

CE243B - DESIGN AND RESPONSE OF RC STRUCTURAL SYSTEMS

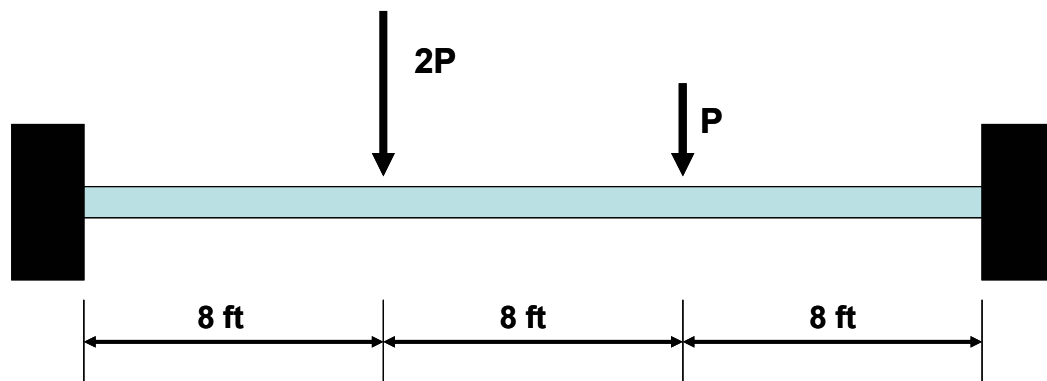
Problem Set #2: Collapse Mechanism Analysis & Incremental (static) Nonlinear Analysis

Due date: 2.1 and 2.2 April 18; 2.3 April 23

Problem 2.1 Simple Frame

For the simple frame given below, conduct the following analyses:

- (1) An incremental, static analysis for monotonically increasing load. Determine the incremental load and deformations for each increment. Estimate curvature demands at critical locations and assess the whether the section has sufficient curvature capacity.
- (2) A collapse mechanism analysis to determine the collapse load



The beam section is 16" wide and 24" deep, with 4 - #9 top and bottom bars. Cover to bar centerline is 2.5" and assume shear strength and anchorage are sufficient to reach the collapse state. Materials are $f'_c = 4$ ksi and $f_y = 60$ ksi.

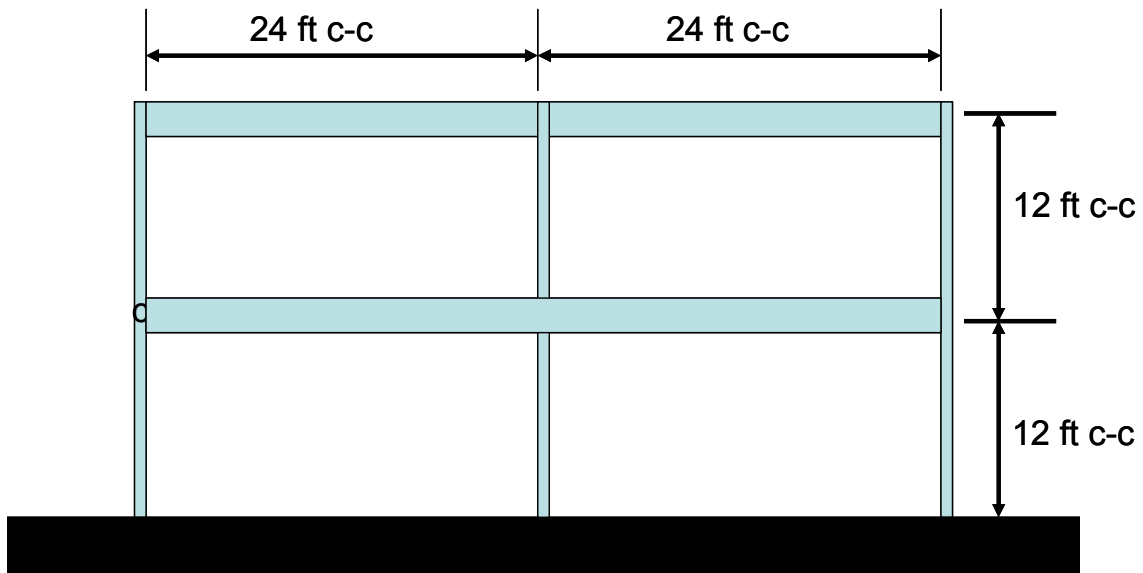
Problem 2.2 Reinforced Concrete Frame

For the frame given below, conduct the following analyses:

- (1) An incremental, static analysis for monotonically increasing load. Determine the incremental load and deformations for each increment. Estimate curvature demands at critical locations and assess the whether the section has sufficient curvature capacity.
- (2) A collapse mechanism analysis to determine the collapse load

Assume beams are rigid, column shear strength and anchorage are adequate, and that joint regions are adequate to reach the collapse state (i.e., flexural yielding hinges at the top and bottom of all columns). Exterior columns are 18" x 18" with 8 - #8 whereas the interior columns are 24" x 24" with 8 - #9. Neglect the influence of axial load on the column stiffness and strength.

Story weights are 200 k/ floor at each level (neglect column selfweight). Use a lateral load distribution consistent with UBC-97 for an equivalent static lateral load analysis. Materials are $f'_c = 4$ ksi and $f_y = 60$ ksi.



Problem 2.3 SAP2000 Pushover Analysis

Use SAP 2000 to conduct a pushover analysis of the frame given in Problem 2.2.