

Technical Memorandum

Subject: Base Embedment

Technical Information:

Some jurisdictions may request that the base for a modular retaining walls be set below the local frost line. Stone Strong has extensive experience with precast modular retaining walls in frost prone environments throughout the Midwest, New England, and across Canada. The large majority of these walls (greater than 95%) were embedded nominally 12 inches (300 mm), more or less, and have experienced virtually no issues related to frost heave. The precast and segmental industries in general can add substantially to this track record. There are a couple of reasons that frost heave is not a concern with these systems. First, the physical mass of the wall will restrain freezing pressures somewhat. In addition, the thermal mass of the backfill lessens frost penetration below the foundation (the exposure below the wall and backfill is dramatically different than on level ground). Second, one of the advantages of a precast modular wall is that the system is somewhat flexible and can withstand minor movements without suffering damage.

Frost considerations aside, minimum embedment of the wall base is addressed in several standards, including the NCMA Design Manual and in the FHWA NHI-10-024/025 manual (Design and Construction of Mechanically Stabilized Earth Walls and Reinforce Soil Slopes). The following table of minimum embedment is adapted from the FHWA manual and the NCMA manual. In this table, the depth of embedment is a function of the toe slope and the exposed height (H') of the facing.

Slope in Front of Wall	Minimum Embedment Depth to Top of Leveling Pad
horizontal	H'/20
3H:1V	H'/10
2H:1V	H'/7
1.5H:1V	H'/5

Based on these tables, Stone Strong has developed and recommends the following algorithm to determine the minimum embedment of the wall base (h_e , measured to the top of the wall base), where H' is the exposed height of the face and S is the run of the slope per unit of height (e.g. S=3 for a 3H:1V toe slope):

$$h_e = H'/(20 \cdot S/6)$$

A minimum embedment of 9 to 12 inches (230 to 300 mm) is recommended for commercial applications. The minimum embedment may be reduced to as little as 6 inches (150 mm) for minor walls not to exceed 6 feet (1.8 m) in height. Minimum embedment for Highway applications are generally specified by individual transportation agencies.