

Section 13

Guidelines for the Design of Ground Mounted Sign Supports

13.1 Introduction

Highway signs fall into two main categories, which are subdivided as follows:

1. Overhead Signs
 - a. Sign Bridge Structures (GO)
 - b. Sign Cantilever Structures (GO)
 - c. Bridge Mounted (GOX)
2. Ground Mounted Signs
 - a. Small Highway Signs (GA)
 - b. Large Highway Signs (GA)

This section covers the design guidelines for Ground Mounted Sign Supports. These guidelines have been developed utilizing the 2006 AASHTO *A Policy on Geometric Design of Highways and Streets*, the 2009 AASHTO *Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals*, the 2011 AASHTO *Roadside Design Guide*, and the 2009 *Manual on Uniform Traffic Control Devices for Streets and Highways* (MUTCD).

Design guidelines and standard drawings for overhead and cantilever signs are covered in the NJDOT *General Design Criteria and Standard Drawings for Overhead and Cantilever Sign Support Structures*, 2007.

The designer has four options from which to choose when locating signs within the highway right-of-way. These options are:

1. Locate the sign beyond the clear zone.
2. Mount the sign overhead.
3. Utilize a breakaway support to reduce impact severity
4. Shield the sign with a longitudinal barrier and/or crash cushion

Ground mounted signs should desirably be located beyond the clear zone. In addition, all ground mounted highway signs are to be installed on breakaway supports, unless otherwise indicated herein. When a small sign is located behind a traffic barrier (which is required for another reason), non-breakaway supports may be used. In cases where noise walls are required at a particular sign location, additional berm widths may be necessary.

In considering the above, it is critical that sign locations and the design of the sign support be considered early in the Initial Design Development Stage. Depending upon the size of the sign, additional right-of-way, or slope easements may be required (see Standard Roadway Construction Details CD-612-4 and 7 for grading details). Also, where sign supports must be shielded, sufficient area must be provided to accommodate guide rail, crash cushions, or other traffic barriers.

13.2 Small Highway Signs

Small highway signs are defined as those with total panel areas less than 50 square feet. When this category of sign is used, the design guidelines for its support shall be steel "U" post sign supports. Aluminum posts are not permitted for small highway signs. Small highway signs shall not be placed in front of guide rail, and the posts shall not straddle guide rail. All small highway sign supports shall be of

the breakaway type with the exception of those installed behind guide rail or behind other traffic barriers.

For those signs included in the NJDOT Standard Roadway Construction Details (CD-612-1, 2 and 3), the contractor shall be responsible for determining the horizontal offset, the quantity of posts, the post size and their associated lengths by utilizing the information provided in Standard Roadway Construction Details CD-612-4.

For signs not included in the NJDOT Standard Roadway Construction Details, the designer shall be responsible for establishing all offsets, quantity of posts, post sizes and lengths by following the step-by-step design guidelines below:

Step 1 Once provided with the necessary panel size, determine the horizontal offset (X1) from edge of pavement to inside edge of sign, as shown in Figure 13-A, by applying Section 2A.19 of the MUTCD as follows:

- a. Urban installations – In areas where lateral offsets are limited, a minimum lateral offset of 2 ft. is desirable. A minimum offset of 1 ft. from the face of the curb may be used in areas where the sidewalk width is limited or where existing poles are close to the curb.
- b. Rural installations – 6 ft. minimum desirable from edge of shoulder, but 12 ft. minimum desirable from edge of traffic or auxiliary lane.
- c. Interstate and Freeway installations – 6 ft. minimum from edge of shoulder, but not less than 12 ft. from the edge of traffic or auxiliary lane.
- d. Ramp installations – 6 ft. minimum from edge of road.
- e. Behind guide rail: 4 ft. minimum from back of beam guide rail element to sign post.

Step 2 When determining the height of ground mounted signs, the following checks should be made:

- a. When signs are installed on slopes 10H:1V or flatter the minimum vertical clearance above the edge of pavement to bottom of the sign panel as shown in Figure 13-A is as follows:

(1) Sign Panels:

For single post installations, the minimum distance above the edge of pavement to the bottom of any panel must be 7 ft. and the minimum distance from edge of pavement to the top of any sign panel must be 9 ft.

For multi-post installations, the minimum distance above the edge of pavement to the bottom of a main sign panel must be 7 ft.

(2) Secondary Sign Panels:

For land service highways, the minimum distance above the edge of pavement to the bottom of a secondary sign panel is 6 ft.

For interstate and freeways the bottom of the main sign shall be a minimum of 8 ft. and secondary sign panel a minimum of 5 ft. above the edge of pavement.

- b. Where the sign is beyond the clear zone or behind a traffic barrier, the 10H:1V slope or flatter grading requirement may be eliminated. Where grading of 10H:1V or flatter cannot be obtained or where there is curb

or berm greater than 4 inches, the minimum vertical clearances will be measured from the ground line to the bottom of the sign.

Where a sign is behind a traffic barrier, regardless of grading, use directions in Step 2a above. Also, the sign under clearance at the far edge of a multi-post sign is 1 ft. minimum in a cut section.

- c. When the height of the sign panel falls below the 7 ft. level, engineering judgment should be exercised to avoid placing these signs in or near pedestrian crossing areas.

Step 3 Determine the maximum distance (L) from the ground line to the centroid of the sign panel in feet and determine the sign panel area (A) in square feet.

NOTE:

Sign Supports shall not be placed on slopes steeper than 10H:1V except where grading of 10H:1V cannot be obtained or where they will be behind a traffic barrier. See Standard Roadway Construction Details CD-612-4 for the grading detail.

Step 4 Determine the size and quantity of posts per sign from Figure 13-B for "A" up to 50 S.F. and "L" from 7 ft. to 15 ft.

NOTE 1:

When the plotted values of "A" and "L" on Figure 13-B indicate an undefined section of the chart, then an alternate design for large highway signs must be initiated (see Section 13-03, "Large Highway Signs").

NOTE 2:

When there is an option of using either a 2.5 lb./ft. post or a 4.0 lb./ft. post, the following applies:

- a. The maximum sign width (W) for single post installations shall be 2.5 ft.
- b. If the number of posts selected are the same, the 2.5 lb./ft. post should be used.
- c. When the number of 2.5 lbs./ft. posts selected are greater than the number of 4 lbs./ft. posts, the 4 lbs./ft. posts should be used.

Example: A = 20 S.F.

L = 10 ft.

Roadside Slope = 10H:1V

From Figure 13-B, the number of posts that may be selected are:

three – 2.5 lbs./ft. posts or,

two – 4.0 lbs./ft. posts

Therefore, use two – 4.0 lbs./ft. posts.

Step 5 After completing Steps 1 through 4 for each sign, determine the post length(s) (P) and enter all the data onto the Steel "U" Post Sign Support Data Table of the Standard Roadway Construction Details CD-612-6 for that project.

The following is an example of a post selection for a non-standard sign:

Highway Type - Freeway

Sign No. GA - 4

Size: 10 ft. x 4 ft.

Roadside Slope < 10H:1V

From the information provided:

Area (A) = 40 S.F.

Horizontal offset (X1) = 6 ft. (min.)

Vertical clearance = 7 ft. (min.)

Ground line to centroid (L) = 9 ft.

From Figure 13-B:

Use three – 4 lbs./ft. posts

Distance between posts = $W/3 = 40$ inches (see Figure 13-A)

Post Length (P) = $7 + 4 = 11$ ft.

Finally, enter the data onto the Steel "U" Post Sign Support Data Table in the Standard Roadway Construction Details CD-612-6.

13.3 Large Highway Signs

Large GA highway signs are defined as those with a panel area equal to or greater than 50 square feet. When this category of sign is used, the design guidelines for the support shall be "Breakaway Sign Support". Details for breakaway sign supports are contained in the NJDOT Standard Roadway Construction Details (CD- 612-7 through CD-612-10).

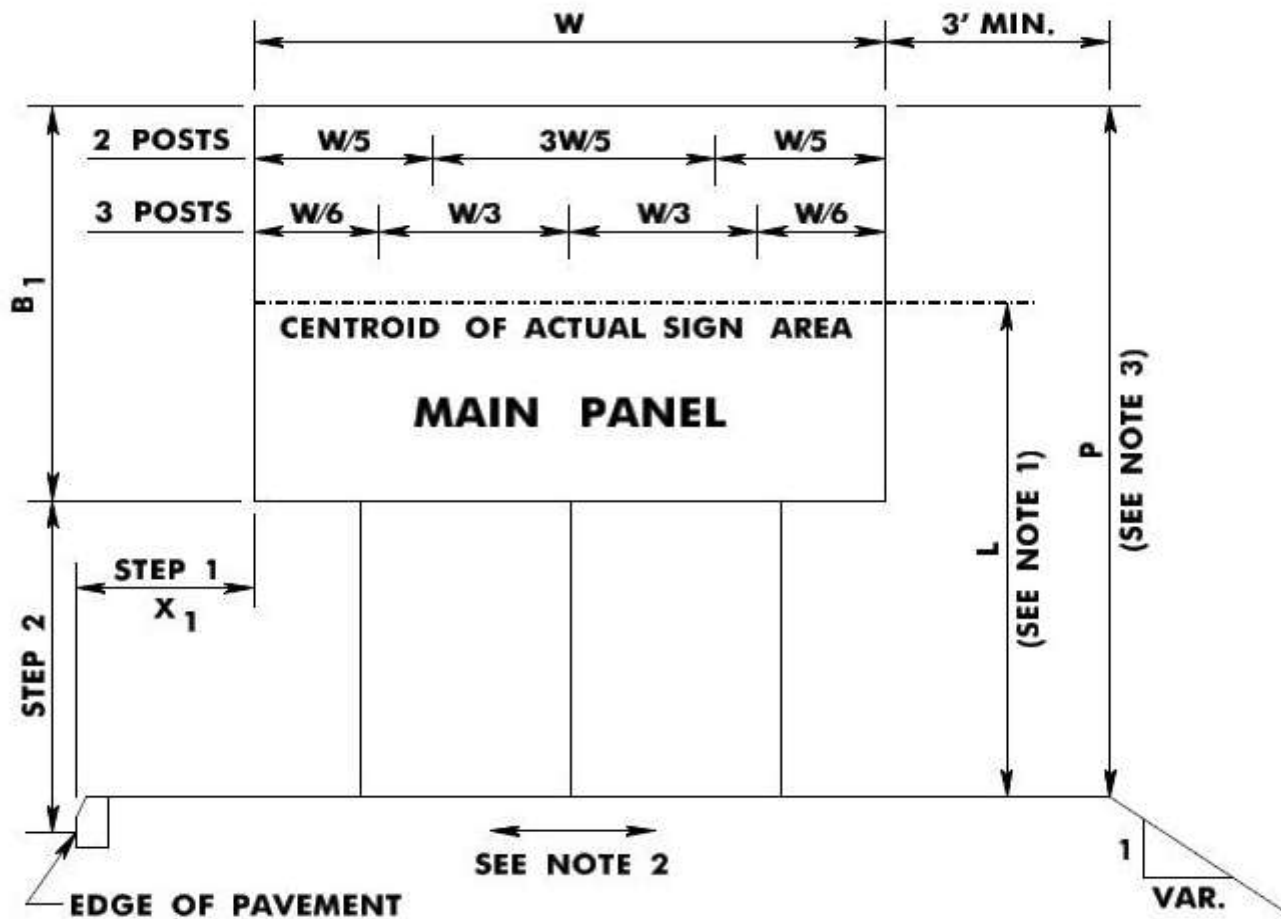
New sign supports for large GA highway signs shall be breakaway including sign supports that are installed behind roadside barriers used to shield other roadside obstructions. When a breakaway sign support is placed behind guide rail, the support should be a minimum of 4 ft. from the back of rail to the face of the sign post. When a breakaway sign support is placed behind barrier curb, the support shall be a minimum of 1.5 ft. from the back of barrier curb to the face of the sign post. In no case shall the leading edge of the sign panel project beyond the face of a roadside barrier.

Existing tubular aluminum GA breakaway signs that have been impacted should be replaced in-kind unless the damage is severe enough to require new footings, signs and/or posts. Existing large permanent GA signs, Specific Service signs (Logo signs) and Tourist-Oriented signs on wooden posts should be replaced with the breakaway sign system discussed below. All new large Specific Service signs (Logo signs) and Tourist-Oriented signs shall be installed with the breakaway supports discussed below.

SIGN ELEVATION FOR STEEL U-POST SUPPORTS

FIGURE 13-A

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NOTE 1: L = Maximum Distance From Ground To Centroid Of Sign Panel In Feet.

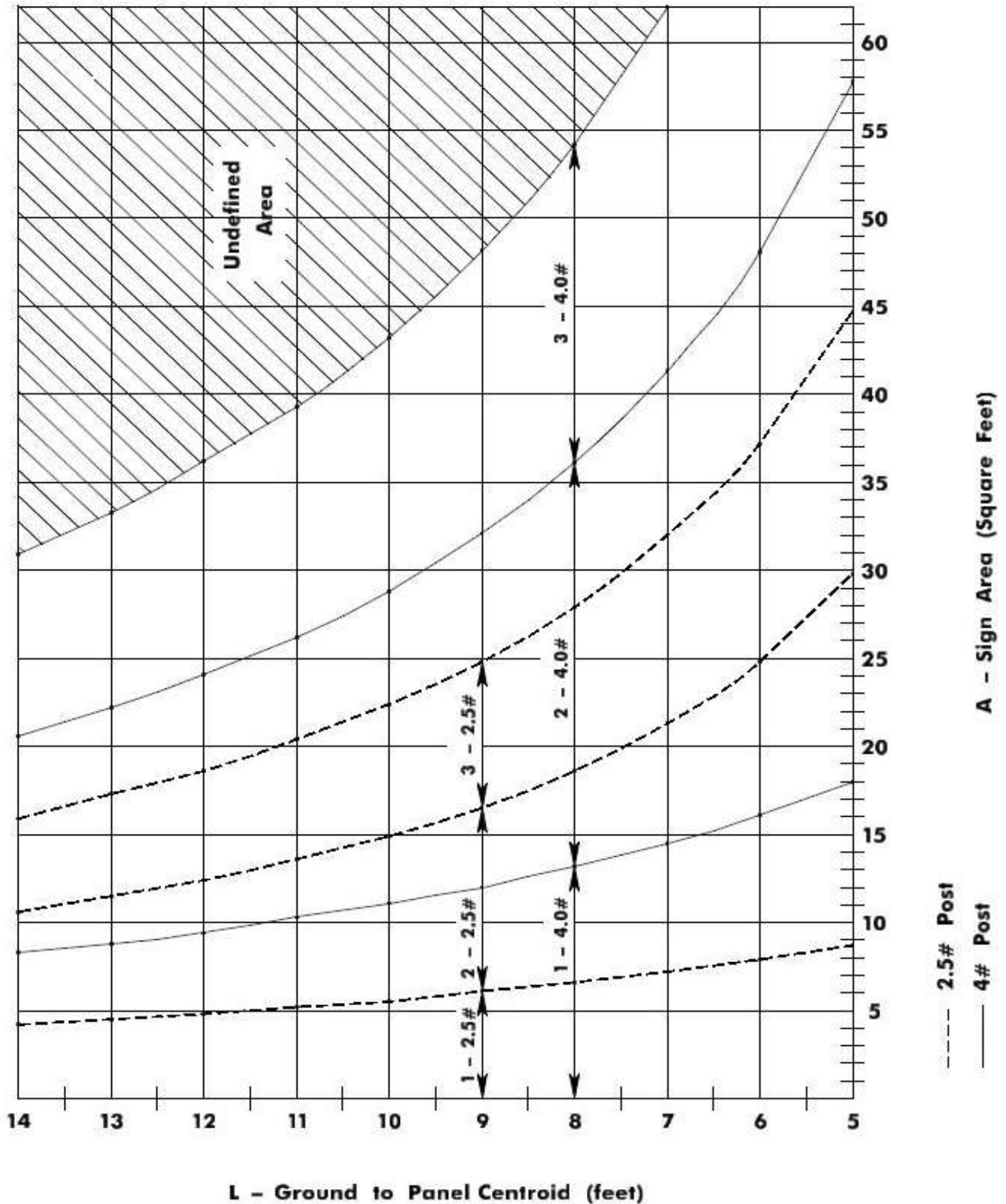
NOTE 2: Slopes Should Not Be Greater Than 10H:1V

NOTE 3: P = Post Length

NUMBER OF STEEL U POSTS PER SIGN

FIGURE: 13-B

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13.3.1 Breakaway Sign Supports

The following subsection provides a step-by-step guide to the design of breakaway sign supports.

13.3.1.1 Breakaway Sign Support

The following is a step-by-step guide to the design of breakaway sign supports:

- Step 1 Once provided with the size of the main panel, determine the horizontal offset, X_1 , from the edge of pavement to the edge of panel. Recommended offset = 8 ft., minimum offset = 7 ft.
- Step 2 Determine the elevation from the edge of pavement to the bottom of the main panel. Minimum mounting height = 7 ft. (see Figure 13-C and 13-D).
- For fill sections, when the sign is within the clear zone and not behind a traffic barrier, a 6H:1V slope or flatter must be held for a minimum of 3 feet beyond the berm (far) side of the main panel and 100 feet ahead of the sign face (see Standard Roadway Construction Detail CD-612-7).
 - For cut sections, when the sign is within the clear zone and not behind a traffic barrier, hold the far edge bottom corner of the main panel at the 7.271 ft. minimum and provide a 6H:1V slope or flatter for a minimum of 3 ft. beyond the berm (far) side of the main panel and 100 ft. ahead of the sign face (see Figure 13-D and Standard Roadway Construction Detail CD-612-7). If the sign is beyond the clear zone or behind a traffic barrier, the clearance at the far edge bottom corner of the main panel may be 1 foot.
 - When the sign is beyond the clear zone or behind a traffic barrier, the 6H:1V slope or flatter grading requirement may be eliminated.
- Step 3 Determine the number of posts required for the specified panel based on a minimum spacing between posts of 7 ft. (see Figure 13-C).

NOTE:

For main panel widths less than 22 to 23 ft., depending on post (flange) width, a three post support system shall not be used. Since the spacing for the three post support system requires $A_1/3$ between sign posts, only a 22 to 23 ft. width or greater would provide the 7 ft. minimum required spacing between posts (face of post to face of post). Since the spacing for the two post support system requires $3A_1/5$ between sign posts, only a 12.5 to 13 ft. width or greater would provide the 7 ft. minimum required spacing between posts (face of post to face of post). See Table 13-1 below for minimum panel length (A_1) based on post (flange) width.

Table 13-1

POST SIZE	FLANGE WIDTH	MIN. PANEL WIDTH (A_1)	
		2 POST SIGN	3 POST SIGN
W6X12	4"	12.5'	22'
W6X16	4"	12.5'	22'
W8X18	5.25"	12.5'	22.5'
W8X21	5.25"	12.5'	22.5'
W10X22	5.75"	12.5'	22.5'
W10X26	5.75"	12.5'	22.5'
W12X26	6.5"	13'	23'
W14X30	6.75"	13'	23'
W18X35	6"	12.5'	22.5'
W18X40	6"	12.5'	22.5'

For a two post support system, $A_1 = 5 (7' + \text{Flange Width}) / 3$

For a three post support system, $A_1 = 3 (7' + \text{Flange Width})$

- Step 4 Determine the distances from ground line to bottom of main panel, L, for each post.

NOTE:

The minimum distance from ground line to the bottom of the main panel shall be 7.271 ft.

- Step 5 Determine the required values of Lmax, H, and A1 where:

Lmax = Maximum post length to bottom of main panel (feet)

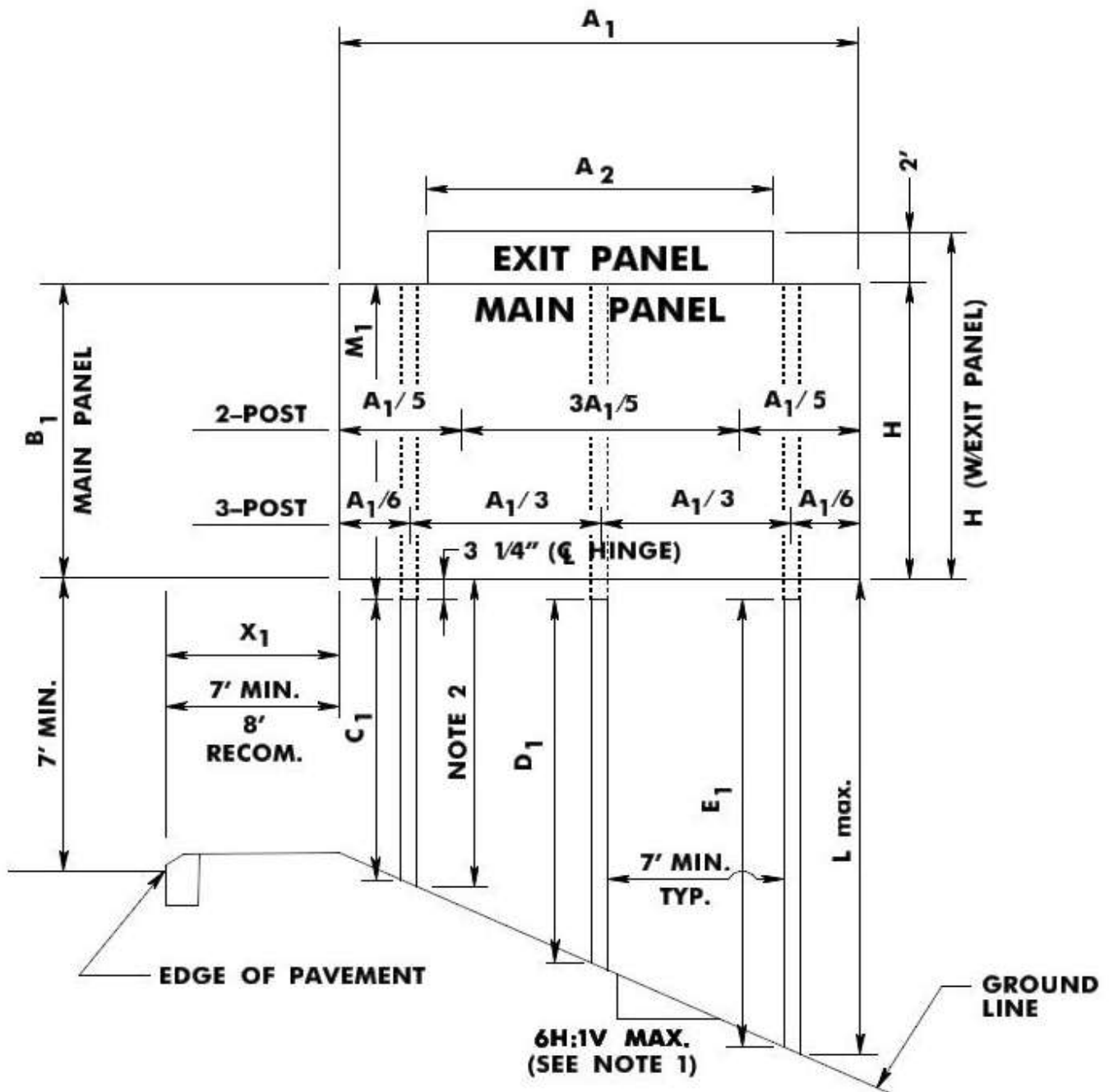
H = Main panel height + Exit panel height (feet)

A1 = Main panel width (feet)

SIGN ELEVATION FOR BREAKAWAY SUPPORTS FILL SLOPES

FIGURE: 13-C

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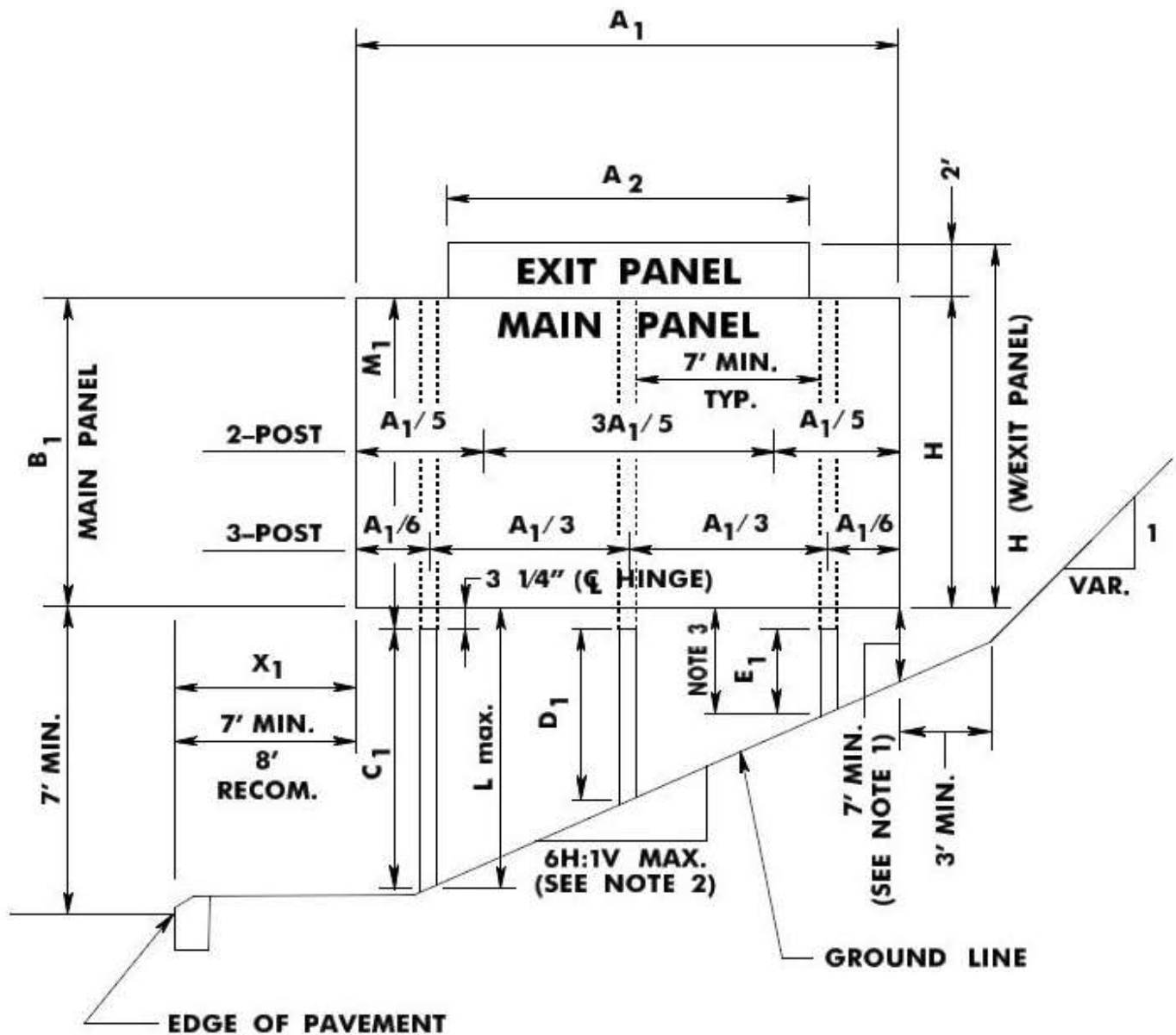
NOTE 1: Fill slope may be 2H: 1V maximum when sign is behind a traffic barrier or beyond clear zone.

NOTE 2: Minimum clearance from ground line to bottom of main panel at shortest post is 7.271 ft. when sign is within clear zone and not behind a traffic barrier.

SIGN ELEVATION FOR BREAKAWAY SUPPORTS CUT SLOPES

FIGURE: 13-D

BDC11MR-04



NOTE 1: Sign underclearance at far end of sign is 1 foot minimum when sign is behind a traffic barrier or beyond the clear zone.

NOTE 2: Back slope may be 2H: 1V maximum when sign is behind a traffic barrier or beyond clear zone.

NOTE 3: Minimum clearance from ground line to bottom of main panel at shortest post is 7.271 ft. when sign is within clear zone and not behind a traffic barrier.

- Step 6 Determine the sign support size by utilizing Tables 13-3.1, 13-3.2, and 13-4, where:

L_{max} = Maximum post length to bottom of main panel (feet)

H = Main panel height + Exit panel height (feet)

$A1$ = Main panel width (feet). For main panel widths ($A1$) between those shown in Tables 13-3.1, 13-3.2 and 13-4, use larger width to determine post size.

Note: Posts in Tables 13-3.1, 13-3.2, and 13-4 were designed for a basic wind speed of 100 mph (3-second gust speeds), with a yield stress for the steel I-beam of 36,000 psi, and a structure design life of 25 years.

Example: L_{max} = 10 ft. H = 9 ft. $A1$ = 24 ft.

Based on the information provided, it is determined according to Step 3 that a two or three post system can be used. The designer should pick the post system that is the most cost effective for their job. This example will continue with a two post system. Entering Table 13-3.1 with the given values above, select a W12x26 post. This post size shall be used for all posts in the structure.

- Step 7 Determine the footing diameter, footing depth and vertical rebar requirement:

Using the post size determined in Step 6, use Table 13-2 determine the footing diameter, footing depth and vertical rebar requirement (see Figure 13-E).

Example: post size = W12x26

Footing Diameter, 3.0 ft.; Footing Depth, 8.0 ft.; Re-Steel, 8-#19

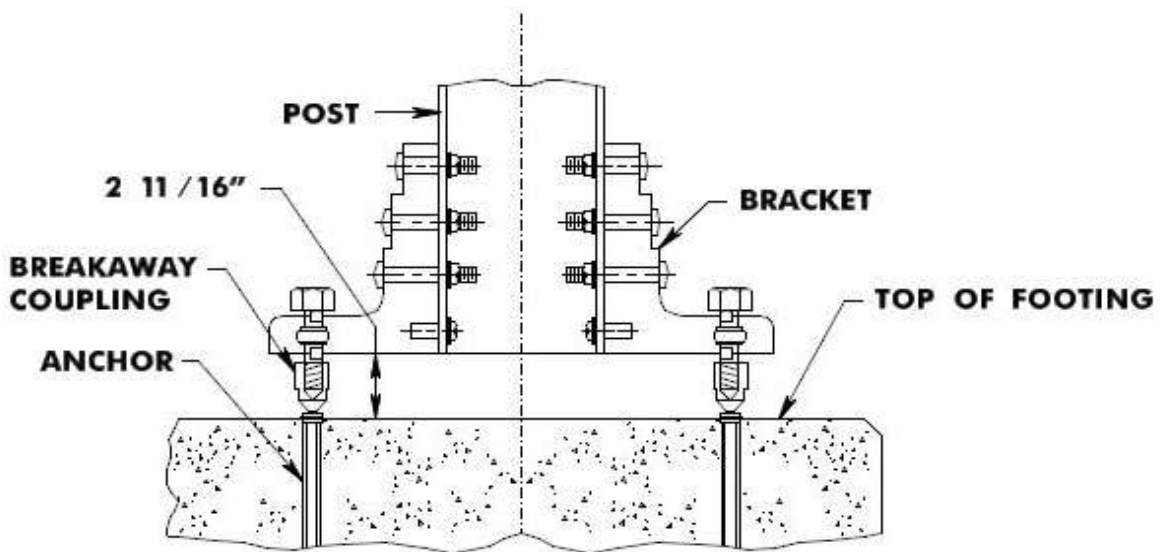
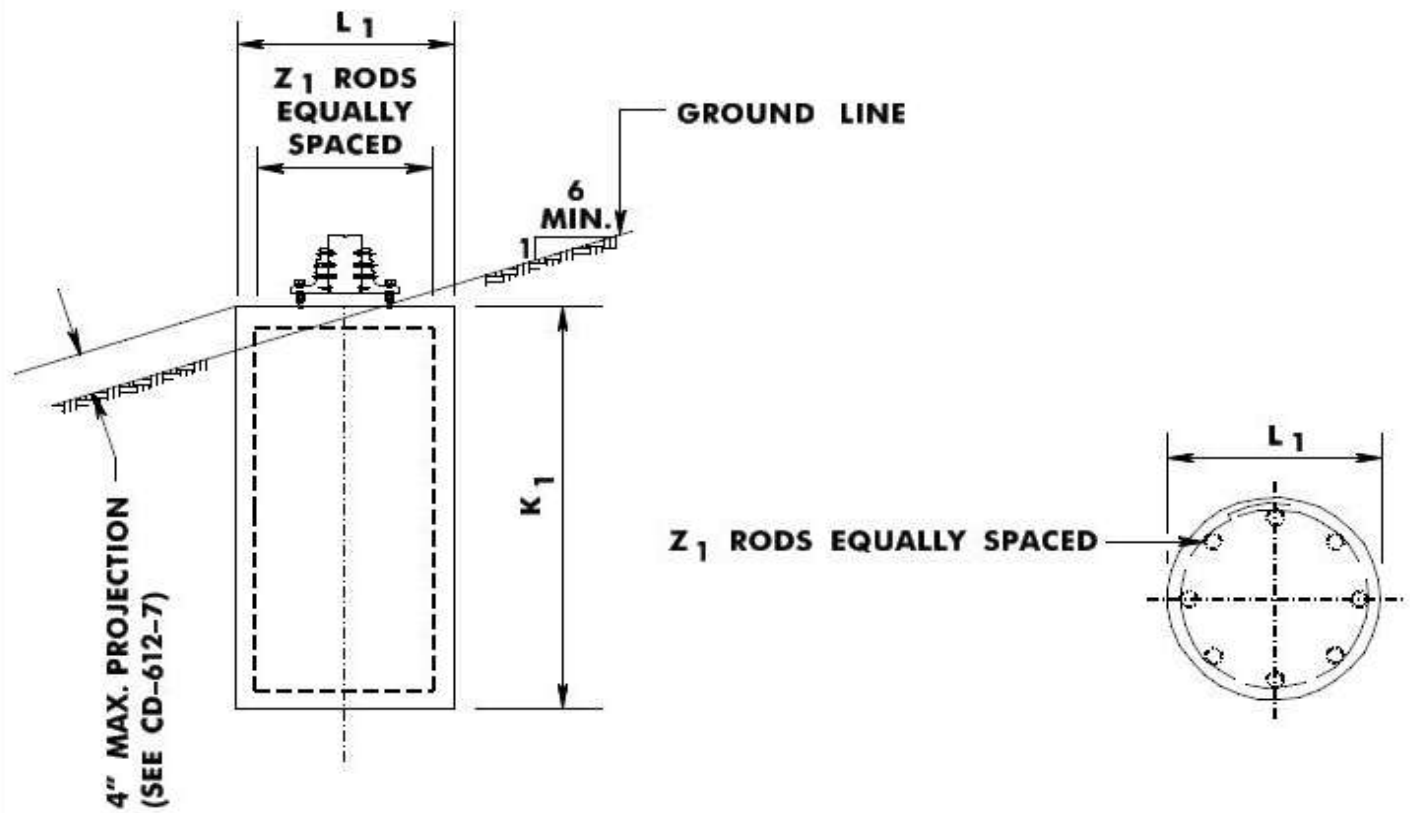
TABLE 13-2

Footing Dimensions			
Post size	Footing Diameter (L1)	Footing Depth (K1)	Re-Steel (Z1)
W6x12, W6x16	2.5'	5.5'	8-#16
W8x18, W8x21	2.5'	6.5'	8-#16
W10x22, W10x26	3.0'	7.5'	8-#19
W12x26	3.0'	8.0'	8-#19
W14x30	3.0'	8.0'	8-#19
W18x35, W18x40	3.5'	8.0'	8-#19

FOOTING DETAIL FOR BREAKAWAY SIGN SUPPORTS

FIGURE: 13-E

BDC09MR-03



SEE CD-612-7 & CD-612-8 FOR FURTHER DETAILS

POST SELECTION TABLE FOR BREAKAWAY SIGNS TWO POSTS						TABLE:-13-3.1		
		H = MAIN PANEL HEIGHT+ EXIT PANEL HEIGHT (FEET)						
A1	Lmax	4	5	6	7	8	9	10
14	8	W6x12	W6x16	W6x16	W8x18	W8x18	W8x18	W8x18
	10	W6x16	W8x18	W8x18	W8x18	W8x21	W8x21	W10x22
	12	W8x18	W8x18	W8x18	W8x21	W10x22	W10x26	W10x26
	14	W8x18	W10x22	W10x22	W10x26	W10x26	W12x26	W12x26
	16	W10x22	W10x26	W12x26	W12x26	W12x26	W14x30	W14x30
16	8	W6x12	W6x16	W8x18	W8x18	W8x18	W8x21	W8x21
	10	W8x18	W8x18	W8x18	W8x18	W8x21	W10x22	W10x22
	12	W8x18	W8x18	W8x21	W10x22	W10x22	W10x26	W12x26
	14	W8x21	W10x22	W10x26	W10x26	W12x26	W12x26	W14x30
	16	W10x22	W10x26	W12x26	W12x26	W14x30	-----	-----
18	8	W6x16	W6x16	W8x18	W8x18	W8x18	W8x21	W10x22
	10	W8x18	W8x18	W8x18	W8x21	W10x22	W10x22	W10x26
	12	W8x18	W8x21	W10x22	W10x22	W10x26	W12x26	W12x26
	14	W8x21	W10x22	W10x26	W12x26	W12x26	W14x30	W18x40
	16	W10x26	W12x26	W12x26	W14x30	-----	-----	-----
20	8	W6x16	W8x18	W8x18	W8x18	W8x21	W10x22	W10x22
	10	W8x18	W8x18	W8x21	W8x21	W10x22	W10x26	W12x26
	12	W8x18	W8x21	W10x22	W10x26	W10x26	W12x26	W14x30
	14	W10x22	W10x26	W12x26	W12x26	W14x30	W14x30	W18x40
	16	W10x26	W12x26	W12x26	W14x30	-----	-----	-----
22	8	W6x16	W8x18	W8x18	W8x21	W8x21	W10x22	W10x26
	10	W8x18	W8x18	W8x21	W10x22	W10x26	W10x26	W12x26
	12	W8x18	W10x22	W10x22	W10x26	W12x26	W14x30	W14x30
	14	W10x22	W10x26	W12x26	W12x26	W14x30	W18x40	W18x40
	16	W12x26	W12x26	W14x30	-----	-----	-----	-----
24	8	W6x16	W8x18	W8x18	W8x21	W10x22	W10x26	W10x26
	10	W8x18	W8x18	W8x21	W10x22	W10x26	W12x26	W12x26
	12	W8x21	W10x22	W10x26	W10x26	W12x26	W14x30	W18x40
	14	W10x22	W10x26	W12x26	W14x30	W18x40	W18x40	-----
	16	W12x26	W12x26	W14x30	-----	-----	-----	-----
26	8	W8x18	W8x18	W8x18	W8x21	W8x21	W10x26	W12x26
	10	W8x18	W8x21	W10x22	W10x26	W10x26	W12x26	W14x30
	12	W8x21	W10x22	W10x26	W12x26	W12x26	W18x35	-----
	14	W10x22	W12x26	W12x26	W14x30	W18x40	-----	-----
	16	W12x26	W14x30	-----	-----	-----	-----	-----
28	8	W8x18	W8x18	W8x21	W10x22	W10x26	W10x26	W12x26
	10	W8x18	W8x21	W10x22	W10x26	W12x26	W14x30	-----
	12	W8x21	W10x22	W10x26	W12x26	W14x30	-----	-----
	14	W10x26	W12x26	W14x30	W18x40	W18x40	-----	-----
	16	W12x26	W14x30	-----	-----	-----	-----	-----
30	8	W8x18	W8x18	W8x21	W10x22	W10x26	W12x26	-----
	10	W8x18	W8x21	W10x22	W10x26	W12x26	W14x30	-----
	12	W10x22	W10x26	W12x26	W12x26	W14x30	-----	-----
	14	W10x26	W12x26	W14x30	W18x40	-----	-----	-----
	16	W12x26	W14x30	-----	-----	-----	-----	-----

POST SELECTION TABLE FOR BREAKAWAY SIGNS TWO POSTS					TABLE:-13-3.2	
		H = MAIN PANEL HEIGHT+ EXIT PANEL HEIGHT (FEET)				
A1	Lmax	11	12	13	14	15
14	8	W8x21	W10x22	W10x22	W10x26	W10x26
	10	W10x22	W10x26	W12x26	W12x26	W14x30
	12	W12x26	W12x26	W14x30	W14x30	W18x35
	14	W14x30	W14x30	W18x40	W18x40	-----
	16	-----	-----	-----	-----	-----
16	8	W10x22	W10x22	W10x26	W10x26	W12x26
	10	W10x26	W10x26	W12x26	W14x30	W14x30
	12	W12x26	W14x30	W14x30	W18x35	W18x40
	14	W14x30	W18x40	W18x40	-----	-----
	16	-----	-----	-----	-----	-----
18	8	W10x26	W10x26	W10x26	W12x26	W14x30
	10	W12x26	W12x26	W14x30	W14x30	-----
	12	W14x30	W14x30	W18x40	-----	-----
	14	W18x40	W18x40	-----	-----	-----
	16	-----	-----	-----	-----	-----
20	8	W10x26	W12x26	W12x26	W14x30	-----
	10	W12x26	W14x30	-----	-----	-----
	12	W18x35	-----	-----	-----	-----
	14	-----	-----	-----	-----	-----
	16	-----	-----	-----	-----	-----
22	8	W12x26	W12x26	-----	-----	-----
	10	W14x30	W14x30	-----	-----	-----
	12	-----	-----	-----	-----	-----
	14	-----	-----	-----	-----	-----
	16	-----	-----	-----	-----	-----
24	8	W12x26	-----	-----	-----	-----
	10	W14x30	-----	-----	-----	-----
	12	-----	-----	-----	-----	-----
	14	-----	-----	-----	-----	-----
	16	-----	-----	-----	-----	-----
26	8	W12x26	-----	-----	-----	-----
	10	-----	-----	-----	-----	-----
	12	-----	-----	-----	-----	-----
	14	-----	-----	-----	-----	-----
	16	-----	-----	-----	-----	-----
28	8	-----	-----	-----	-----	-----
	10	-----	-----	-----	-----	-----
	12	-----	-----	-----	-----	-----
	14	-----	-----	-----	-----	-----
	16	-----	-----	-----	-----	-----
30	8	-----	-----	-----	-----	-----
	10	-----	-----	-----	-----	-----
	12	-----	-----	-----	-----	-----
	14	-----	-----	-----	-----	-----
	16	-----	-----	-----	-----	-----

POST SELECTION TABLE FOR BREAKAWAY SIGNS THREE POSTS		Table- 13-4						
		H = MAIN PANEL HEIGHT+ EXIT PANEL HEIGHT (FEET)						
A1	L _{MAX}	4	5	6	7	8	9	10
24	8	W6x12	W6x16	W8x18	W8x18	W8x18	W8x21	W8x21
	10	W8x18	W8x18	W8x18	W8x18	W8x21	W10x22	W10x22
	12	W8x18	W8x18	W8x21	W10x22	W10x22	W10x26	W12x26
	14	W8x21	W10x22	W10x26	W10x26	W12x26	W12x26	W14x30
	16	W10x22	W10x26	W12x26	W12x26	W14x30	-----	-----
26	8	W6x16	W6x16	W8x18	W8x18	W8x18	W8x21	W10x22
	10	W8x18	W8x18	W8x18	W8x21	W10x22	W10x22	W10x26
	12	W8x18	W8x18	W8x21	W10x22	W10x26	W12x26	W12x26
	14	W8x21	W10x22	W10x26	W12x26	W12x26	W14x30	W14x30
	16	W10x26	W12x26	W12x26	W14x30	W14x30	-----	-----
28	8	W6x16	W6x16	W8x18	W8x18	W8x21	W8x21	W10x22
	10	W8x18	W8x18	W8x18	W8x21	W10x22	W10x26	W10x26
	12	W8x18	W8x21	W10x22	W10x22	W10x26	W12x26	W14x30
	14	W8x21	W10x22	W10x26	W12x26	W12x26	W14x30	W18x40
	16	W10x26	W12x26	W12x26	W14x30	-----	-----	-----
30	8	W6x16	W8x18	W8x18	W8x18	W8x21	W10x22	W10x22
	10	W8x18	W8x18	W8x21	W10x22	W10x22	W10x26	W12x26
	12	W8x18	W8x21	W10x22	W10x26	W10x26	W12x26	W14x30
	14	W10x22	W10x26	W12x26	W12x26	W14x30	W14x30	W18x40
	16	W10x26	W12x26	W14x30	W14x30	-----	-----	-----

		11	12	13	14	15
24	8	W10x22	W10x26	W10x26	W12x26	W12x26
	10	W10x26	W12x26	W14x30	W14x30	W18x35
	12	W12x26	W14x30	W18x35	W18x40	-----
	14	W18x40	W18x40	-----	-----	-----
	16	-----	-----	-----	-----	-----
26	8	W10x22	W10x26	W12x26	W12x26	W14x30
	10	W10x26	W12x26	W14x30	W18x35	-----
	12	W14x30	W14x30	W18x40	-----	-----
	14	W18x40	W18x40	-----	-----	-----
	16	-----	-----	-----	-----	-----
28	8	W10x26	W10x26	W12x26	W14x30	-----
	10	W12x26	W12x26	W14x30	-----	-----
	12	W14x30	W18x40	-----	-----	-----
	14	W18x40	-----	-----	-----	-----
	16	-----	-----	-----	-----	-----
30	8	W10x26	W12x26	W12x26	-----	-----
	10	W12x26	W14x30	-----	-----	-----
	12	W18x35	-----	-----	-----	-----
	14	-----	-----	-----	-----	-----
	16	-----	-----	-----	-----	-----

Step 8 Determine the model number from Table 13-5.

From the post size determined in Step 6, select the Model No.

Example: From Step 6, the post size determined was W12x26. Therefore, use Model No. B650.

TABLE 13-5

Model No. Selection					
Post Size	Model No.		Post Size	Model No.	
W6x12	B525		W10x22	B650	
W6x16	B525		W10x26	B650	
W8x18	B525		W12x26	B650	
W8x21	B525		W14x30	B650	
			W18x35	B650	
			W18x40	B650	

Step 9 Determine the bracket number from Table 13-6.

Calculate L for the longest post ($L = L_{max} + H/2$). Using L and the post size determined in Step 6 enter Table 13-6 and select the appropriate bracket number.

Example: $L = 10 + 9/2 = 14.5$ ft. From Step 6 the post size was determined to be W12x26. Entering Table 13-6 with an 12 inch post and an L of 14.5 ft., select Bracket No. 2.

TABLE 13-6

Bracket Selection						
I-Beam Post Size	Bracket No. 1		Bracket No. 2		Bracket No. 3	
	Min 'L'	Max 'L'	Min 'L'	Max 'L'	Min 'L'	Max 'L'
6"	12'	29'	9'	12'	0	9'
8"	14'	29'	10'	14'	0	10'
10"	16'	29'	11'	16'	0	11'
12"	18'	29'	13'	18'	0	13'
14"	19'	29'	14'	19'	0	14'
18"	23'	29'	16'	23'	0	16'

Step 10 Determine C1, D1, E1 and M1 for each sign post, where:

C1, D1, and E1 = Distance from 0.271 ft. (3 ¼ inches) below the bottom of the sign to bottom of bracket (see CD-612-7 and CD-612-8).

C1, D1, and E1 = Step 4 - (0.224 ft. + 0.271 ft.)

NOTE:

0.224 ft. (2 11/16 inches) corresponds to the distance from top of footing to the bottom of the bracket (see Figure 13-E).

M1 = Distance from the top of sign to 0.271 ft. (3 ¼ inches) below the bottom of the sign (B1+0.271).

- Step 11 Determine F1, G1, and H1 for each post, see Standard Roadway Construction Details CD-612-7. Values above reference line are positive, values below reference line are negative.
- Step 12 The footings should extend a maximum of 4" above the ground. Determine the maximum projection of the footings as per the Footing/Stub Projection Detail in Standard Roadway Construction Detail CD-612-7. If the projection is greater than 4 inches, then the footing will have to be beveled. Determine footing bevel as per Footing Bevel Detail and Footing Bevel Table in Standard Roadway Construction Details CD-612-7 and CD-612-10 respectively. If possible, lower the elevation of the top of footing to reduce projection to 4 inches or less, then footing bevel is not required. Detail Breakaway Grading Detail, Footing/Stub Projection Detail and Footing Bevel Detail do not apply to signs behind a traffic barrier or beyond the clear zone, as per Standard Roadway Construction Details CD-612-7.
- Step 13 Enter all the data onto the Breakaway Support Data Table and Footing Bevel Table in the Standard Roadway Construction Details CD-612-10.
- Note: The Break-Safe Sign Post Selection program on the compact disk is for DOT engineers, consultants and sign contractors. Using input from the designer, this program will automatically select the appropriate sign post section and the corresponding Break-Safe breakaway sign support assembly. To receive a personal copy of the Break-Safe Sign Post Selection CD, go to www.transpo.com/contact.html, fill in the form and request the Sign Post Selection CD in the reason for inquiry box. The designer will need to enter the design criteria for wind speed, yield stress of steel I-beam and structure design life into the program, see note in Step 6 above.

13.3.2 Nonvegetative Surface Under Overhead Signs and Large Ground Mounted Signs

In order to reduce soil erosion and highway maintenance costs associated with spraying or trimming vegetation underneath signs, nonvegetative surfaces should be applied around the foundation of overhead signs and underneath large ground mounted signs as follows:

- A. Sign types – Conditions warranting use of nonvegetative surfaces
1. Overhead Signs
 2. Sign Bridge- All cases
 3. Sign Cantilever – All cases
 4. Large Ground Mounted Signs
 5. Breakaway Sign Supports – Mowable areas
 6. Nonbreakaway Sign Support – Mowable areas

This surface treatment is not to be used at breakaway steel "U" post sign support locations.

The nonvegetative surfaces shall be constructed as shown in Standard Roadway Construction Detail CD-608-1.