



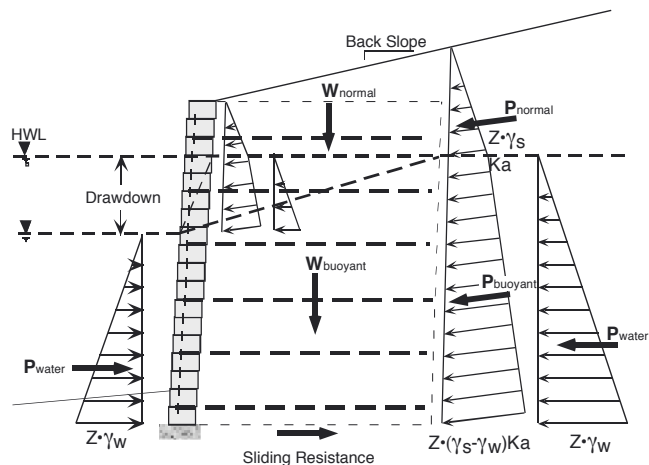
Rapid Drawdown Analysis

Wall structures constructed adjacent to water can experience a wide range of conditions and instability as water levels rise and fall. The extremes may run from a simple retaining structure constructed along a relatively static pond to a flood stabilization project where the structures are in the dry 99% of the time yet completely submerged a few times a year.

Clearly, the risk associated with water applications can be significant, therefore, the design should be addressed in a comprehensive and conservative manner. Building codes do not typically address water applications due to their unique nature and expect that the engineer will provide the correct solution for the conditions based on standards of practice.

As a guide, the 1996 AASHTO code says "For structures along rivers and canals, a minimum differential hydrostatic pressure equal to 3 feet of water shall be considered for the design....". The Army Corps of Engineers' Retaining and Flood Wall Design Manual suggest that a sliding safety factor of 1.33 may be appropriate for unusual or water to the top of wall conditions as well as lower factors for bearing capacity, etc, during the design event.

It is important to properly address internal and external stability of a reinforced soil structure for the 3' drawdown condition. Internally, the hydrostatic pressure differential can create additional loading on the reinforcement and connections while decreasing normal load in the pullout resistance calculations. Externally, high water reduces the effective weight of the mass (buoyancy) and sliding resistance is decreased. Global stability and foundation stability must also be reviewed against the varying water conditions.



Typical Design Section

Drawdown Design Guidelines

- * 3' drawdown condition is a typical design requirement.
- * Drawdown evaluation utilizes lower safety factor for combined loading analysis. (COE Guideline SF > 1.33)
- * Drawdown condition affects wall between normal water and high water elevations as level is varied. Global stability condition can be worse with submerged toe only.
- * Liberal use of free draining backfill material minimizes internal drawdown conditions and associated pressure differentials.