



## **REQUEST FOR QUOTATIONS**

The West Virginia Parkways Authority will receive sealed proposals for the following:

### **Pole and Arm Assembly for Overhead Sign 37**

Proposals will be received at the office of the WV Parkways Authority, Administration Building, 3310 Piedmont Rd., Charleston, WV until **2PM on Thursday, April 7<sup>th</sup>, 2022.** If proposals are mailed via the U. S. Postal Service regular mail, they must be addressed to the WV Parkways Authority, P. O. Box 1469, Charleston, WV 25325. This mail is picked up by the Authority once a day between 7:00 and 8:00 a.m. However, Drop-Off, Express Mail One Day Service, Federal Express, United Parcel Service (UPS), etc. must be delivered /sent to the West Virginia Parkways Authority, 3310 Piedmont Rd., Charleston, WV 25306. Faxed or emailed bids will not be accepted.

It shall be the bidders' responsibility to determine their method of transmittal such that their bids will arrive in the Authority's office prior to the scheduled bid opening. The Authority cannot waive or excuse late receipt of a proposal which is delayed and late for any reason. Late submissions will not be accepted and will remain unopened. Any proposal received after the proposal opening date and time will be immediately disqualified in accordance with applicable law and administrative rules and regulations applicable to the Authority. Changes to the Request for Quotation may be posted at any time to our website [www.wvturnpike.com](http://www.wvturnpike.com) under the Purchasing tab. It is the Vendors responsibility to check the website. Any addendum issued must be signed and submitted with your RFQ.

All proposals **must** be enclosed in a sealed envelope. The outside of the envelope must include the name and address of the proposer and clearly marked as follows:

**Attn: Purchasing Department**

**RFQ: Pole and Arm Assembly for Overhead Sign 37**

**Bid Opening Date: 4/7/22**

Specifications are available at [www.wvturnpike.com](http://www.wvturnpike.com)

The West Virginia Parkways Authority reserves the right to reject any and/or all proposals. Prospective vendors are responsible for all toll charges incurred while providing goods or services to the West Virginia Parkways Authority.

The WVPA is an Equal Opportunity Employer.

**SECTION 1.0 INSTRUCTIONS TO VENDORS SUBMITTING BIDS:** The attached documents contain a solicitation for proposals. Please read these instructions and all documents in their entirety. These instructions provide critical information about requirements that if overlooked could lead to disqualification of a Vendor's proposal. All bids must be submitted in accordance with the provisions contained in these instructions and the Solicitation. Failure to do so may result in disqualification of such Vendor's proposal.

### **1.1 Questions**

All questions must be submitted in writing. Questions regarding this RFQ should be directed to Margaret Vickers, Director of Purchasing, Phone 304 926-1900, fax 304 926-1909 or email: [mvickers@wvturnpike.com](mailto:mvickers@wvturnpike.com). Deadline to submit written questions: Monday, April 4<sup>th</sup>, 2022 by 4pm EST. Non-written discussions, conversations, or questions and answers regarding this solicitation are preliminary in nature and are nonbinding. Submitted emails should have the proposal solicitation name in the subject line. Only information issued in writing and added to the Solicitation by an official written addendum is binding.

### **1.2 Registration**

Prior to contract award, the apparent successful Vendor must be properly registered with the West Virginia Purchasing Division [www.wvoasis.gov](http://www.wvoasis.gov), WV Secretary of State, WV State Tax Department, as applicable, and any other entities as necessary. Each of these entities has different fees that may be applicable to their respective registration requirements.

### **1.3 Purchasing Affidavit**

Vendors are required to sign, notarize and submit the Purchasing Affidavit stating that neither the Vendor nor related parties owe a debt to the State in excess of \$1,000.00. **The affidavit must be submitted with the Vendor's proposal.** A copy of the Purchasing Affidavit is included herewith.

**1.4** The Authority reserves the right to reject any or all proposals or to waive any non-consequential irregularities or informalities in proposals received. The Authority reserves the right to accept the proposal that will, in the Authority's judgment, best serve the interest of the Authority regardless of whether such proposal is the lowest cost submitted.

**WEST VIRGINIA PARKWAYS AUTHORITY  
MAINTENANCE DIVISION  
PROCUREMENT SPECIFICATIONS**

**POLE and ARM ASSEMBLY for OVERHEAD SIGN 37**

The West Virginia Parkways Authority, hereafter “Authority”, is accepting quotations for providing a new pole and arm assembly for Overhead Sign 37. The design number for Overhead Sign 37 assembly shall be DAC-24. The height shall be field verified as per the Standard Drawings. The pole and arm assembly shall be constructed with galvanize steel as per the attached Specifications. The existing sign shall be utilized and modified as needed for the new pole and arm assembly.

**Scope of Work**

**The vendor shall be responsible for submitting a quotation on the providing the new pole and arm assembly.** Minor adjustments to the detail are acceptable; however, each vendor is required to obtain approval from the Authority prior to submitting proposals that vary from the attached detail. The work here shall meet all standards for compliance with Local, State and Federal code guidelines.

All design specifications, base plate, pole, and arm dimensions shall be shown on the fabrication drawings along with required weld sizes. The Authority requires that each set of drawings be stamped by a West Virginia Registered Professional Engineer.

**Testing**

All material, fabrication and testing shall be in accordance with the enclosed specifications and West Virginia Division of Highways Standard Detail Sheets TE4-3A and TE4-5, August 2018.

**Specifications**

The governing specifications for the pole and arm assemblies are as follows:

**Design Standards**

- AASHTO LRFD Specification for Structural Supports for Highway Signs, Luminaires and Traffic Signals, 1st Edition with latest Interim Revisions
- AISC 360-10, Specifications for Structural Steel Buildings
- WVDOH Standard Specifications Roads and Bridges, 2017 with 2021 Supplemental Specification
- AASHTO LRFD Bridge Design Specifications, 9th Edition

### Manufacturing Standards

- Fabrication shall be in accordance with ANSI/AISC 360-10, as applicable
- All welding shall be in accordance with the latest edition of the ANSI/AWS D1.1 Structural Welding Code

### Shipping

The signs will be dropped off and picked up by the Authority.

### Other

Any and all questions pertaining to these specifications or this procurement process must be in **writing** and submitted to:

Margaret Vickers, Director of Purchasing  
West Virginia Parkways Authority  
3310 Piedmont Rd. Charleston, WV 25306  
Phone: (304) 926-1900  
Email; [mvickers@wvturnpike.com](mailto:mvickers@wvturnpike.com)

QUOTATION SUBMISSION PAGE

POLE & ARM ASSEMBLY

FOR

OVERHEAD SIGN 37

Bid Opening 4/7/22 @ 2PM

Total Lump Sum Price \_\_\_\_\_

Estimated Delivery Date \_\_\_\_\_

**SUBMITTED BY:**

COMPANY NAME \_\_\_\_\_

ADDRESS \_\_\_\_\_

PHONE NUMBER \_\_\_\_\_

FAX NUMBER \_\_\_\_\_

EMAIL ADDRESS \_\_\_\_\_

COMPANY CONTACT \_\_\_\_\_

SIGNATURE \_\_\_\_\_

VENDOR REGISTRATION NUMBER \_\_\_\_\_

[www.wvoasis.gov](http://www.wvoasis.gov)

STATE OF WEST VIRGINIA  
Purchasing Division  
**PURCHASING AFFIDAVIT**

**CONSTRUCTION CONTRACTS:** Under W. Va. Code § 5-22-1(i), the contracting public entity shall not award a construction contract to any bidder that is known to be in default on any monetary obligation owed to the state or a political subdivision of the state, including, but not limited to, obligations related to payroll taxes, property taxes, sales and use taxes, fire service fees, or other fines or fees.

**ALL CONTRACTS:** Under W. Va. Code §5A-3-10a, no contract or renewal of any contract may be awarded by the state or any of its political subdivisions to any vendor or prospective vendor when the vendor or prospective vendor or a related party to the vendor or prospective vendor is a debtor and: (1) the debt owed is an amount greater than one thousand dollars in the aggregate; or (2) the debtor is in employer default.

**EXCEPTION:** The prohibition listed above does not apply where a vendor has contested any tax administered pursuant to chapter eleven of the W. Va. Code, workers' compensation premium, permit fee or environmental fee or assessment and the matter has not become final or where the vendor has entered into a payment plan or agreement and the vendor is not in default of any of the provisions of such plan or agreement.

**DEFINITIONS:**

"Debt" means any assessment, premium, penalty, fine, tax or other amount of money owed to the state or any of its political subdivisions because of a judgment, fine, permit violation, license assessment, defaulted workers' compensation premium, penalty or other assessment presently delinquent or due and required to be paid to the state or any of its political subdivisions, including any interest or additional penalties accrued thereon.

"Employer default" means having an outstanding balance or liability to the old fund or to the uninsured employers' fund or being in policy default, as defined in W. Va. Code § 23-2c-2, failure to maintain mandatory workers' compensation coverage, or failure to fully meet its obligations as a workers' compensation self-insured employer. An employer is not in employer default if it has entered into a repayment agreement with the Insurance Commissioner and remains in compliance with the obligations under the repayment agreement.

"Related party" means a party, whether an individual, corporation, partnership, association, limited liability company or any other form or business association or other entity whatsoever, related to any vendor by blood, marriage, ownership or contract through which the party has a relationship of ownership or other interest with the vendor so that the party will actually or by effect receive or control a portion of the benefit, profit or other consideration from performance of a vendor contract with the party receiving an amount that meets or exceeds five percent of the total contract amount.

**AFFIRMATION:** By signing this form, the vendor's authorized signer affirms and acknowledges under penalty of law for false swearing (W. Va. Code §61-5-3) that: (1) for construction contracts, the vendor is not in default on any monetary obligation owed to the state or a political subdivision of the state, and (2) for all other contracts, that neither vendor nor any related party owe a debt as defined above and that neither vendor nor any related party are in employer default as defined above, unless the debt or employer default is permitted under the exception above.

**WITNESS THE FOLLOWING SIGNATURE:**

Vendor's Name: \_\_\_\_\_

Authorized Signature: \_\_\_\_\_ Date: \_\_\_\_\_

State of \_\_\_\_\_

County of \_\_\_\_\_, to-wit:

Taken, subscribed, and sworn to before me this \_\_\_\_ day of \_\_\_\_\_, 20\_\_.

My Commission expires \_\_\_\_\_, 20\_\_.

**AFFIX SEAL HERE**

**NOTARY PUBLIC** \_\_\_\_\_

*Purchasing Affidavit (Revised 01/19/2018)*



## AGREEMENT ADDENDUM

In the event of conflict between this addendum and the agreement, this addendum shall control:

1. **DISPUTES** - Any references in the agreement to arbitration or to the jurisdiction of any court are hereby deleted.
2. **HOLD HARMLESS** - Any provision requiring the Agency to indemnify or hold harmless any party is hereby deleted in its entirety.
3. **GOVERNING LAW** - The agreement shall be governed by the laws of the State of West Virginia. This provision replaces any references to any other State's governing law.
4. **TAXES** - Provisions in the agreement requiring the Agency to pay taxes are deleted. As a State entity, the Agency is exempt from Federal, State, and local taxes and will not pay taxes for any Vendor including individuals, nor will the Agency file any tax returns or reports on behalf of Vendor or any other party.
5. **PAYMENT** - Any references to prepayment are deleted. Payment will be in arrears.
6. **INTEREST** - Any provision for interest or charges on late payments is deleted. The Agency has no statutory authority to pay interest or late fees.
7. **NO WAIVER** - Any language in the agreement requiring the Agency to waive any rights, claims or defenses is hereby deleted.
8. **FISCAL YEAR FUNDING** - Service performed under the agreement may be continued in succeeding fiscal years for the term of the agreement, contingent upon funds being appropriated by the Legislature or otherwise being available for this service. In the event funds are not appropriated or otherwise available for this service, the agreement shall terminate without penalty on June 30. After that date, the agreement becomes of no effect and is null and void. However, the Agency agrees to use its best efforts to have the amounts contemplated under the agreement included in its budget. Non-appropriation or non-funding shall not be considered an event of default.
9. **STATUTE OF LIMITATION** - Any clauses limiting the time in which the Agency may bring suit against the Vendor, lessor, individual, or any other party are deleted.
10. **SIMILAR SERVICES** - Any provisions limiting the Agency's right to obtain similar services or equipment in the event of default or non-funding during the term of the agreement are hereby deleted.
11. **FEES OR COSTS** - The Agency recognizes an obligation to pay attorney's fees or costs only when assessed by a court of competent jurisdiction. Any other provision is invalid and considered null and void.
12. **ASSIGNMENT** - Notwithstanding any clause to the contrary, the Agency reserves the right to assign the agreement to another State of West Virginia agency, board or commission upon thirty (30) days written notice to the Vendor and Vendor shall obtain the written consent of Agency prior to assigning the agreement.
13. **LIMITATION OF LIABILITY** - The Agency, as a State entity, cannot agree to assume the potential liability of a Vendor. Accordingly, any provision limiting the Vendor's liability for direct damages to a certain dollar amount or to the amount of the agreement is hereby deleted. Limitations on special, incidental or consequential damages are acceptable. In addition, any limitation is null and void to the extent that it precludes any action for injury to persons or for damages to personal property.
14. **RIGHT TO TERMINATE** - Agency shall have the right to terminate the agreement upon thirty (30) days written notice to Vendor. Agency agrees to pay Vendor for services rendered or goods received prior to the effective date of termination.
15. **TERMINATION CHARGES** - Any provision requiring the Agency to pay a fixed amount or liquidated damages upon termination of the agreement is hereby deleted. The Agency may only agree to reimburse a Vendor for actual costs incurred or losses sustained during the current fiscal year due to wrongful termination by the Agency prior to the end of any current agreement term.
16. **RENEWAL** - Any reference to automatic renewal is deleted. The agreement may be renewed only upon mutual written agreement of the parties.
17. **INSURANCE** - Any provision requiring the Agency to purchase insurance for Vendor's property is deleted. The State of West Virginia is insured through the Board of Risk and Insurance Management, and will provide a certificate of property insurance upon request.
18. **RIGHT TO NOTICE** - Any provision for repossession of equipment without notice is hereby deleted. However, the Agency does recognize a right of repossession with notice.
19. **ACCELERATION** - Any reference to acceleration of payments in the event of default or non-funding is hereby deleted.
20. **CONFIDENTIALITY** - Any provision regarding confidentiality of the terms and conditions of the agreement is hereby deleted. State contracts are public records under the West Virginia Freedom of Information Act.
21. **AMENDMENTS** - All amendments, modifications, alterations or changes to the agreement shall be in writing and signed by both parties. No amendment, modification, alteration or change may be made to this addendum without the express written approval of the Purchasing Division and the Attorney General.

**ACCEPTED BY:**

WEST VIRGINIA PARKWAYS AUTHORITY,  
an agency of the State of West Virginia

**VENDOR**

Company Name: \_\_\_\_\_

Signed: \_\_\_\_\_

Signed: \_\_\_\_\_

Title: \_\_\_\_\_

Title: \_\_\_\_\_

Date: \_\_\_\_\_

Date: \_\_\_\_\_

GENERAL TERMS & CONDITIONS  
REQUEST FOR QUOTATION (RFQ) AND REQUEST FOR PROPOSAL (RFP)

1. Awards will be made in the best interest of the West Virginia Parkways Authority.
2. The Authority may accept or reject in part, or in whole, any proposal.
3. All quotations are governed by the West Virginia Code and the Legislative Rules of the Purchasing Division and The Authority's purchasing rules.
4. Prior to any award, the apparent successful vendor must be properly registered with the Purchasing Division and have paid the required registration fee.
5. Payment may only be made after the delivery and acceptance of goods or services.
6. Interest may be paid for late payment in accordance with the West Virginia Code.
7. Vendor preference, if applicable, will be granted upon written request in accordance with the West Virginia Code.
8. Agencies of The State of West Virginia are exempt from federal and state taxes and will not pay or reimburse such taxes.
9. The Authority's Director of Purchasing may cancel any Purchase Order/Contract upon 30 days written notice to the vendor.
10. The laws of the State of West Virginia and the Legislative Rules shall govern all rights and duties under the Contract, including without limitation the validity of this Contract.
11. Any reference to automatic renewal is hereby deleted. The Contract may be renewed only upon mutual written agreement of the parties.
12. BANKRUPTCY: In the event the vendor/contractor files for bankruptcy protection, this Contract may be deemed null and void, and terminated without further order.
13. HIPAA Business Associate Addendum - The West Virginia State Government HIPAA Business Associate Addendum (BAA), approved by the Attorney General, and available online at the Purchasing Division's web site (<http://www.state.wv.us/admin/purchase/vrc/hipaa.htm>) is hereby made part of the agreement. Provided that, the Agency meets the definition of a Covered Entity (45 CFR §160.103) and will be disclosing Protected Health Information (45 CFR §160.103) to the vendor.

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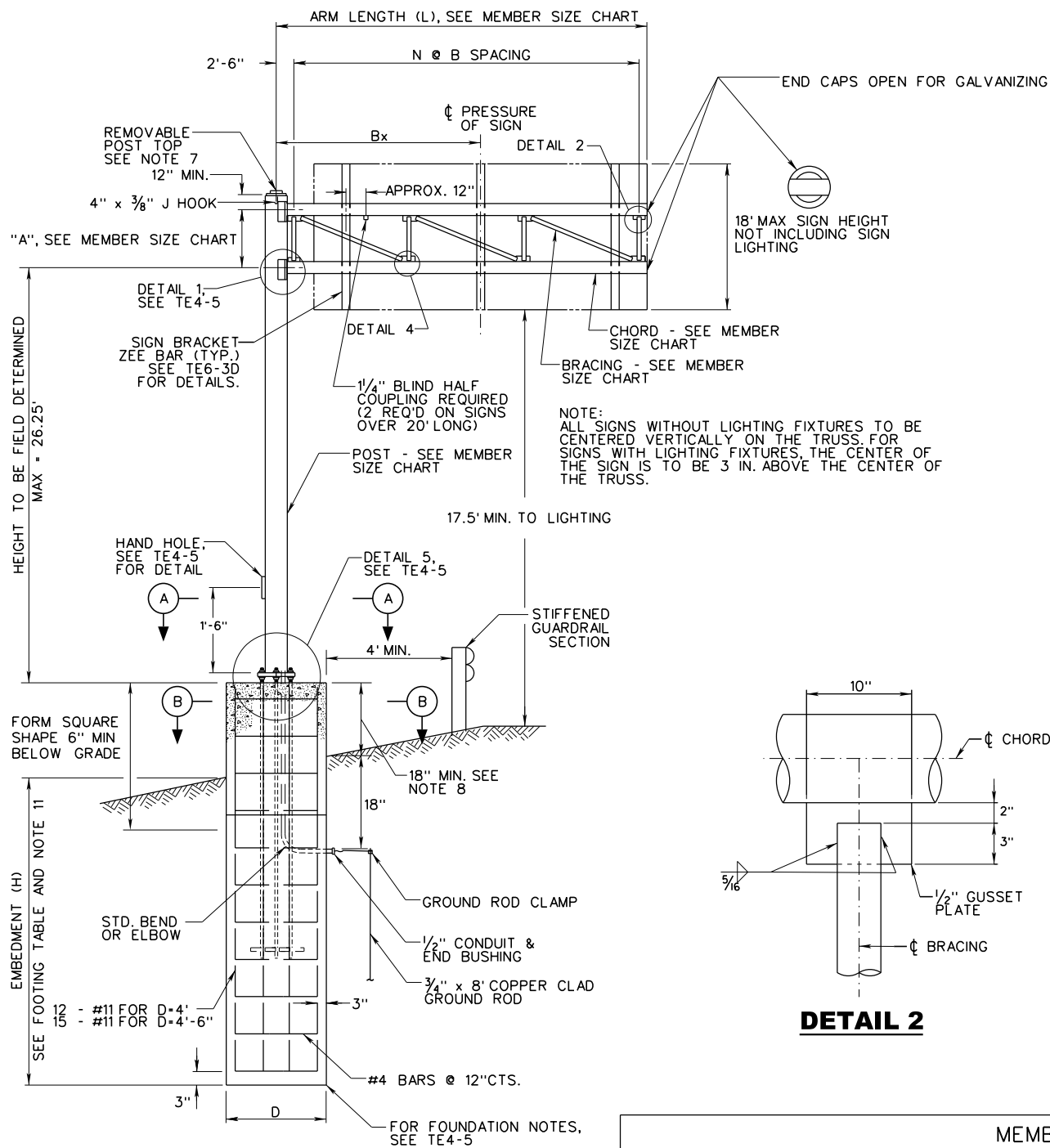
INSTRUCTIONS TO BIDDERS

1. Use the RFP/RFQ forms provided by the Authority.
2. SPECIFICATIONS: Services offered must be in compliance with the provisions of the RFP/RFQ. Any deviations must be clearly indicated by the proposer in the proposal. Alternates offered by the proposer as EQUAL to those specified in the RFP/RFQ must be clearly defined. The Authority, because of the unique nature of the services to be provided under the RFP/RFQ, may decide not to accept EQUAL services under the RFP/RFQ. A proposed offering an alternate should attach complete specifications and literature to the proposal. The Purchasing Director may waive minor deviations to certain requirements.
3. Complete all sections of the proposal form.
4. Unit prices shall prevail in cases of discrepancy.
5. All quotations are considered F.O.B. destination unless alternate shipping terms are clearly identified in the quotation.
6. PROPOSAL SUBMISSION: All quotations must be delivered by the proposer to the office listed prior to the date and time of the proposal opening. Failure to deliver the proposal on time will result in disqualifications.

*Rev. 12/28/16*

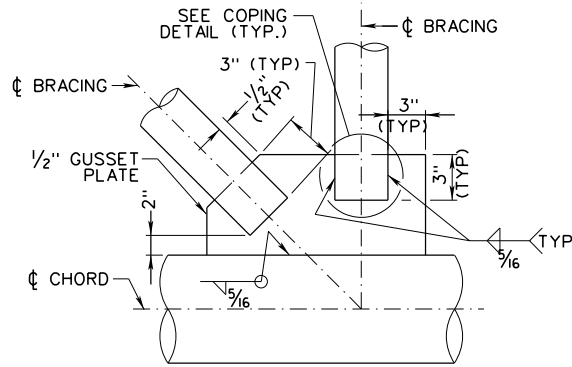
**WV PARKWAYS AUTHORITY**  
Purchasing Department



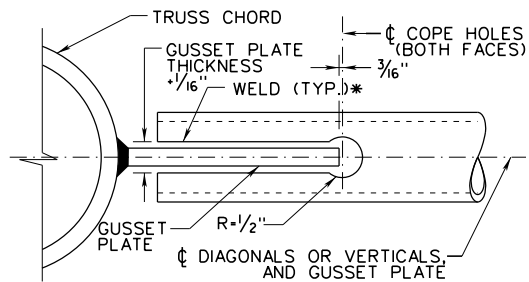


### ELEVATION

POST = VERTICAL LEG SUPPORT  
BASE PLATE = LEG PLATE

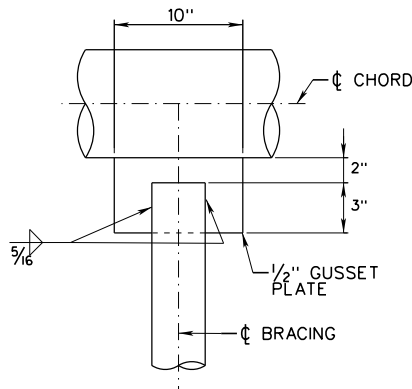


### DETAIL 4

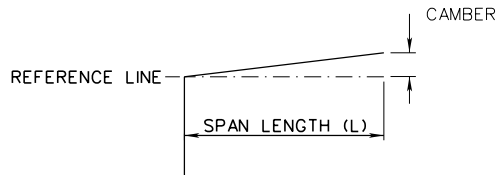


### COPING DETAIL

\* PROVIDE A WELD 'HOLDBACK' AT THE EDGE OF THE GUSSET PLATE IN THE BRACING MEMBERS EQUAL TO THE WELD SIZE REQUIRED.



### DETAIL 2



### CAMBER DETAIL

### NOTES:

1. THE STRUCTURES ARE DESIGNED IN ACCORDANCE WITH THE AASHTO STANDARD SPECIFICATIONS FOR STRUCTURAL SUPPORTS FOR HIGHWAY SIGNS, LUMINAIRES, AND TRAFFIC SIGNALS, 6TH EDITION, 2013, USING 90 MPH WIND SPEED AND FATIGUE CATEGORY I.
2. FOR SECTION A-A, B-B & D-D, SEE TE4-5.
3. FOR FOUNDATION NOTES, SEE TE4-5.
4. FOR ANCHOR BOLT DETAIL, SEE TE4-5.
5. HI-STRENGTH BOLTS SHALL CONFORM TO THE REQUIREMENTS OF THE SPECIFICATIONS. TIGHTEN ALL HIGH STRENGTH BOLTS IN ACCORDANCE WITH THE SPECIFICATIONS.
6. DETAILS LABELED AS 'NOT TO SCALE' ARE INTENTIONALLY NOT DRAWN TO SCALE FOR VISUAL CLARITY.
7. THE REMOVABLE CAP SHOULD BE A FRICTION TYPE CAP. FOR REQUIREMENTS AND DETAILS, SEE NOTES ON SHEET TE1-5A.
8. IF THE FOUNDATION IS WITHIN OR PROJECTS INTO A CONCRETE OR ASPHALT SURFACE UTILIZED BY PEDESTRIANS, THE GUIDELINES PROVIDED IN SECTION 658 OF THE STANDARD SPECIFICATIONS SHALL BE FOLLOWED IN REGARDS TO PLACEMENT AND PEDESTAL HEIGHT. OTHERWISE, ALL FACES OF THE FOUNDATION SHALL BE A MINIMUM OF 18 IN. ABOVE GROUND LEVEL. WHEN FOUNDATION IS INSTALLED ON A SLOPE, THE 18 IN. MIN. SHALL BE APPLIED TO THE UPHILL FACE.
9. FOR A STRUCTURE WITH ARM LENGTH VARYING FROM THE DESIGN LENGTHS SPECIFIED, SIZE MEMBER DIMENSIONS BASED ON THE NEXT LONGER ARM LENGTH IN THE CHART AND ADJUST PANEL WIDTH (B) ACCORDINGLY WHILE RETAINING THE NUMBER OF PANELS (N).
10. SEE SHEET TE6-3A FOR GROUNDING NOTES.
11. DEPTH OF FOUNDATION IS BASED ON AN ASSUMED SOIL SUCH AS MEDIUM CLAY OR SAND CLAY PROVIDING AN UNCONFINED COMPRESSIVE STRENGTH NOT LESS THAN 2500 LBS/SQFT. THESE FOUNDATIONS MAY BE USED IN COHESION-LESS TYPE SOILS PROVIDING THAT THE FRICTION ANGLE IS NOT LESS THAN 30 DEGREES.

### MEMBER SIZE CHART

DESIGN NUMBER	L (FT)	Bx	A	B	N	MAX. CAMBER	CHORD	BRACING	POST (d X t)	MAX SIGN AREA (SF)
DAC-16	16	9'-3"	5'-0"	4'-4"	3	7/8"	10SCH40	2.5SCH40	24 X 0.5	245
DAC-24	24	13'-3"	5'-6"	5'-3"	4	1 1/2"	16SCH40	4SCH40	24 X 0.688	390
DAC-32	32	19'-6"	6'-0"	5'-9"	5	3 1/8"	16SCH40	4SCH40	30 X 0.5	450
DAC-40	40	29'-0"	6'-6"	6'-2"	6	5 1/2"	18SCH40	5SCH40	30 X 0.5	400

L=ARM LENGTH  
Bx=CL POST TO CL SIGN PRESSURE  
A=CL OF CHORD TO CL OF CHORD  
B=LENGTH OF EACH PANEL  
N=NUMBER OF TRUSS PANELS  
d=OUTSIDE DIAMETER (IN.)  
t=PIPE THICKNESS (IN.)  
NPS=NOMINAL PIPE SIZE  
CAMBER MAY VARY.

### FOOTING TABLE

DESIGN NUMBER	POST (DIA. IN.)	PLATE DIMENSION				ANCHOR BOLTS			FOOTING	
		S	F	T	B	NO.	DIA.	HOLE	EMBEDMENT (H)	DIAMETER (D)
DAC-16	24	38"	19"	2"	32"	6	1 3/4"	2 1/8"	11'-0"	4'-0"
DAC-24	24	38"	19"	2"	32"	6	2"	2 3/8"	12'-6"	4'-0"
DAC-32	30	44"	22"	2"	38"	6	2"	2 3/8"	13'-2"	4'-6"
DAC-40	30	44"	22"	2 1/4"	38"	6	2 1/4"	2 5/8"	14'-10"	4'-6"

### BOX CONNECTION TABLE

DESIGN NUMBER	CHORD SIZE (NPS)	THICKNESS OF END PLATE (A)	THICKNESS OF BOX FLANGE PLATE (B)	BOX HEIGHT (HB)	OFFSET (X)	NO. OF BOLTS TOP AND BOTTOM	SPACING (W)	NO. OF INTER. ROWS	TOTAL NO. OF BOLTS
DAC-16	10	2"	1"	9"	8"	5	24"	2	14
DAC-24	16	2"	1"	14"	7"	6	26"	2	16
DAC-32	16	2 1/2"	1 1/4"	14"	10"	6	28"	2	16
DAC-40	18	2 3/4"	1 1/2"	16"	9"	6	30"	4	20

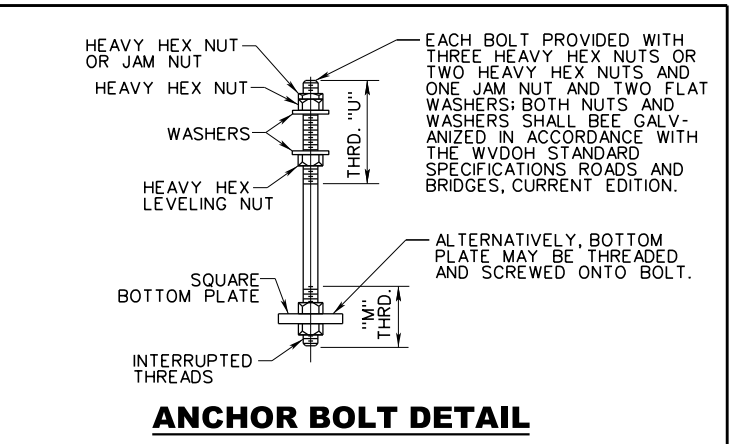
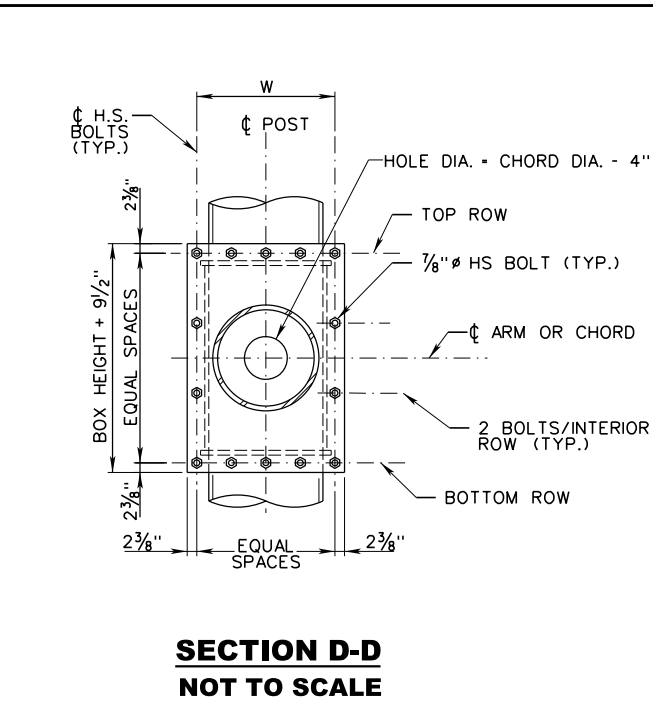
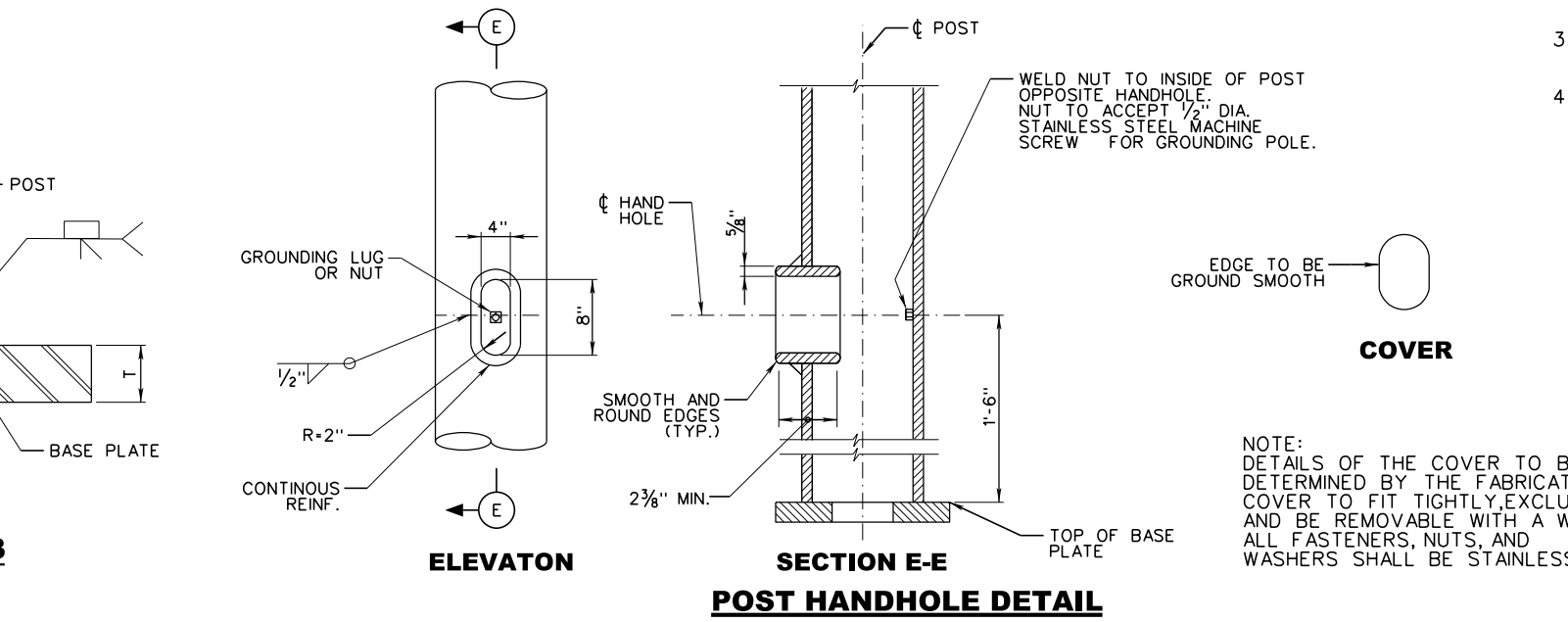
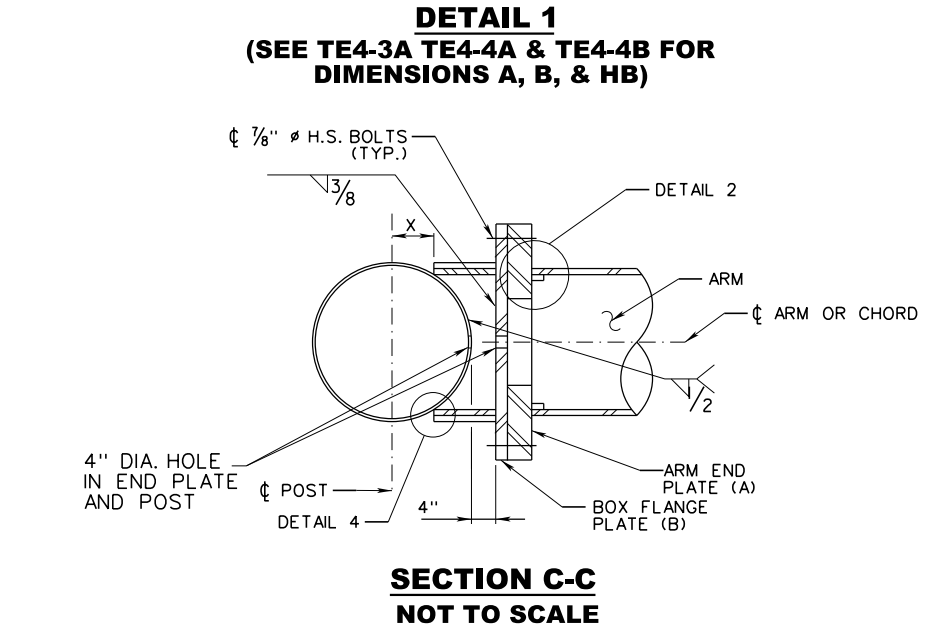
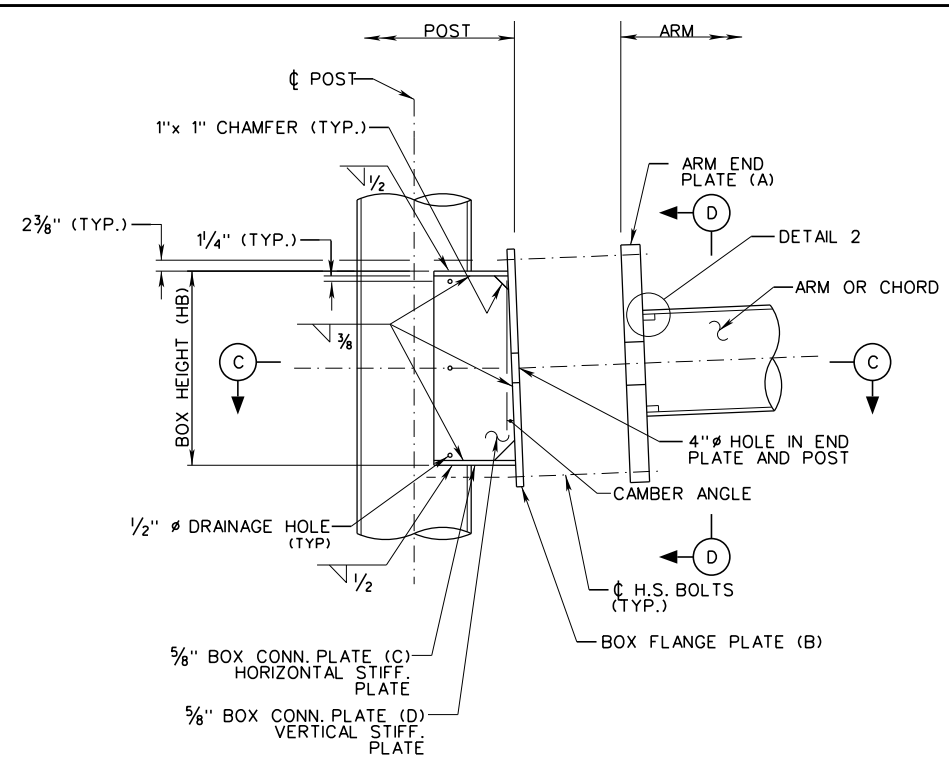
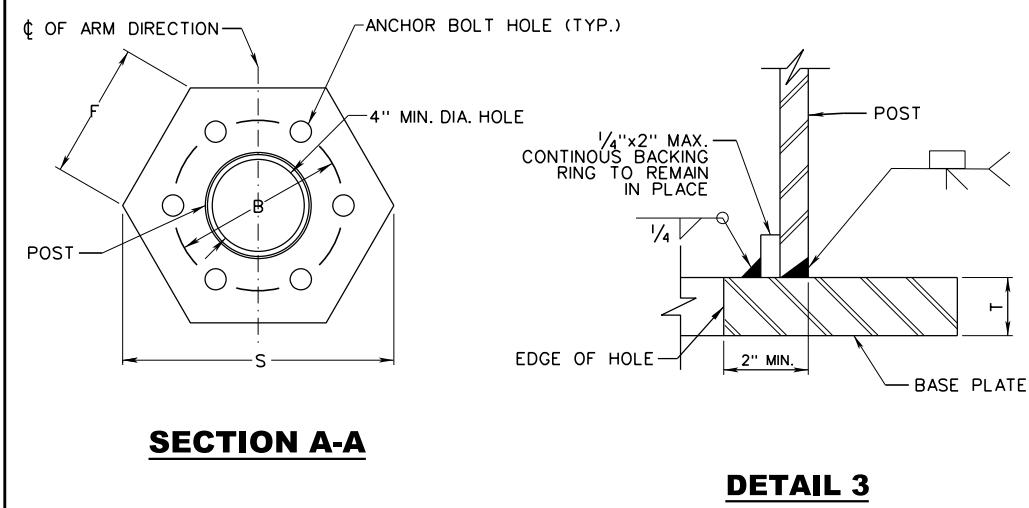
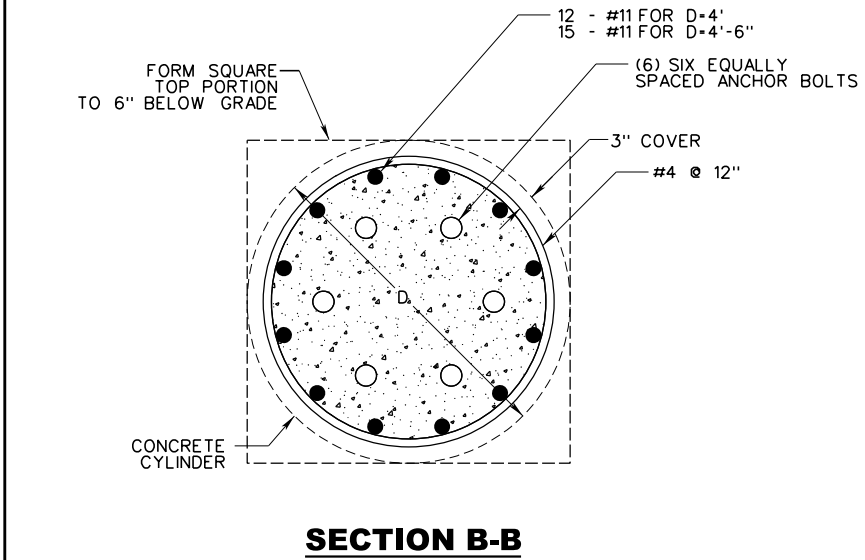
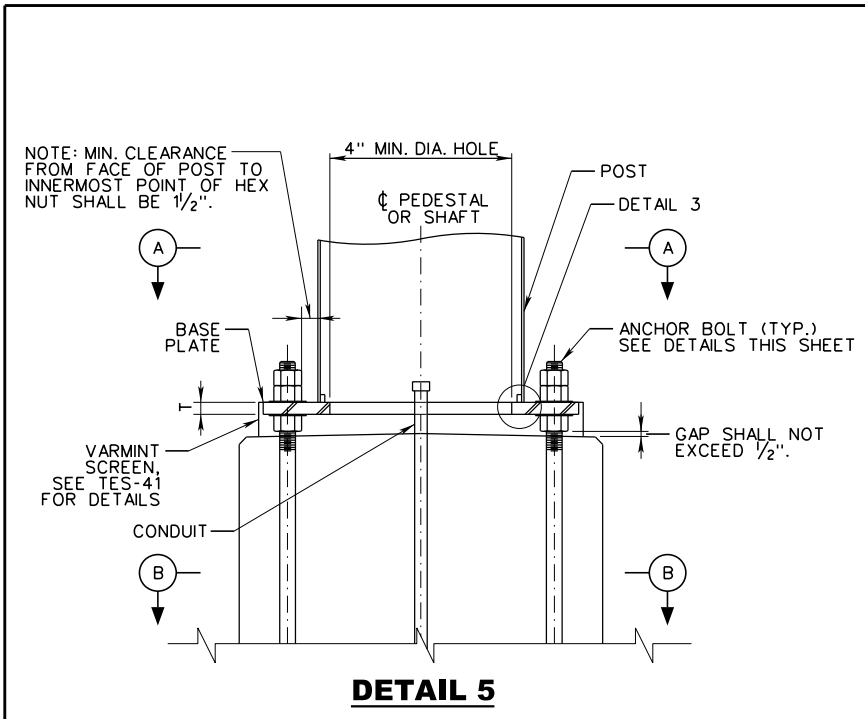
WEST VIRGINIA DEPARTMENT OF TRANSPORTATION  
DIVISION OF HIGHWAYS  
STANDARD DETAIL

PREPARED: 8/2018  
REVISION DATE

### OVERHEAD SIGN SUPPORT-STEEL

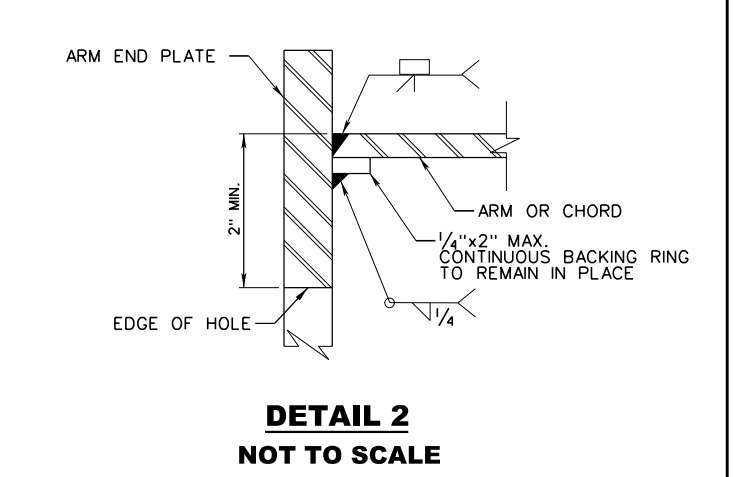
### DOUBLE ARM CANTILEVER

### STANDARD SHEET TE4-3A



**ANCHOR BOLT CHART**

ANCHOR BOLTS (IN)	BOTTOM PLATE (IN)	"M" (IN)	"U" (IN)
1 1/4 x 42	5 x 5 x 1 1/2	4 1/2	8
1 1/2 x 54	6 x 6 x 1 3/4	5 1/4	9
1 3/4 x 84	6 3/4 x 6 3/4 x 2	6	10
2 x 90	7 3/4 x 7 3/4 x 2 1/4	6 3/4	11
2 1/4 x 96	9 x 9 x 2 1/2	7 1/2	12



- NOTES:**
- BOX CONNECTION ASSEMBLY PROCEDURE:  
A. FIT-UP PLATES B, C AND D (TACK WELD).  
B. MAKE ALL FILLET WELDS. SEQUENCE AS REQUIRED TO MINIMIZE DISTORTION.  
C. WELD BOX CONNECTION ASSEMBLY TO POST.
  - ANCHOR BOLTS SHALL CONFORM TO SECTION 658 OF THE SPECIFICATIONS.
  - DETAILS SHOWN ON THIS DRAWING ARE NOT TO SCALE FOR VISUAL CLARITY.
  - GALVANIZE ALL ANCHOR BOLTS AND ASSOCIATED HARDWARE IN THEIR ENTIRETY.

**WEST VIRGINIA DEPARTMENT OF TRANSPORTATION**  
**DIVISION OF HIGHWAYS**  
**STANDARD DETAIL**

**OVERHEAD SIGN**  
**SUPPORT-STEEL**  
**COMMON DETAILS**

PREPARED: 8/2018  
REVISION DATE

**STANDARD SHEET TE4-5**

## **SECTION 658**

### **OVERHEAD SIGN STRUCTURES**

#### **658.1-DESCRIPTION:**

This item shall consist of the fabrication and erection of overhead bridge, cantilever, and butterfly sign supports and fastening accessories in accordance with the requirements of the Plans and of these Specifications. All details not specified or not shown on the Plans shall conform to the details and requirements set forth in the following Specifications and publications:

*The Manual on Uniform Traffic Control Devices for Streets and Highways*, latest issue, including revisions, as printed by the Federal Highway Administration, U.S. Department of Transportation. (Referred to as the MUTCD).

*Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals*, latest issue, including revisions, American Association of State Highway and Transportation Officials.

#### **658.2-MATERIALS:**

Materials furnished by the Contractor shall be of new stock conforming to the requirements of the Standard Specifications, and shall meet with the approval of the Engineer.

All materials shall conform to the requirements of Division 700 of the Standard Specifications and shall also conform to the following requirements unless otherwise modified on the Plans. All referenced specifications for materials shall be the latest available specifications and revisions at the time of award of the contract.

**658.2.1-Aluminum:** Tubular aluminum supports of a uniform diameter shall be fabricated from Alloy 6061-T6 or Alloy 6063-T6, ASTM B221, B429, or B 241 for extruded sections or ASTM B 209 for sheet sections.

Structural shapes and bars shall be Alloy 6061-T6, ASTM B 221, or B 308. Plates shall be Alloy 6061-T6, ASTM B209.

Castings for support top caps and horizontal member end caps shall be ASTM B 26 Alloy 356-F or Alloy 43, and shall be held in place by stainless steel set screws. The same type cap must be used throughout a project.

Aluminum hardware shall meet the requirements of 658.2.1.3. Steel nuts, bolts and washers used on aluminum structures shall be stainless. Welding wire shall be in accordance with 658.4.

#### **658.2.2-Steel:**

**658.2.2.1-Galvanized Steel:** All steel items shall be galvanized in accordance with ASTM A 123 or ASTM A 153, unless otherwise specified.

Vertical poles, transverse horizontal beams and horizontal arms shall be tapered tubular sections or tubular sections of uniform diameter and shall have a minimum yield strength of 55,000 psi (380 MPa) after fabrication. All tubular sections shall have only one longitudinal weld. Any taper shall be uniform and continuous. Other tubular structural members shall be uniform in diameter and shall be fabricated from seamless or welded pipe conforming to ASTM A 501 or ASTM A 53, Type E or S, Grade B (hydrostatic tests are waived).

Tubular sections of a uniform diameter shall be fabricated from seamless and welded pipe conforming to ASTM A 501 or ASTM A 53, Type E or S, Grade B (hydrostatic tests not required).

Steel for other structural members, plates and structural shapes shall conform to ASTM A 36, except plates over 1 inch (25 mm) thick shall conform to ASTM A 572, Grade 42.

Support top and horizontal end cap castings shall be ASTM B 26 Alloy S5A or Alloy 356-F. Caps will be held in place by stainless steel set screws. The same type cap shall be used throughout the project.

Stainless steel bolts, nuts and washers for splicing flanges shall be AISI 300 series, commercial grade and passivated. High strength bolts and nuts for splicing flanges shall conform to ASTM A 325 or ASTM A 193-B7.

Reinforcing materials shall be in conformance with 709.1 to 709.4, inclusive, except that welded wire fabric may be furnished in rolls.

Anchor bolts shall be of sufficient size and strength to fully develop the bending moment of the shaft. Anchor bolts (unless otherwise directed on the Plans) shall be fabricated from high strength steel, meeting ASTM F 1554, GRADE 105. Each bolt shall have the threaded end galvanized for a length sufficient to extend down through the grout and into the concrete foundation. Each bolt shall be provided with two heavy hex nuts and two heavy washers. Both nuts and washers shall be hot-dipped galvanized in accordance with ASTM A 153 and the nuts shall meet the physical, chemical and dimensional requirements of ASTM A 563, Grade DH or ASTM A 194-2H.

Detailed properties, dimensions, bolt circles and appropriate backup calculations for any proposed alternate design anchor bolts shall be submitted to and approved by the Division before fabrication.

**658.2.2.2-Weathering Steel:** All components of the overhead sign supports including miscellaneous fixtures, shall be fabricated from plates, bars, standard W, M, and S shapes produced from steel conforming to AASHTO M270, Grade 50W T-2, and tubes produced from steel conforming to ASTM A 618, Grade 1 with AASHTO M270 supplementary section S83, zone 2 toughness requirements.

Expanded metal screen shall be fabricated from steel sheets conforming to ASTM A 606, Type 4, with special alloys to provide weathering properties equivalent to ASTM A 588 or ASTM A 618 steel. Framing plates for expanded metal screen shall be fabricated from steel conforming to ASTM A 588 or ASTM A 242.

Bolts, nuts and washers for field splices and connections shall conform to ASTM A 325, Type 3. When allowed by the Engineer, they shall conform to ASTM A 325, Type 1 or 2, with hot-dipped galvanizing in accordance with ASTM A 153. Etching and painting shall be performed to match 595 standard color 20062.

The truss of post connections for box truss overhead supports shall be cast steel conforming to ASTM A 486, Class 90. Pins shall conform to ASTM A 108, Grade 1118. Pin holes in the casting shall be reamed to true size.

Reinforcing materials shall be in conformance with 709.1 to 709.4, inclusive, except that welded wire fabric may be furnished in rolls.

Anchor bolts shall be of sufficient size and strength to fully develop the bending moment of the shaft. Anchor bolts shall be fabricated from high strength steel having a minimum yield strength of ASTM A1554, Gr. 105 Each bolt shall be provided with two

heavy hex nuts. Both nuts shall be hot-dipped galvanized and, as a minimum, meet the physical, chemical and dimensional requirements of ASTM A 307. Washers shall be of standard commercial grade steel having the dimensions shown on the Detail Drawings and be hot-dipped galvanized in accordance with ASTM A 153.

Filler metal for welds shall conform to the requirements of 615.5.7.

**658.2.3-Concrete:** Concrete for sign foundations shall be Class B in accordance with 601.

**658.2.4-Reinforcing Steel Bars:** Reinforcing steel bars shall conform to the applicable requirements of 602.

## CONSTRUCTION METHODS

### 658.3-FABRICATION:

**658.3.1-General:** Before fabrication of any sign structure, the Contractor shall submit for the Engineer's approval complete detail drawings, eight copies, of each structure. This shall include drawings of all structural steel or aluminum framing and bracing, aluminum or steel castings, lighting fixtures and supporting brackets, sign brackets and any miscellaneous accessories for the above. It is expressly understood that the review by the Engineer of these drawings relates to the requirements for strength and general details, and will not relieve the Contractor from responsibility for errors in detail, dimension, or quantity of materials, etc.

Overhead sign supports shall be fabricated in accordance with the Plans and this Specification. Any alternate design or significant departure from the Plans proposed by the Contractor must be presented in written or plan form for approval. The Division will approve or disapprove alternate proposals in writing. All materials in any alternate proposal which is a significant departure from the Specifications shall conform to the requirements of current AASHTO and ASTM Specifications. The Division will not approve substitution of material or design detail changes which constitute a reduction in quality, workmanship or strength of the structures.

Ends of sections shall be cut true and smooth, free from burrs and ragged breaks. Open ends of tubular sections shall be capped as shown on the Plans. Drain holes and handholes shall be provided wherever shown or necessary.

Sign supports, either aluminum or steel, shall be void of circumferential welding except at the base, flanges, or intersection of diagonals.

The welding of steel shall be in accordance with the requirements of American Welding Society D1.1 and shall be done by qualified welders. Aluminum Alloy Welding shall be accomplished in accordance with 658.4.

The loading, transporting, unloading, and piling of structural materials shall be conducted so that the metal will be kept clean and free from injury in handling. Structural materials shall be stored above the ground upon platforms, skids, blocks, or other supports. They shall be kept free from accumulation of dirt, oil, acids, or other foreign matter. Any structural material which has been deformed shall be straightened by approved methods before being laid out, punched, drilled, or otherwise worked upon in the shop. Sharp kinks or bends will be cause for rejection.

Where required or indicated on the Plans, a sufficient number of reinforced handholes and electrical wire inlets and outlet fittings shall be built into the structures. Where a cable passes through a hole or runs along a surface at any point through or on the complete assembly, such

holes and surfaces shall be deburred and void of any sharp edges through or along the surface. A "J" hook shall be provided on the inside of the top of the vertical support on which the electrical wiring shall be placed as shown on the Detail Drawings.

**658.3.2-Structures Utilizing Galvanized Steel:** The flanges at the center of the cross beam and at the ends of the horizontal arms shall be fastened to the tapered or straight sections by means of two circumferential welds. One of the circumferential welds shall firmly weld the outside of the flange to the tube. Any alternate flange connection offered shall be designed to develop fully the strength of the tubular sections being jointed together by means of the flange connection.

It is essential that all exposed surfaces of the completed steel structure be finished with a galvanized coating. The frame shall be fabricated into sections as large as can be handled in pickling and galvanizing tanks and then dipped as complete units, ready for field bolted connections wherever possible. Field welding and the need for repairing zinc coatings damaged by assembly shall be kept to an absolute minimum.

Galvanized coatings damaged for any reason shall be repaired by the application of a zinc rich paint conforming to the requirements of 711.21.

The places to be painted shall be thoroughly cleaned before the paint is applied.

**658.3.3-Structures Utilizing Weathering Steel:** Overhead sign structures of weathering steel are to have a natural weathering finish and shall be kept clear of all paint, grease, or other agents which will tend to cause an uneven finish on the posts. Any identification marks shall be painted on the bottom of the base plates, inside faces of loose column components and the top surface of horizontal members. All structures shall be delivered to the job site at least three months prior to completion of the work and stored in a manner that will allow them to obtain initial natural weathering. If they are stacked on the job site during this period, they shall be rotated at least once each two months. All members shall be shop cleaned in accordance with 615.6.4, utilizing commercial blast cleaning throughout. No corrosion inhibitors shall be used in the processes.

All welding shall conform to the requirements of AWS D1.1.

#### **658.4-WELDING OF ALUMINUM ALLOYS:**

These specifications apply to the welding of aluminum alloys used in sign structures, bridge rails, lamp posts, etc.

The welding terms used in these specifications shall be interpreted in accordance with the definitions given in the latest edition of AWS Definitions--Welding and Cutting (AWS A3.0) of the American Welding Society.

The welding symbols used on plans shall be those shown in the latest edition of Standard Welding Symbols (AWS A2.0) of the American Welding Society. Special conditions shall be fully explained by added notes or details.

**658.4.1-Base Metals:** The aluminum alloys to be welded under these specifications may be any of the following alloy designations (ASTM designations):

- i. Wrought non-heat-treatable alloys
  - Alloy 3003
  - Alloy 3004
  - Alloy 5052
  - Alloy 5083
  - Alloy 5086
  - Alloy 5456
- ii. Wrought heat-treatable alloys
  - Alloy 6061
  - Alloy 6063
- iii. Cast heat-treatable alloys
  - Alloy 356.1
  - Alloy A356.2

**658.4.1.1-Materials** used for permanent backing shall be at least equivalent in weldability to the base metal being welded.

**658.4.2-Welding Processes:** These Specifications include provisions for welding by the gas metal-arc process and the gas tungsten-arc process. Other processes shall not be used except as permitted by the Engineer.

**658.4.3-Filler Metal:** Bare wire electrodes for use with gasmetal-arc process and welding rods for use with the gas tungsten-arc process shall conform to the requirements of the latest edition of Specifications for aluminum and aluminum alloy rods and bare electrodes AWS A5.10.

Tungsten electrodes for the gas tungsten-arc process shall conform to the requirements of the latest edition of Specifications for Tungsten-Arc-Welding Electrodes, AWS A5.12.

Filler metals to be used with particular base metals shall be as shown in Table 658.4.3. Other filler metals may be used as approved by the Engineer.

**TABLE 658.4.3**

<b>Base Metal</b>	<b>Filler Material</b>
3003 to 3003	ER1100
3004 to 3004	ER4043
5052 to 5052	ER5356*
5083 to 5083	ER5183
5086 to 5086	ER5356*
5456 to 5456	ER5556
5670B to 6061	ER4043*
5670B to 6063	ER4043*
356.1 to 6061	ER4043
A356.2 to 6063	ER4043
6061 to 6063	ER4043 or ER5356
6061 to 6061	ER4043 or ER 5356
6063 to 6063	ER 4043 or ER5356

\* ER5183, ER5356, and ER 5556 may be used interchangeably for these base metals.



Filler metals shall be kept covered and stored in a dry place at relatively uniform temperatures. Original rod or wire containers shall not be opened until time to be used. Rod and wire shall be free of moisture, lubricant, or other contaminants. Spools of wire temporarily left unused on the welding machine shall be kept covered to avoid contamination by dirt and grease collecting on the wire. If a spool of wire is to be unused for more than a short length of time, it shall be returned to the carton and the carton tightly resealed.

**658.4.4-Shielding Gases:** Shielding gases shall be welding grade or better.

Shielding gas for gas metal-arc welding shall be argon, helium, or a mixture of the two (approximately 75 percent helium and 25 percent argon).

Shielding gas for gas tungsten-arc welding done with alternating current shall be argon.

Shielding gas for gas tungsten-arc welding done with direct current, straight-polarity, shall be helium.

Hose used for shielding gases shall be made of synthetic rubber or plastic. Natural rubber hose shall not be used. Hose which has been previously used for acetylene or other gases shall not be used.

**658.4.5-Preparation of Materials:** Joint details shall be in accordance with design requirements and detail drawings. The locations of joints shall not be changed without the approval of the Engineer.

Edge preparation shall be by sawing, machining, clipping, or shearing. Gas tungsten-arc or gas metal-arc cutting may also be used. Cut surfaces shall meet the American Standards Association surface roughness rating value of 1,000. Oxygen cutting shall not be used.

Surfaces and edges to be welded shall be free from fins, tears, and other defects which would adversely affect the quality of the weld.

Dirt, grease, forming or machining lubricants or any organic materials shall be removed from the areas to be welded by cleaning with a suitable solvent or by vapor degreasing.

On all edges and surfaces to be welded, the oxide shall be removed just prior to welding by wire brushing or by other mechanical methods such as rubbing with steelwool or abrasive cloth, scraping, filing, rotary planing, or sanding. If wire brushing is used, the brushes shall be made of stainless steel. Hand or power driven wire brushes which have been used on other materials shall not be used on aluminum.

Where mechanical methods of oxide removal are found to be inadequate, a standard chemical method shall be used. Welding shall be done within 24 hours after chemical treatment.

When gas tungsten-arc welding with direct current, straight polarity is being used, all edges and surfaces to be welded shall have the oxide removed by a standard chemical method.

Welding shall not be done on anodically treated aluminum, unless the condition is removed from the joint area to be welded.

**658.4.6-Welding Procedure:** All butt welds requiring 100 percent penetration, except those produced with the aid of backing, shall have the root of the initial weld chipped or machined out to sound metal before welding is started from the second side. Butt welds made with the use of backing shall have weld metal thoroughly fused with the backing. Where accessible, backing for welds that are subject to computed stress or which are exposed to view on the completed structure and which are not otherwise parts of the structure, shall be removed

and the joints ground or machined smooth. In tubular members, butt welds subjected to computed stresses shall be made with the aid of permanent backing rings or strips.

The procedure used for production welding of any particular joint shall be the same as used in the procedure qualification for that joint.

All welding operations, either shop or field, shall be protected from air currents or drafts so as to prevent any loss of gas shielding during welding. Adequate gas shielding shall be provided to protect the molten metal during solidification.

The work shall be positioned for flat position welding whenever practicable.

In both shop and field, all weld joints shall be dry at the time of welding.

The size of the electrode, voltage and amperage, welding speed, gas or gas mixture, and gas flow rate shall be suitable for the thickness of material, design of joint, welding position and other circumstances attending the work.

Gas metal-arc welding shall be done with direct current, reverse polarity.

Gas tungsten-arc welding shall be done with alternating current or with direct current straight polarity.

When the joint to be welded requires specific root penetration, the Contractor shall make a sample joint and a macroetched cross section of the weld to demonstrate that the joint welding procedure to be used will attain the required root penetration. The sample joint shall have a length of at least 1 foot (300 mm) and shall be welded with the electrode, polarity, amperage, voltage, speed, gas mixture and gas flow rate that are proposed to be used in production welding. The Engineer, at their discretion, may accept evidence on record in lieu of the preceding test.

Where preheat is needed, the temperature of preheat shall not exceed 350° F (175 ° C) for heat-treated alloys or 600° F (315° C) for non-heat-treated alloys. The temperature shall be measured by temperature indicating crayons or by pyrometric equipment. Heat treated alloys shall not be held at the maximum preheat temperature or at temperatures near the maximum for more than 30 minutes.

**658.4.7-Weld Quality:** Regardless of the method of inspection, the acceptance or rejection of welds shall be determined by the following conditions:

- i Cracks in welds or adjacent base metal will not be acceptable.
- ii Copper inclusions will not be acceptable.
- iii Porosity in excess of that permitted by Appendix IV, Section of the ASME Boiler and Pressure Vessel Code will not be acceptable.
- iv Lack of fusion, incomplete penetration, or tungsten or oxide inclusions will be acceptable only if small and well dispersed.

Undercut shall not be more than 0.01 inch (250 µm) deep when its direction is transverse to the primary stress in the part that is undercut.

Undercut shall not be more than 1/32 inch (800 µm) deep when its direction is parallel to the primary stress in the part that is undercut.

No overlap shall be allowed.

All craters shall be filled to the full cross section of the welds.

Welds having defects greater than the levels of acceptance specified above shall be considered as rejected unless corrected in accordance with 658.4.9.

**658.4.8-Inspection:** To determine compliance with 658.4.7, all welds shall be visually inspected and, in addition, all welds subjected to computed stress shall be inspected by the dye penetrant method except as specified in 658.4.8.3.

**658.4.8.1-**For highway sign structures, the dye penetrant method shall be used on butt welds in columns and main chord members, and on fillet welds connecting columns to bases and main chord members, including the associated flanges, gussets, or main load carrying brackets or members; also, on fillet welds connecting flanges to the main truss chord members.

**658.4.8.2-**The dye penetrant tests shall be performed in accordance with the requirements of ASTM E 165, Method B, Procedures B-2 or B-3.

**658.4.8.3-**Dye penetrant inspection may be omitted provided that the inspector examines each layer of weld metal with a magnifier of 3X minimum before the next successive layer is deposited.

**658.4.9-Corrections:** In lieu of rejection of an entire piece or member containing welding which is unacceptable, the corrective measures listed below may be permitted by the Engineer, whose approval shall be obtained prior to making each repair.

**658.4.9.1-**Defective welds shall be corrected by removing and replacing the entire weld, or as follows:

- i. Cracks in welds or base metal: Determine full extent of crack by dye penetrant method or other positive means. Remove crack throughout its length and depth, and reweld.
- ii. Excessive porosity, lack of fusion: Remove defective portions and reweld.
- iii. Copper or tungsten inclusions: remove defective portions and reweld.
- iv. Excessive concavity of crater, undercut, undersize weld: Clean and deposit additional weld metal.
- v. Overlap: Reduce by removal of excess weld metal.

**658.4.9.2-**The defective areas shall be removed by chipping or machining. Oxygen cutting shall not be used. Before rewelding, the joint shall be inspected to assure that all the defective weld has been removed. If dye penetrant has been used to inspect the weld, all traces of penetrant solutions shall be removed with solvent, water, heat, or other suitable means before rewelding.

**658.4.10-Qualification of Procedures, Welders and Welding Operators:** Joint welding procedures which are to be employed in executing contract work under these specifications shall be previously qualified by tests prescribed in Part B, Section IX, of the ASME Boiler and Pressure Vessel Code. The qualifications shall be at the expense of the Contractor. The Engineer, at their discretion, may accept evidence of previous qualification of the joint welding procedures to be employed.

All welders and welding operators to be employed under these specifications shall be previously qualified by tests as prescribed in Part B, Section IX, of the ASME Boiler and

Pressure Vessel Code. The Engineer, at their discretion, may accept evidence of previous qualification of the welders and welding operators to be employed. The same process and type of equipment that is required for execution of the construction work shall be used in qualifying welders and welding operators.

#### **658.5-ERECTION:**

Erections of sign structures shall be in accordance with the applicable provisions of the current edition of the Standard Specifications and the requirements given below. The Contractor shall provide all tools, equipment and appliances necessary for the expeditious handling of the work, all of which shall be subject to the approval of the Engineer. Materials and workmanship not previously inspected will be inspected on the site of the work and all rejected material shall be removed from the site of the work.

In order to reduce the hazards of performing work over roadways and to provide sign loads to sign bridges immediately, the sections of a horizontal strut of any bridge shall be spliced together for the full length of one span and all sign panels, lighting and other accessories required thereon, as described elsewhere in these Specifications, shall be fully installed before erecting the complete assembly between the previously erected columns or as directed by the Engineer. The fully assembled structure shall be handled and erected in such a manner as not to damage any of the installations thereon.

Overhead sign supports shall provide a vertical clearance, between the bottom edge of the sign or luminaire support for the full width of the pavement and shoulders of not less than 17 feet (5.2 m).

The Contractor shall take full responsibility for checking all cross sections at approved sign locations to determine final sign structure dimensions.

Where cylindrical concrete footings are used, the concrete shall be placed against undisturbed earth. Earth augers, if used shall be of the same diameter as the footings. Where a trench is required, it shall be only as wide and long as is necessary to accommodate the work. The excavation shall be made in accordance with the applicable provisions of the Standard Specifications. All excavations shall be backfilled with suitable random material in horizontal layers not to exceed 4 inches (100 mm) after compaction. Each lift shall be compacted to the satisfaction of the Engineer. Testing is not required. All surplus material shall be removed from the right-of-way and the backfill finished flush with surrounding natural ground, including replacement of any damaged facilities or appurtenances. The Contractor shall restore all areas disturbed by this excavation or other operations to their original conditions including grading, seeding, mulching and fertilizing as directed by the Engineer.

If rock or boulders are encountered during the excavation, they shall be removed to a depth sufficient, in the opinion of the Engineer, to obtain the stability necessary to support the complete sign structure.

The footings shall be of Class B concrete, reinforced, of the types shown on the Plans. Steel reinforcement, anchor bolts and conduit for the footings shall be as shown on the Plans.

All overhead sign structures shall have ground rods, irregardless of whether they have sign lighting or other electrical components. Ground rods shall be copperclad steel,  $\frac{3}{4}$  inches (19 mm) in diameter with a minimum length as noted on the Plans and shall be one piece. Sectional or segmented ground rods are not permitted. The ground rods shall be complete with ground clamp and square head bolt.

The anchor bolts shall be set accurately, by means of a template in the position shown on the drawings and held rigidly in the forms so as to avoid displacement during the pouring of concrete. The steel reinforcement and conduit shall have been properly placed and secured before the pouring of concrete. The Contractor shall make periodic checks of the bolt positions and elevations during concreting operations. It is essential that the distance between the centers of anchor bolt groups of the two or three foundations of a frame be exactly the span lengths shown on the Plans.

Two inch (50 mm) diameter galvanized conduit shall be furnished and installed in the post foundations at locations as specified on the Plans. The conduit shall terminate above the top of the foundation and shall be fitted with a 2 inches (50 mm) capped grounding bushing above the foundation. The lower end of the conduit shall emerge from the side of the footing to be joined to conduit from the junction box.

The entire structure shall be erected and adjusted for plumbness, grades and alignment by the manipulation of the leveling nuts on the anchor bolts.

Electrical materials and other installations need not be in place on the columns at the time of column erection.

Brackets for attaching signs shall be spaced as shown on the Standard Drawings or the Plans. There shall be a minimum of two brackets per sign.

The field assembling of the component parts of a structure shall be done in a manner not likely to produce damage by twisting, bending, or otherwise deforming the metal. Any member slightly bent or twisted shall have all defects corrected in an approved manner before being placed. Members seriously damaged will be rejected. All exposed surfaces shall be free of blemishes and scratches. Painting will not be allowed. Just prior to erection, the aluminum shall be thoroughly cleaned and any accumulations of oil, grease, dirt or foreign materials shall be removed by the use of an approved solvent cleaner.

Protection of aluminum is required where aluminum members are to be attached to concrete masonry or steel which is neither galvanized nor stainless. To avoid the possibility of corrosion, aluminum members attached to such bare steel shall be coated at the points of contact with a zinc chromate primer or as called for on the Plans. The surfaces of steel members, nongalvanized, shall likewise be coated at the points of contact with a suitable priming paint and this shall be followed by a coat of aluminum paint. Where aluminum surfaces are to be in contact with concrete or masonry, they shall first be given a heavy coat of an alkali-resistant bituminous paint.

#### **658.5.1-Erection of Columns or Cantilever Uprights:**

- I. Place leveling nuts, then washers on anchor bolts at level position.
- II. Insure anchor bolts and the bolt holes in base plate are properly aligned.
  - a. No cold working of bolts will be allowed.
  - b. No cutting or reaming of holes will be allowed without prior approval from the Traffic Engineering Division.
- III. Place column or cantilever upright onto the anchor bolts.
- IV. Hold column or cantilever upright at true plumb.
  - a. Adjust leveling nuts as necessary (column may not always be exactly perpendicular to base plate due to welding distortion, etc.).

- V. All bolts will be coated with either of the following waxes; Jon Cote 639 or MacDermid Torque 'N Tension Control Fluid. The top anchor bolt nuts must be installed the same day that the wax is applied to the anchor bolts.
- VI. Place washers, then the top anchor bolt nuts on the anchor bolts.
- VII. Snug the anchor bolt nuts alternating corner-to-corner and side-to-side. Snug tight is defined as the tightness which exists due to the full effort of a man using a spud wrench with the appropriate length handle for the bolt being tightened. The following chart indicates the size of the wrench to be used when snugging bolts:

<b><u>BOLT DIAMETER</u></b>	<b><u>HANDLE LENGTH OF WRENCH</u></b>
3/4 in (19.05 mm)	23" (575 mm)
7/8 in (22.23 mm)	23" (575 mm)
1 in (25.40 mm)	23" (575 mm)
1-1/4 in (31.75 mm)	23" (575 mm)
1-1/2 in (38.10 mm)	36" (900 mm)
1-3/4 in (44.45 mm)	36" (900 mm)
2 in (50.80 mm)	36" (900 mm)
2-1/4 in (57.15 mm)	36" (900 mm)

- VIII. Apply 1/3 turn to each nut in the same sequence as snugging. Mark top anchor bolt nuts, anchor bolts, and base plate for reference to insure proper rotation is achieved. A hydraulic torque wrench meeting the minimum requirements specified must be used to properly tension the anchor bolt nuts. Breaker bars, cheater bars, air wrenches, or other mechanical devices will not be allowed as they cannot achieve the proper tension.
- IX. Release any load by crane or other erection device. The anchor bolt nuts must be properly tightened before removal of the crane.
- X. Check structure. If problems exist such as the anchor connections are loose, then repeat the nut tightening procedure.

#### **658.5.2-Connection of Spans:**

- I. Lift span, with signs, lighting and other accessories attached, to columns and insure bolts and bolt holes properly aligned.
- II. Insure connecting plates fit with no burrs or other seating inhibitors.
- III. Install bolts, nuts, and washers to snug tight, corner-to-corner and side-to-side. Use the above chart to determine a proper size wrench for snugging bolts. All bolts will be properly waxed before the nuts are installed.
- IV. Apply appropriate rotation to turning element in the same sequence as snugging and for high strength bolts in accordance with Table 615.3.214B of the Standard Specifications.
- V. Check structure. If problems exist, such as loose arm connections or showing gaps, the load must be removed from the area in question and steps repeated as necessary.

**658.5.3-Hydraulic Torque Wrench Specifications:** Anchor bolt nuts may only be tightened by a hydraulic wrench with a Minimum Capacity of 5300 feet lbs. (7,180 Newton Meter), and must be capable of tightening or loosening.

**658.5.4-Verification of Contractor's Equipment and Personnel:** The Contractor will contact the Materials Control, Soils and Testing (MCS&T) Section ten working days prior to erection of the first sign structure. MCS&T personnel will meet with the inspector and contractor to verify installation procedures.

**658.6-METHOD OF MEASUREMENT:**

**658.6.1-Class B Concrete Footing, Reinforced, Overhead:** The quantity of work done for Class B Concrete Footings, Reinforced, Overhead will be measured in cubic yards (meters), complete in place and accepted, as determined by the dimensions on the Plans or Contract documents, subject to adjustment as provided for in 104.2 and 109.2.

**658.6.2-Overhead Sign Structures:** Measurement for payment for overhead sign structures will be based on each unit complete in place, which will include the various elements of the structure consisting of vertical end support units, horizontal units, vertical sign brackets, structural framing for signing if required, sign lighting support hardware if required (horizontal brackets, pads, bolts, nuts, plates, etc.) and any other accessories or hardware as required to make a complete installation as called for on the Plans or as directed by the Engineer.

**658.7-BASIS OF PAYMENT:**

The quantities, determined as provided above, shall be paid for at the contract unit price for the items listed below, which prices and payment shall be full compensation for furnishing all the materials and doing all work prescribed in a workmanlike and acceptable manner, including staking out footings and stakes therefore; excavating for footings regardless of the type of material encountered; constructing and removing forms; furnishing and installing reinforcing steel, anchor bolts, washers and nuts; furnishing and installing electrical grounding and conduit sleeves; furnishing, placing, finishing and curing the concrete; furnishing and placing grout as required by the Plans; fabrication, delivery and erection of each overhead sign; and including all tools, equipment, supplies and incidentals necessary to complete the work. All incidental work and materials for which no basis of payment is provided will be considered as completely covered by the prices bid for the items included in the contract.

**658.8-PAY ITEMS:**

ITEM	DESCRIPTION	UNIT
658001-*	Class B Concrete Footings, Reinforced, Overhead	Cubic Yard (Meter)
658002-*	Overhead Sign, Steel-Aluminum Combination	Each
658003-*	Overhead Sign, Galvanized Steel	Each
658004-*	Overhead Sign, Weathering Steel	Each

\* Sequence number



of the ground surface to its original condition. No differentiation in payment shall be made based on support size, bracket type, or the method that was originally used to anchor the support.

**657.6-BASIS OF PAYMENT:**

The quantities, determined as provided, will be paid for at the contract unit price for the items listed below, which prices and payment shall be full compensation for furnishing all the material and doing all the work prescribed in a workmanlike and acceptable manner, including all tools, equipment, supplies and incidentals necessary to complete the work. All incidental work and materials for which no basis of payment is provided will be considered as completely covered by the prices bid for the items included in the Contract.

**657.7-PAY ITEMS:**

ITEM	DESCRIPTION	UNIT
657006-001	S4X7.7 Steel Beam Support	Linear Foot
657006-005	W6X12 Steel Beam Support	Linear Foot
657006-010	W8X18 Steel Beam Support	Linear Foot
657006-015	W10X22 Steel Beam Support	Linear Foot
657008-001	2.00 LB Channel Post	Linear Foot
657010-001	3.00 LB Channel Post	Linear Foot
657012-001	4.00 LB Back to Back Channel Post	Linear Foot
657014-001	6.00 LB Back to Back Channel Post	Linear Foot
657016-001	Class B Concrete Footing, Plain, Roadside	Cubic Yard
657017-001	Class B Concrete Footing, Reinforced, Roadside	Cubic Yard
657018-001	Support or Bracket Removal	Each
657019-001	Pipe Post	Each
657035-001	Square Tube Support, 2.00X14GA	Linear Foot
657040-001	Omni-Directional Breakaway Device	Each
657041-001	Back to Back U-Channel Breakaway Device	Each
657042-001	Surface Mount Breakaway Device	Each
657050-001	Bridge or Retaining Wall Bracket, Type	Each
657060-001	Barrier Wall Bracket, Type	Each

## SECTION 658 OVERHEAD SIGN STRUCTURES

**658.1-DESCRIPTION:**

DELETE THE CONTENTS OF SUBSECTION 658.1 AND REPLACE WITH THE FOLLOWING:

This item shall consist of the fabrication and erection of overhead frame, cantilever, butterfly, and span structure sign supports and fastening accessories in accordance with the requirements of the Plans and of these Specifications. All details not specified or not shown on

the Plans shall conform to the details and requirements set forth in the following Specifications and publications:

- i. West Virginia Department of Transportation, Division of Highways, Standard Details Book Vol. II, Signing, Signals, Lighting, Markings, and ITS, latest issue, including revisions (further referenced to herein as the Standard Details).
- ii. The Manual on Uniform Traffic Control Devices for Streets and Highways, latest issue, as printed by the Federal Highway Administration, U.S. Department of Transportation (Referred to as the MUTCD).
- iii. Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals, 6<sup>th</sup> Edition, including revisions, American Association of State Highway and Transportation Officials.

All material, fabrication, and installation requirements for overhead frame structures shall be included in the project Plans and shop drawings.

## **658.2-MATERIALS:**

DELETE THE CONTENTS OF SUBSECTION 658.2 AND REPLACE WITH THE FOLLOWING:

Materials furnished shall be of new stock conforming to the requirements of the Specifications, and shall meet the approval of the Engineer.

**658.2.1-Pipe:** Non-tapered steel pipe used for arms, chords, support legs, and bracing shown on various Standard Detail sheets shall be seamless or welded pipe conforming to A500 Gr. B or C, API 5L X42 or X52, A53 Grade B, or A252 Grade 3.

Non-tapered aluminum pipe used for chords and bracing shown on Standard Detail sheets TE5-1A and TE5-1B shall conform to ASTM B221, ASTM B429, or ASTM B241, all Alloy 6061, temper T6.

Tapered steel pipe used for arms and support legs shown on Standard Detail sheet TE4-4B shall be manufactured from steel having a min. yield strength of 55,000 PSI after fabrication. Galvanized in accordance with ASTM A123.

**658.2.2-Plate:** Flat steel plate used for chord plates, base plates, arm end plates, arm splice plates, and box flange plates shown on various Standard Detail sheets shall conform to ASTM A 572, Grade 42. Galvanized in accordance to ASTM A 123.

Flat steel plate used for gusset plates, saddle plates, hand hole plates, and stiffener plate shown on various Standard Detail sheets shall conform to ASTM A 36. Galvanized in accordance to ASTM A 123.

Flat aluminum plate used for gusset plates and chord plates shown on Standard Detail sheets TE5-1A and TE5-1B shall conform to ASTM B209, Alloy 6061, temper T6.

**658.2.3-Structural Connection Bolt:** Carbon steel structural connection bolts and associated hardware shown on various Standard Detail sheets shall conform to the following requirements. Bolts: ASTM F3125 Grade A325, Type I. Nuts: ASTM A563, Grade DH with

lubricant contrasting with the color of the galvanizing. Washers: ASTM F436, Type I. All galvanized in accordance to ASTM B695.

**658.2.4-Friction Caps:** Steel friction caps shown on various Standard Detail sheets shall conform to ASTM A653, designation CS, and shall be zinc electrodeposited coated in accordance with ASTM B633, Class 12.

Aluminum friction caps shown on Standard Detail sheets TE5-1A and TE5-1B shall conform to ASTM B26, Alloy 356, temper F.

**658.2.5-Structural Shapes:** Steel W10x77 beams as shown on Standard Detail sheets TE3-1 and TE3-2 shall be standard wide flange shapes fabricated from steel conforming to ASTM A36 or ASTM A572 Grade 50. Steel conforming to ASTM A992 and dual certified to ASTM A572 Grade 50 may also be used. The beams shall be galvanized in accordance with ASTM A123.

Steel WT8x25 tees as shown on Standard Detail sheets TE5-1A and TE5-1B shall be standard WT shapes fabricated from steel conforming to ASTM A36 or ASTM A572 Grade 50. Steel conforming to ASTM A992 and dual certified to ASTM A572 Grade 50 may also be used. The tees shall be galvanized in accordance with ASTM A123.

**658.2.6-U-Bolts:** Carbon steel u-bolts and associated hardware shown on various Standard Detail sheets shall conform to the following requirements: Bolts: ASTM A307 Grade A. Nuts: ASTM A563A Hex. Flat washers: ASTM F844. All galvanized in accordance to ASTM F2329.

**658.2.7-Anchor Bolts:** Steel anchor bolts and associated hardware shown on various Standard Detail sheets shall conform to the following requirements: Bolts: ASTM F1554 Grade 55. Nuts: ASTM F563 Grade A. Washers: ASTM F436. All galvanized in accordance with ASTM B695.

**658.2.8-Concrete:** All concrete shall be Class B in accordance with Section 601.

**658.2.9-Reinforcing Steel:** All reinforcing steel shall be meet the requirements of Section 602.

## **658.5-ERECTION:**

DELETE THE CONTENTS OF SUBSECTION 658.5 AND REPLACE WITH THE FOLLOWING:

**658.5.1-General:** All structures shall be installed at the points designated on the Plans or by the Engineer in accordance with these specifications, the Plans, and approved shop drawings and shall be erected in reasonably close conformity to the locations, elevations, and angles shown on the Plans or established by the Engineer.

Erection of sign structures shall be in accordance with the applicable provisions of the current edition of the Standard Specifications and the requirements given below. The Contractor shall provide all tools, equipment and appliances necessary for the expeditious

handling of the work, all of which shall be subject to the approval of the Engineer. Materials and workmanship not previously inspected will be inspected on the site of the work and all rejected material shall be removed from the site of the work.

The Contractor shall take full responsibility for checking all cross sections at approved structure locations to determine final support lengths. Necessary support lengths shall be determined in accordance with the roadway overhead clearance requirements shown in the Plans or Standard Details.

Before proceeding further, the Contractor shall initially establish the location of each structure in accordance with the Plans or as directed by the Engineer and shall mark each site with construction stakes. The Contractor shall furnish stakes, paint, other materials, and labor for performing the locating and staking as described. When the sites have been staked and are ready for inspection, the Contractor shall inform the Engineer, who will check and approve the site or make necessary changes. Centerline station information will be furnished to the Contractor by the Engineer.

All existing or proposed assembly locations are approximate. In cases where an existing assembly, including supports, is to be removed and replaced with a new assembly, the new assembly shall be located as close as possible to the original with a minimum of 20-feet of clearance between the existing foundation and the new foundation unless otherwise approved by the Engineer.

**658.5.2-Excavation:** The Contractor shall perform excavations for each concrete foundation to the depths and dimensions shown on the Plans. The excavation shall be made in accordance with the applicable provisions of the Standard Specifications.

The Contractor shall contact WV 811 and shall notify all applicable WV 811 non-participating utilities prior to beginning excavation or conduit jacking activities. The Contractor shall hand dig to locate lines or open cut in areas of possible conflict, as determined by the Engineer. The Contractor shall also be responsible for locating and verifying Division owned underground conduit to avoid conflict or damage. All such work shall be incidental to the Contract bid items. All costs associated with any disruption of services as a result of the Contractor's activities shall be the Contractor's sole responsibility.

Earth augers, if used shall be of the same diameter as the footings. Where a trench is required, it shall be only as wide and long as is necessary to accommodate the work.

If rock or boulders are encountered during the excavation, they shall be removed to a depth sufficient, in the judgement of the Engineer, to obtain the stability necessary to support the sign structure. The Standard Detail drawings are compiled on the basis of average soil conditions. Soil conditions surrounding specific foundations may require larger foundations. The Contractor shall adjust the foundation dimensions if directed to do so by the Engineer. Any work in such cases shall be performed without change in the unit bid price.

If a foundation is to be installed within the area of an existing concrete or asphalt surface, the concrete or asphalt shall be carefully opened by drilling, saw cutting, or other suitable methods approved by the Engineer that will not cause unnecessary damage to the surrounding surface.

The Contractor shall remove all excavated material from the site that is not needed for backfill or, if permitted by the Engineer, shall spread this material out in the area immediately surrounding the foundation location to the satisfaction of the Engineer. The Contractor shall restore all disturbed areas to within reasonable conformity of their original conditions by

grading, seeding, mulching, and/or fertilizing as directed by the Engineer. These operations and required materials shall be paid for incidental to the Contract bid items.

**658.5.3-Conduit and Ground Rods:** All overhead sign structures shall have conduit and ground rods, regardless of whether they have sign lighting or other electrical components.

A 2-inch diameter galvanized conduit shall be furnished and installed in the support foundations at locations as specified on the Plans. The conduit shall terminate above the top of the foundation and shall be fitted with a 2-inch capped grounding bushing above the foundation. The lower end of the conduit shall emerge from the side of the footing to be joined to conduit from the junction box.

Ground rods shall be copper clad steel, 3/4- inches in diameter with a minimum length as noted on the Plans and shall be one piece. Sectional or segmented ground rods are not permitted. The ground rods shall be complete with ground clamp and square head bolt.

**658.5.4-Foundation Placement:** The foundations shall be of Class B concrete, reinforced, of the types shown on the Plans. Steel reinforcement, anchor bolts and conduit for the footings shall be as shown on the Plans.

All concrete for each foundation shall be placed in one placement with no construction joints.

Each foundation shall typically be installed with a pedestal as shown on the Standard Details. All pedestals shall be square to a depth of 6-inches minimum below ground level. Each of the two pedestals on each end of box truss span structures shall be constructed at the same elevation. For foundations which are within or project into a concrete or asphalt surface utilized by pedestrians, Americans with Disabilities Act (ADA) walkway specification requirements shall be met as directed by the Engineer. In such cases, the following guidelines shall be followed:

- i. Unless unachievable due to right of way restrictions, the foundation shall be placed such that a 48-inch minimum wide walkway is maintained from the edge of the foundation to the roadside edge of the walkway. This measurement shall not include curbs constructed with a joint separating the curb and walkway.
- ii. If it is not possible to maintain a 48-inch wide walkway, the pedestal portion of the foundation above grade shall be eliminated, and the top of the foundation shall be constructed flush with the walkway. In this case, the width of the walkway shall be measured from the roadside edge of the structure base plate to the roadside edge of the walkway. This measurement shall not include curbs constructed with a joint separating the curb and walkway. This measurement shall not be restricted to less than 32-inches, and the continuous longitudinal length over which the walkway is restricted to less than 48-inches shall be for no more than twenty-four 24-inches. The width of the restriction shall be minimized as much as possible within the available right of way.

The anchor bolts shall be set accurately by means of a template in the position shown on the drawings and held rigidly in the forms so as to avoid displacement during the placement of concrete. The steel reinforcement and conduit shall be properly placed and secured before the placement of concrete. The Contractor shall make periodic checks of the bolt positions and elevations during concrete placement operations. It is essential that the distance between the

centers of anchor bolt groups of the two foundations of a span structure be exactly the span lengths shown on the Plans.

The exposed surfaces of all foundations constructed with pedestals as shown in the Standard Details shall be given a Class 1, ordinary finish as defined in Section 601.

**658.5.5-Backfilling:** If any backfilling is required, excavations shall be backfilled with random material, approved by the Engineer, in horizontal layers not to exceed 4-inches after compaction. Each lift shall be compacted to the satisfaction of the Engineer. Testing is not required.

All surplus material shall be removed from the right-of-way and the backfill finished flush with surrounding natural ground, including replacement of any damaged facilities or appurtenances. The Contractor shall restore all areas disturbed by this excavation or other operations within reasonable conformity to their original conditions including grading, seeding, mulching and/or fertilizing as directed by the Engineer. No separate payment will be made for backfilling materials or operations.

#### **658.5.6-Structure Installation:**

**658.5.6.1-General:** All structures depicted in the Standard Details shall have the support legs installed with the anchor bolts fully tightened before installation of the arms or chords.

The individual sections of any box truss span structure made up of multiple sections shall be spliced together for the full length of one span before lifting into place. In addition, all sign panels, lighting and other accessories required thereon, as described elsewhere in the Standard Specifications, shall be fully installed before lifting the box truss into place.

Two-Tube-Span and One-Tube-Span structures as shown on Standard Detail sheets TE3-1 and TE3-2 shall have the entire span assembled and fully tightened before lifting the span into place. The arm splice connections of Heavy Single Arm Cantilevers and Light Single Arm Cantilevers as shown on Standard Detail sheets TE4-4A and TE4-4B may be assembled after lifting the section attaching to the support leg into place and fully tightening the structural connection bolts.

The field assembling of the component parts of a structure shall be done in a manner not likely to produce damage by twisting, bending, or otherwise deforming the metal. Signs required to be installed prior to erection or immediately after erection as described herein shall be covered in a manner approved by the Engineer if determined to be necessary due to operational considerations.

**658.5.6.2-Installation Preparation:** Proper condition and lubrication of hardware associated with anchor bolts and structural bolted connections is critical to proper installation. Only un-weathered hardware components in new condition shall be used. Fastener components shall be protected from dirt and moisture in closed containers at the site of installation. Fastener components shall not be cleaned of lubricant that is present in the as delivered condition. Components that accumulate rust or dirt resulting from plant or job-site conditions shall not be incorporated into the work. Galvanized bolts that have been fully pretensioned shall not be reused.

All nuts shall be pre-coated with a lubricant as specified herein. Prior to snug tightening of any nuts or bolts, lubricant shall be applied to the bolt threads if the threads of the bolts

have not been lubricated, were last lubricated more than twenty-four (24) hours prior, or have gotten wet since they were last lubricated. Beeswax or toilet ring wax may be used. If the bolt heads are turned in order to tighten a connection, the Contractor shall apply lubricant to the face of the washer that the bottom of the bolt head is to be tightened against. If pre-coated nuts have gotten wet, lubricant shall be reapplied to the threads and the bearing surface face of the nut.

Prior to erection, the following steps shall be taken by the Contractor:

1. Inspect the separate components of the structure for bent or damaged members, damaged coatings, distortion, blemishes, scratches, cracks, and defective fabrication that would affect proper erection, durability, or structure performance. Localized defects in the galvanizing coating shall be repaired in accordance with the requirements of ASTM A780. Any member slightly bent or twisted shall have all defects corrected in an approved manner before being placed. The Engineer may direct the Contractor to not proceed with the erection of any structure if any serious defects warranting further assessment and possible rejection are found.
2. Verify that there will be no potential fit-up problems when the components of the structure are assembled. Insure connecting plates will fit with no burrs or other seating inhibitors. If more than 25-percent of the surface area of the face of a flange bolted to the face of another component, or surface area of the underside of a structural bolt head or nut, is visible after snugging of the bolts this shall be cause for rejection.
3. Apply protective coating materials if aluminum components are to be attached to concrete, masonry, or steel if the steel is neither galvanized nor stainless. If to be attached to steel which is neither galvanized nor stainless, the aluminum points of contact shall be coated with a zinc chromate primer or as called for on the Plans, and the steel shall be coated at the points of contact with a suitable priming paint followed by a coat of aluminum paint. If to be attached to concrete or masonry, the points of contact shall be coated with a heavy coat of an alkali-resistant bituminous paint.
4. Verify that the foundations are set to the proper elevation and anchor bolts are set in the correct pattern and orientation, are of the correct size, and are plumb with the specified extension and thread length above the top of concrete.
5. Just prior to erection, the aluminum shall be thoroughly cleaned, and any accumulations of oil, grease, dirt or foreign materials shall be removed using an approved solvent cleaner.

**658.5.6.3-Installation Procedure:** The following steps shall be followed during the erection procedure:

1. Clean the anchor bolts with a wire brush or equivalent and lubricate the anchor bolts as described herein if this has not already been done.
2. Place and level the foundation leveling nuts with washers on top. Initial placement of the leveling nuts shall be no more than 1/4-inch above the top of the foundation.



3. Bring the support leg(s) into position for placement. Insure anchor bolts and the bolt holes in base plate are properly aligned. No cold working of the anchor bolts shall be allowed. No cutting or reaming of holes will be allowed without prior approval from the Traffic Engineering Division.
4. Place the support leg(s). The Contractor shall take due care to avoid damaging the anchor bolt threads during this process. If the structure has multiple support legs, one support leg shall be placed and fully tightened into place at a time.
5. With the support leg as plumb as possible, adjust the leveling nuts as needed. The gap between the top of concrete and the bottom of each leveling nut shall not exceed the diameter of the anchor bolt after this process is completed.
6. Place top washers and nuts. Snug tighten the top nuts, followed by the leveling nuts. Each set of nuts shall be snug tightened in a star pattern. Snug tightness is considered to be the tightness which exists due to the full effort of a man using a spud wrench with the appropriate length handle for the bolt being tightened. The handle length used for bolts 3/4-inch to 1-1/4-inches in diameter shall be 23-inches. The handle length used for bolts 1-1/2-inches to 2-1/4-inches in diameter shall be 36-inches.
7. Fully tighten the anchor bolts following the procedure described in Section 658.5.6.3.1.
8. Release any load by crane or other erection device. The anchor bolt nuts must be properly tightened before removal of the crane. If problems exist such as the anchor connections are loose after release, then repeat the nut tightening procedure.
9. Lift the structure arms or span into place. The Contractor shall be responsible for determining and selecting appropriate lift points in order to not overstress the structural components or attachments during lifting.
10. Once components that are attached using structural connection bolts are lifted into place and lubrication is applied to the hardware components as required, the bolts shall be snug tightened and then fully tightened immediately. The snug tightening procedure used shall be the same as described for the anchor bolts above under item number 6. The procedure for fully tightening the bolts is described in Section 658.5.6.3.2. Once span structures are lifted into place and proper alignment is verified, they shall be secured to the support legs by installing and tightening the u-bolts immediately.
11. Check structure. If problems exist, such as loose arm connections or showing gaps, the load must be removed from the area in question and steps repeated as necessary. If this requires loosening structural connection bolts that have already been fully tightened, the bolts shall be replaced.
12. If not installed prior to lifting the arms or chords into place (required for box truss spans), all signs to be attached to the structure arms or chords shall be installed immediately after the attachment hardware for the arms or chords are fully tightened.

**658.5.6.3.1-Anchor Bolt Tightening:** After snug tightening has been accomplished, the following procedure shall be followed for fully tightening anchor bolts:

1. Verify that all nuts and washers were brought into firm contact with the base plate. Beveled washers may be necessary under the leveling or top nut if any

face of the base plate has a slope greater than 1:20 and/or any nut could not be brought into firm contact. If it is determined that beveled washers are required, the support leg shall be disassembled from the anchor bolts and the erection procedure shall be restarted as described in Section 658.5.6.3 using the beveled washers. Beveled washers shall be manufactured of the same material as the base plate and shall be galvanized. Beveled washers shall be square with the length of each side being equal to or greater than the diameter of the normal washers. The minimum thickness of the beveled washers shall be the thickness of the normal washers.

2. Before tightening, at each bolt location the reference position of the top nut in the snug-tight condition shall be marked with a suitable marking on one flat with a corresponding reference mark on the base plate.
3. Top nuts shall be turned in increments and in a star pattern over at least two full tightening cycles, meaning the rotation applied to each nut during each cycle shall be approximately half the amount described herein. Nut rotation shall be 1/3 of a turn for bolts 1-1/2-inches in diameter or less and shall be 1/6 of a turn for bolts greater than 1-1/2 inches in diameter. The amount of torque required to fully tighten each nut shall be recorded for use in steps 4 and 5. After tightening, the nut rotation shall be verified. The wrench used shall be a hydraulic torque wrench with sufficient capacity for the bolts to be tightened, and with the capability of loosening. Prior to tightening any fasteners, the Contractor shall provide the Engineer with a copy of calibration certificates for the hydraulic wrench. Separate calibration certificates are required for each wrench and for the gauge associated with each power pack to be used on the project. The date of the calibrations shall be one year or less prior to the advertising date of the Contract. The certificate provided shall be from a calibration lab that is International Organization for Standardization (ISO) 17025 accredited, with the certificate indicating as such. Both the certificate and wrench or gauge shall display matching serial numbers.
4. The same hydraulic torque wrench and power pack combination which was used to fully tighten the anchor bolts shall be used to verify that a torque at least equal to the torque value given by the following equation is required to additionally tighten the leveling nuts and the top nuts. If the required torque is less, this should be interpreted to indicate that the threads have stripped and should be reported to the Traffic Engineering Division.

$$T_v = 0.12 (D_b) F_i$$

Where:

$T_v$  = verification torque (inch-kips)

$D_b$  = nominal body diameter of the anchor bolt (inches)

$F_i$  = 60% of the anchor bolt minimum tensile strength (kips)  
(= 45 ksi for ASTM F1554 Grade 55)

Multiply  $T_v$  by 83.3 to calculate  $T_v$  in ft-lbs

5. After at least 48-hours, the same hydraulic torque wrench and power pack combination which was used to fully tighten the anchor bolts shall be used to

verify that a torque at least equal to 1.10 T<sub>v</sub> is required to additionally tighten the leveling nuts and the top nuts. If the required torque is less, this should be interpreted to indicate that the threads have stripped and should be reported to the Traffic Engineering Division.

**658.5.6.3.2-Structural Connection Bolt Tightening:** After snug tightening has been accomplished, apply the appropriate rotation to the turning elements in the same sequence as snug tightening. Rotation shall be in accordance with Table 615.5.6.3 B. Full tightening of each bolt shall be accomplished in approximately 10- seconds using a hydraulic torque wrench meeting the requirements specified herein, or impact wrenches of adequate capacity.

**658.8-PAY ITEMS:**

DELETE THE TABLE AND REPLACE WITH THE FOLLOWING:

ITEM	DESCRIPTION	UNIT
658001-*	Class B Concrete Footings, Reinforced, Overhead	Cubic Yard
658005-*	Overhead Sign, Two Tube Span	Each
658006-*	Overhead Sign, One Tube Span	Each
658007-*	Overhead Sign, Double Arm Cantilever	Each
658008-*	Overhead Sign, Butterfly Cantilever	Each
658009-*	Overhead Sign, Single Arm Cantilever (Heavy)	Each
658010-*	Overhead Sign, Single Arm Cantilever (Light)	Each
658011-*	Overhead Sign, Steel Box Truss Span	Each
658012-*	Overhead Sign, Aluminum Box Truss Span	Each
658013-*	Overhead Sign, Frame	Each

\* Sequence Number

## SECTION 660 TRAFFIC SIGNALS

**660.19-METHOD OF MEASUREMENT:**

**660.19.2-Traffic Detectors:**

DELETE THE ENTIRE 660.19.2 SUBSECTION AND REPLACE WITH THE FOLLOWING:

**660.19.2-Detectors:**

**660.19.2.1-Traffic Detectors:** Traffic detectors shall be measured per unit complete and in place, mounted in a cabinet or enclosure as required. This item shall consist of the detector tuning unit only. The roadway traffic sensors, such as loops, and associated cables outside of cabinet, shall be included in "Miscellaneous Signal" items. Any supplementary cabinets or other enclosures as required for the detector tuning units shall also be included in "Miscellaneous Signal".