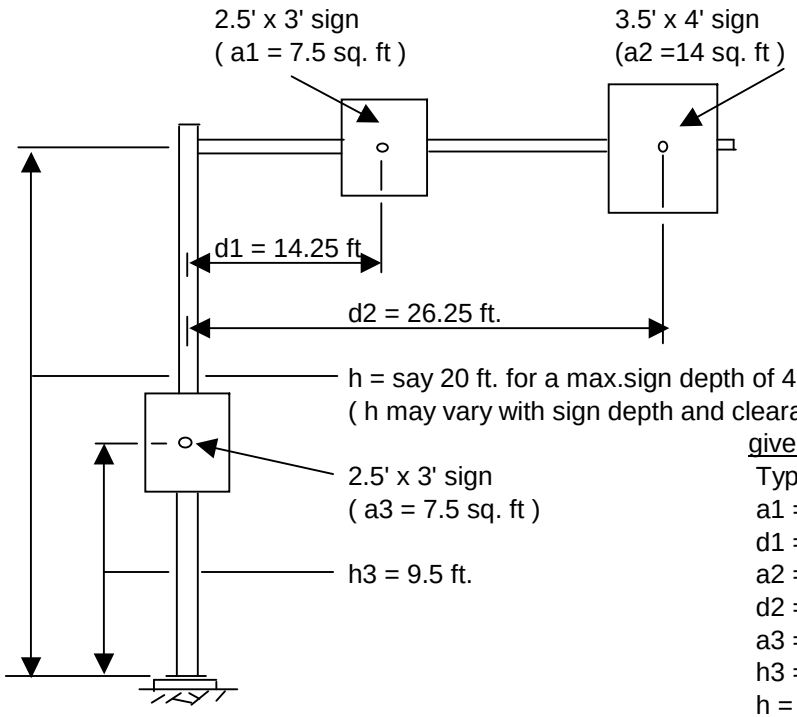
Example of base selection for a cantilever "Overhead Sign Support" :



note: The the number of signs and dimensions shown are for illustrative purposes only. The calculations for any given installation will vary by the specific number of signs and dimensions for that specific installation.

given information:

Type 2 sign areas as shown
a1 = area of inner sign mounted on arm (sq.ft.)
d1 = distance from center line of upright to center of inner sign (ft.)
a2 = area of outer sign mounted on arm (sq.ft.)
d2 = distance from center line of upright to center of outer sign (ft.)
a3 = area of sign mounted on upright (sq.ft.)
h3 = distance from bottom of upright to center of sign on upright (ft.)
h = distance from bottom of upright to attachment point of arm (ft.)
top of footing is not extending above ground surface more than 2" maximum
sign structure arm is 30 ft. long over a city street

Calculate overturning and twisting factors (mv) & (mh):

mv = sum [each sign area x distance from the center of each sign to the bottom of the upright]

mv = (a1 x h) + (a2 x h) + (a3 x h3) = (7.5 sq.ft. x 20 ft.) + (14 sq.ft. x 20 ft.) + (7.5 sq.ft. x 9.5 ft.) = 501 ft.^3

mh = sum [each sign area x distance from the center of each sign to the center line of the upright]

mh = (a1 x d1) + (a2 x d2) + (a3 x 0) = (7.5 sq.ft. x 14.25 ft.) + (14 sq.ft. x 26.25 ft.) + (7.5 sq.ft. x 0 ft.) = 474 ft.^3

1. Find the appropriate Fatigue Category for the cantilever "Overhead Sign Support" from section 641.2.9 of the Standard Specifications For Highway and Structure Construction and Supplemental Specifications. (specs. call for Category 3 criteria)

2. Enter the footing selection table below under the appropriate fatigue category, select the smallest size footing under that category from the table so that "mv" is less than or equal to "MV" **and** "mh" is less than or equal to "MH". (both conditions must be satisfied)

3. The smallest diameter base that will work, under the required Category 3 design for this example installation, is a 30" base; since mv = 501^3 is less than MV = 798 ft^3; and since mh = 474ft^3 is less than MH = 677 ft^3

   (note that the next smallest footing, 24" base, will not work since both mv = 501ft^3 > 395 ft^3 and mh = 474 ft^3 > 266 ft^3)

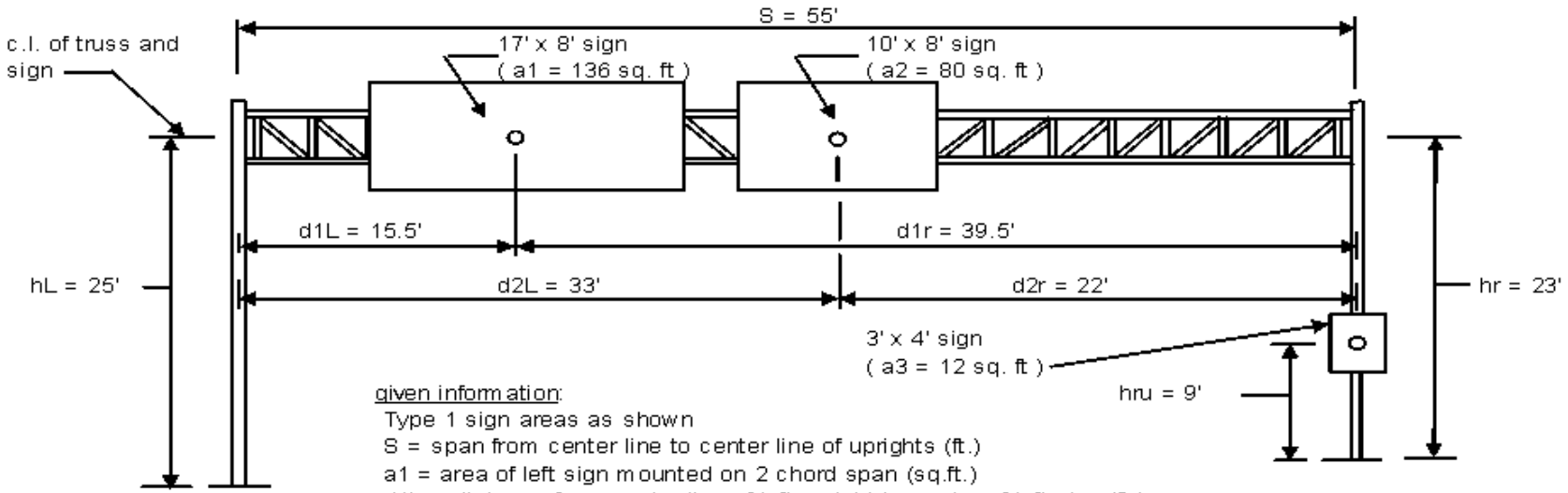
Table for footing selection based on Fatigue Category Criteria for installation* :

Category 1 installation				Category 2 installation				Category 3 installation			
Base Diameter	MV (maximum) (ft.^3)	MH (maximum) (ft.^3)	Maximum Anchor Bolt Circle (in.)	Base Diameter	MV (maximum) (ft.^3)	MH (maximum) (ft.^3)	Maximum Anchor Bolt Circle (in.)	Base Diameter	MV (maximum) (ft.^3)	MH (maximum) (ft.^3)	Maximum Anchor Bolt Circle (in.)
--	--	--	--	--	--	--	--	24"	395	266	12.5
30"	798	311	17.5	30"	798	488	17.5	30"	798	677	17.5
36"	1092	719	23	36"	1092	1071	23	36"	1092	1071	23
42"	1092	1218	29	42"	1092	1533	29	42"	1092	1533	29

* assumptions:

- Top of concrete does not extend out of the ground (on the high side of the footing if sloped ground) more than shown on the SDD.
- Wind loading is based on a 3 - second gust wind speed as described in the AASHTO 2001 "Standard Specifications for Structural Supports For Highway Signs, Luminaires, and Traffic Signals."
- Maximum Anchor Bolt Circle allows for concrete cover, hoops, vertical reinforcement as shown on the SDD, and the use of an anchor bolt template.

Example of checking base adequacy for a full span "Overhead Sign Support" :



given information:
Type 1 sign areas as shown
S = span from center line to center line of uprights (ft.)
a1 = area of left sign mounted on 2 chord span (sq.ft.)
d1L = distance from center line of left upright to center of left sign (ft.)
d1r = distance from center line of right upright to center of left sign (ft.)
a2 = area of right sign mounted on 2 chord span (sq.ft.)
d2L = distance from center line of left upright to center of right sign (ft.)
d2r = distance from center line of right upright to center of right sign (ft.)
a3 = area of sign mounted on right upright (sq.ft.)
hru = distance from center of sign on right upright to ground line on right side (ft.)
hL = distance from center of sign to ground line on left side (ft.)
hr = distance from center of sign to ground line on right side (ft.)

note:
The the number of signs and dimensions shown are for illustrative purposes only. The calculations for any given installation will vary by the specific number of signs and dimensions for that specific installation. This example shows deeper Type 1 signs supported on a full span overhead sign support which requires a 2 chord span. The calculations are the same for a full span overhead sign support carrying Type 2 signs on a 1 chord span. Uprights on each side are single tube elements. Signs are centered on horizontal truss.

Calculate areas tributary to each upright support from overhead span (AL and AR respectively):

AL = sum [each sign area x distance from the center of the each sign to the centerline of right support] / span

AL = [(a1 x d1r) + (a2 x d2r)] / S = [(136 sq.ft. x 39.5 ft.) + (80 sq.ft. x 22 ft.)] / 55 ft. = 129.67 ft.^2

AR = sum [each sign area x distance from the center of the each sign to the centerline of left support] / span

AR = [(a1 x d1L) + (a2 x d2L)] / S = [(136 sq.ft. x 15.5 ft.) + (80 sq.ft. x 33 ft.)] / 55 ft. = 86.33 ft.^2

Calculate overturning factors for the left and right footings (mvL and mvR respectively):

mvL = sum [areas tributary to left upright x distance from the center of areas to groundline at left side]

mvL = (AL x hL) = (129.67 sq.ft. x 25 ft.) = 3242 ft.^3

mvR = sum [areas tributary to right upright x distance from the center of areas to groundline at right side]

mvR = (AR x hr) + (a3 x hru) = (86.33 sq.ft. x 23 ft.) + (12 sq.ft. x 9 ft.) = 2094 ft.^3

Enter the table below for a full span overhead sign support and check the adequacy of the base shown in the SDD plate for a full span overhead sign support.

Use the 36" diameter base for the full span overhead sign support in this (55' span) example for both sides of the sign support since mvL = 3242 ft^3 <= MV =3656 ft^3 and mvR = 2094 ft^3 <= MV = 3656 ft^3.

Table for checking adequacy of full span overhead sign support base:

Span = S (ft.)	45	50	55	60	65	70	75	80	85
MV (maximum) (ft.^3)	3763	3669	3656	3557	3392	3322	3228	3116	2988

The 36" base accomodates an anchor bolt circle of 23"