

## **CHAPTER 37-11-05 DESIGN AND COMPOSITION**

Section	
37-11-05-01	Specifications
37-11-05-02	Sign Face Backing
37-11-05-03	Reflective Sheeting Material
37-11-05-04	Sign Messages
37-11-05-05	"Closed" Plate
37-11-05-06	Height of Sign

### **37-11-05-01. Specifications.**

The furnishing, fabricating, and installation of a tourist-oriented directional sign must be in conformance with the following standards:

#### **1. Materials.**

- a. General. All materials furnished and used in this work item must be new and must meet the plans, the standard drawings, and the following requirements:
  - (1) Signs, supporting structures, breakaway bases, anchor units, brackets, stringers, and hardware must be fabricated to meet the dimensions, metal gauge, and bolt holes set forth in the contract and standard drawings. All flat sheet sign backings must be aluminum with reflective sheeting applied as specified.
  - (2) The traffic-control sign details not otherwise specified must meet the MUTCD published by the federal highway administration.
  - (3) All sign faces must be according to the detail drawings and the alphabets shown in the MUTCD, standard highway signs, and standard alphabets, published by the federal highway administration. Sign faces not detailed in these publications must meet the detailed drawings shown in the supplementary standard highway signs booklet published by the department.
  - (4) Regulatory, warning, and guide signs must be detailed and dimensioned according to detailed drawings of the standard highway signs booklet and department supplement. These detailed drawings are available to the sign fabricator upon request from the department. Signs not illustrated in these booklets must be as shown on the standard drawings. The last number in the sign numbers shown is the width of the sign required.
  - (5) Variable message sign dimensions have been computed by the department of transportation in order to draft these signs by mechanical means. These message computations have been tabulated and must be used to lay out these sign faces in the fabricator's shop. These tabulated sheets will be furnished to the contractor upon request after the contract has been awarded.
- b. Concrete. Concrete used in this item of work must be class AE portland cement concrete mixed and proportioned as specified in section 802.
- c. Reinforcing steel. The reinforcing steel must meet section 612.
- d. Delineators. Delineators must meet section 894.06.
- e. Hardware and fittings. Signs, supporting structures, breakaway bases, anchor units, brackets, stringers, and all hardware and fittings must meet section 894.05 A.

- f. Overhead sign structures. Overhead structures must meet section 894.08.
- g. Grout. Grout must meet section 806.

**2. Construction requirements.**

- a. Locating and positioning signs and sign structures. Each sign and structure must be located according to the plans or, where necessary, for maximum effect of the sign. Installed signs and structures will be inspected at night for maximum effect and minimum specular reflection. If any sign exhibits specular reflection or is ineffective at night, the sign must be adjusted at the contractor's expense.

Signs and delineators located less than thirty feet [9.14 meters] from the pavement edge must be erected with the sign face truly vertical and turned ninety-three degrees away from the center and direction of travel of the lane that the facility serves. Signs located thirty feet [9.14 meters] or more from the edge of the pavement edge must be erected with the sign face truly vertical and aligned ninety degrees from the center and direction of travel of the lane that the offset sign serves. Special attention must be given to the location and positioning of signs and delineators at the point where lanes divide, or on curves, to avoid specular reflection and to obtain maximum effectiveness of the facility.

- b. Sign fabrication.

- (1) General. All sign backing for flat sheet signs must be aluminum unless noted otherwise, with reflective sheeting applied as specified in this chapter. On large variable message signs the messages, symbols, and borders must consist of directly applied reflective sheeting cut to desired shapes. The message, symbols, and border must be applied as specified by the sheeting manufacturer.

- (2) Fabrication of sign backing. Sign backings must be cut to size and shape and must be free of buckles, warps, dents, cockles, burrs, and all defects resulting from fabrication. The surface of all signs must be plane surfaces.

All cutting, shearing, and drilling or punching of holes (except mounting holes for demountable letters, numerals, symbols, and borders) must be completed before metal degreasing and application of reflective sheeting.

- (3) Cleaning and processing. Cleaning and processing of sign backing must take place before applying the reflective sheeting. Cleaning and processing must be performed using the sheeting manufacturer's instructions and recommendations as well as the requirements of section 894.

All metal sign backing material must be handled only by handling devices or clean canvas gloves between cleaning and applying reflective sheeting. Metal must not come in contact with greases, oils, or other contaminants before application of reflective sheeting. When backing materials are chromate-conversion coated beforehand and are allowed to set for several days before applying reflective sheeting, the application surface must be given a solvent wipe before reflective sheeting application.

- (4) Fabrication of flat sheet signs. The background or message and border must be screened on reflective sheeting as specified by the manufacturer of the reflective material and as specified here. Colors must meet the requirements of the contract and as shown in the MUTCD. Care must be taken so screening inks are compatible with reflective sheeting backgrounds.

Reflective material must meet section 894.02.

The reflective sheeting used on flat sheet sign backings larger than the manufacturer's material must require splicing. All sheeting on one individual sign must be from the same manufacturer's lot and must be spliced in one direction only. No more than one splice is permitted per sign. Vertical splices must be in the center of the sign. Horizontal splices, if used in lieu of the vertical splice, must be in the center of the sign with the top portion overlapping the bottom portion of the sheeting when it is in the upright position. Heat-activated, adhesive-coated, reflective sheeting may be overlapped not less than three-sixteenths of one inch [4.76 millimeters] or by a butted gap not to exceed one-thirty-second of one inch [0.79 millimeters]. Splices will be permitted only on sign screens processed with transparent colors. Pressure-sensitive, adhesive-coated, reflective sheetings must be overlapped not less than three-sixteenths of one inch [4.76 millimeters].

The overlapped splice must be made without screening paints between the reflective sheeting.

The sign face must be processed and finished with material as specified by the sheeting manufacturer. Processing of type III A or III B reflective sheeting with screened-on messages must be accomplished before applying to the sign backing. Processing of type II reflective sheeting may be accomplished before or after applying to the sign backing.

The finished signs must have a smooth, uniform surface. All letters and numbers must be clear cut and sharp.

- (5) Fabrication of panel signs. The background must be applied to the panels as specified by the reflective sheeting manufacturer.

Reflective sheeting must be overlap spliced. The splice must be overlapped not less than three-sixteenths of one inch [4.76 millimeters], and sheeting applied to panels must extend over the edges and down the side legs a minimum of one-sixteenth of one inch [1.59 millimeters]. Splices must be at a ninety degree angle to the length of the panel. The splices must be uniformly and neatly made throughout their entire length. An individual panel may not have more than two splices, and the minimum distance between adjacent splices must be eight feet [2.44 meters].

- (6) Date of fabrication. All signs receiving new sign facings must be dated with the month and year fabricated. The date must be placed on the back of the metal backing on the lower corner of the sign near the edge closest to traffic so that it can be read from the ground. The dating layout must consist of one-fourth inch [6.35 millimeters] high numbers on a two and one-fourth inches [57.15 millimeters] long by one and three-fourths inches [44.45 millimeters] high pressure sensitive label. The numbers imprinted on the upper part of the label must be one through twelve, with the last two digits of four consecutive years printed across the bottom (as 92, 93, 94, 95). The month and year of fabrication must be punched out. The label must meet section 894.04. The cost of furnishing, fabricating, and installing labels must be included in the price bid for "flat sheet for signs type II and III A", "panel for signs type II and III A", "refacing signs type II and III A", or "overlay panel type II and III A".

- c. Packaging, labeling, handling, and shipping. Completed signs must be dry before packaging or storing. Packaged signs that become wet before use may not be used. A warning label with instructions designed to prevent damage to the signs must be on the outside of the package, and an additional warning label must be placed in the packages between the first and second sign, before the last sign, and after each five signs in a package. Packaged signs may not be banded and must be stored and shipped on edge.

Packaging must be done so that the signs are protected during storage, shipping, and handling. Packaged signs must be slipsheeted using the material and methods recommended by the sheeting manufacturer.

Unmounted reflective sheeting may be stacked flat to a maximum height of five inches [127.0 millimeters] for temporary storage. Otherwise, they must be stored on edge. The sheeting on signs may not be exposed to temperatures above one hundred fifty degrees Fahrenheit [65.56 degrees Celsius]. The slipsheeting must be left on the sign face until mounted.

Panel signs may be assembled or separated into sections for ease in handling, storing, and shipping. In lieu of packaging, the sign faces may be turned toward each other and fastened together firmly with sufficient spacers to prevent the sign faces from touching. Sign faces that cannot be protected by packaging or fastening face to face must have protective covers placed over them.

d. Label (handling, storage, and installation instructions). The label referred to in section 754.03 C must contain the following instructions:

(1) Loading on vehicles. Signs must be secured vertically in racks to prevent them from rubbing, scratching, or marring front surfaces. Signs that have protective wrappings or slipsheeting must be kept dry.

Signs must be carefully unloaded and stacked on edge off the ground in an upright position.

(2) Storage at jobsite. Signs must be stored indoors and upright on edge to prevent damage to the reflective sheeting.

Signs must be kept dry. Packaged signs that get wet will be rejected.

(3) Installation.

(a) Signs must be handled carefully and not scuffed or walked on.

(b) Nylon washers must be used between flat washers and sign face for all type III and IV reflective sheeted signs.

(c) When washing signs is necessary, a soft bristle brush or sponge and water must be used.

e. Erection of sign supports and delineators.

(1) General. The engineer shall verify the support lengths on all new sign supports prior to the materials being ordered by the contractor. All sign supports must be firmly set and plumb after erection. All concrete foundations must be constructed as specified, with the top sloped enough to drain away from the sign support. All exposed concrete above ground surface must be given a rubbed finish. Excess excavation material removed to set sign supports must be disposed of at the contractor's expense. A driving cap must be used when driving a sign support.

(2) Delineator posts. Delineator posts must be driven without being damaged. If the drilled or punched hole method is used, the hole must be large enough so the post may be set without damage. Any damage to utilities or structures as a result of construction operations must be repaired according to section 105.03.

- (3) Anchor for telescoping perforated tubes and flange channel supports. Anchors for telescoping perforated tubes and flange channel supports must be driven. The perforated tube anchor must be driven to a maximum of four inches [101.6 millimeters] above the ground or sidewalk and four inches [101.6 millimeters] maximum installed height aboveground or sidewalk for flange channel anchor.

Anchors must be installed at plan length, unless the engineer determines a shorter length is sufficient due to good soil bearing developed when driving the anchor. Anchor lengths may be reduced to a minimum of three feet [.91 meters]. When set in sidewalk, the anchor plate may be omitted.

The sidewalk must be cored to install the anchor unit and the cored area must be filled with new concrete to restore the sidewalk surface.

- (4) Tubular sign supports. Tubular sign supports must be set in a class AE portland cement concrete base, constructed as shown on the plans. Breakaway base plates must be assembled with the bolts torqued to plan requirements. The plates must be carefully placed so the tapered bolt slot tapers toward approaching traffic. Either the stub post or the anchor bolt design may be used as detailed. If the anchor bolt design is used, a portland cement grout must be used to raise the top of the foundation to a snug fit under the base plate.
- (5) Overhead sign structures. All overhead sign structures must be shop fabricated so only bolted assembly is required in the field. Drilling to fasten an overhead sign to a bridge is permitted, but field welding is not permitted.

Overhead sign structures, other than those fastened to bridges, must be set on class AE portland cement concrete foundations as required. The foundation may be constructed to grade elevation with the top surface level so the support set on it is truly vertical, or the foundation may be constructed below grade and leveling nuts used to level the base plate and bring it to grade. A portland cement grout must be used to fill the voids between the foundation and the base plate.

- (6) Splicing. Splicing is permitted on telescoping and flange channel posts only to obtain the required post length. A splice must be more than five feet [1.52 meters] above the ground, and only one splice is permitted per post. Splicing costs must be at the contractor's expense. The weight of the splice may not be added to the post pay weight.
- (7) W-shaped sign supports.

- (a) W-shaped sign supports must be set in a class AE portland cement concrete base, constructed as shown on the plans. Breakaway base plates must be assembled with the bolt torqued to plan requirements. The plates must be carefully placed so the tapered bolt slot tapers toward approaching traffic. W-shaped supports must use the stub post design.

The contractor may install an H-pile footing in lieu of the concrete base. If the bearing capacity specified cannot be obtained, the contractor shall install the concrete base specified.

- (b) Flame cutting of w-shaped posts. The gas cutting torch may be used for cutting metals or preparing joints. Carbon steel above 0.30 percent carbon, high alloy steels, heat-treated steel, and plated metals may not be flame cut unless subsequent corrective treatment is provided as approved by the materials and research engineer.

All flame cutting work must be done by the oxyacetylene gas method or other method approved by the engineer. The maximum permissible deviation from true lines is one-sixteenth of one inch [1.59 millimeters]. Repairs of edge defects shall be done according to section 3.2 of AWS structural welding code, as amended by AASHTO specifications for welding of structural steel highway bridges. In general, the roughness of flame cut surfaces may not be greater than an ANSI roughness value of one thousand microinches. All slag from flame cutting must be completely removed.

When flange plates or other members are cut to a curve, the curve must be uniform to the radius required. A series of straight cut tangent to the curve is not acceptable.

When ends of members, which are to take bearing, are cut with a torch a suitable allowance in their length must be made to permit proper milling or planing.

Joints for welding may be prepared by "flame cutting" or "flame gouging" provided all slag and oxidized metals are removed.

- (c) Edge finishing. Members formed to specific size by shearing of structural steel plates having a thickness of one-half inch [12.7 millimeters] or more, must be machined or planed to correct size by removing not less than one-fourth inch [6.35 millimeters] of metal. All field splice plates and stiffeners less than one-half inch [12.7 millimeters] in thickness must have a minimum of one-eighth inch [3.18 millimeters] of metal removed by machining or planing after shearing.
- f. Mounting flat sheet signs type III A and III B sheeting. Flat sheet signs must be bolted to the supports and must have a nylon washer between the flat washer and the sign face.
- g. Removing and resetting signs and supports. Existing signs and supports must be removed and reset as specified. All signs and supports not to be reset must be stockpiled on the project right of way at designated locations. The stockpiled signs and supports remain the department's property.

Removed or reset signs and supports that become damaged during removing, resetting, or stockpiling must be replaced at the contractor's expense.

Existing signs and supports must be removed as construction progresses and must be immediately reset or installed. The contractor shall install new signs or reset signs as shown on the plans. All signs and supports must be on the project site at the time construction begins. The contractor may choose to temporarily reset existing signs, or temporarily install new signs. The cost of installing and resetting signs temporarily must be included in the price bid for other items. Any damaged signs or supports must be replaced at the contractor's expense.

**History:** Effective August 1, 1994.

**General Authority:** NDCC 39-13-09

**Law Implemented:** NDCC 39-13-09

### **37-11-05-02. Sign face backing.**

The sign backing material must be one piece of flat sheet aluminum seventy-two inches [1.83 meters] by sixteen inches [406.4 millimeters] with a minimum thickness of 0.125 inches [3.18 millimeters].

**History:** Effective August 1, 1994.  
**General Authority:** NDCC 39-13-09  
**Law Implemented:** NDCC 39-13-09

### **37-11-05-03. Reflective sheeting material.**

The reflective sheeting material used for the sign face must be a standard blue background with a silver white border and message. Borders must be one inch [25.4 millimeters] wide. Letters must be six-inch [152.4-millimeter] series C, uppercase. Letter details are available from the department.

**History:** Effective August 1, 1994.  
**General Authority:** NDCC 39-13-09  
**Law Implemented:** NDCC 39-13-09

### **37-11-05-04. Sign messages.**

Each sign face is allowed a maximum of two lines of legend. The content of the legend is limited to identification of the business, service, or activity, the distance thereto, directional information, a directional arrow, and the time of operation. Left-turn directional arrows and corresponding distance information must be placed to the left of the written message. Right-turn directional arrows and corresponding distance information must be placed to the right of the written message. Straight ahead arrows and corresponding distance information must be placed to the left of the written message. Symbols may be incorporated as alternates to word messages. Symbols must be either five inch [127.00 millimeters] square or twelve inch [304.80 millimeters] square and attached to the sign face. Symbol sign design must be in accord with department specifications. Proprietary logos for specific businesses, services, or activities may not be used. Sign face legends are subject to approval by the department and must be submitted with the permit application.

**History:** Effective August 1, 1994.  
**General Authority:** NDCC 39-13-09  
**Law Implemented:** NDCC 39-13-09

### **37-11-05-05. "Closed" plate.**

The "closed" plate must meet the same requirements as the sign face backing and have blue reflective sheeting and a one-inch [25.4-millimeter] silver white border. The letters must be six-inch [152.4-millimeter], series C, uppercase. The plate shall be thirty inches [762.00 millimeters] by a minimum of ten inches [254.00 millimeters].

**History:** Effective August 1, 1994.  
**General Authority:** NDCC 39-13-09  
**Law Implemented:** NDCC 39-13-09

### **37-11-05-06. Height of sign.**

The tourist-oriented directional sign structure must be installed so that the top of the signposts are ten feet [3.05 meters] above the ground line.

**History:** Effective August 1, 1994.  
**General Authority:** NDCC 39-13-09  
**Law Implemented:** NDCC 39-13-09