Wall and Column Shear

Jack Moehle
UC Berkeley
10/26/16
ACI 318-14 requirements for columns

Intermediate frames

18.4.3.1 $\varphi V_n$ shall be at least the lesser of (a) and (b):

(a) The shear associated with development of nominal moment strengths of the column at each restrained end of the unsupported length due to reverse curvature bending. Column flexural strength shall be calculated for the factored axial force, consistent with the direction of the lateral forces considered, resulting in the highest flexural strength

(b) The maximum shear obtained from factored load combinations that include $E$, with $\Omega_oE$ substituted for $E$

Special frames

18.7.6.1.1 The design shear force $V_e$ shall be calculated from considering the maximum forces that can be generated at the faces of the joints at each end of the column.

(a) These joint forces shall be calculated using the maximum probable flexural strengths, $M_{pr}$, at each end of the column associated with the range of factored axial forces, $P_u$, acting on the column.

(b) The column shears need not exceed those calculated from joint strengths based on $M_{pr}$ of the beams framing into the joint.

(c) In no case shall $V_e$ be less than the factored shear calculated by analysis of the structure.
Figure 1. (a) Elevation and (b) floor plan of buildings considered.
Column shears

\[ \frac{V_i}{A_g \sqrt{f'_c}}, \text{MPa} \]

- Design - \( V_{MRSA} \)
- Dynamic
- \( \Sigma M_{pr,\text{col},i}/l_{u,i} \)
- \( \Sigma M_{pr,\text{beam},i}/2l_{u,i} \)
- \( V_u = \omega \Omega_0 V_{MRSA} \)

Visnjic, Panagiotou, Moehle, Earthquake Spectra, 2015
Total wall shear amplification

Note: These data are from an ongoing study. Minor revisions expected going forward. Not for general distribution.
Dynamic wall shear amplification

Note: These data are from an ongoing study. Minor revisions expected going forward. Not for general distribution.
Wall moment overstrength

Note: These data are from an ongoing study. Minor revisions expected going forward. Not for general distribution.