Design a masonry wall on the long side of the building shown below for the following conditions.

8” CMU, density = 130 pcf, fully grouted
f’m = 1500 psi
Type N, PCL mortar

Grade 60 reinforcing steel, if needed

DL = 15 psf
Lr (roof live load) = 30 psf
WL = 25 psf

Assume that max. bending occurs 8’ above the ground. Calculate the max. moment due to wind as w L^2 / 8 where L = 16’. Assume that the moment due to wind and the moment due to eccentric gravity load add.

Check the wall for the following conditions:
1. Unreinforced, Allowable Stress Design (ASD), flexural tension only
2. Reinforced, ASD, flexural tension only
3. Reinforced, Strength Design (SD), flexural tension, max. compressive stress, and axial buckling failure modes (but no P-∆).

Analyze the wall using the spreadsheet provided on the class web site. For each analysis, do and document the following.

• Calculate the loads and the external forces (P and M) due to the loads for the controlling load combination. Also calculate the effective eccentricity (e = M / P).

• Determine the depth of the neutral axis (x) to produce internal forces with the same eccentricity as the loads.

• Determine the strain at the extreme compression “fiber” (e_top) to produce internal forces (P and M) equal to the external forces (P and M).

• Record the masonry and steel stresses for ASD design.

• Evaluate the results. If you were able to produce internal forces to balance the external forces, the wall is OK for that failure mode and that load combination. If you were not able to produce internal forces without exceeding limits for that design method, then modify your design (add reinforcement, use larger bars, use closer spacing).