

CODE

- (a) $\phi P_n \geq P_u$
- (b) $\phi M_n \geq M_u$
- (c) $\phi V_n \geq V_u$

11.5.1.2 ϕ shall be determined in accordance with 21.2.

11.5.2 Axial load and in-plane or out-of-plane flexure

11.5.2.1 For bearing walls, P_n and M_n (in-plane or out-of-plane) shall be calculated in accordance with 22.4. Alternatively, axial load and out-of-plane flexure shall be permitted to be considered in accordance with 11.5.3.

11.5.2.2 For nonbearing walls, M_n shall be calculated in accordance with 22.3.

11.5.3 Axial load and out-of-plane flexure – simplified design method

11.5.3.1 If the resultant of all factored loads is located within the middle third of the thickness of a solid wall with a rectangular cross section, P_n shall be permitted to be calculated by:

$$P_n = 0.55 f'_c A_g \left[1 - \left(\frac{k \ell_c}{32h} \right)^2 \right] \quad (11.5.3.1)$$

COMMENTARY

R11.5.2 Axial load and in-plane or out-of-plane flexure

R11.5.2.2 Nonbearing walls, by definition, are not subject to any significant axial force; therefore, flexural strength is not a function of axial force.

R11.5.3 Axial load and out-of-plane flexure – simplified design method

R11.5.3.1 The simplified design method applies only to solid rectangular cross sections; all other shapes should be designed in accordance with 11.5.2.

Eccentric axial loads and moments due to out-of-plane forces are used to determine the maximum total eccentricity of the factored axial force P_u . When the resultant axial force for all applicable load combinations falls within the middle third of the wall thickness (eccentricity not greater than $h/6$) at all sections along the length of the undeformed wall, no tension is induced in the wall and the simplified design method may be used. The design is then carried out considering P_u as a concentric axial force. The factored axial force P_u should be less than or equal to the design axial strength ϕP_n calculated using Eq. (11.5.3.1).

Equation (11.5.3.1) results in strengths comparable to those determined in accordance with 11.5.2 for members loaded at the middle third of the thickness with different braced and restrained end conditions. Refer to Fig. R11.5.3.1.