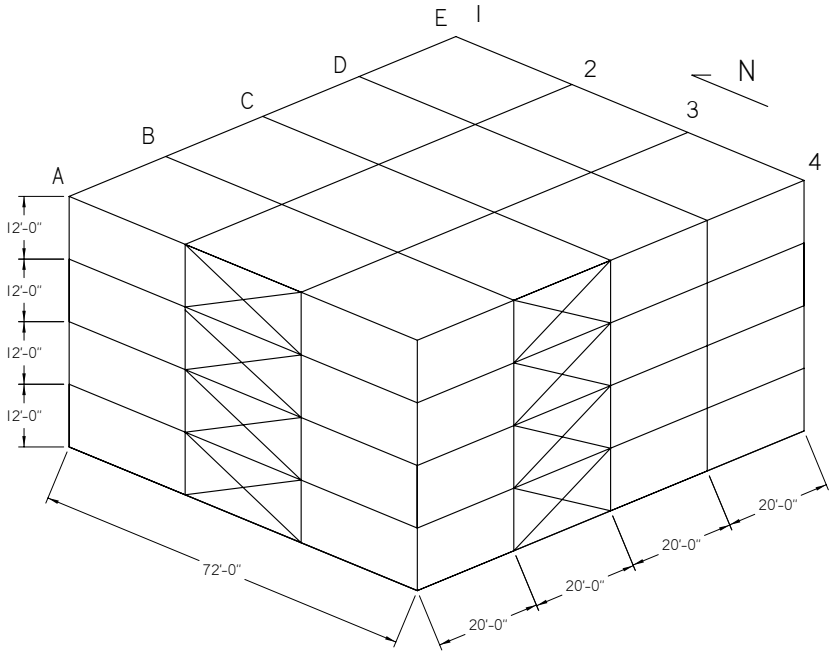
EXAM #3 - CE 342 - Fall 2002

Please use additional paper when necessary. Do not try to cram everything on the pages provided and do not write on the back of the pages.

Problem #1. (33 points)

The structure shown below resists lateral forces in the East-West direction by diagonal bracing in the exterior frames (frames 1 and 4) between grid lines *B* & *C*.

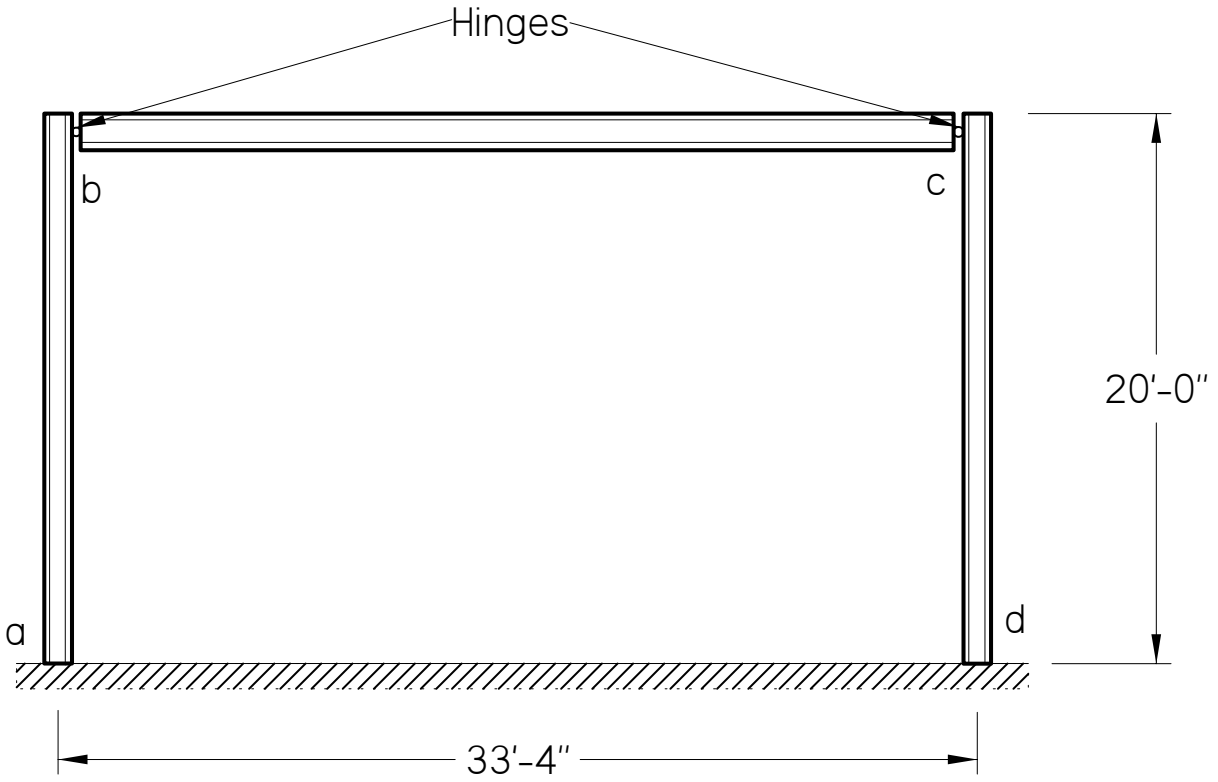


The bracing is pinned at the ends, the beams have pinned ends, and the unbraced columns are assumed to be pinned at the base. For purposes of this analysis, assume that the braced columns are pinned at each floor level. An inward wind pressure of 10 psf is applied to the West face of the building and an outward pressure of 5 psf is applied to the East face. Find the axial forces in the bracing on frame line 4 using approximate methods (i.e., the axial forces in the columns, beams and diagonal members between frame lines *B* and *C*). Assume the bracing members are *not* slender.

Problem #2. (33 points)

The frame shown below encloses a cold-storage area. In the summer, the temperature inside is -20°F while the temperature outside is 150°F. When the structure was built, the temperature was a uniform 65°F. The columns can be assumed to be 12 inches deep (h_c = 12 in) and have a bending moment of inertia I_c = 500 in^4, and a cross section area A_c = 75 in^2. The beams have h_c = 16 in, I_b = 1000 in^4, and A_b = 100 in^2. The beams and columns are steel, with E = 29,000 ksi and α = 6.5×10^{-6}/°F.

Calculate the support reactions for the thermal loads.



Problem #3. (35 points)

The beam shown below carries a uniform load of 1.2 kip/ft on the entire span. Assume that *EI* is constant for the beam.

Calculate the reactions using the slope-deflection method. Draw the shear and moment diagrams for the beam. Note using symmetry will significantly reduce the computational effort required to solve for the moments in the beam.