DIVISION 9
SIGNING

SECTION 900
GENERAL REQUIREMENTS FOR SIGNING

900-1 DESCRIPTION

Furnish, fabricate and erect complete traffic sign systems in accordance with the contract.

900-2 ACCEPTANCE OF SIGNS

Before final inspection of the signs, clean exposed sign and support surfaces and repair the sign as may be deemed necessary to ensure the safety, effectiveness and neat appearance of the work.

Maintain responsibility for the signs until accepted by the Engineer. Any damaged sign will not be accepted by the Engineer. Any repairs to the signs before final acceptance of the project are to be approved by the Engineer.

Do not perform any repair work without written approval. Make repairs only in the presence of the Engineer.

Handle, transport and store all signs in accordance with the sheeting manufacturer's recommendations. Failure to comply with the manufacturer's recommendations during the handling, transporting and storing of the signs will be cause for rejection.

The Contractor may request early Engineer acceptance of part or all of the highway signs, including sign panels, retroreflective sheeting and associated hardware, before final project acceptance. Sign supports will not be accepted early. To be accepted before final project acceptance, the signs shall be required for traffic control at that phase of project construction.

If the Engineer accepts the signs, the Contractor will be relieved of the responsibility for any damage or theft that may occur to the signs, retroreflective sheeting or associated hardware, with exception of any damage caused by the Contractor or any subcontractor working on the project.

900-3 ALTERNATE DESIGN

Standard designs for Types A, B, C, D, E or F signs will be shown in the contract. Instead of the standard design, the Contractor may submit for approval an alternate design for sign panels differing in component parts and construction details from those shown in the contract. Provide any alternate designs that are in accordance with the MUTCD.

Submit complete details of the alternate sign designs to the Engineer for approval. Include the dimensions, thickness and alloys of the component parts, and typical shop drawings of all fabrication, erection and construction details.

Alternate design for supports and footings will not be permitted.

900-4 COVERING OF SIGNS

Cover signs or portions of signs with opaque material if erected on roads open to traffic and not yet applicable. Keep signs or portions of signs covered until instructed to remove the covering. Provide covering for entire signs by an approved method provided by sheeting manufacturer that will prevent the messages from being read or seen during both day and night conditions and that will cause no harm to the sheeting face.

SECTION 901
SIGN FABRICATION

901-1 DESCRIPTION

Fabricate and furnish signs, including sign face, supporting frames, hardware and package the signs for shipment.

901-2 MATERIALS

Refer to Division 10.

Item	Section
Retroreflective Sheeting	1092-2
Signs and Hardware	1092-1
RFID Tracking Program (A, B, and D Signs)	1030-1, 1030-2, 1030-8

901-3 CONSTRUCTION METHODS

(A) General

Details concerning the fabrication and erection of the signs are shown in the contract. Sign designs not shown in the contract are available from the Engineer.

Fabricate all items within 1/8 inch of design measurements. Scribe each sign, shield, arrow, overlay or blank on the back with the month and year.

Do not begin fabrication of Type A and B signs until S-dimension verification revisions have been approved by the Engineer.

Provide mounting holes in the Z-stringers of the signs in accordance with the details shown in the contract or approved shop drawings. Provide a space between the Z-bar and backing strip not greater than 1/8 inch.

Date the erection of all signs and sign assemblies using printed self-adhesive labels designed for punching the appropriate day, month and year numbers with a hole punch. Place the label on the back of each sign in the lower corner nearest the roadway. The Sign Fabricator will provide a sufficient quantity of the labels for each sign. For Type A, B and D signs, print on the back of each sign the size of that sign (e.g. 144 inches x 48 inches) with black vinyl characters at least 4 inches in height and located in the bottom right corner on the back of the sign. The self-adhesive installation date label shall be located near the vinyl characters and should include a Departmental approved RFID tag/label in accordance with Section 1030.

Ship all multi-panel signs to the project intact, completely assembled and ready to be installed. Fabricate signs taller than 12 feet as two separate signs with a horizontal splice, ready to be spliced and installed. Unless approved by the Engineer, no assembly other than a horizontal splice will be permitted except when a route shield or copy is required to be attached because of the horizontal splice.

(B) Department and Contractor Furnished Signs

Use the contract to determine whether the signs are to be fabricated and furnished by the Contractor or whether the Department will provide them to the Contractor.

For both Department and Contractor Furnished Signs, the Contractor provides all mounting hardware consisting of, but not limited to, shims, backing plates, mounting bolts, washers and nuts.

The sign fabricator will provide vertical Z-bars required for attaching secondary signs to the primary signs.

Confirm in writing at least 4 months in advance, the actual date the Department furnished signs will be required. The signs will be made available to the Contractor for pickup at the

North Carolina Department of Public Safety sign fabrication facility on N.C. 39 near Bunn, North Carolina, unless otherwise indicated in the contract. Provide for all transportation.

The Engineer will inspect and approve the signs before they are packaged and crated for shipment. Take delivery of all signs within 60 days of the date requested or the date they are made available, whichever occurs last, and within 96 hours of receiving the first sign. The Engineer shall approve any exception to the above delivery procedure. At the time the signs are delivered to the project, provide to the Engineer one copy of the sales ticket furnished with the signs.

After taking possession of the signs, the Contractor is responsible for any damage or theft that occurs to signs before final acceptance by the Engineer. Comply with the reflective sheeting manufacturer's recommendations for handling, transporting, erecting and storing of the signs. Acceptably repair or otherwise correct any damage to the signs or refabricate them. When requested by the Contractor, the Department may have the necessary repairs made or the signs refabricated, and deduct the associated cost thereof from monies due the Contractor.

(C) Signs

Construct all signs, supporting frames and assemblies in accordance with the details shown in the contract and Tables 901-1 and 901-2.

TABLE 901-1
SIGN TYPE PARAMETERS

Sign Type	Vertical and Horizontal Dimensions	144"x 48" Aluminum Panels	Horizontal Z-Bars	Aluminum Thickness
A	Vertical or Horizontal > 144" or Vertical and Horizontal > 48"	Multiple	Yes	0.125"
B	Vertical and Horizontal ≤ 144" and Vertical or Horizontal ≤ 48"	Single	Yes	0.125"
D	-	Single	No	See Table 901-2
E	-	Single	No	See Table 901-2
F	-	Single	No	See Table 901-2

(1) Type A Signs

Fabricate Type A signs from multiple aluminum sheet increments of the thickness shown in Table 901-1, with welded studs for attachment to the supporting frame.

Use aluminum sheets with increments of 4 feet in width; except, for sign widths that are not multiples of 4 feet, a maximum of 2 panels may be cut to less than 4 feet. No panel may be cut to less than one foot. Mount aluminum sheet increments vertically and provide with backing strips at the vertical joints, held firmly in place, to keep the abutting sheets in proper alignment. Leave a space of 0.020 inch to 0.032 inch between each panel sheeted with non-prismatic sheeting. Prismatic sheeting is be trimmed at a 45° angle from the edge of each panel.

Fabricate signs with a height of 12 feet or less, without horizontal joints. No more than two horizontal joints will be permitted for signs that are more than 12 feet in height. Locate the joint near the mid-height of the sign. Construct this joint according to the details in accordance with the contract.

(2) Type B Signs

Fabricate Type B signs from a single aluminum sheet of the thickness shown in Table 901-1, with welded studs for attachment to the supporting frame.

(3) Types D, E and F Signs and Milemarkers

Fabricate Types D, E and F signs and milemarkers from single sheets of the thickness shown in Table 901-2, with holes for bolting to the supports.

Construct Types E and F signs in accordance with the *FHWA Standard Highway Signs*. Adequately identify each individual sign to the correct assembly. Following the erection of Type E and F sign assemblies, leave the identification markings on the individual signs until Department personnel have verified compliance with these requirements.

(4) Overlays for Existing Signs

Manufacture all overlays for existing signs of the thickness shown in Table 901-2. Do not make holes for rivets in the overlays during fabrication, but instead field-drill them during the erection process.

(D) Aluminum

(1) Thickness Requirements

TABLE 901-2
ALUMINUM THICKNESS REQUIREMENTS FOR SIGNS

Vertical or Horizontal Dimension	Minimum Thickness
Inches	*Inches*
0-11.9	0.032
12-35.9	0.063
36-47.9	0.080
48 and larger	0.125
Milemarkers	0.080
Overlays	0.063

(2) Preparation of Aluminum Sign Surfaces

Do not handle any metal, except by appropriate handling devices or by workmen wearing clean gloves, between the beginning of the coating operations and the completion of the application of the retroreflective sheeting. Retreat aluminum sign surfaces that come into contact with grease, oils or other contaminants before the application of retroreflective sheeting.

Before applying retroreflective sheeting to the aluminum, treat the aluminum sign surfaces with a chromate conversion coating. Such coating shall be applied according to the manufacturer's instruction and shall conform to ASTM B449, Class 2, and should range in color from silvery iridescent to pale yellow. The coating weight shall be 10 mg/sf to 35 mg/sf on the entire surface area including along the edges of the sign substrate with a median of 25 mg/sf as the optimum coating weight. Ensure the coating does not appear dusty when wiped with a clean, lint-free cloth and does not show excessive buildup at edges. Sand smooth all burrs and scratches before applying retroreflective sheeting. Sheet all sanded aluminum within the same day to prevent the formation of corrosion on the metal. Do not sand or use abrasive materials on sheeted faces. Aluminum products shall be randomly tested.

(E) Supporting Frames

Use supporting frames for Types A and B signs consisting of 2 or more horizontal aluminum Z-stringers with vertical aluminum bar stiffeners in accordance with the details

and dimensions shown in the contract. Use a nylon washer to attach all thru bolts with a play of at least 1/16 of an inch and no more than 1/8 of an inch. Provide stringers with necessary holes and slots for bolting stiffeners, attaching aluminum sheet increments and mounting to supports. Do not field drill holes in any part of the structural assembly, except the field drilling of horizontal Z-bars for attaching new signs to existing supports when necessary.

(F) Welding

Weld studs to aluminum sheets by the capacitor discharge method. If the studs are welded after the retroreflective sheeting has been applied, ensure that burn-through does not damage the retroreflective sheeting.

Shoot a test stud on each Type A and B sign in the lower left corner of the most left panel facing the back of the sign.

(G) Retroreflective Sheeting

Apply retroreflective sheeting to the aluminum sign panels in accordance with the retroreflective sheeting manufacturer's recommendations. For each multi-panel increment sign using glass beaded materials, sheet the entire sign from the same roll.

If a sign panel needs to be replaced after sign fabrication, the replacement panel may be sheeted with retroreflective materials from a different lot or drum number than the remainder of the sign; however, use material that visually color matches and meets Article 1092-2.

Take retroreflectometer readings on all 4 corners of each panel and document the readings on the sign design drawings.

Overlap all splices of any encapsulated or enclosed lens sheeting to allow water to run off without running into the splice. All prismatic sheeting will be butt spliced.

Remove all foreign materials on the sheeted face with compressed air.

Keep a sample of each roll of sheeting and test for retroreflective compliance.

Patch wrinkles in the sheeting around thru bolts by removing the affected sheeting from the metal. Then patch this area with a circular patch encompassing an area 1/4 inch outside the affected area. This patch shall not exceed the standard patching limits shown in Table 901-3.

Ensure that all patches on the sign have a 1 inch minimum width or as recommended by the sheeting manufacturer.

Maintain documentation of the lot, drum, inspector, roll size, date received, date sheeted and metal treater on all signs, slip sheeting, copy, borders, shields, overlays, arrows and panels and retroreflectometer readings.

Obtain and assign to the Department in writing warranties for sign sheeting used in the fabrication of all permanent signs from the sheeting manufacturer. Warrant the signs against defective sheeting per the requirements outlined in the contract.

Define “permanent signs” as Types A, B, C, D, E and F signs, overlays for all sign types and milemarkers, and exclude any signs used only for traffic control while the project is under construction.

The reflective sheeting may be patched to repair incidental damage to the sheeting that might occur during manufacture, in transit or after installation; however, the patches cannot exceed the limits in Table 901-3.

TABLE 901-3
SIGN PATCHING LIMITS

Sign Area	Maximum Number and Size of Patches During Fabrication		Maximum Number and Size of Additional Patches After Field Erection	
Square Feet	*Max. Number per Sign*	*Max. Size in Sq.In.*	*Max. Number per sign*	*Max. Patch Size in Sq.In.*
0 to 15.0	0	0	0	0
15.1 to 50.0 (Single Panel)	1	1	1	1
30.0 to 80.0 (Increment Panel)	2	2	1	2
80.1 and Greater	**A**	3	**A**	3

A. Average not to exceed one patch per panel per sign. Maximum of 3 patches per panel allowed during fabrication with one additional patch per panel allowed after field erection.

(H) Reflectorized Letters, Numerals, Symbols, Border and Shields

(1) General

Use direct-applied retroreflective sheeting, approved digital imaging or demountable retroreflective sheeting letters, numerals, borders, shields and arrows as indicated on the sign designs.

Use designs of letters and numerals that conform to the MUTCD and *FHWA Standard Highway Signs and Markings*. Use border widths, design of route shields and arrows that conform to the MUTCD.

Route shields used on Type A or B signs or overlays shall be demountable or as approved digital imaging.

Space and size all legends and borders in accordance with the contract or approved shop drawings. Any loose, deformed or misplaced legends and borders will be cause for rejection of the entire sign.

(2) Direct Applied

Provide direct-applied reflectorized letters, numerals, arrows and borders that are of the type and color of retroreflective sheeting shown in the contract for each sign. All direct applied copy or border not permanently affixed may be removed and replaced on signs if necessary during manufacture.

(3) Demountable

Attach demountable letters, numerals, borders, shields, arrows and alphabet accessories directly to sign faces with rivets as shown in the contract.

Use letters, numerals, arrows, borders and shields made of adhesive-coated retroreflective sheeting, permanently adhered to a flat aluminum backing, in accordance with the contract.

Use aluminum backing of at least 0.032 inch thick aluminum sheeting of 3004-H38, 5052-H38 or 6061-T6 alloy. Treat with a light, tight, amorphous chromate-type coating in accordance with the recommendations of the retroreflective sheeting manufacturer. Apply the retroreflective sheeting to the properly prepared aluminum using the method and equipment prescribed by the sheeting manufacturer.

Supply each letter, numeral, arrow, border and shield with mounting holes, and secure to the sign surface with non-twist corrosion resistant aluminum rivets. Use letters, numerals, arrows and borders that have rivets on all sides and ends spaced not more than 6 inches on centers, measured along the edges. Make sure that each legend piece has at least one rivet in each corner and at least 2 rivets in each end. Attach route shields as part of Type A or B signs with aluminum rivets spaced not more than 9 inches apart, measured along the edges of the shield.

Use a 1/4 inch diameter nylon washer under the head of all pull through type rivets for all demountable copy and shields.

(4) If approved, use digital printing equipment to image or reverse image on retroreflective sheeting for letters, numerals, borders, shields and arrows on digitally approved retroreflective sheeting for traffic control signs on aluminum or digitally printed traffic sign faces intended to be applied to a sign substrate.

(I) Silk Screening

Apply all legends and borders on Type E and F signs by silk-screening or reverse silk-screening after the sheeting is attached to the panels. Perform all screening as recommended by the manufacturer of the retroreflective sheeting. Use the color of all legends, borders and backgrounds, and their placement on the sign, in accordance with the contract.

Use opaque black ink for nonreflectorized message application, as manufactured or recommended by the manufacturer of the retroreflective sheeting.

Use transparent ink and thinner, for application on signs reflectorized with white retroreflective sheeting, as manufactured or recommended by the manufacturer of the retroreflective sheeting. Use colors that conform to the *FHWA Color Tolerance Charts* and AASHTO M 268 when thoroughly dry.

Test all lots of transparent ink for compliance with the minimum coefficient of retroreflection equal to 70% of the specified minimum retroreflection of the corresponding sheeting color and document the retroreflection value.

Inspect the first 5 signs of each screening and then every fifth sign. When unacceptable signs are found, all signs shall be inspected individually.

Only 3 nonwets per sf, no larger than 1/16 inch in diameter, covering no more than 1/3 of the total area of the sign are allowable. This includes nonwets from either the sheeting or the screen-printing.

Only one tadpole per 6 sf, no longer than 1 1/2 inch and not readily visible under lighted inspection is allowable.

(J) Mounting Hardware

Provide all mounting hardware consisting of, but not limited to, shims, backing plates, mounting bolts, washers and nuts. Provide mounting holes in the Z-stringers of the ground mounted signs in accordance with the details shown in the contract.

(K) Packaging, Shipping and Storing

Protect all signs during shipment and storage. Before shipping, make sure that all signs are free of moisture and that all inks are thoroughly dry. Do not apply adhesive tapes to any sign surface. Keep all packaged signs entirely dry.

Use assembled or partially assembled signs other than flat sheet signs that have sufficient braces securely attached to prevent buckling or warping at all times.

Affix a label outlining the retroreflective sheeting manufacturer's recommendations for handling, transporting and storing all types of signs to each shipping carton or crate. Provide full details of such recommendations with each shipment of signs.

Label each crate or package of signs or panels as to the contents (arrows, shields, etc.), WBS number and sequence of packages if more than one package is for a single sign.

Maintain documentation of the lot, drum, inspector, roll size, date received, date sheeted, metal treater on all signs, slipsheeting, copy, borders, shields, overlays, arrows, panels and retroreflectometer readings.

Individually rack or separate by foam or slip sheeting on A-frame racks all sheeted panels. Do not use spliced, overlapped, ripped or torn slipsheeting or foam.

Store all packed signs standing at a 75° to 90° angle.

Turn all panels and sign faces to the inside of the crates, whenever possible.

When crating a one-panel sign, provide the face side with an extra piece of foam and cardboard taped to the outside of the face side of the package.

Pack panels of 102 inches in length or longer in only 2 per package.

Ensure all signs are debris free on the back side, with no misplaced writing, tape or extraneous sheeting.

Crate to allow a 2 inch space on the inside dimensions larger than the size of the largest package.

Store completed Type A and B signs back to back with at least 12 inches between faces.

When crating 2 panels of different sizes, place the smaller panel with its face to the back of the larger panel and package with an extra piece of foam and cardboard taped to the outside of the larger panel, with its face to the outside of the crate. Provide extra packaging on both outsides of the package for double-faced signs.

Crate packaged panels to allow the passage of a 1/8 inch spacer on the inside of each side of the crate, so that the panels are not overly tight or binding in crate.

Inspect all signs and packaging before shipping to assure compliance with the contract. The Department retains the right to inspect the signs and packaging before shipping.

(L) Transparent Films

Use transparent films instead of silk screening when authorized by the Department. Transparent film is a durable, transparent, acrylic colored film coated with transparent, pressure-sensitive adhesive. When the film is applied over reflective sheeting, the coefficient of retroreflectivity shall meet the color and type of sheeting in Tables 1092-3, 1092-4 or 1092-5. Use Department approved transparent film approved by the manufacturer of the reflective sheeting to ensure the materials meet the manufacturer's warranty and obligation in Subarticle 1092-2(B).

(M) Digital Printing

Use digital Printing instead of silk screening or transparent films when authorized by the Department. Digital print technologies consists of digital reflective sheeting, digital ink systems, and clear overlay film. The manufacturing application process and the materials must be approved by the sheeting manufacturer to ensure it meets the manufacturer's warranty and obligation in Subarticle 1092-2(B). The manufacturer may apply all legends and borders on Type E and F signs using digital printing.

Use opaque black ink for nonreflectorized message application, as manufactured or recommended by the manufacturer of the retroreflective sheeting.

Retroreflective sheeting shall consist of white or colored sheeting having a smooth outer surface and that essentially has the property of a retroreflector over its entire surface. Retroreflective sheeting shall conform to all requirements to the FHWA Color Tolerance Charts and AASHTO M 268 when thoroughly dry Digital printed ink systems used to print traffic signs must meet and comply with daytime and nighttime chromaticity (color standards) as recognized in ASTM D4956.

Digital printed ink systems must meet 70% of the initial retroreflectivity in Table 1092-3 and the coefficient of retroreflectivity for color and type of sheeting in Tables 1092-3, 1092-4 or 1092-5.

All digital inks and digital reflective sheeting shall be listed on the NCDOT APL and tested on AASHTO Product Evaluation & Audit Solutions test deck for 3 years prior to consideration to ensure the digital printed ink system meets the warrantee obligations listed in Subarticle 1092-2(B) for the respective sheeting grade.

Permanent traffic signs printed with digital ink systems will be fabricated with a full sign Protective Overlay Film designed to protect the entire sign from fading and UV degradation. The over laminate will comply with the retroreflective sheeting manufacturer's recommendations to ensure proper adhesion and transparency and will also meet the reflective film durability in Subarticle 1092-2(B).

Temporary signs printed with black ink only will not require a protective overlay film as long as the finished sign is warranted for a minimum outdoor durability of three years by the sheeting manufacturer.

901-4 SIGN QUALITY

Provide signs that present a uniform appearance free from color match problems, non-uniform color, streaks, spots, abrasions, blistering or other defects in the sheeting.

Sheeting may be inspected before application to sign blanks, after installation to sign blanks, after completion of the sign in the sign fabricator's facility and after installation. Clean all installed signs before final field inspection.

The retroreflective sheeting will be unsatisfactory if it has deteriorated due to any cause except defacement resulting from vandalism or damage resulting from impact by a motor vehicle or other object to the extent that:

(A) The sign is ineffective for its intended purpose when viewed from a moving vehicle under normal day and night driving conditions, or

(B) The coefficient of retroreflection is less than the minimum specified for that sheeting as shown in Tables 1092-3, 1092-4 or 1092-5 when measured by a Department approved retroreflectometer, or

(C) The screened message and border or reverse screened background has stained, discolored, streaked, faded, turned dark or has developed cracks, scaling, pitting and/or blistering, or

(D) The sign is unsatisfactory with regard to uniform appearance due to cracking, streaking, delamination, blistering, crazing or discoloration of the sheeting, or

(E) The sign is unsatisfactory with regard to remaining uniform in color over the entire reflecting surface both day and night and displaying the same color both in daylight and under lights at night.

(1) For glass bead material, sheeting will be subjected to a visual test with the human eye as the test instrument. Objectionable non-uniformity of color and reflectivity (retroreflection) under light at night is cause for the sign to be tested for retroreflection to determine compliance with the following requirements:

The retroreflection values on any sign shall not vary from each other by more than a ratio of 1.10 (1.20 white) at any 2 points at least 12 inches apart, nor more than 1.30 (1.30 white) at any 2 points anywhere on the sign, nor more than, 1.10 (1.20 white) at any 2 points on the border or between any 2 adjacent letters, numerals or symbols. Failure to meet the above requirements will result in sign rejection. Retroreflection will be tested using a retroreflectometer approved by the Engineer.

(2) For prismatic material, sheeting will be subjected to a visual test with the human eye as the test instrument.

901-5 MEASUREMENT AND PAYMENT

Sign fabrication will be measured and paid as the actual number of square feet of sign face areas of each type, including milemarkers and overlays acceptably fabricated. In measuring this quantity, the sign face areas will be calculated to the nearest 1/100 of a sf, using the dimensions shown in the contract.

The areas of odd-shaped signs (e.g. stop signs and shield-shaped route markers) will be calculated as squares or rectangles using the dimensions shown in the contract. The areas of round, diamond and triangular signs will be calculated for their true shapes using plan dimensions.

Repair or otherwise correct any damage to the signs or refabricate them at no cost to the Department. When requested by the Contractor, the Department may have the necessary repairs made or the signs refabricated, and deduct the associated costs thereof from monies due the Contractor.

Payment will be made under:

Pay Item	Pay Unit
Contractor Furnished, Type ____ Sign	Square Foot

SECTION 902
FOUNDATIONS FOR GROUND MOUNTED SIGNS

902-1 DESCRIPTION

Construct foundations for sign supports including locating, staking, excavating, shoring, backfilling, forming, landscaping and other necessary tasks as required.

902-2 MATERIALS

Refer to Division 10.

Item	Section
Hot Applied Joint Sealer	1028-2
Borrow Material	1018
Organic-Zinc Repair Paint	1080-7
Portland Cement Concrete Production and Delivery	1000
Reinforcing Steel	1070
Select Materials	1016

902-3 CONSTRUCTION METHODS

Establish the proper offset, longitudinal location and foundation elevation of each ground mounted sign support. Provide proper level and orientation of all supports.

Thoroughly compact all backfill in 6 inch layers. Remove all unneeded excavated material from the site.

Perform all excavation necessary for foundation construction to the elevations and dimensions shown in the contract. Place concrete against undisturbed soil.

Construct concrete sign foundations in accordance with Section 825. Construct either reinforced or plain Class A concrete foundations in accordance with the contract. Shape the tops of the foundations to conform to finished ground elevations such that water will not collect against the supports. No construction joints will be permitted.

Form the top 6 inches of foundations by approved methods. Center the supports in the foundations, securely brace and hold in proper position and alignment during placement of the concrete. Provide an ordinary surface finish to the concrete.

902-4 MEASUREMENT AND PAYMENT

Reinforced and *Plain Concrete Sign Foundations* will be measured and paid as the computed number of cubic yards of concrete incorporated into the completed and accepted foundation. Computing the number of cubic yards of concrete will be done from the dimensions shown in the contract or from revised dimensions authorized by the Engineer, calculated to the nearest 1/100 of a cy. Such payment will include, but is not limited to, excavating, shoring, backfilling, forming, landscaping and other necessary tasks as required. No separate measurement and payment will be made for reinforcing steel for *Reinforced Concrete Sign Foundations* as the cost of such shall be included in the price per cubic yard for *Reinforced Concrete Sign Foundations*.

Payment will be made under:

Pay Item	Pay Unit
Reinforced Concrete Sign Foundations	Cubic Yard
Plain Concrete Sign Foundations	Cubic Yard

SECTION 903
GROUND MOUNTED SIGN SUPPORTS

903-1 DESCRIPTION

Furnish, fabricate, clear for sight distance and install ground mounted and barrier mounted signs supports.

The types of supports covered by this section are:

Breakaway steel beam sign supports

Simple steel beam sign supports

3-lb steel U-channel supports

2-lb steel U-channel supports

Barrier sign support assembly

Wood supports

Steel square tube supports

903-2 MATERIALS

Refer to Division 10.

Item	Section
Breakaway or Simple Steel Beam Sign Supports (W- or S-Shapes)	1094-1(A)
Ground Mounted Signs	1094
Hot Applied Joint Sealer	1028-2
Organic-Zinc Repair Paint	1080-7

Item	Section
Signing Materials	1092
Steel Square Tube Supports	1094-1(D)
Steel U-Channel Supports	1094-1(B & C)

903-3 CONSTRUCTION METHODS

(A) Location and Field Verification

The support lengths and dimensions for steel and wood ground mounted supports shown in the contract are estimated for project bid purposes.

The Engineer or contract surveyor will establish the proper offset, longitudinal location; foundation elevation and S-dimension of each ground mounted and barrier mounted sign support. The Signing and Delineation Unit will issue a revision of the Sign Support Chart Sheet following receipt of field-verified S-dimensions.

Order supports for ground mounted signs when the revised support lengths, dimensions and sizes have been determined and the appropriate plan revision is completed.

Provide the proper vertical plumb, level and orientation of all signs and supports.

(B) Clearing for Sign Sight Distance

Clear vegetation in front of signs where necessary to achieve proper sight distance to the sign. The sight distance area includes the triangular region of land extending from the edge of the travel lane 800 feet in advance of the sign to 4 feet beyond the furthest edge of the sign from the travel lane. The Engineer will determine where clearing is required and the amount of clearing at the sign locations. Perform the clearing in accordance with Section 200.

(C) Breakaway Steel Beam and Simple Steel Beam

Fabricate and install the supports in accordance with the contract. Punch, cut or weld supports before galvanizing. Galvanize each component part in accordance with ASTM A123 before assembly. Provide supports that are uniformly straight to within 1/8 inch tolerance for pieces less than 20 feet in length and 1/4 inch tolerance for pieces over 20 feet in length.

Cut the upper and middle sections of breakaway supports from the same member. Bolt the hinge joint in the breakaway supports to ensure true alignment of the 2 sections. After bolting of hinge connections make sure that the 2 sections are in the same position relative to each other, as before being cut. Completely assemble breakaway supports before erection.

Provide supports that are plumb. Do not shim the supports. Take adequate care during erection of supports to prevent damage to the surface finish. Use 2 coats of an approved non-aerosol organic-zinc repair paint in touching up damaged areas on all galvanized materials.

(D) Steel Supports

(1) General

Drive the supports to the required depth, being sure they are plumb. Drive the supports by hand or by mechanical means. Protect the supports with an appropriate driving cap. Concrete foundations are not required. In island applications, cored holes shall be to the soil depth.

Replace any support that is bent, or otherwise damaged in driving.

Do not weld supports in the field. Use 2 coats of an approved non-aerosol organic-zinc repair paint in touching up the tops of U-channel supports that may have been

damaged in driving. Cut ends of supports, frames, cross bracing and damaged areas on these and all other galvanized materials.

Any steel supports cut in the field shall have two coats of an approved non-aerosol organic-zinc repair paint.

Use supports of sufficient length to permit the appropriate sign mounting height. Spliced supports are not permitted on new construction.

(2) U-Channel

Use 3-lb galvanized steel U-channel supports for enhanced milepost signs and Types D, E and F signs. Use 2-lb galvanized steel U-channel supports for milepost signs.

(3) Perforated Square Tubing

Use square tube supports in accordance with the contract.

(E) Barrier Supports

(1) Small

Attach brackets and U-channel supports to the median or shoulder barrier for the erection of Type E or F signs or milemarkers in accordance with the contract.

(2) Large

Attach brackets, anchorage and pipe supports to the median or shoulder barrier for the erection of Type E signs in accordance with the contract.

(F) Wood Supports

Use wood supports in accordance with the contract.

Replace any support that is damaged during erection.

Breakaway wood supports shall be drilled in accordance with the contract. All wood supports larger than 4 inches x 4 inches that have not been drilled shall be behind guardrail.

903-4 MEASUREMENT AND PAYMENT

The supports, specified in these *Standard Specifications*, installed and accepted, will be measured for payment as follows:

Supports, Breakaway Steel Beam and *Supports, Simple Steel Beam* will be measured and paid as the actual number of pounds of structural steel installed and accepted. The computed nominal weights shown in the final revised plans will be used in determining this quantity. Measurement will not be made of the weight of nuts, bolts and washers that are part of the sign support, as they will be incidental to the work.

Supports, 3-lb Steel U-Channel will be measured and paid as the actual number of linear feet of 3-lb steel U-channel supports incorporated into the completed and accepted supports and assemblies. Measurements of length will be made to the nearest 1/10 of a foot.

Supports, 2-lb Steel U-Channel will be measured and paid as the actual number of 2-lb steel U-channel support installed and accepted.

Supports, Barrier (Small) will be measured and paid as the actual number of small barrier supports installed and accepted.

Supports, Barrier (Large) will be measured and paid as the actual number of large barrier supports installed and accepted.

Supports, Wood will be measured and paid as the actual number of linear feet of wood support incorporated into the completed and accepted supports. Measurements of length will be made

to the nearest 1/10 of a linear foot. The computed linear feet of sign supports, as indicated in the final revised plans will be used in determining this quantity.

Supports, Steel Square Tube will be measured and paid as the actual number of linear feet of steel square tube supports incorporated into the completed and accepted supports and assemblies. Measurements of length will be made to the nearest 1/10 of a foot.

Payment will be made under:

Pay Item	Pay Unit
Supports, Breakaway Steel Beam	Pound
Supports, Simple Steel Beam	Pound
Supports, 3-lb Steel U-Channel	Linear Foot
Supports, 2-lb Steel U-Channel	Each
Supports, Barrier (Small)	Each
Supports, Barrier (Large)	Each
Supports, Steel Square Tube	Linear Foot
Supports, Wood	Linear Foot

SECTION 904
SIGN ERECTION

904-1 DESCRIPTION

Erect existing and proposed ground mounted and overhead signs to existing and proposed supports and furnish mounting hardware. Relocate existing signs in accordance with the contract and Specifications.

The types of signs covered by this section are as follows:

Type A signs
Type B signs
Type D signs
Type E signs
Type F signs
Milemarkers
Overlay signs
Reposition signs
Logo Trailblazer
Logo to panel
Relocation signs

904-2 MATERIALS

Refer to Division 10.

Item	Section
Signing Materials	1092
Organic-Zinc Repair Paint	1080-7

904-3 CONSTRUCTION METHODS

(A) General

Provide new mounting bolts, washers, hex nuts, backing plates and all hardware for signs to be mounted on existing or proposed supports. Do not weld, cut or fabricate in any manner in the field, except for as allowed under Section 903 and for the drilling of holes for attaching demountable legends and borders that cannot be attached in the shop. Field drill Z-bars for attaching signs to supports as required.

Use 2 coats of an approved non-aerosol organic-zinc repair paint in touching up field-drilled holes and damaged areas on all galvanized materials as covered under Section 903.

Make sure that the horizontal edges of signs are level and that the faces of signs are vertical.

Refer to Sections 900 and 901 for requirements of care and handling of signs, final clean up and covering of signs.

(B) Type A and B

(1) General

Attach the signs to supports in accordance with the contract or the approved shop drawings. Make sure that the face of the sign is flat. Any appreciable buckling or warping of the sign face will be cause for rejection of the entire sign.

(2) Ground Mounted

Erect ground mounted Type A and B secondary signs by the required method of attachment shown in the contract. Affix these signs by bolting the horizontal Z-stringers directly to the supports or by bolting vertical Z-bars to the horizontal Z-stringers of the primary sign.

(3) Overheads

For new overhead supports, erect overhead secondary signs in accordance with the approved shop drawings.

For existing overhead supports, design and furnish all new structural members and mounting hardware necessary to erect the new signs. Prepare and submit to the Engineer for approval complete shop drawings and design computations for the bracing and accessory hardware required to attach the sign to the existing overhead sign support. Prepare the design in accordance with *AASHTO Structural Supports for Highway Signs, Luminaires and Traffic Signals,* and the Interim Specifications as shown on the plans. Upon request, the Engineer will provide the Contractor with copies of the shop drawings for existing overhead sign supports.

Attach a new sign above a designated existing overhead sign in accordance with the contract. Furnish all new structural members and mounting hardware necessary to erect the new sign.

(C) Type D, E, F and Milemarkers

Attach the signs to U-channel or perforated square tube supports

(D) Overlay (Ground Mounted and Overhead)

Attach overlays to designated existing ground mounted or overhead signs as required by the contract.

Remove and dispose of all conflicting demountable legends, borders and overlays before attaching new overlays. Employ any method of removal necessary, provided it does not damage the existing sign or the attached overlay. Perform such minor repairs to existing signs as necessary before the attachment of overlays to ensure a finished sign face that is completely flat.

Field-drill 5/32 inch holes in both the overlay and the existing sign simultaneously, according to the rivet spacing requirements shown in the contract. Attach the proposed overlays with 1/8 inch diameter aluminum rivets of the “pull-through” type. Exercise sufficient care in attaching the overlays to ensure that the finished sign face is completely flat and without any ripples and/or buckles.

(E) Reposition Overhead Signs

Reposition existing signs on existing overhead sign supports as required by the contract. Reposition associated lighting systems and secondary signs along with the signs.

When required, drill new holes in the existing vertical attachment members, in order to maintain a minimum clearance of 17 feet to the roadway surface at the new location on the structure. No other field drilling will be allowed.

Adjust and relocate conduit and junction boxes as required.

(F) Logo Trailblazer

All logos will be made available for pick up at the Division Traffic Services' sign shop. Erect logos on U-channel or perforated square tube supports in accordance with Type F sign details shown in the contract.

(G) Logo to Panel

All logo panels and logo mileage panels will be made available for pick up at the Division Traffic Services' sign shop. Attach logo panels to the mainline signs with ten 1/8 inch diameter rivets of the pull through type. Attach logo panels to the ramp signs with four 1/8 inch diameter rivets of the pull through type. Attach mileage panels to ramp signs with six 1/8 inch diameter rivets of the pull through type. Drill 5/32 inch holes in the background signs to match those in the logo panels and logo mileage panels for attaching these signs to the background signs. The mileage panel shall be installed 1/2 inch below the logo panel with 3 rivets at the top and 3 rivets at the bottom spaced evenly apart. Place logo as shown on the contract.

(H) Relocation (Ground Mounted) Signs

Maintain signs in good serviceable condition throughout the duration of the project. Repair any areas or materials within the project limits disturbed or damaged in performance of the work required under this section as directed by the Engineer at no cost to the Department.

Remove existing signs from their existing locations and relocate to their new location in accordance with the contract. Repair or replace signs damaged in relocating at no cost to the Department. Refer to Section 907 for disposal of sign components.

Erect signs and supports according to requirements of Sections 903 and 904. Immediately relocate all warning and regulatory signs to new locations. Relocate all other signs to new locations in no more than 12 hours.

904-4 MEASUREMENT AND PAYMENT

Sign Erections (Ground Mounted and Overhead) will be measured and paid as the actual number of ground mounted and overhead signs erected and accepted. Each type F sign assembly will be measured as one sign.

Sign Erection, Relocate Type ____ (Ground Mounted) will be measured and paid as the actual number of signs acceptably relocated. Secondary signs will be incidental work in conjunction with the primary sign. Sign assemblies consisting of more than one sign panel will be considered one sign.

Sign Erection, Logo Mileage Panel to Sign will be measured and paid for as actual number of Mileage Panels erected and accepted. Payment for *Sign Erection, Logo Mileage Panel to Sign* shall be incidental to *Sign Erection, Logo to Panel* erection unless only replacing the logo mileage panel.

Payment will be made under:

Pay Item	Pay Unit
Sign Erection, Type ____ (Overhead)	Each
Sign Erection, Type ____ (Ground Mounted)	Each
Sign Erection, Type ____	Each
Sign Erection, Milemarkers	Each
Sign Erection, Overlay (Overhead)	Each
Sign Erection, Overlay (Ground Mounted)	Each
Sign Erection, Reposition Overhead	Each
Sign Erection, Logo to Panel	Each
Sign Erection, Logo Trailblazer	Each
Sign Erection, Logo Mileage Panel to Sign	Each
Sign Erection, Relocate Type (Ground Mounted)	Each

SECTION 906
OVERHEAD SIGN STRUCTURE

906-1 DESCRIPTION

Design, fabricate, furnish and erect various types of overhead sign assemblies. Fabricate supporting structures using tubular members of either aluminum or steel. The types of overhead sign assemblies included in this specification are span structures, cantilever structures and sign structures attached to bridges.

906-2 MATERIALS

Refer to Division 10.

Item	Section
Structural Steel	1072
Overhead Sign Structures	1096
Signing Materials	1092
Organic-Zinc Repair Paint	1080-7
Direct Tension Indicators	440 and 1072-5

906-3 CONSTRUCTION METHODS

(A) General

Fabricate overhead sign assemblies in accordance with the details shown in the approved working drawings and the requirements of these specifications.

No welding, cutting or drilling will be permitted in the field, unless approved by the Engineer.

Drill bolt holes and slots to finished size. Holes may also be punched to finish size, provided the diameter of the punched holes is at least twice the thickness of the metal being punched. Flame cutting of bolt holes and slots is not permitted.

Erect sign panels in accordance with the requirement for Type A or B signs as indicated in the plans. Field drill two holes per connection in the Z bars for attaching signs to overhead structures. Provide two U-bolts at each U-bolt connection such as each truss chord to sign hanger and each truss chord to walkway support or light support. Provide two U-bolts at each U-bolt connection where ends of truss chords are supported. The minimum diameter of all U-bolts is 1/2 inch.

For all U-bolt connections of hanger beams to overhead assembly truss chords, provide all U-bolts with a flat washer and double nuts at each end of the U-bolts. All double nuts that are on any U-bolt shall be the same thickness and weight. When assembled, the double nuts shall be brought tight against each other by the use of two wrenches.

Use two coats of an approved non-aerosol organic-zinc repair paint to touch up minor scars on all galvanized materials.

For high strength bolted connections, use direct tension indicators in accordance with Article 440-8. When galvanized high strength bolts are required, use bolts, nuts and washers meeting Subarticle 1072-5(F).

(B) Shop Drawings

Design the overhead sign supports, including foundations, prior to fabrication. Submit design calculations and working drawings of the designs to the Engineer for review and acceptance.

Have a professional engineer registered in the State of North Carolina, perform the computations and render a set of sealed, signed and dated drawings detailing the construction of each structure.

Submit to the Engineer for review and acceptance complete design and fabrication details for each overhead sign assembly, including foundations and brackets for supporting the signs and maintenance walkways, if applicable, electrical control boxes, and lighting luminaires. Base design upon the revised structure line drawings, wind load area and the winds speed shown in the plans, and in accordance with the AASHTO *Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals,* and the Interim Specifications as shown on the plans.

Submit electronic (.pdf) copies of completely detailed working drawings and the design calculations including all design assumptions for each overhead sign assembly to the Engineer for approval prior to fabrication. Working drawings shall include complete design and fabrication details, including foundations, provisions for attaching signs, maintenance walkways, when applicable, lighting luminaires to supporting structures, applicable material specifications, and any other information necessary for procuring and replacing any part of the complete overhead sign assembly.

Allow 40 days for initial working drawing review after the Engineer receives them. If revisions to working drawings are required, an additional 40 days shall be required for review and approval of the final working drawings.

Approval of working drawings by the Engineer shall not relieve the Contractor of responsibility for the correctness of the drawings, or for the fit of all shop and field connections and anchors.

(C) Design and Fabrication

(1) The following criteria govern the design of overhead sign assemblies:

Design shall be in accordance with the AASHTO *Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals,* and the Interim Specifications as shown on the plans.

There are several design criteria that are specified. They include:

(a) Overhead cantilever sign structures shall include galloping loads (exclude four-chord horizontal trusses)

(b) The Yearly Mean Velocity, V_{mean}, in North Carolina shall be assumed to be 11.6 mph.

(c) The Fatigue Importance Category used in the design, for each type of structure, shall be for:

(i) Cantilevered structures with span greater than 50 feet – Fatigue Importance Category I.

(ii) Cantilevered structures with span less than or equal to 50 feet – Fatigue Importance Category II.

(iii) Non-Cantilevered structures – Fatigue Importance Category II.

(2) The following interpretations or criteria shall be used in the design of overhead sign assemblies:

(a) For design of supporting upright posts or columns, the effective length factor for columns "K", as provided for in Appendix B, Section B.5 of the AASHTO *Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals,* and the Interim Specifications as shown on the plans*,* shall be taken as the following, unless otherwise approved by the Engineer:

(i) Case 1: For a single upright post of cantilever or span type overhead sign structure, the effective column length factor, "K", shall be taken as 2.0.

(ii) Case 2: For twin post truss-type upright post with the post connected to one chord of a horizontal truss, the effective column length factor for that column shall be taken as 2.0.

(iii) Case 3: For twin post truss-type upright post with the post connected to two truss chords of a horizontal tri-chord or box truss, the effective column length factor for that column shall be taken as 1.65.

(b) For twin post truss-type uprights, the unbraced length of the post shall be from the chord to post connection to the top of base plate.

(c) For twin post truss-type uprights, when the post is subject to axial compression, bending moment, shear, and torsion, the post shall satisfy the AASHTO *Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals,* and the Interim Specifications as shown on the plans. Apply axial compression, bending, and shear equations: Equations 5.12.2.1-1, 5.12.2.1-2 and 5.12.2.1-5 as found in the sixth edition. To reduce the effects of secondary bending, in lieu of Equation 5.12.2.1-2, the following equation may be used:

$$\frac{f_a}{F_a} + \frac{f_b}{\left(1 - \frac{0.6 f_a}{F_{\acute{e}}}\right) F_b} + \left(\frac{f_v}{F_v}\right)^2 \leq 1.0$$

Where f_a = Computed axial compression stress at base of post

(d) The base plate thickness for all uprights and poles shall be a minimum of 2 inches but not less than that determined by the following criteria and design:

(i) Case 1: Circular or rectangular solid base plates with the upright pole welded to the top surface of the base plate with full penetration butt weld, and where no stiffeners are provided. A base plate with a small center hole, which is less than 1/5 of the upright diameter, and located concentrically with the upright pole, may be considered as a solid base plate.

The magnitude of bending moment in the base plate, induced by the anchoring force of each anchor bolt shall be calculated as

M = $(PxD_1)/2$.

(ii) Case 2: Circular or rectangular base plate with the upright pole socketed into and attached to the base plate with two lines of fillet weld, and where no stiffeners are provided, or any base plate with a center hole that is larger in diameter than 1/5 of the upright diameter. The magnitude of bending moment induced by the anchoring force of each anchor bolt shall be calculated as

M = $P \times D_2$

Where:

M = Bending moment at the critical section of the base plate induced by one anchor bolt
P = Anchoring force of each bolt
D_1 = Horizontal distance between the center of the anchor bolt and the outer face of the upright, or the difference between the radius of the bolt circle and the radius of the upright
D_2 = Horizontal distance between the face of the upright and the face of the anchor bolt nut

(e) The critical section shall be located at the face of the anchor bolt and perpendicular to the radius of the bolt circle. The overlapped part of two adjacent critical sections shall be considered ineffective.

(f) The thickness of Case 1 base plate shall not be less than the calculated based on formula for Case 2.

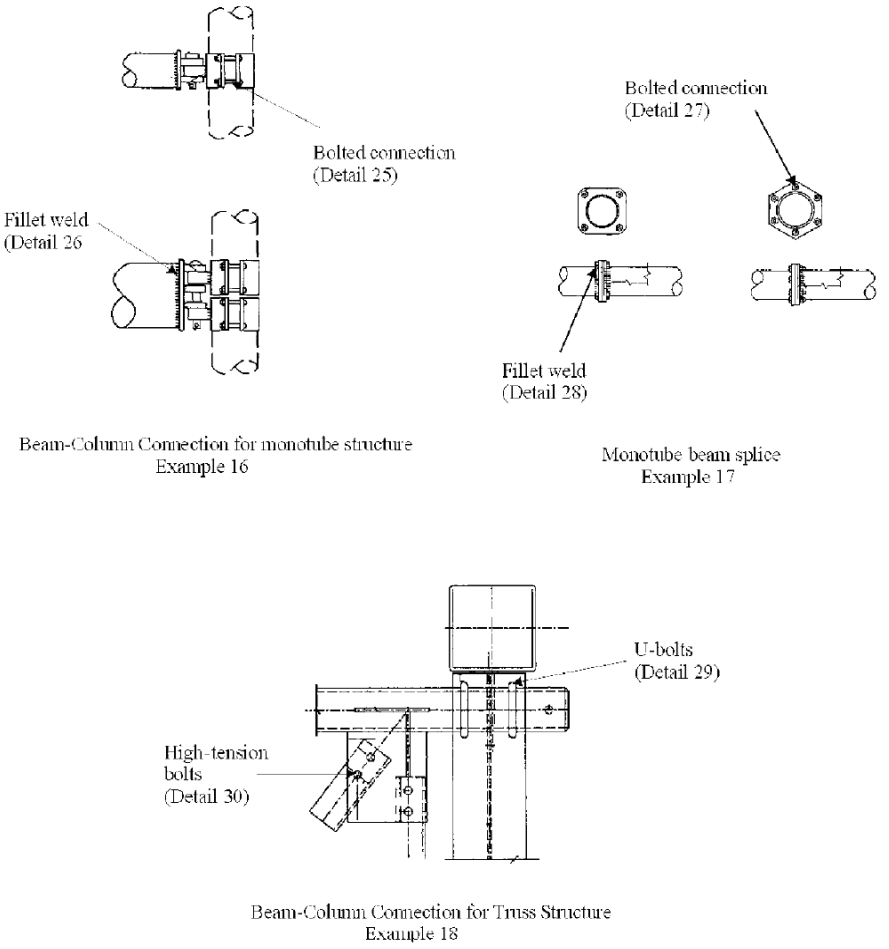
(g) Uprights, foundations, and trusses that support overhead signs shall be designed in accordance with the contract for the effects of torsion. Torsion shall be considered from dead load eccentricity of these attachments, as well as for the attachments such as supporting brackets, lights, etc., that add to the torsion in the assembly. Truss vertical and horizontal truss diagonals in particular and any other assembly members shall be appropriately sized for these loads.

(h) Uprights, foundations, and trusses that support overhead mounted signs shall be designed for the proposed sign wind area as noted in the contract drawings. Truss vertical and horizontal truss diagonals in particular and any other assembly members shall be appropriately sized for these loads.

For non-cantilevered monotube sign support structures, Table 906-1 and Figure 906-1 are considered as a required addition to the AASHTO *Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals,* and the Interim Specifications and shown on the plans*:*

TABLE 906-1
NON-CANTILEVERED MONOTUBE SIGN SUPPORT STRUCTURES

Construction	Detail	Stress Category	Application	Example
Mechanically Fastened Connections	25. Bolts in tension	D	Beam column connection for monotube structures	16
Fillet-Welded Connections	26. Fillet weld with one side normal to the applied stress	E’	Beam column connection for monotube structures	16
Mechanically Fastened Connections	27. High-Strength bolts in tension	D	Monotube or truss-chord splice	17
Fillet-Welded Connections	28. Fillet weld with one side normal to the applied stress	E’	Monotube or truss-chord splice	17
Mechanically Fastened Connections	29. U-bolts tied to the transverse truss column to keep the chords in place	D	Horizontal truss connection with the vertical truss	18
Mechanically Fastened Connections	30. Net section of full-tightened, high-tension bolts in shear	B	Truss-bolted joint	18



From NCHRP Report 494 dated 2003

Figure 906-1. Details shown in Table 906-1.

Fabricate all overhead sign assemblies, including but not limited to foundations, in accordance with the details shown on the approved shop drawings and with the requirements of these Specifications.

Fabricate the span and cantilever supporting structures using tubular members of either aluminum or steel, using only one type of material throughout the project. Sign support structures that are to be attached to bridges shall be fabricated using other structural shapes.

Horizontal components of the supporting structures for overhead signs may be of a truss design or a design using singular (monotube) horizontal members to support the sign panels.

Truss or singular member centerline must coincide with the centerline of sign design area shown on the structure line drawing.

Provide permanent camber in addition to dead load camber in accordance with the AASHTO *Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals,* and the Interim Specifications as shown on the plans. Indicate on the shop drawings the amount of camber provided and the method employed in the fabrication of the support to obtain the camber.

Use cantilever sign structures that meet the following design criteria:

(A) Do not exceed an L/150 vertical dead load deflection at the end of the arm due to distortions in the arm and vertical support, where L is the length of the arm from the center of the vertical support to the outer edge of the sign.

(B) Do not exceed an L/40 horizontal deflection at the end of the arm due to distortions in the arm and vertical support, as a result of design wind load.

Fabricate attachment assemblies for mounting signs in a manner that allows easy removal of sign panels for repair.

906-4 MEASUREMENT AND PAYMENT

Supports, Overhead Sign Structure ____ will be paid for at the contract lump sum for each structure. Such price will be full compensation for design, fabrication, construction, transportation, erection of the complete overhead sign structure, supporting structure hardware, lighting support brackets, preparing and furnishing shop drawings, and attaching the signs to the overhead assembly. *Supports, Overhead Sign Structure* ____ does not include the cost for foundations as this item will be paid for elsewhere in the contract.

Payment will be made under:

Pay Item	Pay Unit
Supports, Overhead Sign Structure _____	Lump Sum

SECTION 907
DISPOSAL AND STOCKPILING OF SIGNING COMPONENTS

907-1 DESCRIPTION

Properly dispose of or stockpile signing components.

907-2 CONSTRUCTION METHODS

(A) General

Repair any areas or materials within the project limits disturbed or damaged in performance of the work required under this section as directed by the Engineer.

(B) Removal

Do not remove existing signing components until required replacements have been erected and are available for use by traffic or are available for immediate replacement.

Remove signing components by methods that will not damage other portions of the project or facility. Repair any damage by methods satisfactory to the Engineer.

Cut and remove electrical conduit to at least 18 inches below finished ground elevation. Plug or seal the ends of the cut conduit by methods approved by the Engineer.

Remove foundations, including any reinforced steel or anchor bolts, to a minimum depth of 2 feet below the finished ground elevation unless otherwise indicated by the contract.

Promptly backfill and compact areas disturbed by removal of foundations with suitable materials and match the finished ground elevation. Seed disturbed areas in accordance with Section 1661.

(C) Disposal

All materials to be removed and disposed of will become the property of the Contractor. Promptly transport the materials from the project after they have been removed unless otherwise permitted by the Engineer.

Promptly dispose of the concrete, reinforcing steel and anchor bolts from the project.

(D) Stockpile

Before stockpiling, remove signs from supports. The Department maintains ownership of all materials to be stockpiled. Transport and stockpile designated items to locations approved by the Engineer. Sort and stockpile all materials neatly in stacks or storage bins. Repair or replace materials damaged in removal or while in storage.

907-3 MEASUREMENT AND PAYMENT

Disposal of ____ and *Stockpile* ____ will be measured and paid as the actual number of signing components acceptably disposed or stockpiled. Removal is incidental to stockpiling and disposal. Secondary signs will be incidental work in conjunction with the primary sign. Sign assemblies consisting of more than one sign panel will be considered one sign. Overhead sign systems include signs, supports, walkways and all electrical components. Sign systems include signs, supports and foundations. Supports include any foundations.

Repair or replacement of any materials or areas within the project limits disturbed or damaged in performance of the work required under this section will be at no cost to the Department.

Payment will be made under:

Pay Item	Pay Unit
Disposal of Sign System, Overhead	Each
Disposal of Sign System, Steel Beam	Each
Disposal of Sign System, U-Channel	Each
Disposal of Sign System, Wood	Each
Disposal of Sign, A and B, (Ground Mounted)	Each
Disposal of Sign, A or B, (Overhead)	Each
Disposal of Sign, D, E or F	Each
Disposal of Sign, Milemarker	Each
Disposal of Sign, Overlay (Overhead)	Each
Disposal of Sign, Overlay (Ground Mounted)	Each
Disposal of Support, Overhead Structure	Each
Disposal of Support, Steel Beam	Each
Disposal of Support, U-Channel	Each
Disposal of Support, Wood	Each
Disposal of Lighting System	Each
Disposal of Lighting Fixtures	Each
Disposal of Walkway	Each
Stockpile Sign System, Overhead	Each
Stockpile Sign System, Steel Beam	Each
Stockpile Sign System, U-Channel	Each
Stockpile Sign System, Wood	Each
Stockpile Sign, A or B, (Overhead)	Each
Stockpile Sign, A and B, (Ground Mounted)	Each
Stockpile Sign, D, E or F	Each
Stockpile Sign, Milemarker	Each
Stockpile Support, Overhead Structure	Each
Stockpile Support, Steel Beam	Each
Stockpile Support, U-Channel	Each
Stockpile Support, Wood	Each
Stockpile Lighting System	Each
Stockpile Lighting Fixtures	Each
Stockpile Walkway	Each