

JANUARY 11, 2017

REPLACEMENT OF HIGHWAY SIGNING ON I-84

FEDERAL AID PROJECT NO. 0843(203)

STATE PROJECT NO. 171-304

TOWNS OF SOUTHTON, PLAINVILLE, NEW BRITAIN AND FARMINGTON

ADDENDUM NO. 1

This Addendum addresses the following questions and answers contained on the “CT DOT QUESTIONS AND ANSWERS WEBSITE FOR ADVERTISED CONSTRUCTION PROJECTS”:

Question and Answer No. 1

SPECIAL PROVISION

NEW SPECIAL PROVISION

The following Special Provision is hereby added to the Contract:

- **ITEM NO. 1202352A – TUBULAR ARCH SIGN SUPPORT FOUNDATION**

REVISED SPECIAL PROVISIONS

The following Special Provisions are hereby deleted in their entirety and replaced with the attached like-named Special Provisions:

- **ITEM NO. 1215020A – TUBULAR ARCH SIGN SUPPORT STRUCTURE**
- **ITEM NO. 1215023A – TUBULAR ARCH CANTILEVER SIGN SUPPORT**

DELETED SPECIAL PROVISION

The following Special Provision is hereby deleted in its entirety:

- **ITEM NO. 1202999A – DRILLED SHAFT TRAFFIC STRUCTURE
FOUNDATION**

CONTRACT ITEMS
NEW CONTRACT ITEMS

<u>ITEM NO.</u>	<u>DESCRIPTION</u>	<u>UNIT</u>	<u>QUANTITY</u>
<u>0910187</u>	<u>R-B 350 BRIDGE ATTACHMENT TRAILING END 10 GA.</u>	<u>EA</u>	<u>1</u>
<u>0910194</u>	<u>METAL BEAM RAIL (TYPE R-B 350 10 GA.)</u>	<u>LF</u>	<u>2,320</u>
<u>0910195</u>	<u>METAL BEAM RAIL (TYPE R-B 350 SYSTEM 5 10 GA.)</u>	<u>LF</u>	<u>20</u>
<u>0910196</u>	<u>METAL BEAM RAIL (TYPE R-B 350 SYSTEM 6 10 GA.)</u>	<u>LF</u>	<u>30</u>
<u>0910891</u>	<u>R-B 350 BRIDGE ATTACHMENT SAFETY SHAPE PARAPET 10 GA.</u>	<u>EA</u>	<u>2</u>
<u>0911925</u>	<u>R-B END ANCHORAGE (TYPE I – 10 GA.)</u>	<u>EA</u>	<u>6</u>
<u>1202352A</u>	<u>TUBULAR ARCH SIGN SUPPORT FOUNDATION</u>	<u>EA</u>	<u>35</u>

DELETED CONTRACT ITEM

<u>ITEM NO.</u>	<u>DESCRIPTION</u>	<u>ORIGINAL QUANTITY</u>	<u>REVISED QUANTITY</u>
<u>0910021</u>	<u>R-B END ANCHORAGE – TYPE 1</u>	<u>6 EA</u>	<u>0</u>
<u>0910041</u>	<u>METAL BEAM RAIL (TYPE R-B SYSTEM 5)</u>	<u>20 LF</u>	<u>0</u>
<u>0910042</u>	<u>METAL BEAM RAIL (TYPE R-B SYSTEM 6)</u>	<u>30 LF</u>	<u>0</u>
<u>0910170</u>	<u>METAL BEAM RAIL (TYPE R-B 350)</u>	<u>2,320 LF</u>	<u>0</u>
<u>0910186</u>	<u>R-B 350 BRIDGE ATTACHMENT – TRAILING END</u>	<u>1 EA</u>	<u>0</u>
<u>0910189</u>	<u>R-B 350 BRIDGE ATTACHMENT SAFETY SHAPE PARAPET</u>	<u>2 EA</u>	<u>0</u>
<u>1202999A</u>	<u>DRILLED SHAFT TRAFFIC STRUCTURE FOUNDATION</u>	<u>35 EA</u>	<u>0</u>

The Detailed Estimate Sheet does not reflect these changes.

The Bid Proposal Form has been revised to reflect these changes.

There will be no change in the number of calendar days due to this Addendum.

The foregoing is hereby made a part of the contract.

ITEM #1202352A – TUBULAR ARCH SIGN SUPPORT FOUNDATION

Description: Work under this item shall consist of the layout and construction of foundation(s) for the "Tubular Arch Cantilever Sign Support" and/or for the "Tubular Arch Sign Support Structure." The work shall include layout, drilled shaft, the removal and satisfactory disposal of all excavated materials, reinforcing steel, concrete, temporary casing, slurry, rigid metal conduit, grounding assemblies, and anchor bolt assemblies in conformity with the requirements of the plans or as ordered, and in conformance with these specifications.

This work may require drilling rock or using slurry filled shafts through whatever materials are encountered, to reach the depths indicated on the plans and specifications.

Materials:

Class "F" Concrete shall conform to the requirements of Section 6.01 and Article M.03.

Reinforcing steel shall conform to the requirements of Section 6.02 and Article M.06.01.

Anchor plate shall conform to the requirements of AASHTO A572, Grade 50, Galvanized.

Anchor bolts shall conform to ASTM F1554, Grade 105 and shall be galvanized as shown on the plans, in accordance with ASTM A153, Class C. The internal threads of nuts shall be retapped after galvanizing to accommodate the increased diameter of the bolts.

Leveling and lock nuts shall conform to ASTM A563, Grade DH and be galvanized in accordance with ASTM A153, Class C. Lock nuts shall also be self-locking of the prevailing torque reusable type and shall conform to the requirements of Article M.18.02.

Washers shall conform to ASTM F436, Type 1 and be quenched, tempered and galvanized in accordance with ASTM A153, Class C.

Rigid metal conduit, ground rod sleeves and related hardware, and end caps shall be galvanized steel conduit, and shall conform to Section M.15.09.

Bare copper wire shall conform to M.15.13.

Zinc-rich field primer for touch up shall conform to the requirements of Federal specification TT-P-641-Type 1 and ASTM A 780. The use of aerosol spray cans shall not be permitted.

Ground rods shall be 5/8-inch in diameter by 12-feet long copper clad steel. The copper cladding shall be a minimum thickness of 0.128 inches. The ground clamp shall be a square-head bolt type, approved for direct burial.

Any admixtures proposed for use in the bentonite slurry shall be approved by the Engineer. Bentonite slurry properties may be adjusted to suit field conditions with the approval of the Engineer. Polymer or other slurry materials may be submitted to the Engineer for review.

Construction Methods: The Contractor shall submit a sequence plan outlining drilling, casing, slurry, reinforcement, and concrete placement procedures for the Engineer to review.

Prior to start of construction of the foundations, the Contractor shall establish and verify the location, dimensions and elevations of the foundation as stated in Section 1.05.16. The top of foundation shall be a minimum 6" above the slope line grade, as shown on the plans. The drilled shafts shall be constructed at the span length shown on the plans and perpendicular to the roadway. The foundations shall be constructed at the appropriate offsets from the protective barrier, as approved by the Engineer. The Contractor shall submit foundation plan locations for approval prior to construction. The foundations shall be in accordance with shop drawings for the sign support structure. The Contractor shall be responsible for the final fit of all members.

The hole shall be drilled to the minimum depth specified and shall be examined for straightness and if the hole which on visual inspection from the top shows less than one-half the diameter of the hole at the bottom of the hole shall be rejected. A suitable temporary casing or slurry shall be furnished and placed when required to prevent caving of the hole before concrete is placed. The Contractor is responsible for maintaining the stability of the shaft excavation. An uncased hole shall only be allowed if the Contractor can insure a stable dry excavation. All loose material existing at the bottom of the hole after drilling operations have been completed shall be removed before placing concrete in the hole. The hole shall be covered when left unattended.

Perform shaft drilling by combinations of augering rotary drilling, down-the hole hammer, reverse circulation drilling, claming, scraping, or other means approved by the Engineer. Use such means as will minimize over excavation and loosening and caving of material outside the designed shaft foundation dimensions.

The Contractor shall construct the appropriate tubular arch sign support foundation, depending on the field conditions as shown on the plans, and as approved by the Engineer. If bedrock is encountered, the Engineer shall be notified to inspect and determine the elevation of the top of competent rock. The required length of rock socket shall be determined from the plans.

Dry construction should be allowed if less than one foot of water accumulates in the bottom of a hole without pumping over a one hour period, the excavation remains stable, and any loose material and water can be removed prior to placement of concrete. Dry construction would allow for free-fall concrete provided the Contractor can place the concrete without hitting the reinforcing steel. Wet construction would be used for all other applications.

When slurry is used in the drilling process, it shall be a mineral slurry. The slurry shall have both a mineral grain size that will remain in suspension and sufficient viscosity and gel characteristics to transport excavated material to a suitable screening system. The percentage and specific gravity of the material used to make the suspension shall be sufficient to maintain

the stability of the excavation and to allow proper concrete placement. The level of the slurry shall be maintained at a height sufficient to prevent caving of the hole.

The mineral slurry shall be premixed thoroughly with clean fresh water at a temperature above 41° F and adequate time allotted for hydration prior to introduction into the shaft excavation. Maintain shaft foundation excavations fully of slurry to within 24 inches of the top casing and at least 48 inches above the existing water level during drilling and until the concrete placement is essentially complete. Circulate or agitate the slurry during drilling operations and immediately prior to concrete placement. Maintain the slurry requirements at all times, including non-working periods and stoppages. Provide continuous circulation or agitation, if necessary, to meet these requirements.

Control tests using suitable apparatus shall be carried out by the Contractor on the mineral slurry to determine density, viscosity, and pH. An acceptable range of values for those physical properties is shown in the following table:

Range of Values (at 68°F)

Property (Units)	Time of Slurry Introduction	Time of Concreting (in Hole)	Test Method
Density (pcf)	64.3 to 69.1	64.3 to 75.0	Density Balance
Viscosity (seconds per quart)	28 to 45	28 to 45	Marsh Cone
PH	8 to 11	8 to 11	pH paper or meter

Before placing reinforcing steel in a slurry filled shaft, all loose debris from the bottom shall be removed by a large capacity air-lift system or submersible pump. Concentrating shall not start until the alignment, dimension, and cleanliness of the shaft excavation has been verified by the Engineer.

Carefully lower reinforcing steel in drilled shaft immediately after cleaning the bottom as herein specified. Dropping or forcing cages into the shaft will not be allowed. If the reinforcing steel does not properly and smoothly enter the shaft, it shall be retrieved and the shaft adjusted and properly cleaned as specified, until the reinforcing fits smoothly. Repair or replace any damaged reinforcing cage to the satisfaction of the Engineer.

The steel reinforcing cage shall be placed and firmly held with approved centering devices at least 4 inches wide to insure the alignment of the reinforcing within the hole. Thin concrete or plastic rollers will not be allowed.

The depth of drilling shall be checked immediately prior to concrete placement, in the presence of the Engineer.

Immediately prior to placing concrete, the Engineer will inspect and verify the cleanliness of the shaft. If the inspection indicates that sediment has accumulated at the bottom of excavation, the Contractor shall remove all steel and reclean the shaft.

Start placement of concrete in shaft as soon as possible, but no more than four hours after completion of slurry and bottom cleaning, and no more than two hours after reinforcing steel cage placement. Proceed continuously until completion of concreting. If the time limitations specified above are exceeded, remove cage and reclean bottom as specified.

Place concrete in the slurry filled shaft by the tremie method, in such a manner that the concrete displaces the slurry from bottom and rises like a liquid, and mixing of concrete with the slurry will not occur. The concrete shall be placed through a top metal hopper and into a rigid leak-proof elephant trunk tremie pipe, sufficiently large enough to permit free flow of concrete. The tremie pipe shall be located so that it can be removed without disturbing the position of the reinforcing. Initially, there shall be a suitable plug at the bottom of the tremie pipe which will not discharge concrete until the concrete head has at least reached the top of level of the slurry.

The intent is that bentonite slurry not be permitted to contaminate the concrete as the concrete is initially introduced to the tremie pipe. Thereafter, a positive concrete head shall be maintained throughout. The bottom of the tremie pipe shall be inside the concrete for at least a depth of 5 feet, and this depth shall be maintained throughout. The concrete level shall be horizontal during the pouring operations. No horizontal movement of the tremie pipe will be permitted. The concreting of the shaft shall proceed continuously to 12 inches above the final top of shaft elevation to produce a monolithic shaft foundation, with uncontaminated concrete for the design shaft length.

The concrete shall be finished in conformance with the pertinent requirements of Subarticle 6.01.03-21.

Casings, if used in drilling operations, shall be removed from the hole. The casing may be removed as concrete is placed, provided a 5 foot head of concrete is maintained, or the casing may be removed after the concrete has been poured, provided that the concrete has not been set. Separation of the concrete by hammering or otherwise vibrating the casing, during withdrawal operations, shall be avoided.

The maximum allowable horizontal variation of the center of the top of the drilled shaft from the required location shall be 0.5% of the shaft diameter.

The concrete shaft shall not be out of plumb by more than 1% of the total length.

The top of the concrete foundation shall be level within $\pm 1/8$ ".

The anchor bolt locations shall be in accordance with shop drawings for the sign support structure.

Anchor bolt assemblies shall conform to the requirements shown on the plans and shall be embedded in the concrete which shall be placed to within the minimum distance of the finished surface of the stem as shown on the plans. A template to hold the required anchor bolt assemblies, ground rod sleeve and conduit in their correct position, shall be used. Each bolt of the anchor bolt assembly shall be fitted with two leveling nuts.

The gap leveling template shall be clamped in position by two leveling nuts at each anchor bolt. These leveling nuts shall be adjusted to assure a truly level finished foundation surface at the proper elevations.

After the sign support has been erected and the nuts fully tightened; the bolts, nuts, and washers shall be coated with Zinc Rich Field Prime, as directed by the Engineer.

The space between the leveling template and pedestal concrete shall be hollow.

All conduit ends terminating below grade shall be capped with a malleable iron cap. All above grade conduit ends shall be terminated with an insulated bonding bushing with tinned insert. The number of conduits in the foundation will be as shown on the plans. Additional conduits are to be installed as required.

Ground rod and ground wire shall be installed as shown on the plans.

Method of Measurement: This work will be measured for payment by the number of foundation units, of the type specified, completely installed and accepted. Each tubular arch cantilever sign support shall have one (1) foundation unit and each tubular arch sign support structure shall have two (2) foundations units.

Basis of Payment: The work will be paid for at the Contract unit price each for "Tubular Arch Sign Support Foundation," of the type specified, complete in place, which price shall include layout, materials, drilling, rock socket, temporary casing, slurry, excavation, backfill, concrete, reinforcing, anchor bolts, rigid metal conduits, ground rod, ground wire, clamp, as directed by the Engineer, and all equipment, labor, tools and work incidental thereto.

PAY ITEM	PAY UNIT
Tubular Arch Sign Support Foundation	EA.

ITEM #1215020A – TUBULAR ARCH SIGN SUPPORT STRUCTURE

ITEM #1215023A – TUBULAR ARCH CANTILEVER SIGN SUPPORT

Description: This item shall consist providing field survey, furnishing, fabricating, surface preparation, galvanizing, transporting and erecting a tubular arch sign support, on a prepared foundation in accordance with the details shown on the plans, in accordance with these specifications and as ordered by the Engineer.

Materials: The post and overhead members shall be round, non-tapered, tubular steel pipe and conform to the following requirements:

The pipe shall conform to the one of the following material designations:

ASTM A106, Grade C Type S only (ASTM A106M, Grade C Type S only)
ASTM A252, Grade 3, Type E or S (ASTM A252M, Grade 3, Type E or S)
ASTM A500, Grade B (ASTM A500M, Grade B)
API 5LX, Grade X42, Type E or S (or greater)

The pipe shall meet the following Charpy-V Notch toughness requirements:

Minimum test value energy 20ft.-lbs. (27 J)
Minimum average energy 25 ft.-lbs. at 40° F (34 J at 4 °C)

The Charpy V-notch sampling and testing shall be in accordance with ASTM A673, "P" piece frequency.

The steel used for rolled shapes, plates, and bars shall conform to the requirements of AASHTO M270, Grade 50 (AASHTO M270M, Grade 345). The steel for the base plates and the flange plates shall conform to the requirements, including the supplementary notch toughness requirements, of AASHTO M270, Grade 50F2 (AASHTO M270M, Grade 345F2).

The steel for the handholes shall conform to ASTM A500, Grade B. The steel shall meet the following Charpy-V Notch toughness requirements:

Minimum test value energy 20ft.-lbs. (27 J)
Minimum average energy 25 ft.-lbs. at 40° F (34 J at 4 °C)

The Charpy V-notch sampling and testing shall be in accordance with ASTM A673, "P" piece frequency.

All steel members and components shall be completely hot-dip galvanized, after fabrication, in accordance with ASTM A123 (ASTM A123M).

All high strength bolts shall conform to ASTM A325, Type 1 (ASTM A325M, Type 1). Nuts shall conform to ASTM A563, Grade DH (ASTM A563M, Property Class 10S). Circular, flat, hardened steel washers shall conform to ASTM F436 (ASTM F436M). The bolts, nuts and washers shall be galvanized in accordance with ASTM A153 (ASTM A153M) or ASTM B695, Grade 50. The nuts shall be overtapped to the minimum amount required for the bolt assembly and all surfaces of the nuts shall be lubricated with a lubricant containing a visible dye of any color that contrasts with the color of the galvanizing. The high strength bolts shall conform to the requirements of Subarticle M.06.02-5, amended elsewhere herein.

Compressible-washer-type direct tension indicators shall conform to ASTM F959, Type 325 (ASTM F959M, Type 8.8), and shall be galvanized in accordance with ASTM B695, Class 50.

U-bolts shall conform to ASTM A449. The nuts shall conform to ASTM A563, Grade DH (ASTM A563M, Property Class 10S). The washers shall conform to ASTM F436 (ASTM F436M). The bolts, nuts and washers shall be galvanized in accordance with ASTM A153 (ASTM A153M) or ASTM B695, Grade 50.

Bonded bushings, couplings and square head plugs shall conform to the requirements of ASTM A105 and be galvanized in accordance with ASTM A153 (ASTM A153M).

All stainless steel nuts, bolts, cap screws, plates and washers shall be nickel-stainless steel conforming to AISI 300 series.

Zinc-rich field primer for touch-up of damaged galvanized areas shall conform to the requirements of Federal Specification TT-P-641-Type I and ASTM A780. The use of aerosol spray cans shall not be permitted.

Where "Silicone Joint Sealant" is specified on the plans, a primer will also be required for proper adhesion of the joint sealant to the steel. The following primer and silicone joint sealant or approved equals shall be used:

Dow Corning 1200 Prime Coat and Dow Corning 790 Silicone Building Sealant, manufactured by the Dow Corning Corporation, Midland, Michigan 48686-0994.

Neoprene gasket material for the access openings shall conform to ASTM D1056, Grade 2A2 or 2A3. Other grades of neoprene approved by the Engineer may be used.

Bare copper grounding conductor shall be #8 AWG stranded bare copper wire conforming to M.15.13. The grounding bolt shall be stainless steel with a hex head.

The Contractor shall submit Certified Test Reports and Materials Certificates in conformance with Article 1.06.07 for the steel used in the sign support members and components, high-strength bolts (including nuts and washers) and U-bolts (including nuts and washers). The Certified Test Reports shall include the following:

- a. Mill test reports that indicate the place where the material was melted and manufactured.
- b. High-strength bolt test results for proof load tests, wedge tests, and rotational-capacity tests that indicate where the tests were performed, date of tests, location of where the components were manufactured and lot numbers.
- c. Galvanized material test results that indicate the thickness of the galvanizing.

Prior to incorporation into the work, the Contractor shall submit samples in conformance with Article 1.06.02 for the steel used in the sign support members and components, high-strength bolts (including nuts and washers) and U-bolts (including nuts and washers).

Construction Methods: Prior to the submittal of shop drawings, the Contractor shall prepare and submit one copy of a cross-section (elevation) drawing based on a field survey for each overhead sign support for review and approval. Each cross-section drawing shall be submitted in paper form and shall be printed on an ANSI B (11" x 17"; 279 mm x 432 mm; Ledger/Tabloid) sheet. Each drawing shall have a border and title block. Located in the lower right hand corner of the drawing adjacent to the title block, each drawing shall have a rectangular box, 2 1/4" wide x 1 3/4" high (57 mm wide x 44 mm high), for the reviewers stamp. On the ANSI B sheets, the minimum text height and width shall be 1/16". All letter characters shall be uppercase. Only one sign support cross-section shall be shown on each drawing.

The cross-sections shall include, but not be limited to the following:

- Project number, town, location (route number, direction, mileage), station structure number, sign location number, and site number
- Location and dimensions of travel lanes and shoulders
- Location of sign panel(s) relative to the roadway travel lanes.
- Type of protection (guide rail/barrier), and the dimension from the front face of guide rail/barrier to the edge of the foundation and centerline of the foundation
- Location of the high point of road and elevation.
- Minimum dimension from high point of road to the centerline of the overhead member and the bottom of the sign panel(s)
- Pole height(s), dimension from bottom of baseplate to centerline of overhead member
- Span, dimension from centerline to centerline of poles or centerline of pole to end of arm, as applicable

- Dimensions of sign panel(s) and location relative to the centerline of the post and foundation
- Elevation of top of foundation
- Elevation of centerline of overhead member
- Dimension from top foundation to finish grade (proposed or existing as applicable)
- Foundation depth

The cross-section drawings shall be submitted to the Engineer for approval.

The approval of cross-sections does not relieve the Contractor from verifying that all dimensions are correct. If there are any changes to approved cross-section, the cross-section shall be re-submitted for review and approval.

Based on the approved cross-sections, the Contractor shall prepare and submit shop drawings for each sign support for review and approval in accordance with Subarticle 1.05.02-3. An individual, independently packaged set of shop drawings, with all details and documents necessary for fabrication and erection of the structure and its components, including a copy of the approved support cross-section, shall be prepared and submitted for **each** sign support. **A single set of drawings with tabulated data for multiple sign supports is not permitted.** The shop drawings shall be prepared in Customary U.S. units.

The packaged set of shop drawings for each sign support shall be submitted either in paper (hard copy) form or in an electronic portable document format (.pdf) with appropriate bookmarks. The packaged set submitted in paper form shall be bound with a staple. The packaged set submitted in an electronic portable document format (.pdf) shall be in an individual file.

Shop drawings submitted in paper form shall be printed on ANSI B (11" x 17"; 279 mm x 432 mm; Ledger/Tabloid) sheets. Each drawing shall have a border and title block. Located in the lower right hand corner of the drawing adjacent to the title block, each drawing shall have a rectangular box, 2 ¼" wide x 1 ¾" high (57 mm wide x 44 mm high), for the reviewers stamp. On the ANSI B sheets, the minimum text height and width shall be 1/16". All letter characters shall be uppercase. Supporting procedures and data shall be printed on ANSI A (8 ½" x 11", 216 mm x 279 mm) letter sheets.

Shop drawings submitted in an electronic portable document format (.pdf) shall be created on ANSI D (22" x 34"; 559 mm x 864 mm) full scale (1" electronic file = 1" paper) sheets. (The purpose of creating the drawings on ANSI D sheets is so that the sheets may be printed/plotted at that size or smaller without loss of legibility.) Each drawing shall have a border and title block. Located in the lower right hand corner of the drawing adjacent to the title block, each drawing

shall have a rectangular box, 2 ¼" wide x 1 ¾" high (57 mm wide x 44 mm high), for the reviewers stamp. On the ANSI D full scale sheets, the minimum text height and width shall be 1/8". All letter characters shall be uppercase. The electronic files for supporting procedures and data shall be created on ANSI A (8 ½" x 11", 216 mm x 279 mm) letter sheets.

The shop drawings shall include, but not be limited to the following:

- Project number, town, station, structure number, sign support identification number and location number
- Plan and elevation view of the sign support including member lengths, dimensions, elevations
- Dimensions of sign panel(s) and location relative to the centerline of the post and foundation
- Support beam lengths, number and location relative to the edge of the sign panels
- Complete details and dimension of all the support components, including anchor bolts
- Plan view of the anchor bolt layout relative to the orientation of the overhead member, including the anchor bolt tightening sequence
- Elevation of top of foundation
- Dimension from top foundation to finish grade (proposed or existing as applicable)
- Material designations/specifications for all components
- Weld procedures
- Non-destructive weld testing requirements
- Camber

Shop drawings shall be submitted to the Engineer for approval.

The Contractor shall be responsible for all measurements and the final fit of all members.

The sign supports shall be fabricated in accordance with the latest edition of the AASHTO LRFD Bridge Construction Specifications, including the latest interim specifications, amended herein.

The steel fabricator shall be AISC certified for the fabrication of Simple Steel Bridges (SBR).

Fabrication of the sign support may begin only after the shop drawings have been approved and the Engineer has authorized fabrication to begin. The Contractor shall submit to the Engineer, no less than 2 weeks prior to the start of fabrication, the name and location of the fabrication shop where the work will be done so that arrangements can be made for an audit of the facility and the assignment of the Department Quality Assurance inspector. No fabrication will be accepted unless the QA inspector is present during fabrication. No changes may be made during fabrication without prior written approval by the Department.

The Contractor shall furnish facilities for the inspection of material and workmanship in the shop by the Engineer. The Engineer and his representative shall be allowed free access to the necessary parts of the premises.

The Engineer will provide Quality Assurance (QA) inspection at the fabrication shop to assure that all applicable Quality Control plans and inspections are adequately adhered to and maintained by the Contractor during all phases of the fabrication. A thorough inspection of a random selection of elements at the fabrication shop may serve as the basis of this assurance.

Prior to shipment to the project, each individual piece of structural steel shall be marked in a clear and permanent fashion by a representative of the fabricators' Quality Control (QC) Department to indicate complete final inspection by the fabricator and conformance to the project specifications for that piece. The mark must be dated. A Materials Certificate in accordance with Article 1.06.07 may be used in lieu of individual stamps or markings, for all material in a single shipment. The Materials Certificate must list each piece within the shipment and accompany the shipment to the project site.

Following the final inspection by the fabricator's QC personnel, the Engineer may select pieces of structural steel for re-inspection by the Department's QA inspector. Should non-conforming pieces be identified, all similar pieces must be re-inspected by the fabricator and repair procedure(s) submitted to the Engineer for approval. Repairs will be made at the Contractor's expense.

The pieces selected for re-inspection and found to be in conformance, or adequately repaired pieces, may be marked by the QA inspector. Such markings indicate the Engineer takes no exception to the pieces being sent to the project site. Such marking does not indicate acceptance or approval of the material by the Engineer.

Following delivery to the project site, the Engineer will perform a visual inspection of all material to verify shipping documents, fabricator markings, and that there was no damage to the material or coatings during transportation and handling.

The Engineer is not responsible for approving or accepting any fabricated materials prior to final erection and assembly at the project site.

Fabrication of the sign supports shall conform to the requirements of Articles 6.03.04-6, and 10-13.

All tubular members on a structure shall have the same material designation. The tubular members may be fabricated from multiple pieces. The pieces shall be joined using a complete joint penetration groove weld with a backing ring. 100% of the complete joint penetration groove weld shall be non-destructively tested by the ultrasonic method.

Posts for sign structure shall be formed to the radii shown on the contract drawings by heat treatment or by fabrication to such radii by methods that will not crimp or buckle the interior radius of the pipe bend, and will not change the physical properties of the material. Pipe bending shall be performed by a prequalified pipe bending manufacturer in accordance with PFI standard ES-24 and IPA-VIBS-(LATEST EDITION) standard specifications. The anticipated degree of "ovaling" due to the bending process shall be indicated in the shop drawing submittal.

All welding details, procedures and nondestructive testing shall conform to the requirements of AWS D1.1 Structural Welding Code - Steel.

Personnel performing the nondestructive testing shall be certified as a NDT Level II technician in accordance with the American Society for Non Destructive Testing (ASNT), Recommended Practice SNT-TC-1A and approved by the Engineer.

All nondestructive testing shall be witnessed by Engineer. Certified reports of all tests shall be submitted to the Engineer for examination. Each certified report shall identify the structure, member, and location of weld or welds tested. Each report shall also list the length and location of any defective welds and include information on the corrective action taken and results of all retests of repaired welds.

The Department reserves the right to perform additional testing as determined by the Engineer. Should the Engineer require nondestructive testing on welds not designated in the contract, the cost of such inspection shall be borne by the Contractor if the testing indicates that any weld(s) are defective. If the testing indicates the weld(s) to be satisfactory, the actual cost of such inspection will be paid by the Department.

Steel surface defects such as fins, slivers, tears, delaminations, burrs, sharp edges and other defects shall be ground down with use of a power disc grinder or other tools approved by the Engineer, to afford as close to a continuous surface characteristic as possible. Defects that in the opinion of the inspection personnel are so large or deep that grinding may not rectify the defect, shall be referred to the Engineer for resolution.

After the sign support members and components have been fabricated, welds ground smooth, flux and splatter removed, they shall be hot-dip galvanized in accordance with ASTM A123 (ASTM 123M). All members and components shall be hot-dip galvanized in a single dip. Double-dipping shall not be used. All damaged areas of the galvanizing shall be properly

prepared and touched-up. Damaged zinc shall be touched-up in accordance with ASTM A780. Spray aerosol cans of zinc rich primer will not be permitted.

After fabrication, the sign support shall be assembled in the fabricator's shop, in the presence of the Engineer, to determine the acceptability of the bolted connections. The high-strength bolts, including nuts and washes, shall be installed and tensioned in accordance with Subarticle 6.03.03-19, amended elsewhere herein. The faying surfaces shall be free of dirt, loose scale, burrs, other foreign material and other defects that would prevent solid seating of the parts. Prior to assembly, the galvanized faying surfaces shall be scored by wire brushing. The connections may be found acceptable by the Engineer if the faying surfaces of the flange (connection) plates are in firm, continuous contact after properly tensioning the bolts. Only sign supports with acceptable bolted connections shall be shipped. Bolts, nuts and washers used for the trial shop fit-up shall not be reused in the final field assembly.

After fabrication, the overhead member of the tubular arch sign support structure shall be assembled in the fabricator's shop, in the presence of the Engineer, to determine the permanent camber. The overhead members with splices shall be bolted together as described in the preceding paragraph. With the overhead member supported at its ends and properly oriented, the permanent camber shall be measured at mid-span. The overhead member shall be rejected if the camber does not fall within the following limits:

Minimum Permanent Camber	Span / 1000
Maximum Permanent Camber	Span / 500

The finished members and components shall be protected with sufficient dunnage and padding to protect them from damage and distortion during transportation. Damage to any material during transportation, improper storage, faulty erection, or undocumented fabrication errors may be cause for rejection of said material at the project site. All costs associated with any corrective action will be borne by the Contractor.

High-strength bolts, nuts and washers shall be stored in accordance with Subarticle 6.03.03-19, amended elsewhere herein.

Prior to erection of the sign support, the threads of the projecting anchor bolts shall be cleaned of accumulated dirt and concrete. The anchor bolt nuts shall be re-lubricated with a lubricant containing a visible dye of any color that contrasts with the color of the galvanizing. On each anchor bolt, all the nuts shall be run down by hand on the anchor bolt threads.

During the erection of the sign support, the Contractor shall take the proper precautions to ensure the stability of all structural elements until the total structure is erected and all connections are found acceptable.

The overhead member shall be temporarily and fully supported while all the high-strength bolts are installed and tensioned. High-strength bolts, including nuts and washes, shall be installed and

tensioned in accordance with Subarticle 6.03.03-19, amended elsewhere herein. The temporary member support shall not be removed until the Engineer has confirmed that the faying surfaces of the flange (connection) plates are in firm, continuous contact and the high-strength bolts were properly installed and tensioned. All high-strength bolts in the bolted connections shall be inspected (in accordance with Subarticle 6.03.03-19, amended elsewhere herein) to confirm the high-strength bolts were properly tensioned.

The post shall be erected so that the centerline of the post will be plumb after the application of all the dead loads. The post may be initially installed raked in the opposite direction of the overhead member to obtain the plumb condition.

During the erection of the post, the leveling nuts and washers shall be inspected, and if necessary adjusted, so that they are in full contact with the bottom surface of the baseplate. Subsequently, the top nuts and washers shall be inspected, and if necessary adjusted, so that they are snug tight (in full contact with the baseplate).

With the top nuts snug tight, the top nuts shall be tightened one-sixth of a turn beyond snug tight. After the top nuts are tightened, the leveling nuts should be retightened to assure the full contact has been maintained. The distance from the bottom of the leveling nuts to the top of the foundation shall not exceed dimension shown on the plans.

After tightening the anchor bolts, lock nuts shall be installed over the top anchor nuts. The lock nuts shall have full thread engagement.

After erecting the sign support, the sign support shall be electrically grounded by attaching the bare copper grounding conductor to the inside of the handhole frame with a stainless steel bolt and to the ground rod with a ground clamp. The rigid metal conduit shall be electrically grounded by attaching the bare copper grounding conductor to the insulated bonding bushing and to the ground rod with a ground clamp.

After installation of the sign panel(s), the anchor bolt nuts (leveling and top anchor nut) and washers shall be in full contact with the top and bottom surfaces of the pole base plate and the centerline of the pole shall be plumb.

Method of Measurement: This work will be measured for payment by the actual number of tubular arch sign supports of the type specified, installed and accepted in place.

Basis of Payment: This work will be paid for at the contract unit price each for "Tubular Arch Sign Support Structure" and/or "Tubular Arch Cantilever Sign Support," complete in place, which price shall include field survey, furnishing, fabricating, surface preparation, galvanizing, transporting and erecting a tubular arch sign support, including the sign panel support beams, and all materials, equipment, labor, tools, and work incidental thereto.

The cost of foundation, including excavation, reinforcement, concrete and anchorage materials, shall be paid for under the item "Tubular Arch Sign Support Foundation".