer.

**METHOD OF MEASUREMENT**

**580.04.01 MEASUREMENT**

The quantity of PREFABRICATED STEEL PEDESTRIAN BRIDGE will be measured per lump sum.

**BASIS OF PAYMENT**

**580.05.01 PAYMENT**

The accepted quantity of PREFABRICATED STEEL PEDESTRIAN BRIDGE will be paid for at the contract unit price of lump sum shall include all materials, equipment and labor required including, but not limited to, shop drawings; welding; fabrication; painting; shipping; delivery; tools; all required hardware; bearings; bearing pads; anchor bolts; and all other items necessary to complete the work as shown on the Plans, as specified herein and as directed by the Engineer to ensure the bridge is complete, in place and operational.

Substructures, foundations, approach slabs, and concrete bridge deck will not be measured as part of this work but shall be considered as part of separate bid items.

Payment will be made under:

|  |  |  |
| --- | --- | --- |
| **ITEM NO.** | **ITEM DESCRIPTION** | **UOM** |
| 580.0005 | PREFABRICATED STEEL PEDESTRIAN BRIDGE | LS |

**END OF SECTION 580**