Example – Memphis, TN

Design a 12 ft high wall for a building in Memphis, TN. The following gravity loads and parameters are given.

Concentric Dead Load: 150 lb/ft
Eccentric Dead Load: 600 lb/ft
Live Load: 0 lb/ft (one-story building)
Roof Live Load: 400 lb/ft
Snow Load: 200 lb/ft
eccentricity = 1.5 inches

The ASCE 7-10 wind speed is 115 mph (Risk Category II). It is assumed that S_{DS} = 1.0. Using a conservative wall weight of 56 psf (fully grouted), the out-of-plane load is $0.4S_{DS}(56psf) = 0.4(1.0)(56psf)$ = 22.4 psf.

Assume that Type S mortar is used; f'_m is taken as 2930 psi.

Load combination (6), 0.9D +1.0W, controls the design, even with the high seismic load. Required spacing of the reinforcement is:

#3: 36 inches
#4: 66 inches
#5: 108 inches

Even though wind controls the design, the prescriptive requirements for Seismic Design Category D of TMS 402-11 need to be met. Based on Section 1.18.3.2.6, the maximum spacing of horizontal and vertical reinforcement shall be the smaller of one-third the length of the wall, one-third the height of the wall, and 48 inches. Assuming the wall is at least 12 ft long, the maximum spacing of reinforcement is 4 ft, or 48 inches.

Section 1.18.3.2.6 also requires that the sum of the horizontal and vertical reinforcement shall be at least 0.002 multiplied by the gross cross-sectional area of the wall, with at least 0.0007 times the gross cross-sectional area of the wall in each direction. This would require 0.047 in^2/ft in each direction with a total reinforcement of 0.135 in^2/ft. #4 at 48 inches provides 0.05 in^2/ft, which meets the minimum requirement. #5 at 48 inches provides 0.0775 in^2/ft. Using #5 at 48 inches horizontal and vertical would meet the minimum requirements, both in each direction and the total required reinforcement.