	CMS Model 500	CMS Model 510	
Standard Pile Depth (ft) Cohesionless soils*	18.5	16	Standard Pile Depth (ft) Cohesionless soils*
Standard Pile Depth (ft) Cohesive soils**	21	17	Standard Pile Depth (ft) Cohesive soils**
Vertical (k)***	18.7	13.7	Vertical (k)***
Shear (k)***	12.2	7.0	Shear (k)***
Moment (k-ft)***	372	207	Moment (k-ft)***
Torsion (k-ft)***	131	55	Torsion (k-ft)***

*Standard pile depths for cohesionless soils were determined using Broms method for cohesionless soils as described in the commentary to Chapter 13 of the AASHTO code****. A value of 30 degrees was assumed for the angle of internal friction (ϕ) and 120 pcf-62 pcf = 58 pcf was assumed for the effective unit weight of soil (γ) with high ground water table. The safety factor used for pile depth determination was 3.5. This assumed knowledge of soils is through borings done in the area. Table value assumes top of pile up to 6" above top of soil plus a soil slope up to 1V:4H. Add 3 feet where soil slopes are greater than 1V:4H but less than 1V:2H. Where base plate is up to 4 feet above grade due to pile location at median barrier (See for instance A76C in the 2006 Standard Plans), increase the pile depth below grade by 4'.

Standard pile depths for cohesive soils were determined using Broms method for cohesive soils as described in the commentary to Chapter 13 of the AASHTO code**. A value of 1.2 ksf was assumed for cohesive soil strength (c). The safety factor used for pile depth determination was 3.5. This assumed knowledge of soils was through borings done in the area. Table value assumes top of pile up to 6" above top of soil plus a soil slope up to 1V:4H. Add 2.5 feet where soil slopes are greater than 1V:4H but less than 1V:2H. Where base plate is up to 4 feet above grade due to pile location at median barrier (See for instance A76C in the 2006 Standard Plans), increase the pile depth below grade by 4'.

Loads shown above are worst case service level loads (With safety factors not included yet) for use in designing CIDH pile foundations where soil conditions do not meet minimum assumptions for ϕ and γ listed above or where known soil conditions are to be used to optimize design length. The above loads include dead load and wind load but do not include AASHTO code* ice loads (From the phenomenon where rain freezes to solid objects on contact). Wind loads are based on AASHTO code**** using 100 mph basic wind speed (3 second gust) with an importance factor of 1.0. CMS panel uses drag coefficient (Cd) of 1.7. Vertical loads usually do not usually govern CIDH designs for these structures, however, loads are provided in case they are needed. Torsional loads are provided for use in those design methods that account for the effects of torsional loads. Per AASHTO code**** these torsional loads assume wind load on one arm of structure only but are to be included with other reactions based on full wind loading. Safety factors used in conjuction with the above supplied loads should reflect uncertainties typical in foundation design. The following minimum safety factors are suggested to be applied to loads when using L-Pile to determine minimum pile length for foundation stability.

For cases where soil properties are established based on full depth boring at the pile location, SF = 2.0 min.
For cases where soil properties are established based on other soil borings in the area, SF = 3.0.
For other cases, engineering judgement should be used in determination of load factors and undercapacity factors.

When using L-Pile to determine maximum service level deflections, use the loads above without safety factors. It is suggested that for typical CMS sign structure the lateral pile head deflection under service loads be kept to less than 1". Maximum rotation of pile head under service loads be kept to less than 0.03 radians.

In cases where more detailed reaction report is needed to optimize design for load directions other than worst case directions, contact the Senior Specialist for Signs and Overhead Structures.

**** AASHTO's Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals, 4th Edition, 2001 with 2002 Interim Revisions.

DIST.	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No.	TOTAL SHEETS

REGISTERED ENGINEER - CIVIL

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER
No. _____
Exp. _____ CIVIL
STATE OF CALIFORNIA

THIS SHEET NOT A PART OF CONTRACT PLANS

OVERHEAD SIGNS
CHANGEABLE MESSAGE SIGNS

FOUNDATIONS | **31**