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SECTION 13

GUIDELINES FOR THE DESIGN OF GROUND MOUNTED SIGN SUPPORTS

13-01 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 1994 AASHTO *A Policy on Geometric Design of Highways and Streets*, the 1994 AASHTO *Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals*, the 1996 AASHTO *Roadside Design Guide*, and the 1988 *Manual on Uniform Traffic Control Devices for Streets and Highways* (MUTCD).

Design guidelines and Standard Drawing Plates for overhead signs are covered in the NJDOT *Design Manual - Bridges and Structures, Third Edition,* 1998.

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 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.

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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-619-4 and 7 for grading details). Also, where sign supports must be shielded, sufficient area must be provided to accommodate guide rail or a crash cushion.

13-02 SMALL HIGHWAY SIGNS

Small highway signs are defined as those with total panel areas less than 4.6 square meters. 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 rails, 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 roadside barriers.

For those signs included in the NJDOT *Standard Roadway Construction Details* (CD-619-1, 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-619-4.

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 (X_1) from edge of pavement to inside edge of sign, as shown in Figure 13-A, by applying Section 2A-24 of the MUTCD as follows:

a. Urban installations - 305 millimeters minimum from curb face where sidewalk width is limited or existing poles are close to the curb. Otherwise 610 millimeters minimum.
b. Rural installations - 2 meters minimum desirable from edge of shoulder, but 4 meters minimum desirable from edge of traffic or auxiliary lane.
c. Interstate and Freeway installations - 2 meters minimum from edge of shoulder, but not less than 3 meters from the edge of traffic or auxiliary lane.

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

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

Superseded

(1.) Sign Panels:

- For single post installations, the minimum distance above the edge of pavement to the bottom of any panel must be 2.1 meters and the minimum distance from edge of pavement to the top of any sign panel must be 2.7 meters.

- For multi-post installations, the minimum distance above the edge of pavement to the bottom of a main sign panel must be 2.1 meters.

(2.) Secondary Sign Panels:

- The minimum distance above the edge of pavement to the bottom of a secondary sign panel is 1.8 meters.

- For interstate and freeways the bottom of the main sign shall be a minimum of 2.5 meters and secondary sign panel a minimum of 1.5 meters above the edge of pavement.

b. Where grading of 1:10 or flatter cannot be obtained or where there is curb or berm greater than 100 millimeters, the minimum vertical clearances will be measured from the ground line to the bottom of the sign.

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

NOTE: Sign Supports shall not be placed on slopes steeper than 1:10 except where grading of 1:10 cannot be obtained or where they will be behind a traffic barrier. See *Standard Roadway Construction Details* CD-619-4 for the grading detail.

Step 4. Determine the size and quantity of posts per sign from Figure 13-B for "A" up to 4.6 square meters. and "L" from 2.2 meters to 4.6 meters.

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 3.7 kilograms per meter post or a 6.0 kilograms per meter post, the following applies:

Superseded

a. The maximum sign width (W) for single post installations shall be 760 millimeters.
b. If the number of posts selected are the same, the 3.7 kilograms per meter post should be used.
c. When the number of 3.7 kilograms per meter posts selected are greater than the number of 6.0 kilograms per meter posts, the 6.0 kilograms per meter posts should be used.

Example: A = 1.75 square meters
L = 3.1 meters
Roadside Slope = 1:10

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

three - 3.7 kilograms per meter posts or,
two - 6.0 kilograms per meter posts

Therefore, use two - 6.0 kilograms per meter 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-619-6 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: 3000 x 1200 millimeters
Roadside Slope < 1:10

From the information provided:
Area (A) = 3.6 square meters
Horizontal offset (X_1) = 2.0 meters (min.)
Vertical clearance = 2.1 meters (min.)
Ground line to centroid (L) = 2.7 meters

From Figure 13-B:
Use three - 6.0 kilograms per meter posts.

Distance between posts = W/3 = 1.0 meter (see Figure 13-A)

Post Length (P) = 2.1 + 1.2 = 3.3 meters

Finally, enter the data onto the Steel "U" Post Sign Support Data Table in the *Standard Roadway Construction Details* CD-619-6.

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SIGN ELEVATION FOR STEEL U-POST SIGN SUPPORTS

FIGURE 13-A

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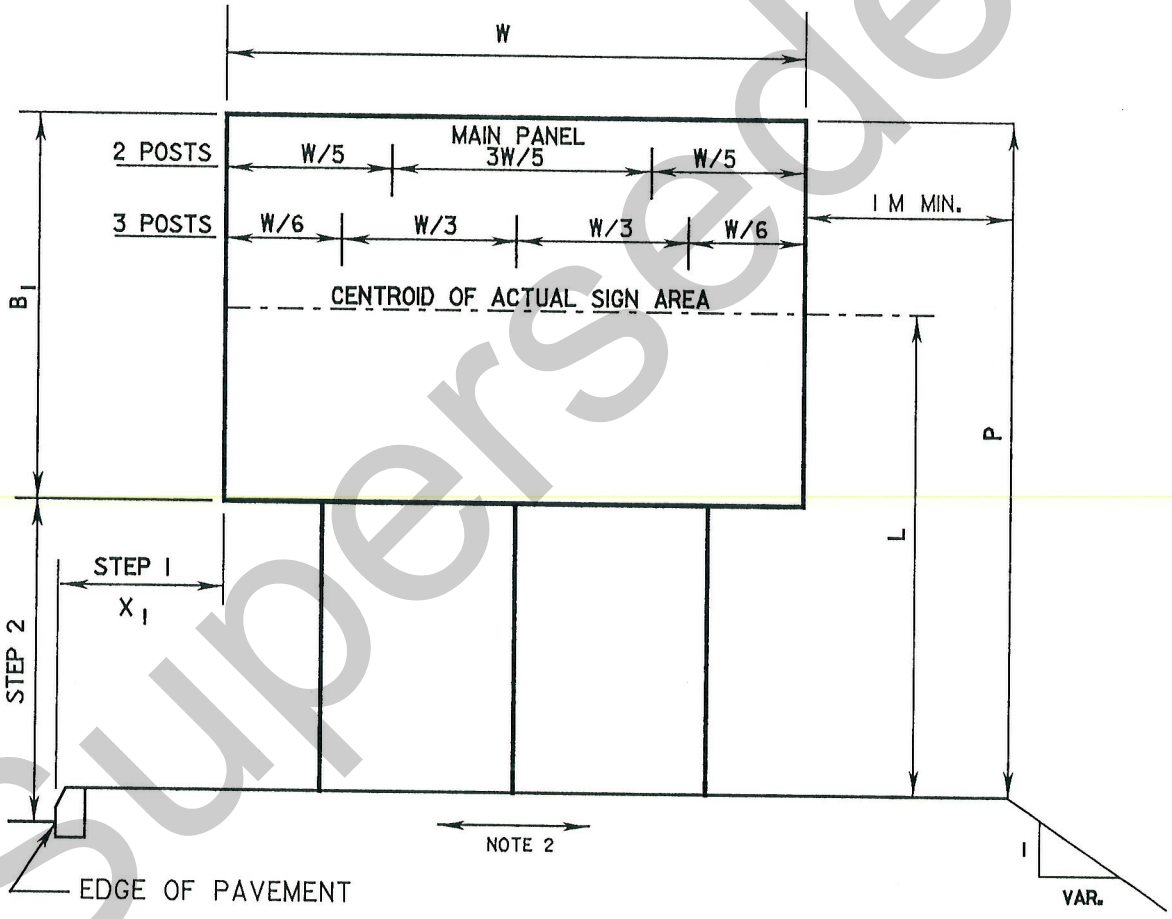

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NOTE 1: L= MAXIMUM DISTANCE FROM GROUND TO THE CENTROID OF SIGN PANEL IN METERS

NOTE 2 : SLOPES SHOULD NOT BE GREATER THAN 1:10

NOTE 3 : P= POST LENGTH

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NUMBER OF STEEL U-POSTS PER SIGN

FIGURE 13-B

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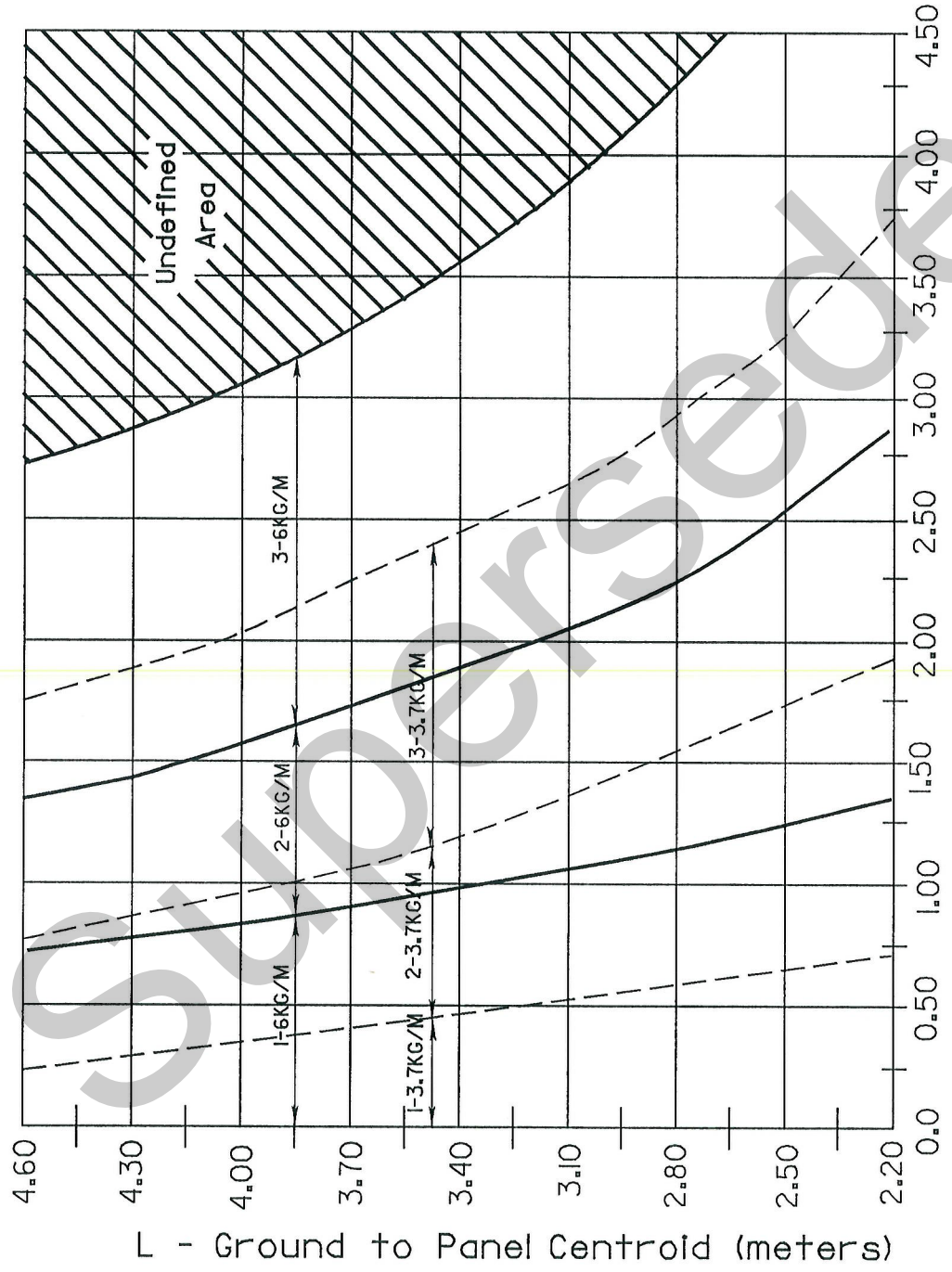

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13-03 LARGE HIGHWAY SIGNS

Large highway signs are defined as those with a panel area equal to or greater than 4.6 square meters. When this category of sign is used, the design guidelines for the support shall be either "Breakaway Sign Supports", Section 13-03.1, or "Non-Breakaway Sign Supports", Section 13-03.2. Details for breakaway and non-breakaway sign supports are contained in the NJDOT *Standard Roadway Construction Details* (CD-619-7 through 15).

Non-breakaway sign supports shall be installed behind roadside barriers used to shield other roadside obstructions. When a non-breakaway sign support is placed behind guide rail, the support should be a minimum of 1.3 meters from the back of rail to the face of the sign post. When a non-breakaway sign support is placed behind barrier curb, the support shall be a minimum of 500 millimeters from the back of barrier curb to the face of the sign post.

13-03.1 Breakaway Sign Supports

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 edge of pavement to edge of panel. Recommended offset - 2.5 meters, minimum offset - 2.2 meters (see Figure 13-C).

Step 2. Determine the elevation from the edge of pavement to the bottom of the main panel. Minimum elevation - 2.2 meters (see Figure 13-C).

a. For fill sections, go to Step 3.
b. For cut sections, hold the traffic side bottom corner of the main panel at the 2.2 meter minimum. A 1:6 slope, or flatter, must be held for a minimum of 1.0 meter beyond the berm side of the main panel and 30 meters ahead of the sign face (see Figure 13-C and *Standard Roadway Construction Details* CD-619-7).

Step 3. Determine the number of posts required for the specified panel based on a minimum spacing between posts of 2.2 meters (see Figure 13-C).

NOTE: For widths less than 6.6 meters, a three post support system shall not be used. Since the spacing for a three post support system requires $A_1/3$ between sign posts, only a 6.6 meter width or greater would provide the minimum required spacing. Therefore, either a two post or three post support system could be utilized for widths greater than or equal to 6.6 meters.

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

Superseded

Step 5. Determine the sign support post diameter and wall thickness by utilizing Tables 13-1.1, 13-1.2, and 13-2, where:

L_{max} = Maximum post length to bottom of main panel (meters)
H = Main panel height + Exit panel height (meters)
A_1 = Main panel width (meters)

Example: L_{max} = 3.1 meters H = 2.8 meters A_1 = 6.9 meters
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 three post system. Entering Table 13-2 with the given values above, select a post with nominal diameter 250 millimeters and nominal wall thickness 6 millimeters. This post size shall be used for all posts in the structure.

Step 6. Determine the distance, $Y_1 + 32$ millimeters, from the bottom of the main panel to the centroid of the actual sign area (including exit panel area, if used). See Figure 13-C and *Standard Roadway Construction Details* CD-619-10 "Channel Frame View F-F").

Step 7. Determine C_1, D_1, and E_1 for each sign post, where:

C_1, D_1, and E_1 = Distance from the centroid to bottom of post base plate
C_1, D_1, and E_1 = Step 4 + Step 6 - 176 millimeters

NOTE: 176 millimeters corresponds to the maximum allowable distance from ground line to the bottom of the post base plate (see Figure 13-E).

Step 8. Utilizing the values of C_1, D_1, and E_1 for each sign post, determine the specific Load Concentrating Washer and Base Type from Figure 13-D.

Example: Assume a value of C_1 = 4 meters and a nominal tube diameter of 250 millimeters. Enter Figure 13-D from the left side and continue horizontally to the intersection with the previously selected tube diameter and corresponding Base Type curve, in this case Base Type #4. Drop down vertically from the curve to find the required Load Concentrating Washer Number, in this case washer #3.

Step 9. Determine the footing dimensions for each post by utilizing Figure 13-E.

Example: For a Base Type #4, the footing diameter will be 910 millimeters. The footing depth will be 2.06 meters and the footing will require 8-#16 bars of reinforcement steel, equally spaced.

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SIGN ELEVATION FOR BREAKAWAY SIGN SUPPORTS

FIGURE 13-C

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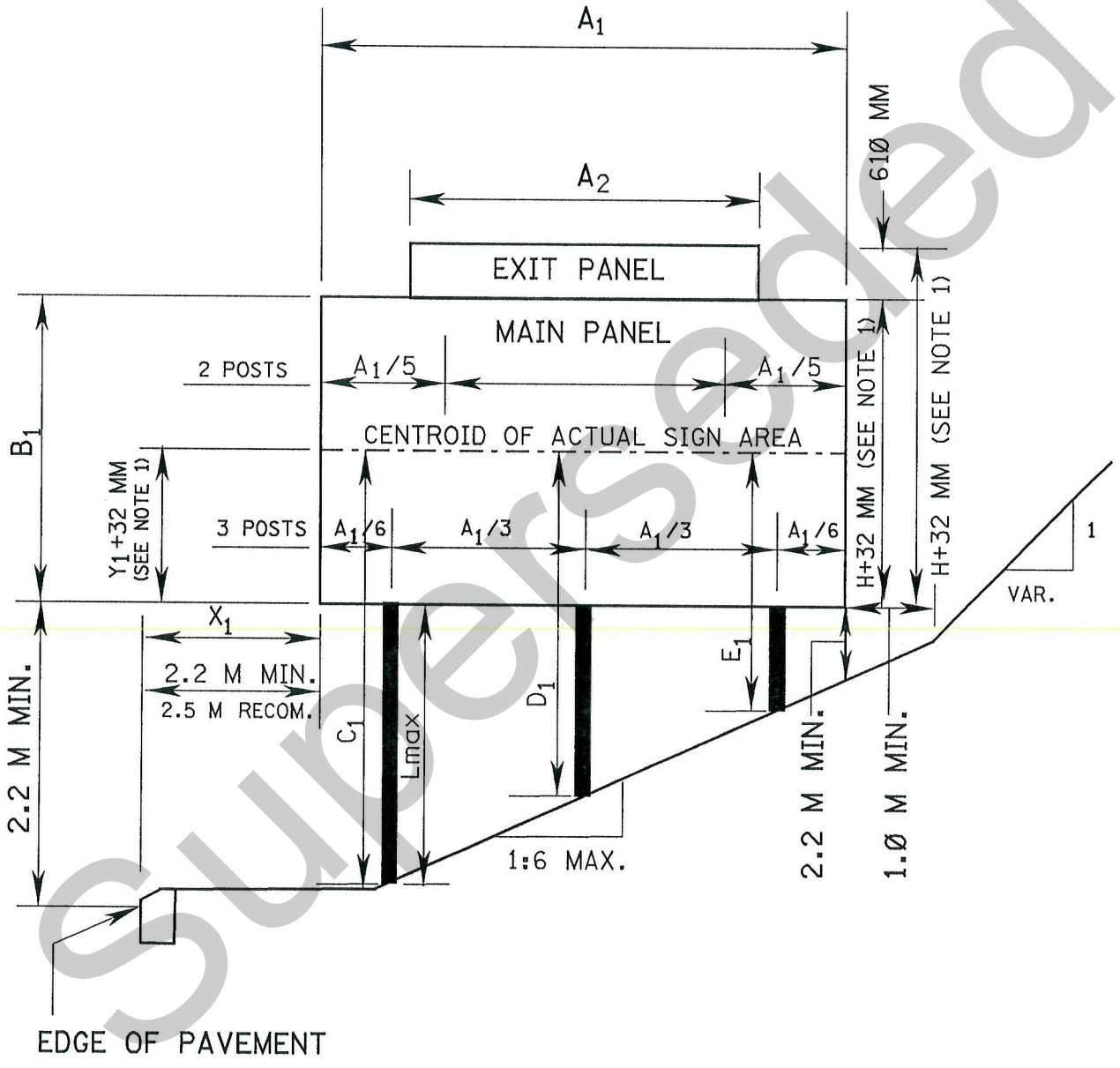

Note 1: See CD-619-1Ø "Channel Frame View F-F". Value of 32 MM corresponds to a "lip" at the base of the channel frame.

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POST SELECTION TABLE FOR BREAKAWAY SIGNS DESIGNED FOR 130 KM/H WIND & TWO POSTS

TABLE: 13-1.1

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A1 = WIDTH (METERS)	Lmax = POST LENGTH (M)	H = MAIN PANEL HEIGHT + EXIT PANEL HEIGHT (METERS)								
		1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0
4.0	2.0	150 - 5	150 - 5	150 - 5	200 - 5	200 - 5	200 - 6	250 - 5	250 - 5	250 - 6
	2.5	150 - 5	150 - 5	200 - 5	200 - 5	200 - 6	200 - 6	250 - 5	300 - 6	300 - 6
	3.0	150 - 5	150 - 5	200 - 5	200 - 5	200 - 6	250 - 6	300 - 6	300 - 6	300 - 6
	3.5	150 - 5	200 - 5	200 - 5	200 - 6	250 - 6	250 - 6	300 - 6	300 - 6	
	4.0	150 - 5	200 - 5	200 - 6	250 - 5	250 - 6	300 - 6	300 - 6	300 - 6	
	4.5	200 - 5	200 - 5	200 - 6	250 - 5	250 - 6	300 - 6	300 - 6		
	5.0	200 - 5	200 - 5	200 - 6	250 - 6	250 - 6	300 - 6	300 - 6		
4.5	2.0	150 - 5	150 - 5	200 - 5	200 - 5	200 - 5	200 - 6	250 - 5	250 - 6	250 - 6
	2.5	150 - 5	150 - 5	200 - 5	200 - 5	200 - 6	250 - 5	250 - 6	300 - 6	300 - 6
	3.0	150 - 5	200 - 5	200 - 5	200 - 6	200 - 6	250 - 6	300 - 6	300 - 6	
	3.5	150 - 5	200 - 5	200 - 5	250 - 5	250 - 6	300 - 6	300 - 6		
	4.0	150 - 5	200 - 5	200 - 6	250 - 6	250 - 6	300 - 6	300 - 6		
	4.5	200 - 5	200 - 5	250 - 5	250 - 6	300 - 6	300 - 6			
	5.0	200 - 5	200 - 6	250 - 5	250 - 6	300 - 6	300 - 6			
5.0	2.0	150 - 5	150 - 5	200 - 5	200 - 5	200 - 6	250 - 5	250 - 6	250 - 6	300 - 6
	2.5	150 - 5	200 - 5	200 - 5	200 - 5	200 - 6	250 - 6	250 - 6	300 - 6	
	3.0	150 - 5	200 - 5	200 - 5	200 - 6	250 - 5	300 - 6	300 - 6		
	3.5	150 - 5	200 - 5	200 - 5	250 - 6	250 - 6	300 - 6	300 - 6		
	4.0	150 - 5	200 - 5	250 - 5	250 - 6	300 - 6	300 - 6			
	4.5	200 - 5	200 - 6	250 - 5	250 - 6	300 - 6	300 - 6			
	5.0	200 - 5	200 - 6	250 - 6	250 - 6	300 - 6				
5.5	2.0	150 - 5	150 - 5	200 - 5	200 - 5	200 - 6	250 - 6	250 - 6	300 - 6	300 - 6
	2.5	150 - 5	200 - 5	200 - 5	200 - 6	250 - 5	250 - 6	250 - 6		
	3.0	150 - 5	200 - 5	200 - 5	200 - 6	250 - 6	300 - 6	300 - 6		
	3.5	150 - 5	200 - 5	200 - 6	250 - 6	300 - 6	300 - 6			
	4.0	200 - 5	200 - 6	250 - 5	250 - 6	300 - 6	300 - 6			
	4.5	200 - 5	200 - 6	250 - 6	300 - 6	300 - 6				
	5.0	200 - 5	200 - 6	250 - 6	300 - 6	300 - 6				
6.0	2.0	150 - 5	200 - 5	200 - 5	200 - 6	250 - 5	250 - 6	250 - 6	300 - 6	300 - 6
	2.5	150 - 5	200 - 5	200 - 5	200 - 6	250 - 6	250 - 6	300 - 6		
	3.0	150 - 5	200 - 5	200 - 6	250 - 5	250 - 6	300 - 6			
	3.5	200 - 5	200 - 5	200 - 6	250 - 6	300 - 6	300 - 6			
	4.0	200 - 5	200 - 6	250 - 6	250 - 6	300 - 6				
	4.5	200 - 5	200 - 6	250 - 6	300 - 6	300 - 6				
	5.0	200 - 5	250 - 5	250 - 6	300 - 6					
6.5	2.0	150 - 5	200 - 5	200 - 5	200 - 6	250 - 5	250 - 6	300 - 6	300 - 6	300 - 10
	2.5	150 - 5	200 - 5	200 - 5	200 - 6	250 - 6	250 - 6	300 - 6		
	3.0	150 - 5	200 - 5	200 - 6	250 - 5	250 - 6	300 - 6			
	3.5	200 - 5	200 - 5	200 - 6	250 - 6	300 - 6				
	4.0	200 - 5	200 - 6	250 - 6	300 - 6	300 - 6				
	4.5	200 - 5	250 - 5	250 - 6	300 - 6					
	5.0	200 - 5	250 - 5	250 - 6	300 - 6					

NOTE 1: SOME PANEL WIDTHS WERE OMITTED BECAUSE THEY EXCEED 2.2 METER PATH CRITERIA.

NOTE 2: FOR PANEL SIZES BETWEEN THOSE INDICATED, USE THE NEXT HIGHEST HALF METER VALUE.

NOTE 3: MAXIMUM LENGTH OF A "300 - 10" IS APPROXIMATELY 4.6 METERS. CHECK AVAILABILITY OF MATERIAL.

NOTE 4: "200 - 6" SIGNIFIES A 200 MILLIMETER NOMINAL DIAMETER SUPPORT WITH A NOMINAL WALL THICKNESS OF 6 MILLIMETERS.

NOTE 5: DIAMETERS SHOWN HAVE BEEN ROUNDED TO THE NEAREST 10 MILLIMETERS.

NOTE 6: Lmax = MAXIMUM POST LENGTH TO THE BOTTOM OF THE MAIN PANEL (METERS).
H = MAIN PANEL HEIGHT + EXIT PANEL HEIGHT (METERS).
A1 = MAIN PANEL WIDTH (METERS).

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POST SELECTION TABLE FOR BREAKAWAY SIGNS DESIGNED FOR 130 KM/H WIND & TWO POSTS

TABLE: 13-1.2

BDC99MR-001

A1 = WIDTH (METERS)	Lmax = POST LENGTH (M)	H = MAIN PANEL HEIGHT + EXIT PANEL HEIGHT (METERS)								
		1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0
7.0	2.0	150 - 5	200 - 5	200 - 5	200 - 6	250 - 6	250 - 6	300 - 6	300 - 6	
	2.5	150 - 5	200 - 5	200 - 6	250 - 5	250 - 6	300 - 6	300 - 6		
	3.0	200 - 5	200 - 5	200 - 6	250 - 6	250 - 6				
	3.5	200 - 5	200 - 5	250 - 5	300 - 6	300 - 6				
	4.0	200 - 5	250 - 5	250 - 6	300 - 6					
	4.5	200 - 5	250 - 5	250 - 6	300 - 6					
	5.0	200 - 6	250 - 6	300 - 6	300 - 6					
7.5	2.0	150 - 5	200 - 5	200 - 5	200 - 6	250 - 6	250 - 6	300 - 6	300 - 10	
	2.5	150 - 5	200 - 5	200 - 6	250 - 5	250 - 6	300 - 6	300 - 6		
	3.0	200 - 5	200 - 5	200 - 6	250 - 6	300 - 6				
	3.5	200 - 5	200 - 6	250 - 5	300 - 6					
	4.0	200 - 5	250 - 5	250 - 6	300 - 6					
	4.5	200 - 6	250 - 6	300 - 6	300 - 6					
	5.0	200 - 6	250 - 6	300 - 6						
8.0	2.0	150 - 5	200 - 5	200 - 6	250 - 5	250 - 6	300 - 6	300 - 6		
	2.5	200 - 5	200 - 5	200 - 6	250 - 6	250 - 6	300 - 6	300 - 10		
	3.0	200 - 5	200 - 5	250 - 5	250 - 6	300 - 6				
	3.5	200 - 5	200 - 6	250 - 6	300 - 6					
	4.0	200 - 5	250 - 6	300 - 6	300 - 6					
	4.5	200 - 6	250 - 6	300 - 6						
	5.0	200 - 6	250 - 6	300 - 6						
8.5	2.0	150 - 5	200 - 5	200 - 6	250 - 5	250 - 6	300 - 6	300 - 6		
	2.5	200 - 5	200 - 5	200 - 6	250 - 6	300 - 6	300 - 6			
	3.0	200 - 5	200 - 6	250 - 5	250 - 6	300 - 6				
	3.5	200 - 5	200 - 6	250 - 6	300 - 6					
	4.0	200 - 5	250 - 6	300 - 6	300 - 6					
	4.5	200 - 6	250 - 6	300 - 6						
	5.0	200 - 6	250 - 6	300 - 6						
9.0	2.0	150 - 5	200 - 5	200 - 6	250 - 6	250 - 6	300 - 6	300 - 10		
	2.5	200 - 5	200 - 5	250 - 5	250 - 6	300 - 6	300 - 6			
	3.0	200 - 5	200 - 6	250 - 6	250 - 6	300 - 6				
	3.5	200 - 5	200 - 6	250 - 6	300 - 6					
	4.0	200 - 5	250 - 6	300 - 6						
	4.5	200 - 6	250 - 6	300 - 6						
	5.0	250 - 5	300 - 6	300 - 6						
9.5	2.0	200 - 5	200 - 5	200 - 6	250 - 6	300 - 6	300 - 6			
	2.5	200 - 5	200 - 6	250 - 5	250 - 6	300 - 6	300 - 10			
	3.0	200 - 5	200 - 6	250 - 6	300 - 6	300 - 6				
	3.5	200 - 5	250 - 5	250 - 6						
	4.0	200 - 5	250 - 6	300 - 6						
	4.5	200 - 6	250 - 6	300 - 6						
	5.0	250 - 5	300 - 6							

NOTE 1: SOME PANEL WIDTHS WERE OMITTED BECAUSE THEY EXCEED 2.2 METER PATH CRITERIA.

NOTE 2: FOR PANEL SIZES BETWEEN THOSE INDICATED, USE THE NEXT HIGHEST HALF METER VALUE.

NOTE 3: MAXIMUM LENGTH OF A "300 - 10" IS APPROXIMATELY 4.6 METERS. CHECK AVAILABILITY OF MATERIAL.

NOTE 4: "200 - 6" SIGNIFIES A 200 MILLIMETER NOMINAL DIAMETER SUPPORT WITH A NOMINAL WALL THICKNESS OF 6 MILLIMETERS.

NOTE 5: DIAMETERS SHOWN HAVE BEEN ROUNDED TO THE NEAREST 10 MILLIMETERS.

NOTE 6: Lmax = MAXIMUM POST LENGTH TO THE BOTTOM OF THE MAIN PANEL (METERS).
H = MAIN PANEL HEIGHT + EXIT PANEL HEIGHT (METERS).
A1 = MAIN PANEL WIDTH (METERS).

Superseded

POST SELECTION TABLE FOR BREAKAWAY SIGNS DESIGNED FOR 130 KM/H WIND & THREE POSTS

TABLE: 13-2

BDC99MR-001

A1 = WIDTH (METERS)	Lmax = POST LENGTH (M)	H = MAIN PANEL HEIGHT + EXIT PANEL HEIGHT (METERS)								
		1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0
7.0	2.0	150 - 5	150 - 5	200 - 5	200 - 5	200 - 6	200 - 6	250 - 6	250 - 6	300 - 6
	2.5	150 - 5	150 - 5	200 - 5	200 - 5	200 - 6	250 - 5	250 - 6	300 - 6	
	3.0	150 - 5	200 - 5	200 - 5	200 - 6	250 - 5	250 - 6	300 - 6	300 - 6	
	3.5	150 - 5	200 - 5	200 - 5	250 - 5	250 - 6	300 - 6	300 - 6		
	4.0	150 - 5	200 - 5	200 - 6	250 - 6	250 - 6	300 - 6	300 - 6		
	4.5	200 - 5	200 - 5	250 - 5	250 - 6	300 - 6	300 - 6			
	5.0	200 - 5	200 - 6	250 - 5	250 - 6	300 - 6	300 - 6			
7.5	2.0	150 - 5	150 - 5	200 - 5	200 - 5	200 - 6	250 - 5	250 - 6	250 - 6	300 - 6
	2.5	150 - 5	200 - 5	200 - 5	200 - 5	200 - 6	250 - 6	250 - 6	300 - 6	
	3.0	150 - 5	200 - 5	200 - 5	200 - 6	250 - 5	300 - 6	300 - 6		
	3.5	150 - 5	200 - 5	200 - 5	250 - 6	250 - 6	300 - 6	300 - 6		
	4.0	150 - 5	200 - 5	250 - 5	250 - 6	300 - 6	300 - 6			
	4.5	200 - 5	200 - 6	250 - 5	250 - 6	300 - 6	300 - 6			
	5.0	200 - 5	200 - 6	250 - 6	250 - 6	300 - 6				
8.0	2.0	150 - 5	150 - 5	200 - 5	200 - 5	200 - 6	250 - 5	250 - 6	300 - 6	300 - 6
	2.5	150 - 5	200 - 5	200 - 5	200 - 6	250 - 5	250 - 6	250 - 6		
	3.0	150 - 5	200 - 5	200 - 5	200 - 6	250 - 6	300 - 6	300 - 6		
	3.5	150 - 5	200 - 5	200 - 6	250 - 6	300 - 6	300 - 6			
	4.0	200 - 5	200 - 6	250 - 5	250 - 6	300 - 6	300 - 6			
	4.5	200 - 5	200 - 6	250 - 6	250 - 6	300 - 6				
	5.0	200 - 5	200 - 6	250 - 6	300 - 6	300 - 6				
8.5	2.0	150 - 5	150 - 5	200 - 5	200 - 5	200 - 6	250 - 6	250 - 6	300 - 6	300 - 6
	2.5	150 - 5	200 - 5	200 - 5	200 - 6	250 - 5	250 - 6	300 - 6		
	3.0	150 - 5	200 - 5	200 - 5	200 - 6	250 - 6	300 - 6			
	3.5	150 - 5	200 - 5	200 - 6	250 - 6	300 - 6	300 - 6			
	4.0	200 - 5	200 - 6	250 - 5	250 - 6	300 - 6				
	4.5	200 - 5	200 - 6	250 - 6	300 - 6	300 - 6				
	5.0	200 - 5	250 - 5	250 - 6	300 - 6	300 - 6				
9.0	2.0	150 - 5	200 - 5	200 - 5	200 - 6	250 - 5	250 - 6	250 - 6	300 - 6	300 - 6
	2.5	150 - 5	200 - 5	200 - 5	200 - 6	250 - 6	250 - 6	300 - 6		
	3.0	150 - 5	200 - 5	200 - 6	250 - 5	250 - 6	300 - 6			
	3.5	200 - 5	200 - 5	200 - 6	250 - 6	300 - 6	300 - 6			
	4.0	200 - 5	200 - 6	250 - 6	250 - 6	300 - 6				
	4.5	200 - 5	200 - 6	250 - 6	300 - 6	300 - 6				
	5.0	200 - 5	250 - 5	250 - 6	300 - 6					
9.5	2.0	150 - 5	200 - 5	200 - 5	200 - 6	250 - 5	250 - 6	300 - 6	300 - 6	300 - 10
	2.5	150 - 5	200 - 5	200 - 5	200 - 6	250 - 6	250 - 6	300 - 6		
	3.0	150 - 5	200 - 5	200 - 6	250 - 5	250 - 6	300 - 6			
	3.5	200 - 5	200 - 5	200 - 6	250 - 6	300 - 6				
	4.0	200 - 5	200 - 6	250 - 6	300 - 6	300 - 6				
	4.5	200 - 5	250 - 5	250 - 6	300 - 6					
	5.0	200 - 5	250 - 5	250 - 6	300 - 6					

NOTE 1: SOME PANEL WIDTHS WERE OMITTED BECAUSE THEY EXCEED 2.2 METER PATH CRITERIA.

NOTE 2: FOR PANEL SIZES BETWEEN THOSE INDICATED, USE THE NEXT HIGHEST HALF METER VALUE.

NOTE 3: MAXIMUM LENGTH OF A "300-10" IS APPROX. 4.6 METERS. CHECK AVAILABILITY OF MATERIAL.

NOTE 4: "200 - 6" SIGNIFIES A 200 MILLIMETER NOMINAL DIAMETER SUPPORT WITH A NOMINAL WALL THICKNESS OF 6 MILLIMETERS.

NOTE 5: DIAMETERS SHOWN HAVE BEEN ROUNDED TO THE NEAREST 10 MILLIMETERS.

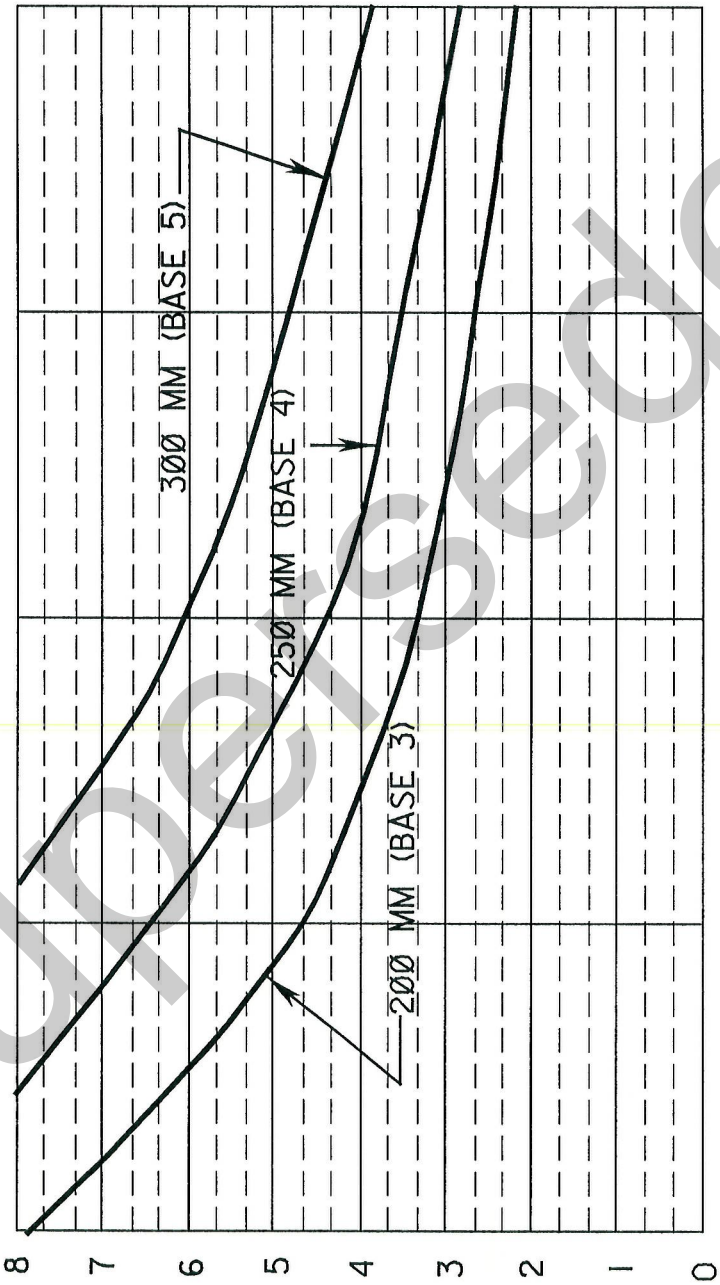
NOTE 6: Lmax = MAXIMUM POST LENGTH TO THE BOTTOM OF THE MAIN PANEL (METERS).
H = MAIN PANEL HEIGHT + EXIT PANEL HEIGHT (METERS).
A1 = MAIN PANEL WIDTH (METERS).

Superseded

LOAD CONCENTRATING WASHER AND BASE TYPE SELECTION GRAPH FOR BREAKAWAY SIGN SUPPORTS

FIGURE 13-D

BDC99MR-ØØ1



NOTE 1: 150 MM DIAMETER POST = BASE TYPE 2; 200 MM DIAMETER POST = BASE TYPE 3
250 MM DIAMETER POST = BASE TYPE 4; 300 MM DIAMETER POST = BASE TYPE 5

NOTE 2: USE LC WASHER #1 FOR BASE TYPE 2

Superseded

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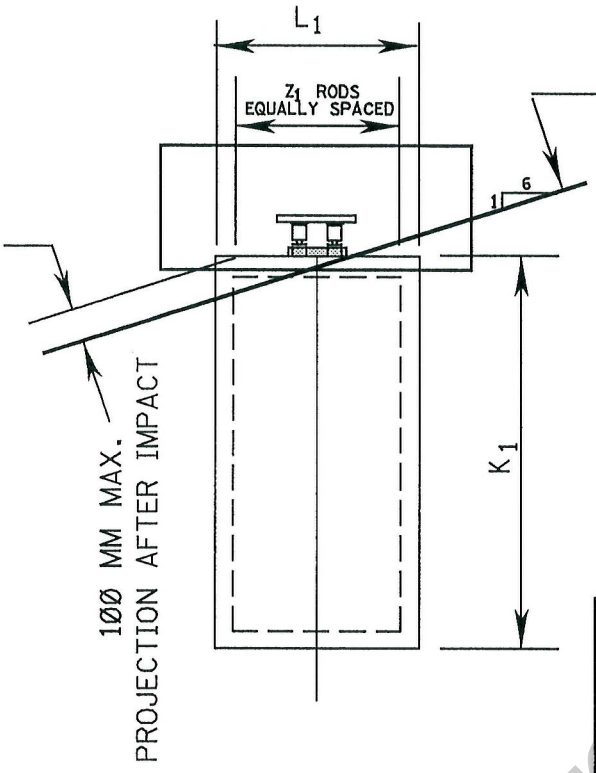
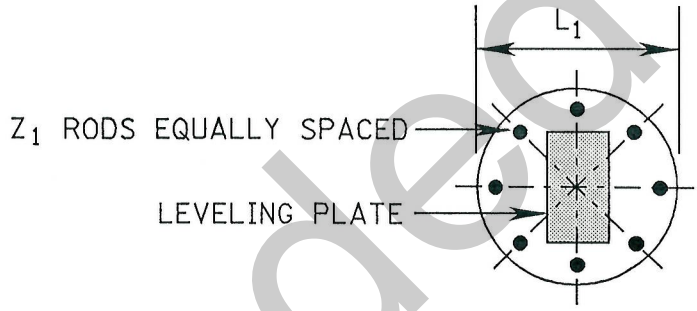
FOOTING DETAIL AND SELECTION TABLE FOR BREAKAWAY SIGN SUPPORTS

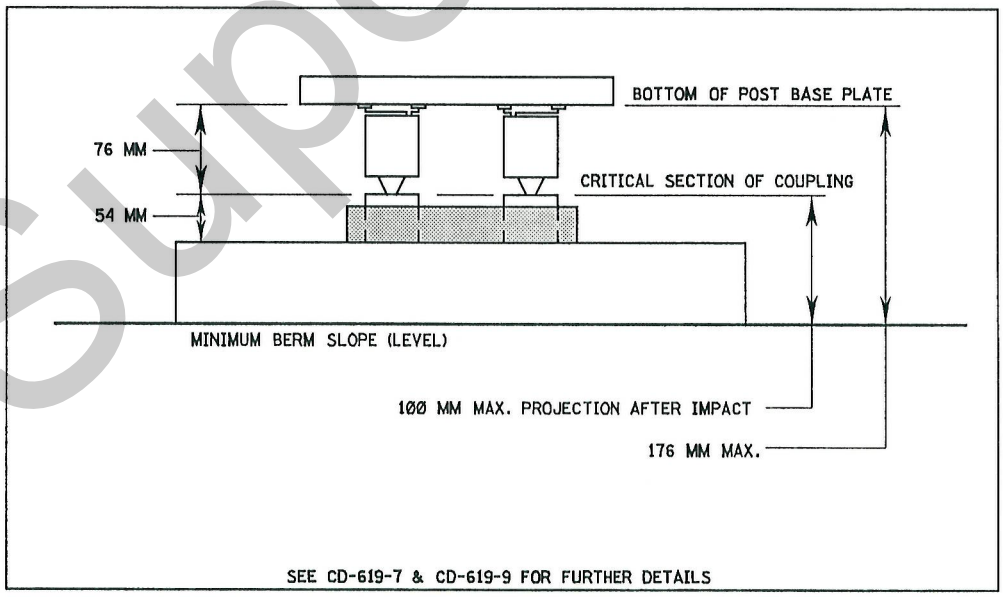
FIGURE 13-E

BDC99MR-ØØ1





FOOTING SELECTION TABLE			
BASE	DIAMETER L_1 (MM)	DEPTH K_1 (METERS)	RE-STEEL Z_1
2	610	1.37	8-#16
3	760	1.83	8-#16
4	910	2.06	8-#16
5	910	2.44	8-#19



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Step 10. Determine F_1, G_1, and H_1 for each post, see *Standard Roadway Construction Details* CD-619-7. Values above reference line are positive, values below reference line are negative.

Step 11. Enter all the data onto the Breakaway Sign Support Data Table in the *Standard Roadway Construction Details* CD-619-12.

13-03.2 Non-Breakaway Sign Supports

The following is a step by step guide to the design of non-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 - 2.5 meters, minimum offset - 2.2 meters.

Step 2. Determine the elevation from the edge of pavement to the bottom of the main panel. Minimum elevation - 2.2 meters (see Figure 13-F).

a. For fill sections, go to Step 3.
b. For cut sections, hold the berm side bottom of the main panel at a 400 millimeters minimum above ground line.

Step 3. Determine the number of posts required for the specified panel based on a maximum sign area per post of 17.8 square meters (see Figure 13-F).

Example: A_1 = 9.3 meters AREA = 42.78 meters^2 H = 4.6 meters
The calculated sign area suggests a minimum of three posts. The required spacing between posts for a three post system is $A_1/3$. This translates to a 3.1 meter spacing between posts (see Figure 13-F).

Step 4. Determine the distances from the top of footings to bottom of the main panel, L, for each post.

NOTE: The minimum height of any post from ground line to the bottom of the main panel shall be 800 millimeters.

Step 5. Determine the required values of L_{max}, H, and A_1 where:

L_{max} = Maximum post length to bottom of main panel (meter)
H = Main panel height + Exit panel height (meter)
A_1 = Main panel width (meter)

Step 6. Determine moment of sign area per post, MSA:

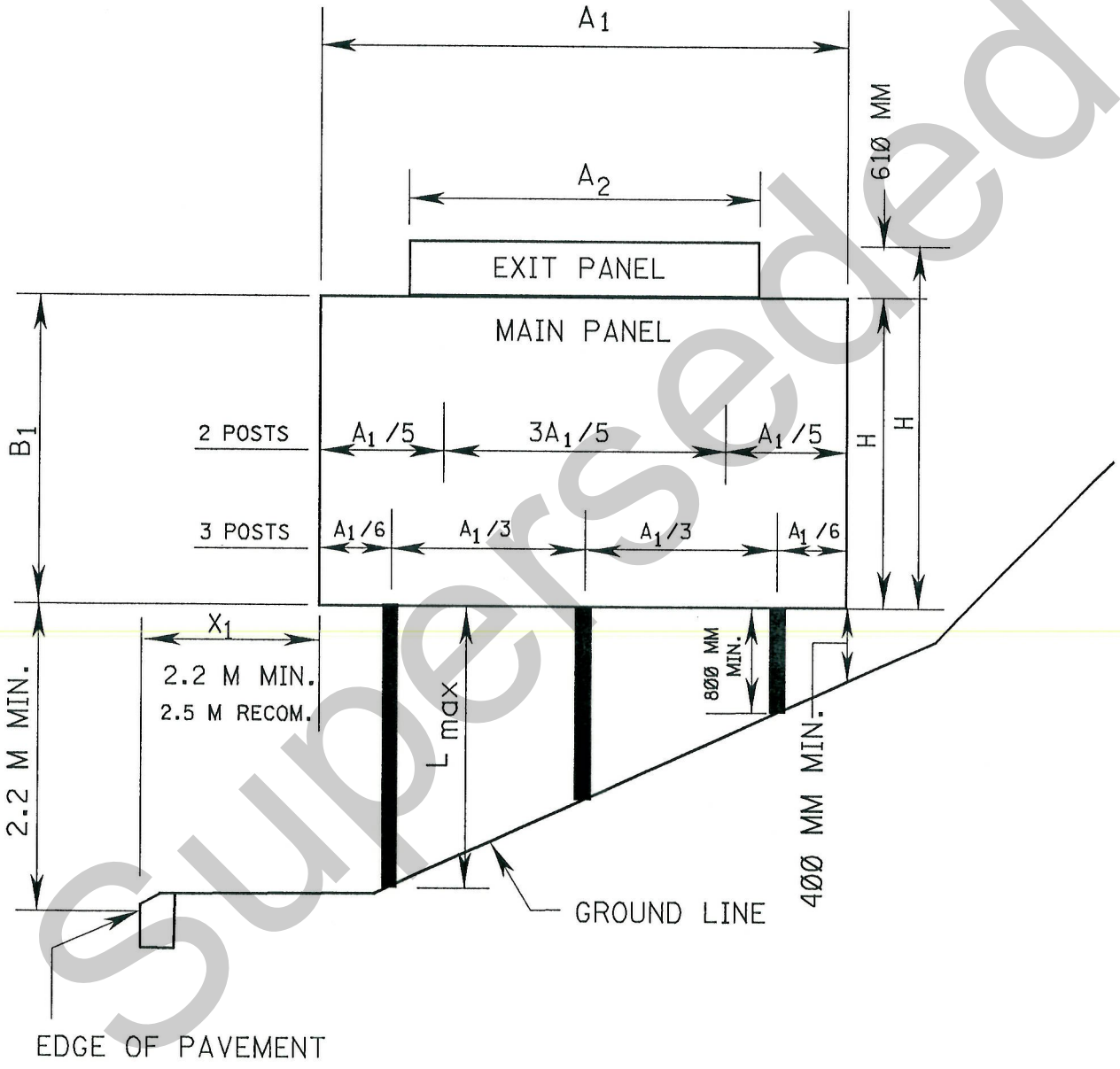
P = Number of sign posts
MSA = $[A_1 * H * (L_{max} + (H/2))] / P$

Superseded

SIGN ELEVATION FOR NON BREAKAWAY SUPPORTS

FIGURE 13-F

BDC99MR-ØØ1



Superseded

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Step 7. Using the value obtained in Step 6, determine the post diameter, wall thickness, and base type from Table 13-3 below. Use this selection for all posts in the structure.

Table 13-3
Post and Base Selection Table

MSA (M^3)	Post Dimensions		Base Type
	Outside Diameter (MM)	Wall Thickness (MM)	
11.89	150	6	A
22.65	200	6	A
36.81	250	6	B
54.37	300	6	B
71.07	300	10	B

Step 8. Determine C_1, D_1, and E_1 for each post, see *Standard Roadway Construction Details* CD-619-13.

Step 9. Determine F_1, G_1, and H_1 for each post, see *Standard Roadway Construction Details* CD-619-13. Values above reference line are positive, values below reference line are negative.

Step 10. Enter all the data onto the Non Breakaway Sign Support Data Table in *Standard Roadway Construction Details* CD-619-15.

13-03.3 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:

Sign Types	Conditions warranting use of nonvegetative surfaces
Overhead signs	
Sign bridge	All cases
Sign cantilevers	All cases
Large Ground mounted signs	
Breakaway sign supports	Mowable areas
Nonbreakaway sign supports	Mowable areas

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

Superseded

The nonvegetative surfaces shall be constructed as shown in *Standard Roadway Construction Details* CD-814-1.

Superseded