Section 641 Sign Bridges and Overhead Sign Supports

641.1 Description

(1) This section describes providing zinc coated steel sign bridges and overhead sign supports.

641.2 Materials

641.2.1 General

(1) , Furnish zinc coated steel sign structures.

641.2.2 Steel Bolts

641.2.2.1 High-Strength Bolts

(1) Furnish zinc-coated type 1 bolt/nut/washer assemblies for field tensioning conforming to 506.2.5 and as follows:

- Use the size, number, type, and configuration of hardened flat washers the DTI manufacturer recommends for bolt diameters greater than 1 1/8 inches.
- Ensure that the supplier pre-assembles each bolt/nut/washer assembly before shipping.
- Ensure that bolt/nut/washer assemblies are accompanied by a certified report of test or analysis giving the results of the supplier's rotational-capacity testing. No field rotational-capacity testing is required.
- Ensure that bolt/nut/washer assemblies are shipped in sealed and labeled containers.
- Furnish 3 or more additional bolt/nut/washer assemblies of each rotational-capacity lot for pre-installation testing.
- Submit 2 or more additional bolts and 3 or more additional nuts and washers from each lot and heat for department mechanical testing. The contractor need not submit components from a lot and heat the department previously approved.

641.2.2.2 Direct Tension Indicating Washers

(1) Furnish zinc-coated direct tension indicating (DTI) washers conforming to ASTM F959 type 325. Ensure that DTIs have identifying marks applied by the manufacturer. Provide the engineer with 2 copies of the DTI manufacturer's instructions showing acceptable installation configurations. Provide 3 or more additional DTIs as required for pre-installation testing. Also provide the engineer with at least two 0.005-inch metal feeler gauges.

641.2.2.3 Anchor Rods

(1) Furnish anchor rods conforming to ASTM F1554, grade 55 and Supplementary Specification S4, ASTM A563 heavy hex nuts, and ASTM F436 washers all hot-dip galvanized according to ASTM A153 supplemented by ASTM F2329. Over-tap galvanized nuts according to ASTM F2329.

(2) Use only nuts and anchor rods manufactured with sufficient clearance to allow the nuts to run freely on the rods after coating the threads and nuts with a wax-based lubricant.

641.2.3 Grating

(1) Provide walkway grating conforming to the plans.

641.2.4 Pipe

(1) Provide pipe for handrail conforming to ASTM B241 alloy 6063-T6.

641.2.5 Steel Chain

(1) Provide zinc coated carbon steel chain of the size, type, and length the plans show and include accessories the plans show.

641.2.6 Certification

(1) Submit a certified report of test or analysis to the engineer for the castings, columns, truss members, pipes, anchor rods, high-strength bolts, nuts, and washers, and structural sections. The engineer must approve the material before the contractor may install in the work.

(2) The engineer may retest materials delivered to the job site; furnish the specimens for this testing at no expense to the department.

Retitle and revise 641.2.7 to specify material requirements for catwalk supports and railing.

641.2.7 Aluminum Components

(1) Furnish extruded aluminum for handrails conforming to ASTM B221, alloy 6061-T6. Furnish aluminum structural shapes for catwalk supports conforming to ASTM B308, alloy 6061-T6. Furnish plate and sheet aluminum conforming to ASTM B209, alloy 6061-T6. Ensure material is free from discoloration, nicks, and blemishes.

(2) Furnish stainless steel U bolts, bolts, nuts, and washers for connections to aluminum components conforming to 513.2.2.5.

641.2.8 Steel Sign Bridges

(1) Furnish materials conforming to the following:

Structural Steel and Miscellaneous Metals 506.2

(2) Furnish sign bridge trusses, columns, and steel accessories zinc coated according to ASTM A123, the zinc coating must withstand 8 one-minute dips in the Preece test solution, ASTM A239.

641.2.9 Overhead Sign Supports

Revise 641.2.9(1)-(3) to reference the bridge plans for the required AASHTO design specifications.

(1) Provide commercially fabricated overhead sign supports conforming to the AASHTO design specifications referenced in the plans.

(2) Submit shop drawings identified by structure number, design computations, and material specifications, to the engineer before erecting sign supports. Provide tightening procedures for mast arm or luminaire arm to pole shaft connections on the shop drawings. Have a professional engineer registered in the state of Wisconsin sign, seal, and date the shop drawings and certify that the design conforms to AASHTO standards and the contract.

(3) Provide steel pole shafts, mast arms or trusses, and luminaire arms zinc coated according to ASTM A123. Provide tapered pole and arm shafts with a minimum taper of 0.14 inch per foot for single-member vertical and single-member horizontal structure components. Provide bolts and other hardware conforming to 641.2.2.

641.3 Construction

641.3.1 General

641.3.1.1 Methods

(1) Use construction methods for this work, including fabrication, inspection, erection, mill test reports, and shop drawings, conforming to 506.3. Construct concrete footings conforming to 636. Cure exposed portions of concrete footings as specified in 502.3.8.1. Wait until the concrete has attained 3500 psi compressive strength or 7 equivalent days as specified in 502.3.10 before erecting any portion of the structure on the footing.

641.3.1.2 High-Strength Bolts

641.3.1.2.1 Handling and Storage

(1) Store bolts/nut/washer assemblies and DTIs in closed containers in a protected shelter to protect them from dirt and moisture until used. Maintain fastener system components as nearly as possible in the as-manufactured condition until installed. Remove from storage only as needed and promptly return unused components to storage.

641.3.1.2.2 Pre-installation Testing

(1) Notify the engineer before performing the required field pre-installation testing.

(2) Lubricate high-strength bolt threads with a wax-based lubricant before testing. Test bolt/nut/washer assemblies with DTIs in all the configurations used for installation.

(3) Perform pre-installation testing in the field conforming to the procedures enumerated in department form DT2322 for bolt/nut/washer assemblies of each rotational-capacity lot with DTIs in each installation configuration. Provide the engineer with the test results by submitting 2 copies of department form DT2322.

641.3.1.2.3 Bolt Installation

(1) Do not begin bolt installation without the engineer's approval.

(2) Lubricate high-strength bolt threads with a wax-based lubricant before installation.

(3) Tension high-strength bolts using DTIs. Install the DTI on the bolt with the protrusions facing away from the connected materials. Install bolt/nut/washer assemblies with DTI washers in the same configuration used for pre-installation testing.

(4) Tighten conforming to department form DT2322 to provide the correct installation tension. During the operation, ensure no rotation of the part not turned by the wrench. Snug systematically from the most rigid part of the connection to the free edges. Repeat until the full connection is in a snug condition and the faying surfaces are in firm contact. Systematically tighten the connection required number of refusals is achieved. If the gaps on the DTI are completely closed, discontinue tightening.

(5) Perform QC testing as specified in 506.3.12.3.3.3 for tensioning with DTIs. After observing at the initial QC testing frequency, the engineer may decide to observe QC testing at a reduced frequency. The engineer may verify bolt installation by periodically testing with a feeler gauge.

641.3.1.3 Anchor Assembly

(1) Install structures on anchor rods conforming to the procedures enumerated in department form DT2321. Complete department form DT2321 for each structure. Indicate the parties responsible for the installation and submit the form to the engineer for inclusion in the permanent project record.

641.3.1.4 Sign Installation

(1) Install permanent signs as soon as support structures are erected. If permanent signing is not available, install sign-blanks to control vibration. Fasten to the supporting structure conforming to 637.3.3.3.

(2) For overhead sign supports, ensure that sign-blanks are the same sizes and at the same locations as the permanent signs.

(3) For sign bridges, attach sign-blanks to a minimum of 1/4 the truss length near its center. Use sign-blanks that are at a minimum 24 inches larger than the truss depth and project an equal distance beyond the top and bottom chord members.

(4) Install structure identification plaques on overhead sign supports and sign bridges in the locations the plan details show.

Delete 641.3.2. Aluminum Sign Bridges. The department no longer builds aluminum sign bridges.

641.3.2 Steel Sign Bridges

641.3.2.1 General

(1) Under the Sign Bridge Single Pole Sign Support One Sign bid items, furnish and erect single pole sign supports with attachments for signs facing in one direction.

(2) Under the Sign Bridge Single Pole Sign Support Two Signs bid items, furnish and erect single pole sign supports with attachments for signs facing in opposite directions.

(3) Under the Sign Bridge Cantilevered bid items, furnish and erect cantilevered sign bridges with a single supporting structure.

(4) Under the Sign Bridge Structure Mounted bid items, furnish and erect sign bridges mounted on overhead roadway bridges.

(5) Under the Sign Bridge bid items, furnish and erect sign bridges with multiple supporting structures.

641.3.2.2 Welding

(1) Perform shop welding for steel sign bridges and supports as the plans show and conforming to AWS D 1.1, Structural Welding Code - Steel.

(2) Do not weld in the field without the engineer's written approval. The engineer will only allow field welding for repairs in noncritical locations and when a department-approved individual competent to perform inspections is present during the welding. Perform field welding using personnel qualified under AWS D 1.5, Bridge Welding Code.

(3) Inspect welds visually, additionally, if the engineer determines, test butt welds in main, stress-carrying members subject to tension or stress reversal by radiographic or ultrasonic methods over the entire length of the weld. Test other butt welds in these members by the same methods, except the engineer will determine the length of weld to test. Use either the dye penetrant method, or the magnetic particle method to test the fillet welds connecting columns to bases and main chord members, including the associated flanges, gussets, or main load carrying brackets or members, and on fillet welds connecting flanges to the main truss chord members. Perform the dye penetrant test according to ASTM E165 and perform the magnetic particle method according to ASTM E709.

(4) Shop weld aluminum catwalk supports and handrails conforming to AWS D 1.2, Structural Welding Code - Aluminum. Do not weld aluminum in the field.

641.3.2.3 Fabrication

(1) Blast clean and then zinc coat the fabricated sign bridge trusses, columns, and their steel accessories after completing cutting, punching, drilling, and welding.

(2) After zinc coating, assemble the individual members making up the truss sections, unless fabricated and zinc coated in one piece in the shop, adjust to the proper shape and alignment, and tighten the high-strength bolts to the required tension. Provide a certificate of compliance certifying that high-strength bolts within truss sections are tensioned conforming to 506.3.12. Then, assemble the truss sections that make up any one sign bridge in the shop, and adjust to proper alignment and camber as the plans show. Matchmark all truss sections and shims before disassembling for shipment.

641.3.2.4 Handling and Field Assembly

(1) Protect zinc coated members from damage to the zinc coating during transportation, storage, and erection. Paint areas of damaged zinc coating with 2 coats of zinc dust/zinc oxide paint. Clean damaged and adjacent areas by sanding, scraping, chipping, or wire brushing. Apply a profile to the bare metal surface using a needle gun before painting. For areas of damage larger than 10 square inches metalize according to AASHTO M36 or, for field repairs, using an engineer-approved high-temperature application of zinc powder and flux in paste or stick form.

(2) Assemble the sections making up the truss, together as a single unit, before attaching to the columns.

641.3.3 Overhead Sign Supports

(1) Under the Overhead Sign Support bid item, furnish and erect commercially designed sign supports fabricated from steel. Construct according to the shop drawings.

641.4 Measurement

(1) The department will measure the Sign Bridge bid items as a single lump sum unit for each sign bridge acceptably completed.

(2) The department will measure the Overhead Sign Support bid items as a single lump sum unit for each overhead sign support acceptably completed.

641.5 Payment

(1) The department will pay for measured quantities at the contract unit price under the following bid items:

ITEM NUMBER	DESCRIPTION	UNIT
641.0100	Sign Bridge Single Pole Sign Support One Sign (structure)	LS
641.0600	Sign Bridge Single Pole Sign Support Two Signs (structure)	LS
641.1200	Sign Bridge Cantilevered (structure)	LS
641.5100	Sign Bridge Structure Mounted (structure)	LS
641.6600	Sign Bridge (structure)	LS
641.8100	Overhead Sign Support (structure)	LS

(2) Payment for the Sign Bridge bid items is full compensation for providing sign bridges; for anchor assemblies and templates; for high-strength bolt/nut/washer assemblies and DTIs including those required for testing; and for sign blanks. Concrete footings are paid for separately under 636.5.

(3) Payment for the Overhead Sign Support bid items is full compensation for designing the sign support structure; for providing the sign support; for excavating and backfilling; for providing concrete footings including reinforcing steel; for providing anchor assemblies and templates; for high-strength bolt/nut/washer assemblies and DTIs including those required for testing; and for sign blanks.

(4) The department will pay separately for signs and the sign mounting system under 637.5 and for luminaires under 659.5.