



## CHAPTER VIII TRAFFIC CONTROL DEVICES

### SECTION 8-03

### HIGHWAY SIGNING

**8-03.1 GENERAL.** This section outlines procedures for the preparation of contract signing plans, and supplements the Manual on Uniform Traffic Control Devices (MUTCD), and the FHWA manual of Standard Highway Signs manual. The standard plans are referred to for further details. Before beginning sign selection or location, the following are to be reviewed: the guidelines of the MUTCD, this section, FHWA's Standard Highway Signs manual and the current Traffic Manual. When conflicting options arise among the manuals, the Project Development Manual should take precedence. It is important to use standard sign design and layouts in order to provide consistent signing throughout the state of Missouri. The districts are responsible for proper review of signing plans for accuracy, to ensure that standards are met, and that deviations from the standards are justified.

The preliminary layouts of all signs included in the project, along with a completed Sign Design Order Form (Design Form D-28), shall be provided to the GHQ Traffic Sign Production Center (SPC) as soon as the signs are identified. See [Figure 8-03.36](#) for an example of a completed D-28 form. Each sign shall be identified as an overhead or ground mounted sign. The SPC shall be provided with a date the sign designs need to be returned for review. The return date needs to allow enough time to design and quantify the bases and trusses or posts.

**8-03.1 (1) INTERSTATE SYSTEM.** Signing of all interstate highways is coordinated on a national basis by the MUTCD and the Standard Highway Signs manual.

**8-03.1 (2) HIGHWAYS OTHER THAN THE INTERSTATE SYSTEM.** Signing of highways other than the interstate system is coordinated on a statewide basis by MoDOT, the MUTCD and the Traffic Manual of the Traffic Division.

**8-03.2 EXTENT OF SIGNING.** The extent of signing by contract on any project is determined early in the project scope. Structural guide signs and supports (overhead or ground mounted) are normally paid for by contract, regardless of the type of facility. Sheet signs and supports are supplied by contract for certain route classifications and project conditions. When signs are furnished and erected by MoDOT, installation should be coordinated with the district operations engineer. Unless otherwise agreed to among departments or divisions, the following are general guidelines for the extent of contract signing.

**8-03.2 (1) SIGNING ON INTERSTATES, FREEWAYS, AND EXPRESSWAYS WITH FULL ACCESS CONTROL.** Complete signing (structural and sheet signs, supports, delineators, etc.) is provided by contract for these roadways and all directly affected side roads, interchanges or intersections.

**8-03.2 (2) SIGNING ON URBAN PROJECTS.** Structural ground mounted or overhead guide signs and supports are supplied by contract. Ground mounted sheet signs (regulatory, warning, informational, etc.) and sign supports may be furnished and erected by MoDOT. Delineators, when specified, are furnished and installed by contract.

**8-03.2 (3) SIGNING ON RURAL PROJECTS.** Structural overhead and ground mounted guide signs and sign supports are supplied by contract. When an interchange is within the limits of a rural project, route markers, guide, regulatory and warning signs within the interchange limits are supplied by contract. Delineators, when specified, are furnished and installed by contract. Ground mounted sheet signs (regulatory, warning, informational, etc.) and sign supports may be furnished and erected by MoDOT.

**8-03.3 PLAN DEVELOPMENT PROCEDURE.** The preparation of signing plans requires the cooperation and coordination between the district departments of Maintenance, Traffic, and Design. Comments on the preliminary layout may be provided by GHQ Design at the district's request. GHQ Bridge is consulted for mounting signs directly on bridges and other structures, special truss designs, and bridge or wall mounted trusses. The flowcharts provided on [Figures 8-03.33](#) and [8-03.34](#) give an overview of the steps taken from early plan development to final design.

Sign visibility from a distance is critical. Sign locations are to be coordinated with other design features which

include, but are not limited to the following: horizontal and vertical alignments which decrease sign visibility, bridges, highway lighting, traffic signals, drainage structures, and overhead and underground utilities.

Proposed sign locations are prepared by the district. The district should review the plans for standards and quality control. It is suggested that districts form review teams from various departments to review plans at the preliminary layout stage, and at final design. After plans are reviewed by the district, GHQ Design may be consulted for review at the district's discretion. It is recommended that all signs which do not follow standard designs be identified, with justification for the non-standard designs.

For preliminary discussions, only the sign location plan showing existing and proposed signing is recommended. Sign details, cross sections, signing forms (Forms D-29 and D-30), computer generated sign designs, or other detailed information are not completed at this time. Once the preliminary location plan is agreed on, the district prepares special sign detail sheets, tabulation sheets, truss data sheets, and template cross sections for trusses and ground mounted signs. Truss cross sections are not drawn on the same sheets as ground mounted sign cross sections. The districts are responsible for accuracy of the preliminary and final detail design. GHQ Design is available for consultation during any part of the plan preparation process.

The district finalizes the plans and submits them to GHQ Design with the roadway plans, or as a separate project if so programmed. The districts are responsible for accuracy and completeness of plans.

Typical signing location plans for interchanges are shown on [Figures 8-03.1, 8-03.2, and 8-03.3](#). Location plan examples may be found in the MUTCD.

- 8-03.3 (1) LOCATION PLANS.** Location plans show the proposed pavement geometrics, the sign location, sign number, station, width and height, sign code (if applicable), and special or standard legend on standard 22 in. x 24 in. [560 mm x 865 mm] sheets drawn to a scale of 1" = 100' [ratio of 1:1000] or 1" = 200' [1:2000]. Larger plan scales, like 1" = 50' [1:500], may be used if necessary to show complex interchanges or intersections with numerous signs. Sign sizes are shown as WIDTH x HEIGHT, in feet and/or inches [millimeters] for sheet signs, and in feet only [millimeters] for structural signs. Existing signs are shown to tabulate removals and for general information. The standard sign code (i.e. R3-1a, W10-1, etc.) is shown for signs found in the Standard Highway Signs manual or standard plans. Signs are numbered in a logical order. Existing signs which are to be removed or remain in place are not numbered. Multiple signs on a single mount are further indicated with lower case letters [i.e. 45(a), 45(b), 45(c)]. If signs are added or deleted at a later date, renumbering all signs is not required. If signs are added, signs may be numbered 43, 43A, 43B, etc., or the next highest sign number may be used. If signs are deleted, a general note listing voided signs is provided.

Existing signs are shown with dashed lines and listed as a removal item where appropriate. Existing signs to be relocated to new posts, and new signs on existing posts are numbered and noted as such. Existing signs in poor condition are replaced. In complex areas where many signs exist and will be replaced, proposed signing and existing signing may be shown separately on different plan sheets to avoid clutter and plan confusion.

When replacing signs for many kilometers (miles) of roadway to be let in sections, it is desirable to generate an overall sign location plan to coordinate guide sign placement through numerous projects. For this situation it is not necessary to show signs other than guide signs. Review by the GHQ Design is available upon request at the district's discretion. It is recommended to show the limits of each project on this location plan.

Two or more segments of alignment may be shown on one sheet. For ease of design, review and construction, sign locations for interchanges are shown completely on one sheet. Signs are identified as truss, bridge or ground mounted, or as strapped to a post or column. If applicable, truss type (cantilever, span, butterfly) and location are shown. Whether the truss is box or tubular does not need to be noted on preliminary location plan, but is shown on the final plan. A standard legend identifying symbols is used to alleviate crowding on plans. Typical location plans at interchanges are illustrated on [Figures 8-03.1 and 8-03.2](#).

Truss pedestals are not placed in gore areas or other areas which have high exposure to traffic. See [Subsection 8-03.5](#) for additional truss information.

**8-03.3 (2) STANDARD SIGNS.** A number of standard signs are detailed in the Standard Highway Signs manual and in the standard plans. Special sign detail sheets are not required for any signs detailed in these reference books. A Sign Design Order Form (D-28) should be completed for all standard and special signs and sent to the SPC as soon as the signs are identified. See [Figure 8-02.36](#) for an example of a completed D-28 form.

**8-03.3 (3) SPECIAL SIGN DETAILS.** Any sign not shown in the Standard Highway Signs manual or in the standard plans is detailed as a special sign, including any modifications of a standard sign. Signs shown in the GHQ Traffic Signing Manual that do not appear in the standard plans or in the Standard Highway Signs manual are considered special signs. Guide signs are designed using standards as described later in this section.

Preliminary layouts of special signs should be submitted along with the completed D-28 form to the SPC so the final design can be produced using SignCAD. This program incorporates MoDOT standards and generates an output sheet which can be inserted into the plans.

All special signs are designed in accordance with the dimensional data shown in the Standard Highway Signs manual, standard plans, MUTCD, the standard specifications, and elsewhere in this section.

When using preexisting structures to accommodate larger new signs, consideration must be given to the dimensions and load capacity of the existing structure. The larger signs must properly fit on the existing structure and not exceed the structure's design capacity.

**8-03.3 (4) INCOMPLETE SIGNS.** When staged projects are scheduled in unison or closely together, complete signs are provided with the inappropriate legend covered until needed. Legends to be covered are noted on the plans. No direct pay is made for covering legends. Covering methods should be approved by the resident engineer. When structural signs are to be erected with only part of the legend in place at the initial time of construction, the sign and legend are shown on the plans with solid lines, and the legend to be placed at a later date is shown with dashed lines. A note is included indicating the dashed legend will be provided by future construction. The omitted legend is included in the roadway contract which modifies the sign.

When the legend of an existing sign built to current standards is modified, the existing sign and legend are shown with dashed lines, and the legend to be added is shown with solid lines. Sufficient information is provided to show series, type, size, and spacing of new legend on the sign detail sheet. New legend types (L-1 or L-3) match the existing legend type. The work is paid for as "Modified Legend", lump sum, and a special provision and special pay item are included. It is not recommended to modify the legend of a sign with L-2 (demountable) or L-4 (button) copy. These signs should be completely replaced. Any signs originally fabricated with a baked enamel background (STB type) should be completely replaced.

When the need arises to modify the legend of a sign not built to current standards, the sign is replaced. When the sign is mounted on a truss, all signs on the truss not built to current standards are replaced. If an existing truss with luminaires is provided with new signs, consideration should be given to shutting off the power and removing the luminaires due to the high reflectivity of structural sign sheeting.

**8-03.3 (5) TABULATION SHEETS.** The district prepares tabulation sheets on Forms D-29 (Sign Posts, Footings, Delineators and Mileposts) and D-30 (Signs), and Truss Data Sheets D-32 through D-34. These forms are available as MicroStation seed files, and examples are shown on [Figures 8-03.4, 8-03.5, 8-03.6, 8-03.7 and 8-03.8](#).

On Form D-29, sign are listed in order according to sign number. This form includes truss footing and pedestal concrete quantities.

On Form D-30, all standard signs are totaled on the left hand side of the sheet. The right hand side is used to list special signs and provides an overall summary of all sign types.

Truss data sheet forms are completed for all trusses. Form D-32 is used for cantilever and butterfly box trusses. Form D-33 is used for span and span-cantilever box trusses. Form D-34 is the truss data sheet used for all tubular sign supports. See [Figures 8-03.6, 8-03.7 and 8-03.8](#) for acceptable examples of these forms.

**8-03.4 GROUND MOUNTING.** Signs are ground mounted whenever possible unless mounting overhead is justified. All ground mounted structural and sheet signs are mounted on pipe posts, wide flange (WF) fabricated steel posts, u-channel posts, perforated square steel tube posts or wood posts as shown in the standard plans.

Cross sections of relocated or new signs are drawn and included in the final plans. The cross sections are drawn to a scale of 1" = 5' [1:50] to allow for scaling of quantities. The following information is shown for each sign: sign number, station, edge of traveled way, edge of shoulder, sign dimensions, guardrail and curb locations, post configuration, all non-standard horizontal and vertical clearances, backing bars and post lengths. Random grid lines are used to draw the cross section and elevations are not shown. For multiple post designs, number the posts from left to right, and only use one post design type per sign. All cross sections are drawn as the driver views the sign face. Existing signs relocated to new posts and posts being used in place are shown with dashed lines. All signs which are back-to-back are noted, and the far sign is shown with dashed lines. It is not necessary to outline the footing width and depth since this information is noted in the standard plans. A note is added to the cross section if the footing depth is greater than the minimum shown in the standard plans. See [Standard Plan 903.03](#) for recommended footing depths for various post designs and slopes. The post stub length is shown below the finished ground line in order to scale the correct post pay length. An acceptable example of ground mounted cross sections is shown on [Figure 8-03.12](#).

Whenever possible, available truss columns, lighting and signal poles, etc. are used to mount sheet signs. This is less expensive and encourages cross comparisons of signal, lighting, and signing plans. Utility poles are not used to mount signs.

**8-03.4 (1) HORIZONTAL CLEARANCES.** Sheet type (SH) signs and structural type (ST) signs require a standard (minimum) horizontal clearance of 6 ft. [1.8 m] from the edge of shoulder or front face of curb. "EXIT" signs placed in the gore only require a 2 ft. [0.6 m] horizontal clearance from both edges of shoulder or front face of curbs. For divisional and channelizing islands, a 2 ft. [0.6 m] offset is maintained between the edge of sign and the front face of curb. When signing at the nose of a 4 ft. [1.2 m] median, a 1 ft. [0.3 m] offset is acceptable between the edge of sign and the front face of curb. Maximum clearances will depend on roadway geometrics, profiles and cross sections, which all affect the visibility of the sign. ST and SH signs should generally be placed no more than 15 ft. [4.5 m] from the edge of shoulder. Horizontal clearances are not noted on Form D-29 unless they differ from the standard 6 ft. [1.8 m] offset.

For roadways with no shoulders, a horizontal clearance of 12 ft. [3.6 m] from the edge of traveled way should be maintained.

It is acceptable to adjust the standard horizontal clearance to obtain a better cross section and still maintain sign effectiveness and visibility. For example, sign posts are not placed in the center of ditches, therefore the horizontal clearance may be adjusted to better span a flat bottom ditch. Existing drainage structures, pull boxes and sidewalks may also affect horizontal clearance.

A minimum sight distance of signs should be maintained. A general rule is a minimum of 60 ft. [0.72 m] of sight distance for each inch [mm] of letter height is required with a desirable minimum of 1000 ft. [300 m], where possible. When this is not possible, relocating the sign or providing additional advance signing should be considered.

The brightness of the sign may drop 24 percent when the normal offset from edge of traveled way is increased to 30 ft. [9 m]. The legibility remains at an 80 percent level or higher when using the standard 6 ft. [1.8 m] offset. The skew angle shown on the standard plans is valid for signs on tangent sections of road regardless of offset distance. The skew angle may be adjusted to maintain brightness and avoid glare for signs on curved sections of road. The plans indicate which signs require a skew angle other than that shown in the standard plans.

**8-03.4 (2) VERTICAL CLEARANCES.** Vertical clearances for single wide flange and all post designs are set from the driving edge of traveled way to the bottom of the lowest sign. Vertical clearances for multiple wide flange posts are set from the driving edge of traveled way to the bottom of the lowest sign, or the length of the shortest

post, whichever requirement provides the higher clearance. Vertical clearances for different designs are shown in the standard plans.

Supports for SH signs, such as regulatory, warning and route shield markers, are designed to provide a vertical clearance of 7'-0" [2.10 m]. This will allow for field adjustments to maintain a required clearance of 6'-0" [1.8 m].

All two and three post guide signs (any LOGO sign or sign with white legend on green, blue or brown sheeting) have a minimum 7'-6" [2.25 m] clearance from the driving edge of traveled way. Also, the shortest post is a minimum of 7'-9" [2.30 m] from the ground line to the bottom of the lowest sign. This will provide sufficient post length to allow hinge plate installation, provide a 7'-0" [2.10 m] clearance for errant vehicle impacts, and a 6 in. [0.15 m] field adjustment. Secondary signs placed directly under a guide sign have a minimum design vertical clearance of 5'-6" [1.65 m] from the nearest edge of traveled way, the shortest post is 7'-9" [2.30 m] from the ground line to the bottom of the lowest sign, and the main guide sign is a minimum of 8'-6" [2.55 m] from the nearest driving edge of traveled way. Meeting one of these three requirements will exceed the other two minimum clearances.

Due to wide flange post limitations, large vertical clearances of 25 ft. [7.5 m] or more are avoided by either moving the sign or considering a truss mounted sign.

All two and three wide flange post signs contain hinge plates as shown in the standard plans. On the shortest post a vertical clearance of 7'-9" [2.30 m] is maintained from ground line to the bottom of the lowest sign. This will allow sufficient post for a hinge point cut line 3 in. [75 mm] from the bottom of the lowest sign. Maintaining this clearance on the shortest post is critical for exit gore and other signs which are located between roadways and have high exposure to traffic.

- 8-03.4 (3) PIPE POSTS.** Steel pipe posts are used for sheet (SH) signs up to 30 ft<sup>2</sup> [2.7 m<sup>2</sup>]. Available pipe size diameters are 2-1/2 in., 3 in., and 4 in. [65 mm, 75 mm, and 100 mm]. Post sizes are determined using [Figure 8-03.30](#), which shows one and two post designs. It is recommended to provide a two post design for sheet sign widths greater than 3'-6" [1050 mm] (other than diamonds or the 48 in. [1200 mm] and 60 in. [1500 mm] Yield). When sizing a post (or posts) which will hold multiple signs, the extreme height and width of the combined signs are used as the design height and width.

It is desirable to keep posts out of the ditch flow line, when possible.

Breakaway assemblies are required on all pipe posts, regardless of location. Multi-direction assemblies are also required and are noted on Form D-29 (see [Figure 8-03.4](#)).

The standard plans show design data for computing the weights [masses] of pipe posts, along with data for computing footing quantities.

- 8-03.4 (4) WIDE FLANGE (WF) POSTS.** WF posts are used for mounting signs greater than 30 ft<sup>2</sup> [2.7 m<sup>2</sup>] in area, for all ST signs, and for side by side route markers assemblies. The post design number is determined from [Figures 8-03.18, 8-03.19, 8-03.20, 8-03.21, 8-03.22, and 8-03.23](#) when a sign is mounted alone or with an exit panel above the main sign. When a secondary sign is mounted below a guide sign, [Figures 8-03.24, 8-03.25, 8-03.26, 8-03.27, 8-03.28, and 8-03.29](#) are used for post design. When sizing a post (or posts) which will hold multiple signs, the extreme height and width of the combined signs are used as sign height and width, unless otherwise noted in the appropriate figures.

In many cases, two designs are possible using a two or three post design chart. There is no special criteria for determining which of these two designs to use. Generally, signs from 6 to 17 ft. [1.8 to 5.1 m] wide will be designed for two posts, while signs greater than 17 ft. [5.1 m] will require three posts. It is desirable to keep posts out of the ditch flow line and median, when possible. This may be a deciding factor for a two or three post design.

A single WF post is required for supporting side by side route marker assemblies. Normally a number one WF

post design will support a side by side assembly. For larger two post sign design combinations, [Figure 8-03.25](#) is used. Once the clearance is determined, this figure is used with a sign width twice as wide as the actual sign, but with the same sign height. The next higher post design is used when in doubt.

[Standard Plan 903.03](#) shows data needed for computing the weights [masses] of WF posts, along with data to compute footing quantities.

Breakaway assemblies are required on all WF posts, regardless of location and are noted on Form D-29 (see [Figure 8-03.4](#)). Multi-direction assemblies are not available for WF footings.

- 8-03.4 (5) U-CHANNEL POSTS.** These supports are galvanized 3-lb [4.5 kg] steel posts used primarily for installing SH signs. Details of these posts are shown on [Standard Plan 903.03](#). The number of posts to be used is based on the sign area for each installation and is calculated from the Post Size Requirements Table in [Standard Plan 616.10](#). Use of these posts should be based on discussions with district Traffic. These posts are paid for by the linear foot [meter]. No additional payment will be made for hardware.
- 8-03.4 (6) WOOD POSTS.** These supports are pressure treated 4 x 4-inch [100 x 100 mm], 4 x 6-inch [100 x 150 mm] or 6 x 6-inch [150 x 150 mm] wood posts used primarily for installing SH signs. Details of these posts are shown on [Standard Plan 903.03](#). The number of posts to be used is based on the sign area for each installation and is calculated from the Post Size Requirements Table in [Standard Plan 616.10](#). Use of these posts should be based on discussions with district Traffic. These posts are paid for by the linear foot [meter]. No additional payment is made for slotting the larger posts or for hardware.
- 8-03.4 (7) PERFORATED SQUARE STEEL TUBE POSTS.** These supports are galvanized 2-inch [50.8 mm] square 12-gauge [2.77 mm] steel posts used primarily for installing SH signs. Details of these posts are shown on [Standard Plan 903.03](#). The number of posts to be used is based on the sign area for each installation and is calculated from the Post Size Requirements Table on [Standard Plan 616.10](#). Use of these posts should be based on discussions with district Traffic. The actual posts are paid for by the linear foot [meter]. An additional pay item must be included for the anchor sleeve, paid for by the linear foot [meter], for each post used. No additional payment will be made for hardware.
- 8-03.4 (8) SECONDARY SIGN SUPPORTS.** These supports are aluminum wide flange posts used to attach service signs and exit number panels to structural signs. Details of these posts are shown in the standard plans. There is no direct pay for these posts.
- 8-03.4 (9) BACKING BARS.** Backing bars support wide SH signs and side by side route assemblies. The standard plans show requirements for backing bars and additional information is given in [Subsection 8-03.9 \(8\)](#). Lengths and the weight per foot [mass per meter] of backing bars are shown in the standard plans. Backing bars are totaled and included in the pay item for structural steel posts. Backing bars are totaled on Form D-29 (see [Figure 8-03.4](#)).
- 8-03.4 (10) HINGE PLATES.** Hinge plates are installed on all multiple post WF post designs as shown in the standard plans. Hinge plate cut lines are 3 in. [75 mm] below the bottom of the lowest sign. The cut line is a minimum of 7'-6" [2.25 m] above the ground line on the shortest post. No direct pay is made for hinge plates.
- 8-03.4 (11) BREAKAWAY ASSEMBLIES.** Breakaway assemblies are provided for all ground mounted pipe post and WF post designs regardless of location. Breakaway assembly details are shown in the standard plans and additional information is given in [Subsection 8-03.9 \(7\)](#). Breakaway assemblies are totaled on form D-29 (see [Figure 8-03.4](#)).

Breakaway assemblies are not required for u-channel, wood or perforated square steel tube posts. However, if three perforated square steel tube posts are used, a slip base is required for each post.

- 8-03.5 OVERHEAD GUIDE SIGN MOUNTING.** Overhead guide signs are warranted at many important locations. It is recommended that justification be provided when mounting signs overhead. Warrants are not specific, but the following conditions should be considered (listed in a general priority):

- Traffic volume at or near capacity
- Complex interchange design
- Four or more lanes in each direction
- Restricted sight distance
- Reduction of basic lanes
- EXIT ONLY lane drops
- Left exit ramps
- Closely spaced interchanges
- Three lanes in each direction
- Large percentage of trucks
- Background of street lighting and advertising signs
- High-speed traffic
- Insufficient space for ground mounted signs

If a mix of situations exists on a route, where some locations require overheads and others do not, then all guide signs on the project are mounted overhead. Mixing ground mounted guide signs with overhead guide signs is discouraged. Supplemental guide signs for traffic generators are not mounted overhead for any highway system and are not considered when determining whether to mount all guide signs overhead.

- 8-03.5 (1) LOCATING TRUSSES.** Truss pedestals of any type are not placed in pavement gores or other exposed locations. Every attempt is made to avoid special truss pedestal and column designs. Whenever possible, trusses are not mounted on bridges or walls, and are placed in areas which may already require guardrail or traffic barrier due to other obstacles.

Box span trusses may also support a cantilever support beyond one or both columns. This may help eliminate the need for a truss for the opposing traffic direction. Guide signs may be placed over the left hand lanes to utilize a span-cantilever design.

Truss locations should be checked against existing and proposed underground drainage and utilities for potential conflicts. Trusses in paved medians with concrete traffic barrier shall be located at a minimum of 150 ft. [45 m] from median inlets to allow for barrier transitions and field adjustments of the underground storm culvert, if necessary.

To minimize glare and sign obstructions, trusses are located so that signs do not face roadway lighting units and traffic signals. When limited geometrics require numerous traffic control devices within a given area, a 300 ft. [90 m] minimum is maintained between the sign face and the stop bar location. This includes trusses located before or after the stop bar. For lighting units, a minimum recommended distance between the front of a sign and the luminaire is 75 ft. [22.5 m]. Signals, lighting and sign trusses should be coordinated to achieve the best layout and remain within the standards indicated in [Sections 8-01](#) and [8-02](#).

Roadway geometrics may cause sign glare at night from vehicle headlights on parallel outer roads, service roads or the mainline. Headlights from a mainline vertical crest curve located before overhead signs may create sign glare, and if possible trusses should be located to reduce or eliminate this glare.

Roadway curvature should be considered when placing overhead guide signs with down arrows (Type C). Down arrows on the outside of a curve may give the illusion of pointing to a lane other than intended. Down arrows on the inside of a curve may appear to point down at the shoulder or side slope. Consideration should be given to move overhead guide signs out of curves, or provide additional advance overhead signs on tangent sections of roadway.

- 8-03.5 (2) HORIZONTAL CLEARANCES.** The preferred horizontal pedestal location is outside the clear zone. Normally, this may only be accomplished with span trusses. When this clearance is not economically feasible, the minimum horizontal clearance to the nearest part of the overhead sign support pedestal is designed with an appropriate barrier according to the standard plans and the AASHTO Roadside Design Guide. Cantilever trusses with appropriate guardrail design are used to mount single guide signs at the exit gore location.

- 8-03.5 (3) VERTICAL CLEARANCES.** A minimum vertical clearance of 17'-6" [5.3 m] is maintained between the highest point of pavement or shoulder (including mountable curbs located within the shoulder limits) and the lowest point of the sign or truss. This applies to all types of overhead trusses. Bridge mounted signs are no lower than the bridge, or 17'-6" [5.3 m], whichever clearance is lower.

Signs may be raised above the standard vertical clearance to improve visibility and avoid other obstructions such as signal equipment.

- 8-03.5 (4) GUARDRAIL.** Type A guardrail designed according to the standard plans and the AASHTO Roadside Design Guide is used to shield traffic from truss pedestals. Type E guardrail is used only when necessary for areas with limited horizontal clearance, and installed within the guidelines as shown in the standard plans. Trusses are designed to eliminate the need for Type E guardrail.

Consideration may be given to placing guardrail at the edge of the clear zone to protect traffic from pedestals placed outside the clear zone.

- 8-03.5 (5) SPAN, CANTILEVER AND BUTTERFLY BOX TRUSSES.** Aluminum and steel span, combination span-cantilever, butterfly and cantilever box trusses are shown on the standard plans. These types are used when the required span exceeds the 90 ft. [27 m] maximum span of standard tubular supports, or when sign height, sign design area, or sign spread exceeds the limits of tubular support designs. Details necessary to complete truss data sheets for overhead trusses are obtained from [Figures 8-03.15, 8-03.16, and 8-03.17](#). Design data for both aluminum and steel span box trusses are shown on Forms D-32 (see [Figure 8-03.6](#)) and D-33 (see [Figure 8-03.7](#)). The contractor has the option to use steel or aluminum for span designs. Steel box trusses are used without option for all types of bridge mounted trusses, and for all butterfly and cantilever trusses.

Truss designs for spans exceeding 160 ft. [48 m], bridge, wall and any special mounting conditions are requested from the Bridge Division. See other areas in this section for truss design procedures involving the Bridge Division.

Column height "H" for box trusses is shown to the nearest inch [0.05 m] on the truss cross section sheet. Pedestal heights are designed as shown in the standard plans. This height may be adjusted up 6 in. [150 mm] or down 3 in. [75 mm] during construction to meet field conditions. This will avoid any change in design height "H" of the prefabricated steel columns. An assumed elevation of 100 ft. [100 m] at the highest point of the roadway is used to create the truss cross section, and the scale is 1" = 5' [1:50]. An assumed elevation will allow the movement of a truss over an area with the same template without adjusting all the elevations. Elevations to be shown (referenced to the assumed elevation) on the cross section include: top of pedestal, top of footing, bottom of base plate, and the centerline elevations of truss, signs, and bottom chord. A 0.20 ft. [60 mm] elevation difference is assumed between the bottom of base plate and top of pedestal for placement of expansive grout. The truss cross section contains, at a minimum, the following information: truss number, station, roadway, column types, sign design area, overall truss length, pedestal and footing information, sign locations, guardrail, and any signs to be strapped to the truss column. Columns are numbered from left to right. Different column types are allowed for each column. Truss sections are drawn as the driver views the main sign(s). If applicable, signs are indicated as near and far side, the far side sign being shown with dashed lines. Lighting is not provided for any overhead sign. Provisions are made for hand holes and pedestal conduit, as shown in the standard plans.

See [Figures 8-03.9 and 8-03.10](#) for examples of span, cantilever and butterfly box truss cross sections. Combination span-cantilever truss cross sections require similar information.

- 8-03.5 (6) TUBULAR STEEL SIGN SUPPORTS.** Tubular span, cantilever and butterfly sign supports are shown on the standard plans. Details necessary to complete Form D-34 (see [Figure 8-03.8](#)) are shown on various drawings on the standard plans. These structures have limiting design factors including sign height, total sign area, and sign spread, as noted on each drawing. When any one of these limits is exceeded, box type trusses are used.

Required information on cross sections is similar to box truss cross sections. For two arm spans between 40 and

75 ft. [12.2 and 22.9 m], post lengths are in 3 in. [150 mm] increments. Post lengths for other designs are in 1 ft. [300 mm] increments. The footing height above the ultimate ground line is designed as shown in the standard plans. The footing height plus the post length provides the minimum vertical clearance of 17'-6" [5.3 mm] and meets the minimum post length requirements. During construction the footing height may be adjusted up 6 in. [150 mm] or down 3 in. [75 mm] to match actual field conditions. This will avoid changes in the prefabricated post lengths and accommodate actual field conditions. Quantities for concrete footings and various bolt down heights and types of pedestals are shown in [Figure 8-03.14](#) and in the standard plans.

See [Figure 8-03.11](#) for an example of a one arm span tubular truss cross section. Other types of tubular designs require similar information as shown on this figure.

- 8-03.5 (7) BRIDGE AND WALL MOUNTED SIGNS.** Bridges are utilized wherever possible to mount guide signs. This concept removes a potential roadside obstacle and any need for guardrail or concrete traffic barrier, and is generally more economical. The district requests the Bridge Division to prepare details for bridge mount sign support brackets after preliminary sign location approval. The Bridge Division prepares plans which are included in the appropriate bridge details. The Bridge Division is responsible for pay items and design of bridge and wall mounted sign support brackets on new bridges. When retrofitting an existing bridge with a new bracket, the Bridge Division designs the bracket and submits the plan to the district for inclusion into the roadway plans.

The sign and sign brackets are designed to provide a clear distance of 2 ft. [600 mm] from the outside edge of the bridge to the edge of the sign. The sign has a maximum skew angle of 5 degrees to the roadway for which it is provided. The sign bracket is designed so that the sign is visible to traffic at least 600 ft. [180 m] ahead of the installation.

- 8-03.5 (8) BRIDGE AND WALL MOUNTED TRUSS DESIGNS.** The Bridge Division designs all bridge and wall mounted truss pedestals.

For wall and bridge mounts, the district prepares and submits a truss cross section to the Bridge Division for their concurrence of location, column type and height. The sign dimensions and location over the roadway are included with the request. The district coordinates design details with the Bridge Division so that footing and pedestal details are included in the bridge or wall plans. The Bridge Division is responsible for pay items and design of pedestals for bridge and wall mounted trusses. The district is responsible for the truss and column design and pay items.

When retrofitting an existing structure with a new truss, the preferred truss location and existing bridge or wall number is submitted to the Bridge Division, along with the same data as required for a new bridge mounted truss. The incorporation of pay items is similar to new bridge mounted trusses.

- 8-03.5 (9) TRUSS SPANS EXCEEDING 160 ft. [48 m].** Special design details are required on spans greater than 160 ft. [48 m]. A truss cross section is submitted to the Bridge Division as required for any new truss. The district receives recommendations from the Bridge Division for special footing, pedestal, truss, and column information. Unless otherwise noted, the district is responsible for including the information in the final plans.

- 8-03.6 GUIDE SIGN DESIGN.** For the purpose of this section, guide signs are considered to be the white on green signs normally associated with major highways and interstates. When preparing signing plans, consistency and coordination with existing signing is critical. This does not mean that poor signing should be replaced in kind for the sake of consistency. Consistent application of legend styles, abbreviations, control cities, wording, and arrow placement are important for proper driver guidance and expectancy. This is accomplished by routinely applying standards. Signing is basically for the first time driver, not repeat traffic. An example of poor signing would be having two advance guide signs for the same exit listing different control cities. Another example would be using local cities for general guidance instead of standard control cities. It is important to have consistent signing throughout the state of Missouri.

- 8-03.6 (1) DESIGN VARIANCES.** Guide sign standards in this section and as shown on the standard plans are used whenever possible. Conditions that require deviation from these standards are held to a minimum and justified.

Design variances require district justification at the preliminary sign location stage. Signing variances are also noted in the plans. Some deviations from design standards may require approval as outlined in [Subsection 2-01.9](#).

- 8-03.6 (2) ROADWAY SIGNING CATEGORIES AND LEGEND SIZE.** Roadway signing categories for freeways and expressways have been established by the MUTCD to determine appropriate design standards for guide sign letter heights, shield sizes, etc. The roadway category is determined at the preliminary sign location approval stage.

The maximum upper/lower case letter height combination for an overhead advance or exit guide sign is 16/12 in. [400/300 mm]. This will keep most overhead signs to manageable sizes for placement over lanes. The maximum upper/lower case letter height combination for a ground mounted advance or exit guide sign is 20/15 in. [500/375 mm].

The MUTCD provides a separate table for expressways and freeways. For freeways and interstates, signing category "Major, Category (a)" is used for all interchanges regardless of traffic volumes. If signing is placed overhead, the "Overhead" category applies.

For expressways, each intersection or interchange may be signed differently, based on volume of traffic, geometrics, signalization, etc. For example, rural expressways with relatively low volume intersections may be signed as a "Minor" expressway. The signing category for expressway interchanges is "Major", regardless of traffic volumes. It is left for the designer to determine whether sub category (a) or (b) is used. If signing is placed overhead, the "Overhead" category applies.

For two lane undivided roadways, signing categories have not been established. When signing is done by contract on these types of roadways, the Traffic Manual and Signing Detail Manual should be used for general guidance.

Engineering judgement is required for some roadways which do not fit categories as outlined in the MUTCD, or this section. For example, a high volume urban city street approaching Route I-70 may require guide signs with large destination lettering such as 13.33/10 in. or 16/12 in. [335/250 mm or 400/300 mm], while low volume supplementary system roadways approaching Route I-55 may only require route marker assemblies and cross over signing. Each roadway must be examined to determine what type of signing is appropriate or needed. The Design Division or district traffic should be consulted before making this determination.

- 8-03.6 (3) LETTER AND NUMERAL SERIES.** Overhead and ground mounted guide signs are designed with Series E or E Modified letters, as shown in the Standard Highway Signs manual. If black legend L-3 is to be used (such as "EXIT ONLY") the E Modified Series should be chosen. For all other L-3 legends, the E Series should be used.

Series B through F are mainly for smaller sheet signs such as: warning, regulatory, and route marker signs. The Standard Highway Signs manual and the Traffic Manual show series and letter heights for these types of signs.

- 8-03.6 (4) LEGEND TYPES.** Two different legend types are available, L-1 and L-3. Each has a particular use in signing. The bid item description contains this information. For example, an SHR1L-1 type sign has an L-1 legend.

L-1 is a screen process applied character, or "painted" character. L-1 is used for many smaller sheet signs such as speed limits, yields, one way, etc. L-1 is also specified for the reverse silk screen process which is used for red series signs.

L-3 is a direct applied character, which means the entire character surface adheres to the sign panel. L-3 is required for all overhead and ground mounted guide signs with a white legend on green, blue or brown background. L-3 may also be used on signs which are too large to screen process, such as "EXIT ONLY" panels.

**8-03.6 (5) REFLECTIVE SHEETING TYPES.** There are two types of reflective sheeting available: high intensity (R2) and microprismatic (R3). For special sign designs, the type of reflective sheeting is noted on the special sign detail sheet (indicated as "BACKGROUND"). R2 is used on all sign backgrounds. R3 is used on all legend and symbols on guide signs

**8-03.6 (6) STRUCTURAL AND SHEET SIGNS.** There are two types of sign material available, structural (ST) and sheet (SH).

SH signs are sheet aluminum, usually one piece units, and have several available thicknesses as indicated in the standard plans.

ST signs are 1'-0" [305 mm] tall extruded aluminum panels which are bolted together to form a sign of variable height. ST signs are used on all overhead mounted signs, including "Low Clearance" and exit number panels, signs greater than 6 ft [1.8 m] in width, and signs greater than 30 ft<sup>2</sup> [2.7 m<sup>2</sup>] in area.

**8-03.6 (7) NUMBER OF LINES.** Guide signs are designed to provide the minimum amount of needed information. Sign clutter is avoided. Signs are designed with no more than five lines of copy, preferably only three or four. "Lines of Copy", as used above includes an arrow or shield on a line by itself.

**8-03.6 (8) LEGEND SPACING.** Horizontal spacing between words is 1.5 times the lower case letter height. For legends with only upper case letters, the spacing is 1.5 times the upper case letter height.

Horizontal and vertical spacing between the overall legend and the outside sign edge is approximately equal to the largest upper case letter height which appears on the sign. Odd amounts of space are placed on the two outside spaces between the sign edge and the extreme limit of the legend. Odd spacing widths may occur due to rounding the overall sign width and height to even 12 in. [305 mm] increments.

For upper case letter heights of 13.33 in. [335 mm] and above, spacing around arrows and shields is a minimum of 12 in. [300 mm] to words or any other arrow or shield. For other letter heights this distance may be narrowed depending on the amount of legend, letter sizes and sign appearance. Some general guidance may be found in the Standard Highway Signs manual and the Traffic Manual.

Vertical spacing between lines is equal to the larger of the lower case letter height of the two lines. If all letters are upper case, then the spacing equals 3/4 of the larger upper case letter height of the two lines.

**8-03.6 (9) ARROW PLACEMENT.** Standard arrows are shown in the standard plans. Type A and B arrows are commonly referred to as "up" arrows, and as the name indicates should generally point up on guide signs, or placed horizontally to point left or right. Type A and B arrows are white arrows on green backgrounds. Type C arrows are referred to as "down" arrows. They are used for lane assignment on overhead signs and should always point directly down. Type C arrows are white when placed on green sheeting, and black when placed on yellow sheeting such as "EXIT ONLY" panels.

Type A arrows are standard for overhead guide signs, regardless of the number of lines of copy. See the MUTCD for general appearance of single line signs with a 45 arrow. The standard angle for Type A arrows is 45, regardless of roadway geometrics. One Type A arrow for a single lane exit is placed on the left or right hand side of the sign, depending on a left or right hand exit, as shown in the MUTCD. The arrow is placed at the end (or beginning) of the last line of copy, or vertically centered to the left (or right) of the entire sign legend as shown in the MUTCD, or above the destination city in an open space. The latter arrangement will allow for a reduced sign width. Note that when signing for a left hand exit, at least one diagrammatic sign is used as an advance guide sign. This does not include one way outer roads with left hand slip ramps leading to the mainline. See "Diagrammatic Signs" later in this section.

Type B arrows have limited use and are only used on signs with limited space conditions. Multiple Type B arrows are not used. When Type B arrow use is justified, placement is the same as indicated for Type A arrows.

The standard Type C arrow size is 32 in. x 22 in. [810 mm x 560 mm]. A smaller Type C arrow is only used on signs with limited space. Standard Type C arrows are used on all advance guide signs with an "EXIT ONLY" panel. Type C arrows are placed within the "EXIT ONLY" panel for one and two lane exits, as shown in the standard plans. When these arrows are used on pull through signs, they should be the last line of copy with no other symbol or words.

Type A arrows are not placed on signs with "EXIT ONLY" panels which contain a Type C arrow. Either a Type A or C arrow is used, but not both on the same sign. For example, for a right hand exit only lane, a Type C arrow is used on the advance guide sign and a Type A arrow is used on the exit guide sign.

Multiple arrows are used at multilane exits. Multiple 45 Type A arrows or any Type C arrows are always placed in the bottom line of copy with no other legend, and centered over the appropriate lane or lanes. Type C arrows are used as shown in the MUTCD. Standard Type C arrows are combined with "EXIT ONLY" panels when appropriate, as seen in the standard plans.

When used with an "EXIT ONLY" panel, multiple Type A arrows appear directly above the panel, and are spaced horizontally over the center of the appropriate lanes.

**8-03.6 (10) SHIELDS.** Shields are detailed in the standard plans. Numbered primary, U.S. and interstate route shields have two widths available for each type of mount: one for two digit routes and one for three digit routes. Only standard sizes should be used for guide signs and independent use. Route shields are placed before street names and destinations, usually in the first line of the legend.

For the interstate system, additional shields are available for business loops or spurs. For all other routes, the word "BUSINESS" should appear above and horizontally centered over the shield on guide signs. Cardinal directions are not normally used next to shields for business routes. The word "BUSINESS" should be all capital letter and series E(M) letters. It is recommended that 6 in. [150 mm] capital letters be used for 24 in. [600 mm] shields, 8 in. [200 mm] capital letters for 36 in. [900 mm] shields, and 10 in. [250 mm] capital letters for 48 in. [1200 mm] shields. The spacing between the word "BUSINESS" and the shield should be 2 in. [50 mm] less than the letter height of the word "BUSINESS".

A business plaque is available in the standard plans for independent use only.

**8-03.6 (11) CARDINAL DIRECTIONS WITH A SINGLE SHIELD.** Cardinal directions are the words NORTH, SOUTH, EAST and WEST. Cardinal directions are upper case with the first letter being the next letter size taller than the others. For example, the proper cardinal direction letter size is 15/12 in. [375/300 mm] upper case for a sign with a 16/12 in. [400/300 mm] destination/name. The MUTCD shows proper letter height combinations for different roadway categories.

Cardinal directions are placed on the right hand side of the route shield for right hand exits, and on the left for left hand exits. The cardinal direction does not appear on top of the shield, and the top of the first letter of the direction vertically aligns with the top of the route shield.

For the purpose of sign design, a shield/cardinal direction combination is considered one "unit". For guide signs at the exit gore with a Type A arrow and destination line of copy, this "unit" is centered over the destination line, not centered on the width of the sign. If the "unit" is wider than the destination, center the destination under the "unit". This is also true for shields with no cardinal direction. See the example in the standard plans.

No cardinal direction is used for exits which access both directions of a route. The directions should be shown near the ramp terminal on a supplemental guide or route marker assembly. No cardinal direction is required on advance guide signs for routes which begin (or end) at an interchange, or for routes which are continued through an interchange ramp. For this condition, a control city (see [Figure 8-03.32](#)) or major destination should accompany a route shield. For example, Route 350 begins at the interchange, and Route 50 follows the interchange off ramp. The advance guide sign for westbound Route I-470 shows the Route 50 shield first since this exit is first, and the first destination shown is for Route 50. The exit guide for Route 50 would show no

cardinal direction and would only have the Route 50 shield, destination and appropriate arrow. The guide signs for Route 350 are similar to the Route 50 guide signs. Once the driver is on the route, route marker assemblies confirm the route with a cardinal direction.

Since lettered routes are not designated as being strictly North/South or East/West, the shield would not normally carry a cardinal direction with it. An exception is with a lettered route which has two exits, which would occur at a cloverleaf interchange. The cardinal direction used in this case would be the direction physically associated with the route.

**8-03.6 (12) CARDINAL DIRECTIONS WITH MULTIPLE SHIELDS.** Many roadways carry several overlapping routes. In order to maintain route continuity, all route shields associated with a roadway are included on the guide sign.

Multiple shields for overlapping roadways are arranged in the following order of importance: interstate, interstate business, U.S. routes, U.S. business, Missouri numbered, Missouri lettered. Multiple shields for the same roadway type (i.e. I-35 and I-70, or U.S. 34 and U.S. 67) are arranged in numerical order starting with the lowest numbered route. For lettered routes, arrange the shields in alphabetical order.

When several routes end at a ramp terminal, all guide sign shields are arranged as you view the routes at the ramp terminal, from left to right, and cardinal directions are not required. For example, at a directional ramp split, to the left is Route U, and to the right are overlapping Routes A and U.S. Route 47. On the first line of copy, the guide sign shows the Route U shield first, then the U.S. Route 47 shield next to the Route A shield. This impresses upon the motorists to turn left for Route U. The space between the U.S. Route 47 and the Route A shields may be narrowed from the standard 12 in. [300 mm] to as low as 6 in. [150 mm] to give the impression of unity. The space between the Route U shield and the U.S. Route 47 shield is a minimum of 24 in. [600 mm] to give the impression of separation.

Cardinal directions for two shields which designate the same roadway and have the same direction are placed on the right or left hand side of the two shields, and only one direction is required. For example, an exit to the right for overlapping Routes I-64 and Route 40 is ordered as I-64, Route 40, with one cardinal direction "EAST" placed to the right of the Route 40 shield.

Cardinal directions for two and three shields which designate the same roadway, but have different directions, are vertically stacked with the appropriate cardinal direction next to each shield or shields. The shields are listed in the order previously noted. Also, multiple control cities are ordered respectively with shield order.

**8-03.6 (13) CARDINAL DIRECTIONS FOR ROADWAYS OTHER THAN THE STATE SYSTEM.** For roads not on the state system, cardinal directions follow the roadway name, and appear on a line of copy by itself. A direction is indicated only if the exit accesses one direction of the side road. Directions are indicated only for a roadway with multiple exits from a state route.

**8-03.6 (14) "EXIT ONLY" PANELS.** "EXIT ONLY" legends are used when a continuous lane is dropped at an interchange, and the lane being dropped is a minimum of 1500 ft. [450 m] in length from full lane width to the driving pavement exit gore point. "EXIT ONLY" legends are only used on overhead signs and are centered over the lane being dropped. Refer to the standard plans for design details.

Some single exit only lanes develop into dual exit only lanes. It is preferred that an advance "EXIT ONLY" guide sign be placed over the single lane before it develops into two, then a second advance "EXIT ONLY" guide sign after both lanes are fully developed.

New "EXIT ONLY" legends are placed within the white border of the guide sign. This panel spans the entire sign width along the bottom of a guide sign, except for diagrammatic signs. Refer to the MUTCD and the Standard Highway Signs manual for proper "EXIT ONLY" legend placement on diagrammatic signs.

No direct payment is made for "EXIT ONLY" legends. These legends are treated as a shield, arrow or any other symbol or wording. Payment for this legend is included in the cost of the structural guide sign to which it

is attached.

Distances are not placed above "EXIT ONLY" legends for any distance less than one mile.

- 8-03.6 (15) BASIC LANE REDUCTION.** When basic lanes are reduced on a roadway by merging lanes (lane not dropped at an interchange), at least two overhead advance signs are recommended. The first sign should indicate the lane that ends, and a distance. For example, the first line may read "RIGHT LANE ENDS". The second line should provide a distance in feet or mileage such as "1000 FT" or "1/2 MILE". When sufficient distance is available, two advance distance signs are provided at 1 mile and 1/2 mile [1.6 km and 0.8 km].

The last sign should indicate the lane that ends and an action line. For example, the first line states "RIGHT LANE ENDS", and the second line may read "MERGE LEFT".

These signs should be black legend on yellow background (STR2L-3), and placed over the lane which is ending. These signs should have 12 in. [300 mm] series E(M) letters, all capitalized.

- 8-03.6 (16) EXIT NUMBERS AND EXIT NUMBER PANELS.** Exits are numbered for the interstate system only, and coincide with mileposts. Exit number panels are detailed in the standard plans and should not appear on the special sign detail sheets. All guide signs contain an exit number panel which is placed to the far left or the far right of the main sign, depending on a left hand exit or a right hand exit. For proper placement on diagrammatic signs, refer to the MUTCD and to details defined later in this section. Exit gore signs have a panel showing only the exit number, and this exit panel is horizontally placed over the exit gore sign.

Some supplemental guide signs show as the last line of copy "EXIT XX" in the main sign for numbered exits, as shown in the MUTCD. These signs are for large traffic generators such as stadiums, universities, amusement parks, etc.

Exit numbers are based on the milepost number in which the crossroad centerline ties to the mainline centerline. For example, if milepost 24 falls before the crossroad centerline and also between two exit ramps for a standard cloverleaf, the exits are numbered 24A, 24B. In this example, exit 24A appears before milepost 24. For the opposite direction in this example, the exit numbers are reversed (24B, 24A) in order to have both ramps numbered 24B accessing the same direction on the crossroad. Generally Ramp A will be placed at a log mile which is lower than the log mile for Ramp B. This may not be the case for complex or closely spaced interchanges.

Since exits are numbered on the interstate system, the terms "NEXT LEFT", "NEXT RIGHT", or "SECOND LEFT", "SECOND RIGHT" and "NEXT EXIT" are not used. The exit number is always referred to on the exit number panel which is placed above the main guide sign. Supplemental guide signs should not have exit number panels placed above the main sign. For supplemental guide signs on the interstate, "EXIT 24B" is used as the last line on the sign. For interstate guide signs, the term "EXIT XX MILES" is not used. For example, the exit panel will show "EXIT 23", and the distance in the main guide sign will show "3/4 MILE".

The MUTCD shows several examples of exit numbering for collector distributor roadways.

Whenever milepost number 1 appears on a route, exits between log mile 0.0 and 2.0 (not inclusive of 2) are numbered 1A, 1B, 1C, etc.

State maps show the exit numbers for interstates with a different number for each exit. To avoid confusion, separate interchanges are not numbered the same. For example, EXIT 1C is for northbound I-55 exiting to eastbound U.S. Route 199. There should not be another EXIT 1C on southbound I-55, except for an exit to eastbound U.S. Route 199. If this exit does not exist on southbound I-55, there is no EXIT 1C on southbound I-55. When changing existing exit numbers is required, contact the Mapping Section in Support Center General Services in order for the state map to be updated.

Some guide sign exit number panels refer to two exits. The exit number letters appear in the same order as the driver approaches them. For example, if exit 15B is the first physical exit before 15A, the exit panel shows

"EXITS 15B-A".

**8-03.6 (17)GUIDE SIGN DISTANCES.** For interchanges, all guide sign distances are calculated from the advance sign location to the exit guide sign. Guide signs are located as close to the actual distance as possible. Guide sign distances do not have to be exact, but they should be as close as practical. For intersections, the stop bar or beginning of the cross road radius is used to set guide sign distances. When referencing to a cloverleaf or another design where the exit ramps for the same route are separated by an appreciable distance, advance guide sign distances refer to the first exit gore.

Only mileage distances rounded to the nearest 1/4 mile are used on guide signs. Only three fractions are used, 1/4, 1/2 and 3/4. The fraction nearest to the actual distance is used.

All distances one mile or less are treated as singular. For example, proper terminology is "1 MILE", and "1 1/4 MILES".

Distances are not placed above "EXIT ONLY" panels for any distance less than one mile.

**8-03.6 (18)DESTINATIONS AND CONTROL CITIES.** Destinations and control cities are provided on guide signs to provide general direction for the first time traveler, and travelers unfamiliar with the cardinal direction of a route. Destinations do not include traffic generators such as universities, stadiums, amusement parks or other privately owned attractions. Traffic generators appear on supplemental guide signs. States are not routinely listed as destinations in conjunction with the control city or destination. For example, when listing Des Moines on a guide sign, it is not necessary to list Iowa, or the abbreviation IA. When ambiguity exists such as Kansas City, Missouri or Kansas City, Kansas, it becomes necessary to list the city with the states proper abbreviation. Justification is required when using abbreviations of states or the entire state name on guide signs.

Consistent use of the same control city is vital to properly guide traffic to major destinations. Control cities for interstates are provided by AASHTO. This list is updated approximately every five years. The control city listing for the Missouri interstate system is shown on [Figure 8-03.32](#). Interstate control cities are used for the following conditions:

- Interchange of two interstates
- Separation points of overlapping interstates
- On directional signs on intersecting routes, to guide traffic entering the interstate
- On pull through signs
- On the bottom line of post interchange distance signs

Although the control cities are listed sequentially along specific interstate routes, it may be desirable to select control city destinations whose locations may be more readily recognized by the interstate traveler. To provide continuity and consistency, the control city should remain the same on all successive signs throughout the length of the route until that destination is reached. Continuity should be maintained from state to state.

Local cities may be listed on guide signs for conditions other than the five listed above. For example, the Route I-70 guide sign at Route 54 may list Jefferson City for general guidance to the south, and Mexico for guidance to north Route 54.

**8-03.6 (19)STREET NAMES ON GUIDE SIGNS.** The public often makes reference to MoDOT routes by name instead of the official MoDOT route identification number or letter. If this is the case, the route name may be used in conjunction with the MoDOT route shield. The route shield and, if required, the cardinal direction appear on the first line of copy, and the second line indicates the route name. All route names carry the appropriate designation as street (St), boulevard (Blvd), road (Rd), avenue (Ave), drive (Dr), etc (see [Figure 8-03.35](#)).

Control cities are used in place of route names when both conditions exist.

Using a route shield, a control city and a route name on the same sign is avoided whenever possible. Some situations require a route shield, a control city, and a street name, with the street name being a separate roadway

or exit than the MoDOT route. For this condition, the order is route shield, control city (or major destination) and then the street name as the third line of copy, regardless of roadway geometrics.

- 8-03.6 (20)SEPARATOR LINES.** A "separator line" may be used on a guide sign to separate lines of copy which may be confusing when read as shown on the sign. For example, for Hanley Road South and Eager Road, the same exit ramp is taken for both roadways. At the ramp terminal, Hanley Road South is left and Eager Road is right. On the guide sign, the first line of copy is Hanley Road, the second is South, and the third is Eager Road. A first time driver may not know whether South is for Hanley or Eager Road. A "separator line" should be used to imply roadway separation.

Separator lines are made of the same material used for sign borders, therefore these lines are always the same thickness as the border thickness used on the sign. Horizontal or vertical separator lines may be used when deemed appropriate. Separator lines should not connect to the overall sign border.

Separator lines are not standard and their use requires justification.

- 8-03.6 (21)STREET IDENTIFICATION SIGNS.** These signs are bridge mounted where roadways over state routes are not provided direct access by an interchange. This does not include bridges for ramps, pedestrian overpasses or railroad bridges passing over state routes. They are for general knowledge only, and show the name of the roadway overpass.

These signs are placed over the shoulder of the state route. If other signs are in conflict with this location, the sign is placed approximately 6 in. [1.8 m] from the edge of the nearest sign and always away from the centerline of the state route. The following sign criteria is standard: STR2L-3, upper/lower case letter heights of 8/6 in. [200/150 mm], series E(M), 2 ft. [600 mm] in height by a variable width.

The sign support brackets are designed by the Bridge Division as stated [Subsection 8-03.5 \(7\)](#).

This type of sign is not required when roadways pass underneath a state route with no direct access.

- 8-03.6 (22)LANE-USE CONTROL SIGNS.** Lane-use control signs are typically R3-5 through R3-6 regulatory series. These signs are mounted overhead on tubular trusses approximately 250 ft. [75 m] in advance of the stop bar. These signs should be used for ramps with two or more lanes approaching the ramp intersection, or approaches to intersections with high approach volumes, or unusual or unexpected geometrics. It is best to use a one arm cantilever tubular truss to support these signs whenever possible to eliminate an obstacle on one side of the roadway. Another option is to utilize a signal mast arm design (without signal heads) to mount these signs, which allows a longer arm than standard one or two arm tubular sign supports. The pedestal may be placed on either side of the roadway, and if possible, placed so that roadway geometrics draw traffic away from the pedestal. These signs are detailed in the Standard Highway Signs manual and are SHR1L-1 (black legend on a white background).

If overhead lane control signing is justified and the ramp, highway or street approaches a state controlled route, a small lane control guide sign is used. These signs contain a shield, cardinal direction and the appropriate arrows and action messages. See the standard plans and [Figure 8-03.3](#) for further details. Place, street or highway names may also be used in place of a shield. These lane control signs are STR2L-3, white legend on a green sheeting. Signal mast arms designs are not used to support these signs.

- 8-03.6 (23)INTERCHANGE SEQUENCE SIGNS AND SIGN SPREADING.** Interchange sequence signs and sign spreading are used for closely spaced interchanges, as shown in the MUTCD. Sign spreading avoids overloading drivers with too much information. In conjunction with this concept, the sign location plan shows interchange sequence signs to inform motorists of the next three exits. When this concept is approved, only one advance guide sign is required, with the sequence signs replacing other advance guide signs. Even with this concept, it is still preferable to install a second advance guide sign when sufficient distance exists (i.e., 1.0 mile [1.5 km]) or more between exits). Note that advance guide signs or interchange sequence signs are placed on bridges whenever possible.

Interchange sequence signs contain three destinations. The MUTCD lists letter and numeral heights for this sign. A standard height with a varying width, depending on the destination legend and distance, is shown in the standard plans for freeways and major expressways. See the MUTCD for sequence signs for other types of expressways.

Interchange sequence signs are placed approximately half-way between interchanges. This will allow two signs (one for each direction of traffic) to be placed back to back on the same truss. Since the signs are usually back to back, a butterfly truss is installed in the median of divided highways. Barrier protection is as suggested by the AASHTO "Roadside Design Guide". Some conditions may arise where back to back sequence signs are not practical. When this occurs, it may be acceptable to place this sign and truss on the right hand side of traffic flow to avoid exposing opposite directions of traffic to a truss pedestal. If exposure to both directions of traffic is not a concern, place this sign and truss at the standard location, on the left hand side of the traffic flow.

An interchange sequence sign is not placed on a truss with any other guide sign, unless the sequence sign faces the opposite direction of all other guide signs.

These signs should list the common name of the roadway instead of the state route designation, only if the advance and exit guide signs show this common name under the state route designation. For example, Route 67 is commonly referred to as Lindbergh Boulevard. On the advance and exit guide signs, a U. S. Route 67 shield appears with the common name "Lindbergh Boulevard" underneath. The interchange sequence signs show Lindbergh Boulevard. The verbiage on the interchange sequence sign should always appear on the appropriate advance and exit guide signs for sign continuity.

**8-03.6 (24) SUPPLEMENTAL GUIDE SIGNS.** These signs are for major traffic generators and additional information, aimed more at local interests, such as colleges, stadiums, military bases, major attractions, etc. These signs are only installed upon request from the district operations engineer. These signs are ground mounted when adequate space is available, regardless of other guide signs being overhead or ground mounted. For the interstate system, the main sign provides the exit number in the last line of copy. For exits which are not numbered, the terms NEXT RIGHT, SECOND RIGHT, NEXT LEFT, etc., are appropriate.

**8-03.6 (25) DIAGRAMMATIC GUIDE SIGNS.** Diagrammatic guide signs show a graphical view of the exit arrangement in relationship to the main roadway. Diagrammatics are used conservatively, and for unusual or unexpected conditions. These signs are always mounted overhead, centered over all traffic lanes, and with no other guide sign. Use this type of guide for any one of the following conditions:

- All left hand exits including left hand lane drops
- In areas where driver confusion is possible due to existing conditions
- Optional lane splits
- Multiple lanes with multiple exits closely spaced
- Major divergences

Major divergences do not include dual lane off ramps for diamond, cloverleaf or directional interchanges.

The MUTCD shows several diagrammatic guide sign applications. Type A, B or C arrows are not used on diagrammatic signs. Diagrammatic arrow "branches" always curve with a radius and point to approximately the lower half of the shield for state routes, and to the street name for other than state routes. Normally, the main stem of the arrow represents the main line and points towards the top of the sign. Main line information is placed at the top of the sign, on the side of the arrow without branches.

Arrows require special detail information for arrow radii, angle of turn, stem length, etc. Sufficient information is provided on a special sign detail sheet for assembly by sign fabricators. The arrow stem represents the existing number of lanes directly under the sign. Lanes are picked up or dropped on the arrow above the stem, in order to represent number of traffic lanes. Arrows are constructed from the L-3 type of legend. See the MUTCD for further arrow standards.

Normally, only one exit number panel is placed over what is considered the exit side of this sign. Horizontally

center this exit panel over the widest line of copy on the exit side.

Examples of a diagrammatic signs are shown in the Standard Highway Signs manual.

- 8-03.6 (26) ABBREVIATIONS.** Abbreviations may be used to reduce sign width. Consistently abbreviate the same word on guide and advance guide signs until the destination is reached. No periods are used for abbreviations. Do not abbreviate proper names, the word "Route" when referring to a state route, the words EXIT or MILE when referring to distances, or cardinal directions. See [Figure 8-03.35](#) for a list of acceptable abbreviations.

When using names of states is justified, abbreviations are used in conjunction with the control city or destination. The second letter of each abbreviation is capitalized.

- 8-03.6 (27) USING "TO" ON GUIDE SIGNS.** Using "TO" is applicable in areas where a guide sign is acting similar to a trailblazer. Some turning movements for roadways may lead to a route, but they may also have other possible destinations. Use "TO" only to trailblaze to a route, not a destination. "TO" is vertically centered on the shield, and is always before the shield to read properly. When a conflict arises between "TO" and a cardinal direction on the left of a shield, place "TO" first (starting from left hand side), then the shield, then the cardinal direction.

- 8-03.6 (28) PULL THROUGH SIGNS.** These are signs used to guide motorists through complex interchange areas where multiple lanes exist and driver confusion is expected. Most situations do not require pull through signs. These signs are used at exit gores in conjunction with advance diagrammatic guide signs as shown in the MUTCD. Ground mounted route markers are used for route confirmation, not pull through signs. Major destinations are placed under the route shield(s), and cardinal directions are not indicated.

Pull through signs are eliminated when the sign spreading concept is applied. When pull through signs are required, they are used with Type C arrows for proper lane assignment.

- 8-03.6 (29) GENERAL SIGN PLACEMENT.** The material presented in this section, including the figures, and the Traffic Manual and MUTCD, show numerous examples of standard sign placement for rural and urban conditions. Good engineering judgement is used to select the example which most nearly applies to the geometrics, traffic and roadway conditions. Maintenance, Traffic, Construction, and Design Divisions are available for consultation on complicated geometric sign location plans.

No more than three signs are placed on any truss for one direction of traffic, preferably only two. Only one advance guide is placed on a truss for one traffic direction.

Ground mounted exit guide signs are located based on standard clearances as previously discussed. Ground mounted exit guide signs are located at the beginning of the deceleration lane taper.

Overhead signs are placed over traffic lanes. Advance guide signs are placed over any convenient lane, preferably over the right lane for right hand exits, and over the left lane for left hand exits. Any guide sign with a Type C arrow is directly centered over the appropriate lane. Overhead exit guide signs are centered over the exiting lane at the theoretical driving pavement gore point. An overhead exit guide sign may be shifted to hang over the right lane and part of the shoulder in order avoid installing a span truss, or to align another sign with a Type C arrow over the center of an adjacent lane. Whenever possible, Type C and multiple Type A arrow guide signs line up with the center of the traffic lane. When signs become too large to place several signs on the same truss and maintain arrow alignment with lanes, the sign spreading concept is applied and a second truss will be required. Another option is to arrange the Type C arrows off the center of the lane up to but not to exceed 2 ft. [600 mm].

Two advance guide signs should not be placed side by side. This can create confusion. The earliest an advance guide sign may be installed is next to an exit guide sign. The interchange sequence and sign spreading concept are utilized when the need arises to provide additional advance guide signing. A minimum of two advance guide signs are required for each exit, preferably three for major junctions if geometrics allow. Typically, advance guide signs are placed 2 miles, 1 mile, and 1/2 mile [3.2 km, 1.6 km, and 0.8 km] from the exit guide. Generally urban designs have sufficient distance for two advance guides, while rural designs may allow for

three.

**8-03.6 (30) LOGO SIGNS.** These signs are normally installed by contracts administered by the Traffic Division, and not by a design contract unless requested by a district operations engineer. When relocating logo signs, comments are requested from a district operations engineer. Many logo signs should not be removed from drivers view for extended periods, due to contractual agreements between MoDOT and private businesses. Refer to the Traffic Manual for logo sign guidelines. Generally these signs follow the design criteria of a standard guide sign for horizontal and vertical mounting, and are not mounted overhead.

**8-03.6 (31) BOUNDARY AND ORIENTATION SIGNS.** These signs are installed at locations of general interest, such as river crossings, county lines, city limits, etc. Details for these signs are shown in the standard plans. These signs are white legend on green sheeting.

**8-03.6 (32) DESTINATION SIGNS.** Destination signs show the next two or three major destinations or routes which the driver may encounter. Post destination signs are located after intersections or entrance ramps.

Details for destination signs are shown in the standard plans. Distances are rounded to the nearest whole mile, and the distances should be to the actual destination (for example, the actual city limits), not the ramp exit gore or intersection. These signs may have one line or a maximum of three lines. Destinations may be a number of miles from the route terminus. Destinations should appear on all subsequent destination signs for continuity.

For interstates, post interchange distance signs should contain at least two lines, preferably three. The first line is generally the next destination reached by means of the next interchange. The second line, if used, may be any significant destination between the next exit and the next control city. If no significant destinations exist, the second line is omitted. The third line (or in some cases the second) should always be the next control city, or the control city used consistently throughout the route. Destination signs are not provided on roadways which provide interchange sequence signing.

Post interchange signs for routes other than the interstate are used as seen in the Traffic Manual. If a route leads to a control city listed on [Figure 8-03.32](#), the city should be listed as the last destination.

Advance destination signs are located a minimum of 200 ft. [60 m]) before an intersection or any ramp terminal. These signs may be eliminated in urban areas where numerous destinations exist, numerous signs exist, or ground mounting space is limited. These signs should not contain distances unless requested by a district operations engineer. For three line signs, the destination going straight is always listed first, with the arrow to the extreme left of the sign. The destination left is next with the arrow to the extreme left, and the third line with the destination right, with the arrow to the extreme right. The same order is used for two line destination signs. Examples are shown in the standard plans and [Figures 8-03.1](#) and [8-03.2](#).

Some exit and advance guide signs may list several destinations for the same exit ramp. For this condition and for guidance continuity, advance and post intersection signs should list the same destinations listed on the guide signs.

### **8-03.7 MISCELLANEOUS SIGNING ITEMS.**

**8-03.7 (1) MILEPOSTS.** Mileposts are used only on the interstate system. Mileposts are used to determine exit numbers. A milepost is not installed if it cannot be set within 50 ft. [15 m] of its exact location. Every attempt is made to install mileposts, even if this requires special mounting designs on walls, bridges or concrete median barrier.

**8-03.7 (2) DELINEATORS.** Refer to the standard plans for delineator placement and use. Delineators are placed on all divided highways, expressways, freeways and interchanges. It is not necessary to spot each delineator on the sign location plan, unless the geometrics are unusual, and placement is not readily apparent when referencing the standard plans. Totals are estimated and shown on Form D-29 (see [Figure 8-03.4](#)).

**8-03.7 (3) OBJECT MARKERS.** Object markers are used to mark obstructions within or adjacent to the roadway. They are normally mounted 4 ft. [1.2 m] above the traveled way to the bottom of the sign.

- 8-03.7 (3) (a) TYPE I OBJECT MARKER.** The Type I Object Marker is used to mark obstructions within the roadway. Where other signing such as Keep Right signs or Double Down Arrows are used to mark the obstruction, the Type I Object Marker is not needed. However, if additional emphasis is needed, this object marker may be used with other signs.
- 8-03.7 (3) (b) TYPE II OBJECT MARKER.** The Type II Object Marker is used to mark obstructions which are adjacent to the roadway or traveled way that are so close that they may pose a hazard. These objects include underpass piers and bridge abutments. In some cases, there may not be a physical object involved but other roadside conditions such as narrow shoulder drop-offs.
- 8-03.7 (3) (c) TYPE III OBJECT MARKER.** This object marker may be used in lieu of Type I or Type II Object Markers. Type III Object Markers are installed so that the stripes are angled downward toward traffic.
- 8-03.7 (3) (d) TYPE IV OBJECT MARKER.** The Type IV Object Marker is used at a road terminus. Three object markers are placed across the end of the road spaced 1.8 m (6') apart.
- 8-03.7 (4) ROUTE MARKER SHIELD ASSEMBLIES.** The Traffic Manual contains a number of examples of proper placement of route marker assemblies. These assemblies for independent use are SHR1L-1 signs. For interstate shields payment is the same but these contain blue sheeting. For cardinal directions placed over the interstate shield, a note is placed on Form D-30 (see [Figure 8-03.5](#)) to indicate the number of cardinal directions which are interstate design, and which are the black on white type. This is also indicated for arrow signs which may be placed below the interstate shield. For overlapping routes with an interstate and any other type of roadway containing the same cardinal direction, only one cardinal direction is required, and one arrow sign, with the interstate design being used, as indicated on [Figure 8-03.1](#) and [8-03.2](#).

Cardinal direction sheet signs are 30 in. [900 mm] in width for interstate shields which are 30 in. [900 mm] wide. Cardinal direction signs are used above independent shields of lettered routes, business loops, or advance intersection assemblies which contain a junction sign.

#### 8-03.8 SIGNING PLANS.

- 8-03.8 (1) SIGNING AS A SEPARATE PROJECT.** When signing is a separate project, the plans are assembled in the following order:
1. title sheet
  2. 2A sheet
  3. 2B sheets for roadway items
  4. sign location plan sheets
  5. special sheets
  6. traffic control plans
  7. erosion control plan
  8. tabulation sheet (D-29)
  9. tabulation sheet (D-30)
  10. special sign detail sheets
  11. design data sheets for cantilever and butterfly box trusses (D-32)
  12. design data sheets for overhead span box trusses (D-33)
  13. design data sheet for tubular trusses(D-34)
  14. truss cross section sheets
  15. cross sections for ground mounted signs
  16. special sheets for bridge mounted signing
  17. standard plans.
- 8-03.8 (2) INCLUDED WITH ROADWAY PLANS.** Typically, signing is included with the roadway plans. When this is the case, the plans are assembled together, including the quantity sheets. Separate 2B sheets are not generated for signing quantities. The signing plans are arranged in the following order:

1. sign location plan sheet
2. tabulation sheet (D-29)
3. tabulation sheet (D-30)
4. special sign detail sheets
5. design data sheets for cantilever and butterfly box trusses (D-32)
6. design data sheets for overhead span box trusses (D-33)
7. design data sheet for tubular trusses (D-34)
8. truss cross section sheets
9. cross sections for ground mounted signs
10. special sheets for bridge mounted signs
11. any miscellaneous special signing detail sheets.

**8-03.9 COMPUTATION OF QUANTITIES.**

- 8-03.9 (1) SIGNS.** Signs are totaled on Form D-30 (see [Figure 8-03.5](#)). ST signs are designed to the nearest 12 in. [300 mm] width increment and 12 in. [300 mm] height increment. Each individual standard or special sign is calculated to the nearest 0.1 ft<sup>2</sup> [0.05 m<sup>2</sup>], subtotaled to the nearest 0.1 ft<sup>2</sup> [0.05 m<sup>2</sup>], and final pay total is to the nearest 1.0 ft<sup>2</sup> [0.1 m<sup>2</sup>].
- 8-03.9 (2) POSTS.** All post quantities are calculated and totaled on Form D-29 (see [Figure 8-03.4](#)). All post lengths are calculated in increments of 0.25 ft. [0.075 m] including the length that extends into the concrete footing or ground as shown on the standard plans. All u-channel post lengths should include the full length of both pieces when overlaps are required. The post length for wide flange and pipe posts is multiplied by the lb/ft [kg/m] factor, as shown in the standard plans; each sign's posts are subtotaled to the nearest pound [kg]; all sign posts are subtotaled; and the final pay totals are shown to the nearest 10.0 lb [5.0 kg]. All u-channel, wood and perforated square steel tube post length quantities are totaled, and rounded up to the nearest foot [meter]. For perforated square steel tube posts, an additional pay item must be included for the anchor sleeve, which is paid for by the linear foot, for each post used (and may also include a soil plate).
- 8-03.9 (3) CONCRETE FOOTINGS.** Concrete for signs and trusses are totaled on Form D-29 (see [Figure 8-03.4](#)). Concrete for truss footings and pedestals is bolt down. Concrete for all ground mounted sign footings is embedded. Bolt down and embedded quantities are calculated for each sign to the nearest 0.01 yd<sup>3</sup> [0.01 m<sup>3</sup>], subtotaled to the nearest 0.01 yd<sup>3</sup> [0.01 m<sup>3</sup>], and a final pay total is shown to the nearest 0.1 yd<sup>3</sup> [0.1 m<sup>3</sup>].
- 8-03.9 (4) TUBULAR TRUSSES.** Cantilever and butterfly tubular support trusses have standard pay items. Span tubular trusses require special pay items. Information in the description includes span length, truss number and span design type. Truss pay items include costs for all labor and materials associated with the truss, from the bottom of the base plate, on up, as a lump sum item. Each span truss has a separate pay item. Truss data is provided on Form D-34 (see [Figure 8-03.8](#)).
- 8-03.9 (5) BOX TRUSSES.** All box trusses require a special pay item for each truss. All pay item descriptions include span length and truss number. Truss pay items include costs for all labor and materials associated with the truss, from the bottom of the base plate up, as a lump sum item. Each box truss, regardless of type, has a separate pay item.
- 8-03.9 (6) DELINEATORS, MILEPOSTS AND TYPE IV OBJECT MARKERS.** See the standard plans for payment of these items. These items are paid for per each on Form D-29 (see [Figure 8-03.4](#)), and include installation, bolts, post and sign.
- 8-03.9 (7) BREAKAWAY ASSEMBLIES.** Breakaway assemblies are totaled on Form D-29 (see [Figure 8-03.4](#)). All assemblies are paid for with the same bid item.
- 8-03.9 (8) BACKING BARS.** Backing bar lengths and weights [masses] are shown on Form D-29 (see [Figure 8-03.4](#)), and are totaled with the pay item for structural steel posts. No weight [mass] deductions are made for punched or drilled holes. If no structural steel posts are used on a project, backing bar weights [masses] are added to

pipe post weights [masses].

- 8-03.9 (9) SPECIAL ITEMS.** Special pay items for signing may be required. Some examples of special work include: modifying legends, relocating existing signs to new posts, temporary ground mounting guide signs, bridge mounted support brackets, truss painting, pedestal repair, etc. It is left to the designer to decide which items require special pay items.
- 8-03.9 (10) NO DIRECT PAY ITEMS.** Special pay items are not included for items considered to be small amounts of work such as the following: strapping signs to lighting or signal posts or truss columns; covering inappropriate legends; "EXIT ONLY" panels on new signs; any symbol, arrow, shield or legend on new guide signs; hinge plates; aluminum wide flange posts for connecting service signs and exit number panels to structural guide signs; etc. No additional payment will be made for hardware. Other than the above, it is left to the designer to decide which items do not require direct pay.
- 8-03.9 (11) REMOVALS.** Most jobs include the removal of existing signs and/or trusses. All removals are listed with other roadway Removal of Improvements. It is preferred to list type of truss to be removed, number of pedestals, posts, footings, and a rough estimate of sign area. A district operations engineer is consulted about which removals to salvage and where the contractor is to deliver the salvaged materials. Items to be salvaged and delivery of these items are mentioned in the job special provisions and this work is paid for under Removal of Improvements.