Appendix A: Post Type Selection – Single Post

Introduction

Standard Plans for single post trusses include 8 post type designations (II-VII). This Appendix provides two methods for determining to post size to be shown on the project plans.

Single Post Truss Post Type Selection Method 1

Method 1 uses charts (Figure 1 through Figure 6). Procedure is as follows.

- Determine the basic dimensions (see Figure 1)
    - Sign Panel Depth, D
    - Length of the longer arm, L_1
    - Length of the shorter arm, L_2
        - For a full cantilever assume L_2 is 2 feet.
    - Height, *h*, from bottom of base plate to the bottom of the truss.

Verify the basic dimensions meet the following limitations.

- *D* must be 50 inches, 60 inches, 70 inches, 80 inches, 90 inches, 100 inches, 110 inches, or 120 inches
- L_1, *must* be less than 40 feet
- L_2, must be less than 30 feet
- Total Length (L_1+ L_2) must be less than or equal to 60 feet
- *h* must be less than or equal to 20 feet-9 inches. For *h* greater than 20 feet-9 inches do not use Method 1. Use Method 2, if applicable. If neither method is applicable, a special design is required.

Verify minimum clearance

- Typical minimum vertical clearance to the bottom of truss is
    - 18 feet-6 inches if walkway, sign illumination, or similar is attached to the bottom of the truss
    - 18 feet-0 inches if nothing will extend below the truss.
- If the structure is on the Extra Legal Load Network, other criteria might apply.
- Check whether clearance should be adjusted for future additional paving, overlay, or widening.

Extra attachments are limited to:

- Single-sheet sign-panels strapped directly to the post. Maximum area of the sign panels is the lesser of 16 square foot or 5% of the truss length times the panel depth *D* (expressed in feet). The sign must be approximately centered on the post horizontally. The sign must be below the post connection to the truss.
- CCTV as shown on Standard Plan ES-16A or lighting as shown on Standard Plan ES-6C.

Find the figure corresponding to the maximum depth, *D*, of sign panel to be used on the

structure.

Find the location on the selected chart corresponding to the arm lengths L_1 and L_2 for the sign structure. For “full cantilever” use L_2 as 2 feet for purposes of post selection.

Select post size indicated on the chart. If the intersection of L_1 and L_2 falls on a solid line, use the smaller post type.

Appendix A: Post Type Selection – Single Post

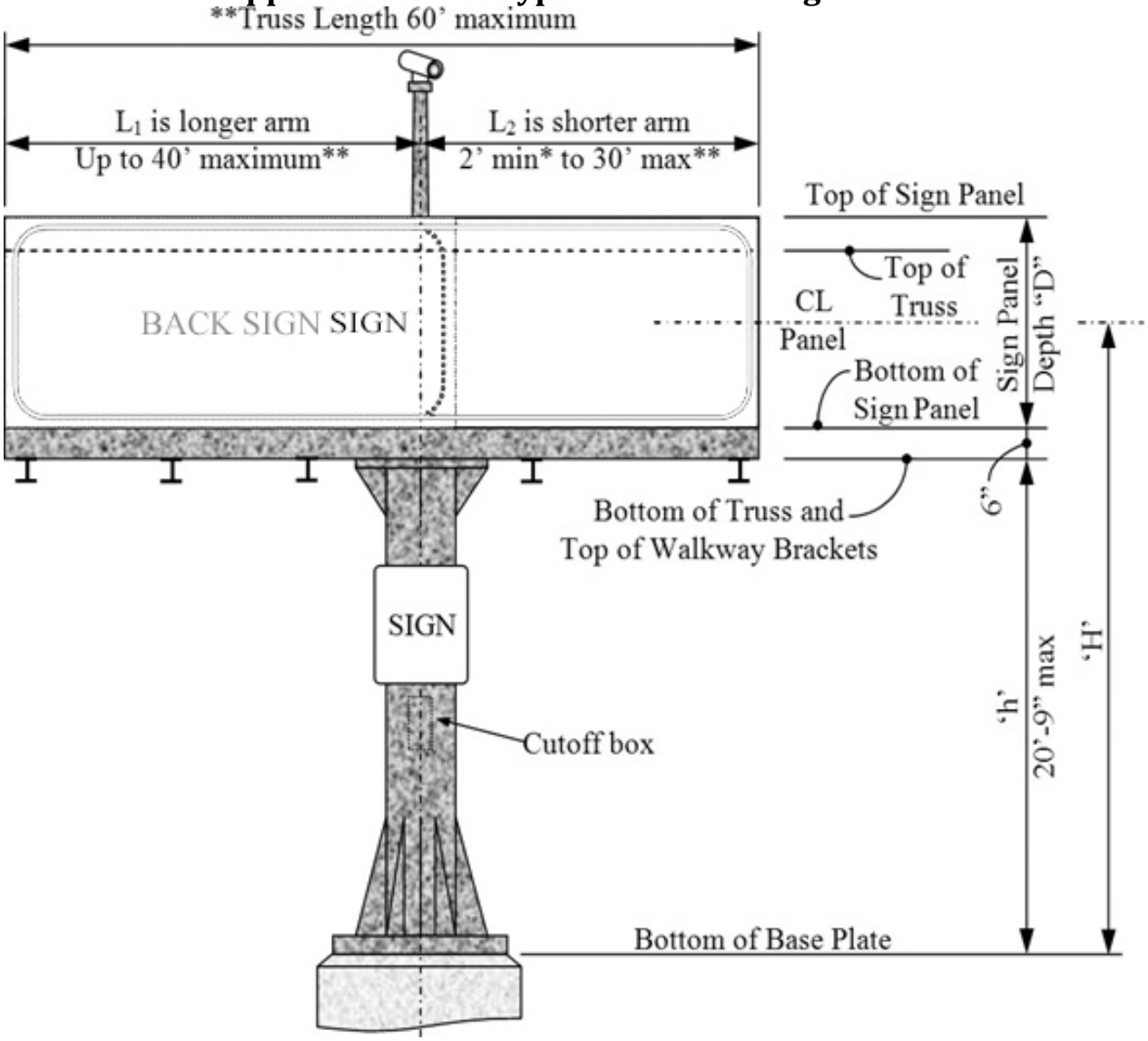
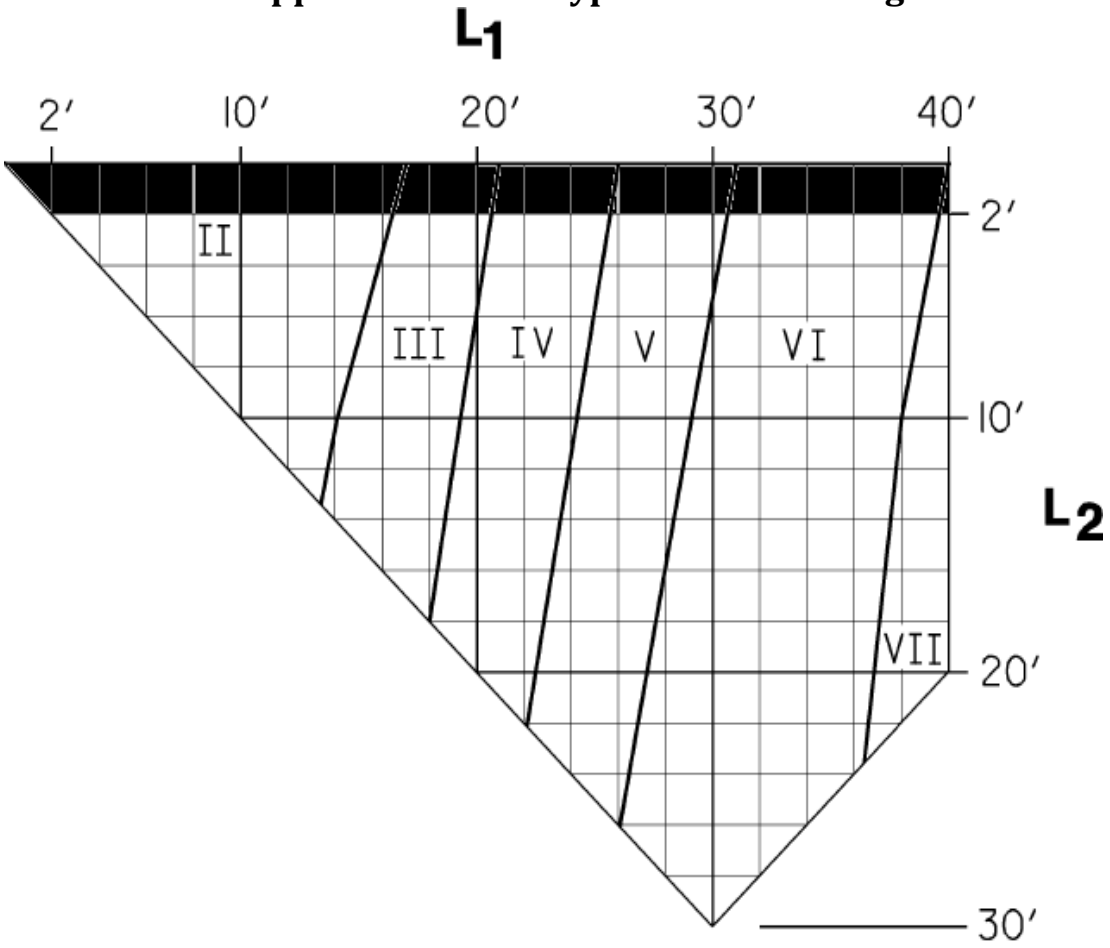


Figure 1: Explanation of dimensions

Notes

- For sign panels depth of 100 inches or less, the top of sign panel is the same at the top of truss.
- For sign panel depth of 110 inches the top of sign panel typically is 4 inches above the top of the truss.
- For sign panel depth of 120 inches the top of sign panel typically is 14 inches above the top of the truss.
- The 2 feet minimum length for L_2 is approximation used for Method 1. The actual length of L_2 may vary somewhat depending on fabrication needs.
- Typical walkway brackets are 5 inches tall.



50" SIGN PANEL DEPTH

Figure 2: Post Selection Method 1 for Single Post Overhead Truss 50 inch Sign Panel Depth

Notes

- For a full cantilever, assume 2 feet for L_2.
- When selecting post type, if the intersection of L_1 and L_2 falls on a solid line, use the smaller post type.
- Post selection charts are based on an h = 20 feet-9 inches maximum. For *h* greater than 20 feet-9 inches, use Method 2, if applicable. If neither method is applicable, a special design is required.
- This chart was based on applying a wind pressure of 40.3 psf on the sign panels. This chart assumed full sign coverage.
- For diagram explaining dimensions, see Figure 1.

Appendix A: Post Type Selection – Single Post

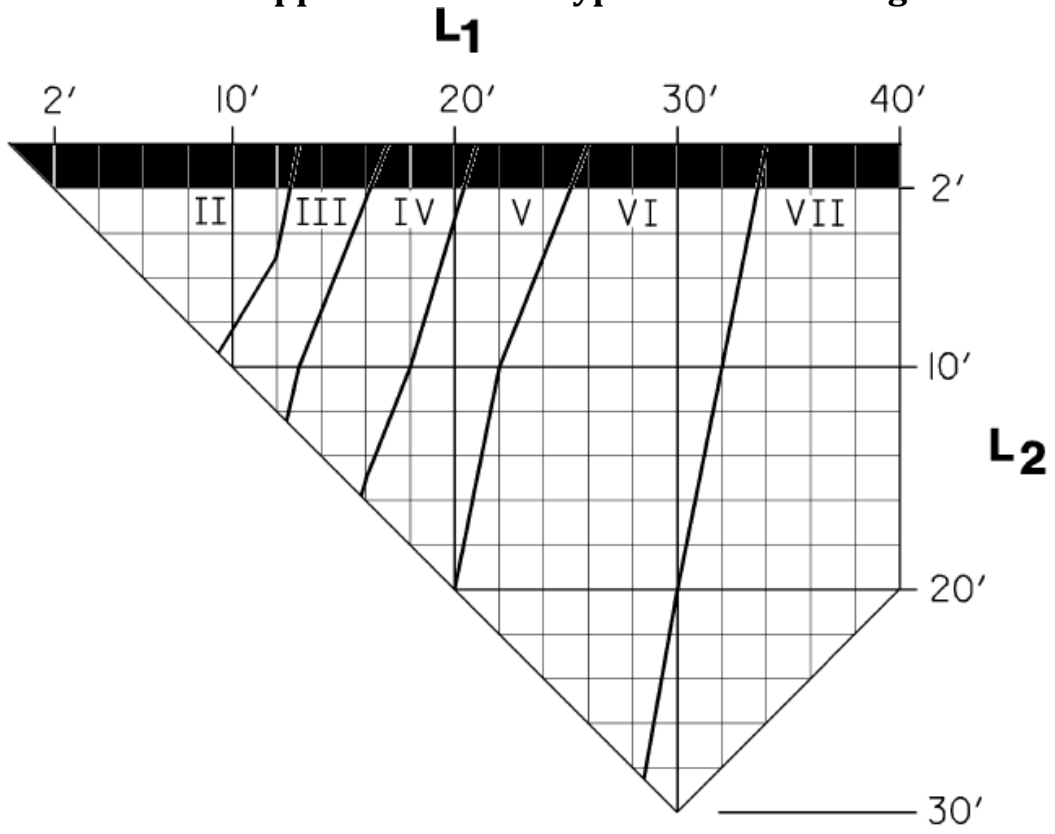


Figure 3. Post Selection Method 1 for Single Post Overhead Truss 60 inch and 70 inch Sign Panel Depth

Notes

- For a full cantilever, assume 2 feet for L_2.
- When selecting post type, if the intersection of L_1 and L_2 falls on a solid line, use the smaller post type.
- Post selection charts are based on an h = 20 feet-9 inches maximum. For *h* greater than 20 feet-9 inches, use Method 2, if applicable. If neither method is applicable, a special design is required.
- This chart was based on applying a wind pressure of 40.3 psf on the sign panels. This chart assumed full sign coverage.
- For diagram explaining dimensions, see Figure 1.

Appendix A: Post Type Selection – Single Post

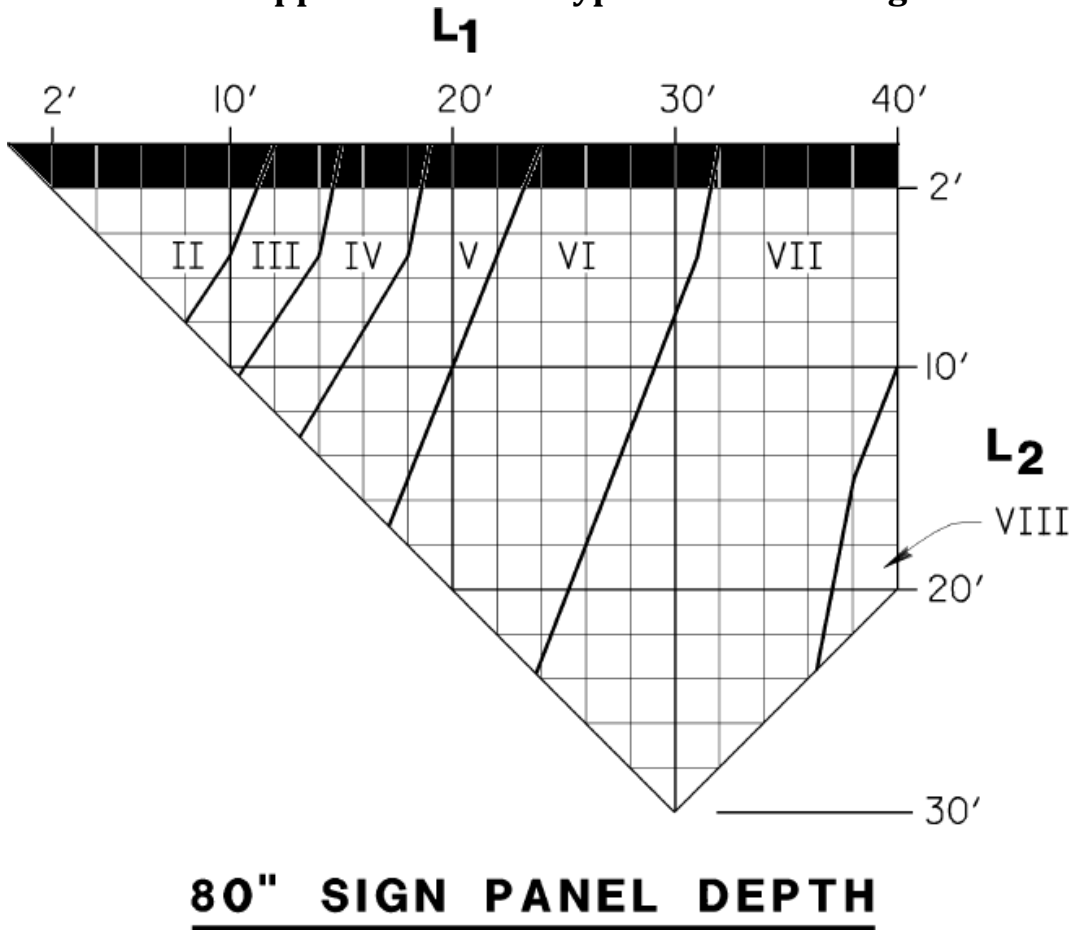


Figure 4. Post Selection Method 1 for Single Post Overhead Truss 80 inch Sign Panel Depth

Notes

- For a full cantilever, assume 2 feet for L_2.
- When selecting post type, if the intersection of L_1 and L_2 falls on a solid line, use the smaller post type.
- Post selection charts are based on an h = 20 feet-9 inches maximum. For *h* greater than 20 feet-9 inches, use Method 2, if applicable. If neither method is applicable, a special design is required.
- This chart was based on applying a wind pressure of 40.3 psf on the sign panels. This chart assumed full sign coverage.
- For diagram explaining dimensions, see Figure 1.

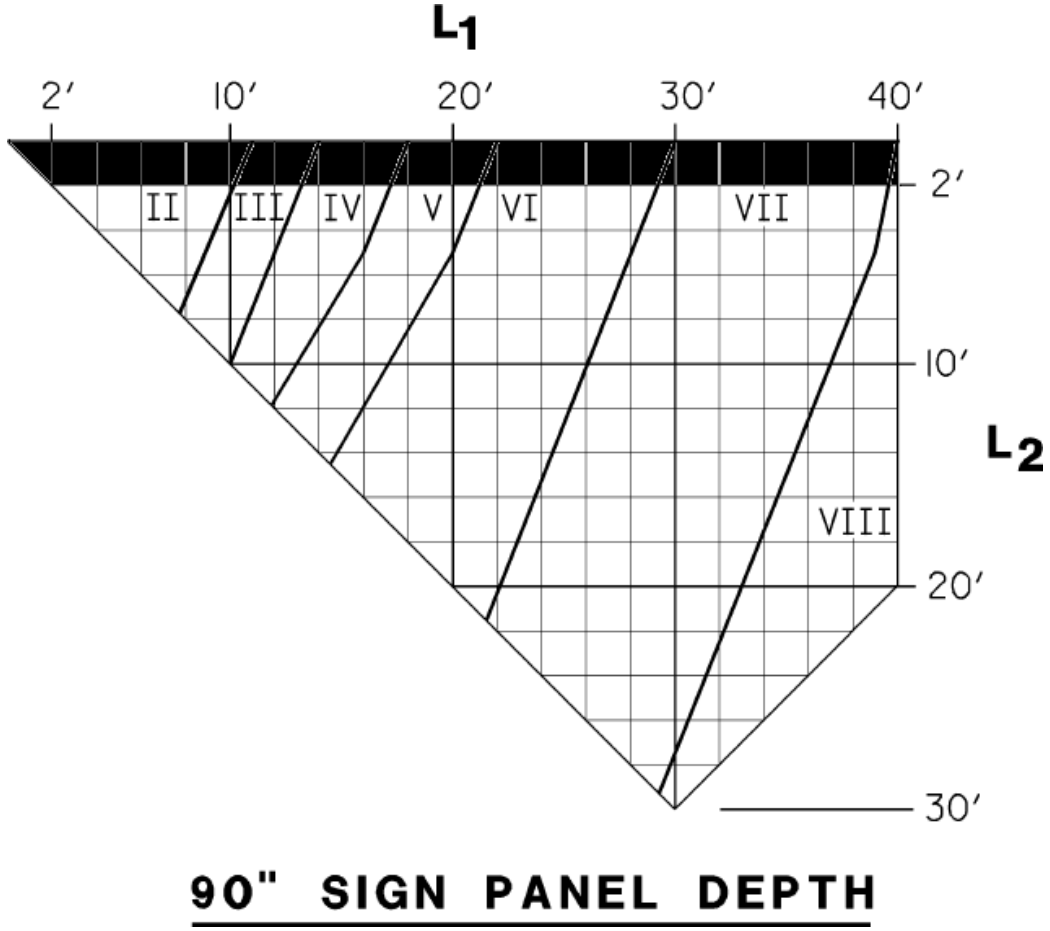


Figure 5. Post Selection Method 1 for Single Post Overhead Truss 90 inch Sign Panel Depth

Notes:

- For a full cantilever, assume 2 feet for L_2.
- When selecting post type, if the intersection of L_1 and L_2 falls on a solid line, use the smaller post type.
- Post selection charts are based on an h = 20 feet-9 inches maximum. For *h* greater than 20 feet-9 inches, use Method 2, if applicable. If neither method is applicable, a special design is required.
- This chart was based on applying a wind pressure of 40.3 psf on the sign panels. This chart assumed full sign coverage.
- For diagram explaining dimensions, see Figure 1.

Appendix A: Post Type Selection – Single Post

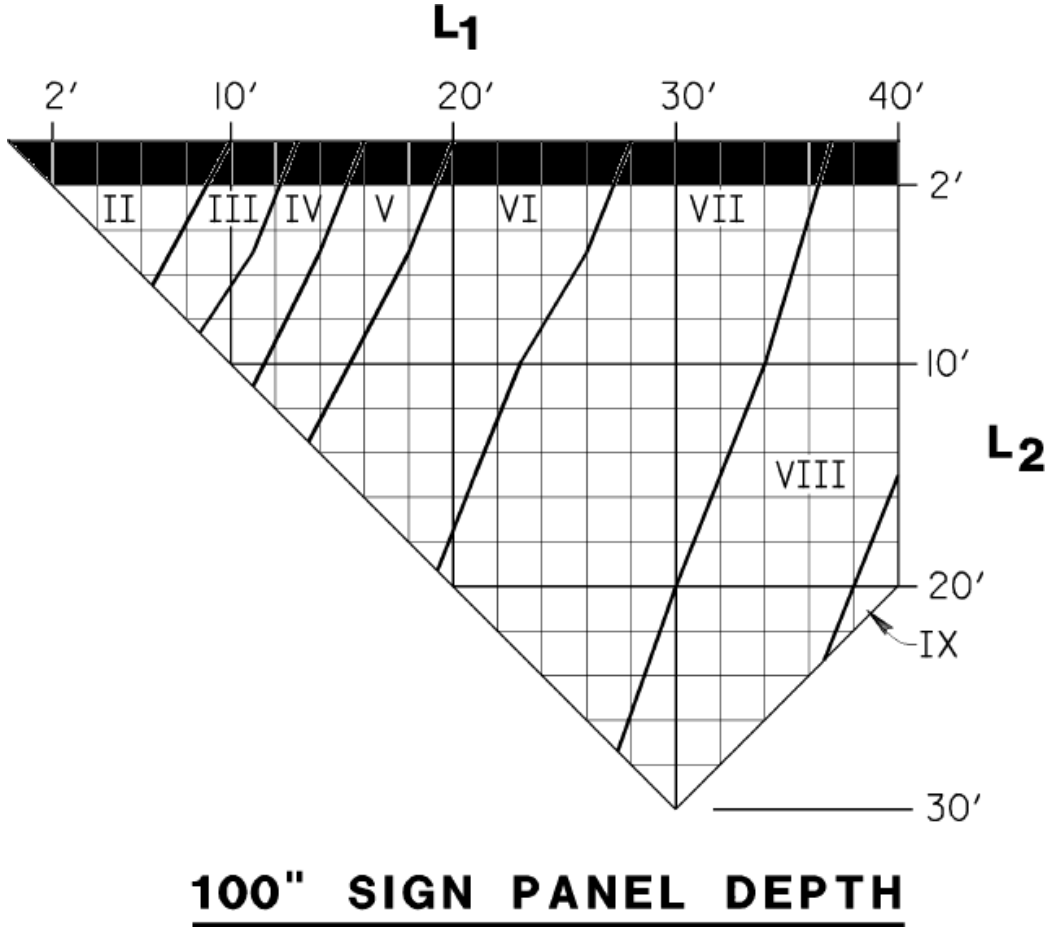


Figure 6. Post Selection Method 1 for Single Post Overhead Truss 100 inch Sign Panel Depth

Notes:

- For a full cantilever, assume 2 feet for L_2.
- When selecting post type, if the intersection of L_1 and L_2 falls on a solid line, use the smaller post type.
- Post selection charts are based on an h = 20 feet-9 inches maximum. For *h* greater than 20 feet-9 inches, use Method 2, if applicable. If neither method is applicable, a special design is required.
- This chart was based on applying a wind pressure of 40.3 psf on the sign panels. This chart assumed full sign coverage.
- For diagram explaining dimensions, see Figure 1.

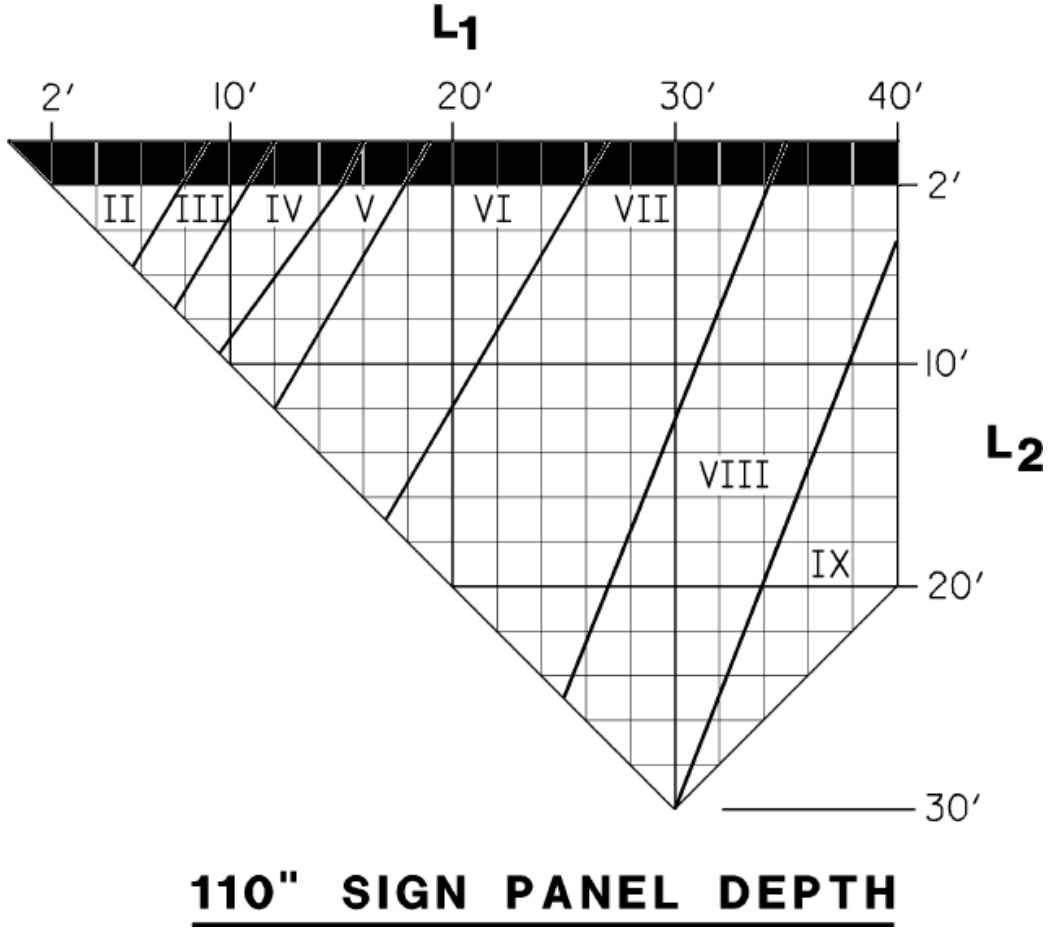
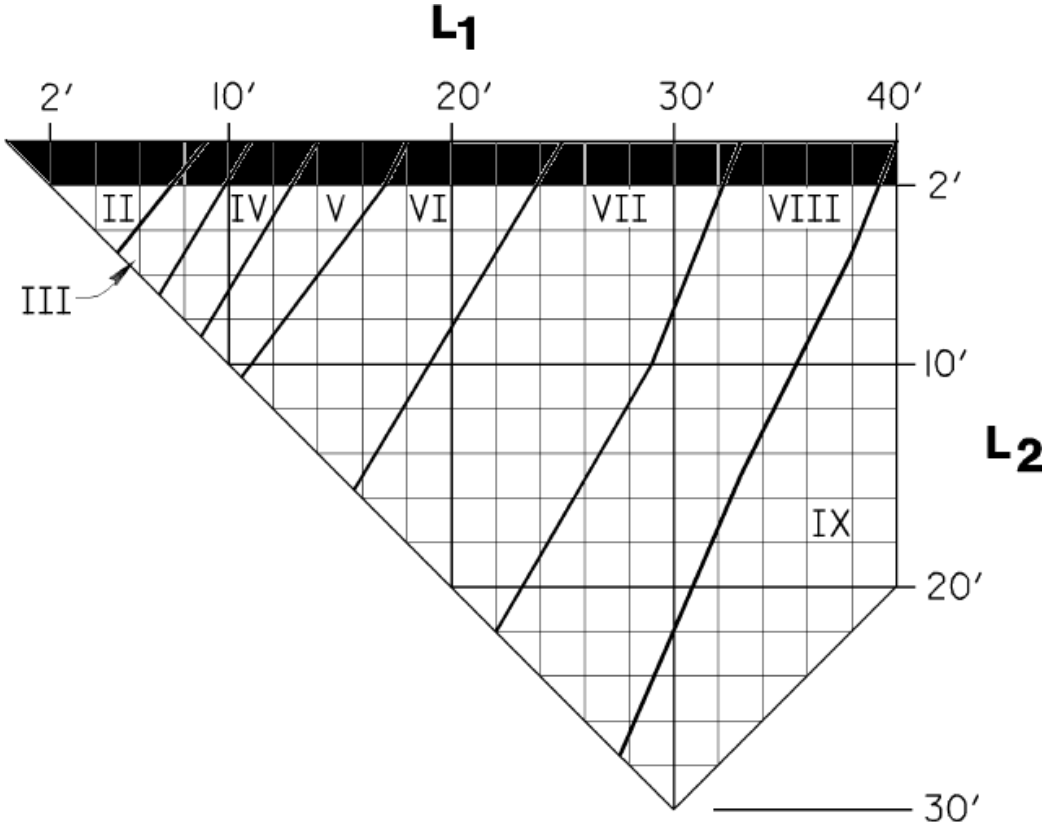


Figure 7. Post Selection Method 1 for Single Post Overhead Truss 110 inch Sign Panel Depth

Notes:

- For a full cantilever, assume 2 feet for L_2.
- When selecting post type, if the intersection of L_1 and L_2 falls on a solid line, use the smaller post type.
- Post selection charts are based on an h = 20 feet -9 inches maximum. For *h* greater than 20 feet-9 inches, use Method 2, if applicable. If neither method is applicable, a special design is required.
- This chart was based on applying a wind pressure of 40.3 psf on the sign panels. This chart assumed full sign coverage.
- For diagram explaining dimensions, see Figure 1.

Appendix A: Post Type Selection – Single Post



120" SIGN PANEL DEPTH

Figure 8. Post Selection Method 1 for Single Post Overhead Truss 120 inch Sign Panel Depth

Notes:

- For a full cantilever, assume 2 feet for L_2.
- When selecting post type, if the intersection of L_1 and L_2 falls on a solid line, use the smaller post type.
- Post selection charts are based on an h = 20 feet-9 inches maximum. For *h* greater than 20 feet-9 inches, use Method 2, if applicable. If neither method is applicable, a special design is required.
- This chart was based on applying a wind pressure of 40.3 psf on the sign panels. This chart assumed full sign coverage.
- For diagram explaining dimensions, see Figure 1.

Appendix A: Post Type Selection – Single Post

Single Post Truss Post Type Selection Method 2

Method 2 relies on calculating a "pseudo-moment". It is not an actual structural design moment and has no intended application outside of the post selection presented here. It is important to verify the structure meets the limitations listed in the procedure and to use the calculation method shown. Significantly unconservative designs might result if

- Using calculation methods other than those shown to arrive at the "pseudo-moment"
- Using the calculated "pseudo-moment" in other types of design calculations.
- Applying Method 2 to a structure that falls outside of the limitations listed in the procedure.

Notation

all values are to be positive numbers

Area	=	Project area of the sign panel (based on full coverage) (foot squared)
D	=	Depth of sign panel (inch)
$Dead_A$	=	Dead Load contribution to PM (pound-foot)
DL_1	=	Total Dead Load of longer arm (pound)
DL_2	=	Total Dead Load of shorter arm (pound)
DL_{Tr}	=	Dead Load of the truss from Table 1 (pound)
DL_{Ot}	=	Dead Load of the walkway, sign panels, etc. (pound)
ecc_1	=	Assumed Dead Load Eccentricity of longer arm = $L_1/2$ (feet)
ecc2	=	Assumed Dead Load Eccentricity of shorter arm = $L_2/2$ (feet)
H	=	Height from bottom of base plate to mid-height of the combined truss and sign panel. (feet)
h	=	height from bottom of base plate to the bottom of the truss (feet)
$Live_A$	=	Live Load contribution to PM (pound-foot)
L_1	=	Length of longer arm (feet)
L_2	=	Length of shorter arm (feet)
PM	=	Pseudo-Moment used to determine minimum post size (pound-foot)
$Wind_A$	=	Wind contribution to PM from Equation 3 (pound-foot)
$Wind_B$	=	Wind contribution to PM from Equation 4 (pound-foot)

Procedure:

- Determine the basic dimensions (see Figure 1)
    - Sign Panel Depth, D, in inches
    - Length of the longer arm L1 in feet
    - Length of the shorter arm L2 in feet
    - Height h from bottom of base plate to the bottom of the truss in feet
    - Height H from bottom of base plate to center of sign panel in feet
- Verify the basic dimensions meet the following limitations.
    - D must be 50”, 60”, 70”, 80”, 90”, 100”, 110”, or 120”
    - L1 must be less than 40 feet
    - L2 must be less than 30 feet
    - Total Length, L1+L2 must be less than or equal to 60 feet
    - Post height h must be greater than 20 feet-9 inches and less than or equal to 29 feet-0 inches.
        - For post height h 20 feet-9 inches or less, use Method 1, if applicable. If neither method is applicable, a special design is required.
- Verify minimum clearance
    - Typical minimum vertical clearance to the bottom of truss is
        - 18 feet-6 inches if walkway, sign illumination, or similar is attached to the bottom of the truss
        - 18 feet-0 inches if nothing will extend below the truss.
    - If the structure is on the Extra Legal Load Network, other criteria might apply.
    - Check whether clearance should be adjusted for future additional paving or overlay.
- Verify the design conforms to additional limitations
    - Details of the structure and sign panels must conform to the typical Standard Plans for single post trusses.
    - Must not include CMS or EMS or other electronic sign panels.
    - Center of sign panel must be no more than 43 feet above the surrounding terrain.
    - Extra attachments are limited to:
        - Single-sheet sign-panels strapped directly to the post. Maximum area of the sign panels is the lesser of 16 square feet or 5% of the truss length times the panel depth *D* (expressed in feet). The sign must be approximately centered on the post horizontally. The sign must be below the post connection to the truss.

- Calculate $Wind_A$

$$H = h + 0.5 + \frac{D}{24} \quad \text{(Equation 1)}$$

$$Area = \frac{D}{12}(L_1 + L_2) \quad \text{(Equation 2)}$$

$$Wind_A = H(Area)40.3 \quad \text{(Equation 3)}$$

- Calculate $Wind_B$

$$Wind_B = 0.2(Wind_A) \quad \text{(Equation 4)}$$

- Determine Dead Loads on each arm

Find DL_{Tr} from Table 1

Calculated DL_{Ot}

If walkway and/or sign illumination will be installed

$$DL_{Ot} = (L_1 + L_2)110 \quad \text{(Equation 5a)}$$

Otherwise

$$DL_{Ot} = (L_1 + L_2)30 \quad \text{(Equation 5b)}$$

$$DL_1 = \frac{(DL_{Tr} + DL_{Ot})L_1}{(L_1 + L_2)} \quad \text{(Equation 6)}$$

$$DL_2 = \frac{(DL_{Tr} + DL_{Ot})L_2}{(L_1 + L_2)} \quad \text{(Equation 7)}$$

- Calculate $Dead_A$

$$ecc_1 = \frac{L_1}{2} \quad \text{(Equation 8)}$$

$$ecc_2 = \frac{L_2}{2} \quad \text{(Equation 9)}$$

$$Dead_A = DL_1(ecc_1) - DL_2(ecc_2) \quad \text{(Equation 10)}$$

- Calculate $Live_A$

$$Live_A = 500(L_1) \quad \text{(Equation 11)}$$

- Calculate Pseudo-Moment

$$PM = Wind_A + Wind_B + Dead_A + Live_A \quad \text{(Equation 12)}$$

- Use *PM* and Figure 9 to determine minimum post size

Appendix A: Post Type Selection – Single Post

Table 1. Truss Dead Load

Truss Length	Panel Depth					
	50”	60”	70”	80”	90”	100”, 110”, or 120”
12’	2652	2687	2712	2736	2760	2833
13’	2782	2822	2848	2873	2897	2970
14’	2926	2954	2985	3009	3034	3106
15’	3060	3091	3120	3146	3170	3245
16’	3183	3232	3256	3280	3307	3382
17’	3331	3366	3393	3417	3444	3521
18’	3457	3510	3527	3554	3580	3657
19’	3591	3649	3664	3691	3717	3796
20’	3739	3781	3801	3827	3854	3933
21’	3865	3907	3935	3964	3990	4072
22’	4004	4048	4072	4098	4127	4209
23’	4140	4187	4209	4235	4264	4345
24’	4273	4321	4343	4372	4400	4484
25’	4425	4451	4480	4508	4537	4621
26’	4550	4601	4616	4645	4674	4760
27’	4698	4724	4753	4782	4810	4896
28’	4817	4872	4888	4918	4947	5035
29’	4958	5018	5024	5053	5084	5172
30’	5099	5130	5161	5190	5220	5311
31’ & 32’	5888	5919	5948	5981	6012	6105
33’ & 34’	6188	6221	6252	6288	6321	6411
35’ & 36’	6479	6517	6556	6592	6629	6715
37’ & 38’	6764	6801	6861	6898	6936	7022
39’ & 40’	7079	7121	7163	7202	7244	7326
41’ & 42’	7392	7434	7467	7509	7551	7632
43’ & 44’	7657	7745	7771	7815	7859	7937
45’ & 46’	7959	8005	8075	8120	8166	8243
47’ & 48’	8256	8305	8377	8426	8474	8547
49’ & 50’	8600	8651	8682	8732	8781	8854
51’ & 52’	8891	8944	8986	9037	9090	9158
53’ & 54’	9180	9235	9290	9343	9396	9464
55’ & 56’	9464	9519	9592	9650	9705	9769
57’ & 58’	9802	9859	9896	9954	10013	10075
59’ & 60’	10079	10141	10201	10260	10320	10379

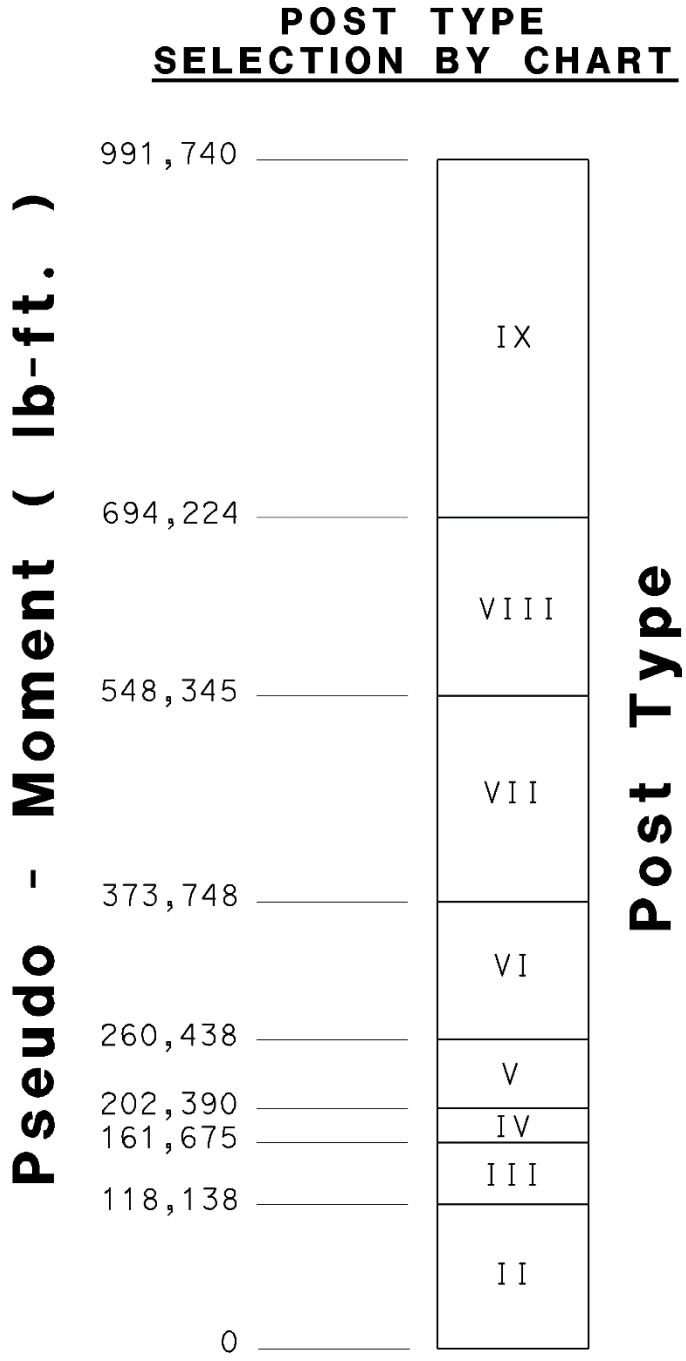


Figure 9. Post Type Selection for Single Post Truss Using Pseudo-Moment