Equivalent Lateral Force Procedure

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1 Design story stiffness

The story deflections are given by equation 12.8-15 as:

$$\delta_x = \frac{C_d \delta_{xe}}{I_e} \tag{1}$$

Where δ_{xe} is the calculated elastic deflection. This is taken to be:

$$\delta_{xe} = \frac{F_x}{K_x} \tag{2}$$

Where F_x is the design story shear (§12.8.3) and K_x is the story stiffness. The story drift is the difference between story deflections:

$$\Delta_x = \delta_x - \delta_{x-1} \tag{3}$$

Equations (1) and (2) can substituted into this to get:

$$\Delta_x = \frac{C_d}{I_e}\left(\frac{F_x}{K_x} - \frac{F_{x-1}}{K_{x-1}}\right) \tag{4}$$

K_x is then solved for:

$$K_x = \frac{F_x}{\frac{\Delta_x I_e}{C_d} + \frac{F_{x-1}}{K_{x-1}}} \tag{5}$$

2 Pre-capping rotation

The equivalent lateral force procedure returns the maximum strength, M_c, which is used to back-calculate the yield strength, M_y, of the story. This also requires an assumption of the ratio of the pre-capping rotation, θ_p, to the rotation at yield, θ_y. This is a variable in the analysis, `py_factor`.