# CE142: PROBLEM SET #1 – LOADS

PS 1-1: Gravity Loads and Live Load Reductions

A three-story, 5-bay office building as indicated is to be constructed in Santa Monica using UBC-97 requirements (see Table 16-A). Use 20 psf unreduced live load for the roof (Table 16-C). Determine gravity loads (dead load and live load) for the members indicated in Problems 1.1-1.3. You will need to keep track of dead and live loads separately since different load factors are used for dead versus live load.

(a) Determine the gravity loads (dead & live) for Joist A at a floor level. Indicate your result on a sketch.
(b) Determine the gravity loads for floor Girder B (interior) and indicate your answers on a sketch. Provide two solutions, one without and one with live load reductions.
(c) Determine the gravity loads for an interior and exterior Columns C & D at each level and indicate the result on a sketch. Provide two solutions, one without and one with live load reductions.

Use the following information:
1) Roof and floors consist of 3 inch thick normal weight concrete slab
2) Concrete joists are spaced 6 ft on center.
3) Assume floor joists are 12 in. wide and 18 in. deep (including the slab depth)
4) Assume floor girders are 16 in. wide and 28 in. deep.
5) Assume columns are 24 in. by 24 in. (neglect column dead weight)
6) Estimate ceiling covering weight to be 10 psf
7) Estimate floor partitions and floor coverings weight as 30 psf
8) Estimate miscellaneous roof materials (insulation, membrane, etc) as 15 psf
9) Normal weight concrete weighs approximately 150 pcf.
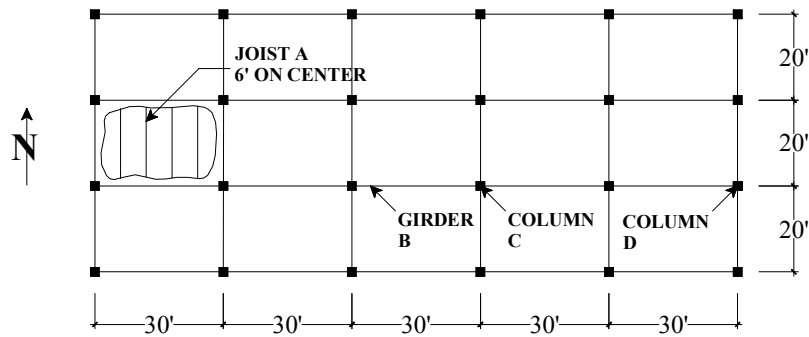
PLAN VIEW
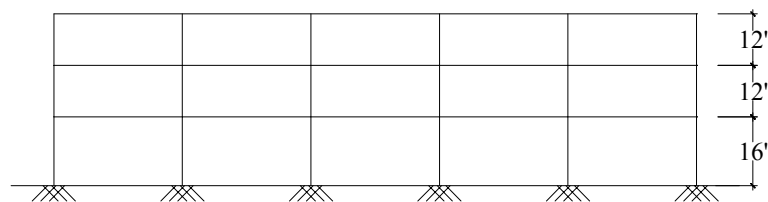
ELEVATION VIEW

PS 1-2: Earthquake Loads

You work for a company that specializes in the construction of special moment resisting frame (SMRF) buildings. You have been asked by your supervisor to compute earthquake loads for the interior frame of the three-story, five-bay frame to be located in Santa Monica. Assume Seismic Source Type A (Table 16-U) with closest distance to known seismic source of 5 km (Tables 16-R, 16-S, 16-T). Soil conditions consist of a stiff soil with an average shear wave velocity of 800 ft/s.

Review UBC-97 Sections 1630.1 (assume $\rho = 1.0$, $E_v = 0.0$, and neglect Eq. 30-2 for E_m), 1630.2, 1630.3.2, 1630.5, and 1630.6 (assume a rigid diaphragm).

F_3

F_2

F_1

Base Shear = $\rho E_h + E_v$