CODE

6.2.4 Additional analysis methods that are permitted include 6.2.4.1 through 6.2.4.4.

6.2.4.1 Two-way slabs shall be permitted to be analyzed for gravity loads in accordance with (a) or (b):

(a) Direct design method for nonprestressed slabs
(b) Equivalent frame method for nonprestressed and prestressed slabs

6.2.4.2 Slender walls shall be permitted to be analyzed in accordance with 11.8 for out-of-plane effects.

6.2.4.3 Diaphragms shall be permitted to be analyzed in accordance with 12.4.2.

6.2.4.4 A member or region shall be permitted to be analyzed and designed using the strut-and-tie method in accordance with Chapter 23.

6.2.5 *Slenderness effects*

6.2.5.1 Slenderness effects shall be permitted to be neglected if (a) or (b) is satisfied:

(a) For columns not braced against sidesway

$$\frac{k\ell_u}{r} \le 22 \qquad (6.2.5.1a)$$

(b) For columns braced against sidesway

$$\frac{k\ell_u}{r} \le 34 + 12(M_1/M_2) \qquad (6.2.5.1b)$$

and

$$\frac{k\ell_u}{r} \le 40 \qquad (6.2.5.1c)$$

where M_1/M_2 is negative if the column is bent in single curvature, and positive for double curvature.

COMMENTARY

An inelastic analysis i) represents the nonlinear stress-strain response of the materials composing the structure; ii) satisfies compatibility of deformations; and iii) satisfies equilibrium in the undeformed configuration for first-order analysis or in the deformed configuration for second-order analysis.

Finite element analysis was introduced in the 2014 Code to explicitly recognize a widely used analysis method.

R6.2.4.1 Code editions from 1971 to 2014 contained provisions for use of the direct design method and the equivalent frame method. These methods are well-established and are covered in available texts. These provisions for gravity load analysis of two-way slabs have been removed from the Code because they are considered to be only two of several analysis methods currently used for the design of two-way slabs. The direct design method and the equivalent frame method of the 2014 Code, however, may still be used for the analysis of two-way slabs for gravity loads.

R6.2.5 *Slenderness effects*

Second-order effects in many structures are negligible. In these cases, it is unnecessary to consider slenderness effects, and compression members, such as columns, walls, or braces, can be designed based on forces determined from first-order analyses. Slenderness effects can be neglected in both braced and unbraced systems, depending on the slenderness ratio ($k\ell_u/r$) of the member.

The sign convention for M_1/M_2 has been updated so that M_1/M_2 is negative if bent in single curvature and positive if bent in double curvature. This reflects a sign convention change from the 2011 Code.

The primary design aid to estimate the effective length factor k is the Jackson and Moreland Alignment Charts (Fig. R6.2.5.1), which provide a graphical determination of k for a column of constant cross section in a multi-bay frame (ACI SP-17M(09); Column Research Council 1966).

Equations (6.2.5.1b) and (6.2.5.1c) are based on Eq. (6.6.4.5.1) assuming that a 5 percent increase in moments due to slenderness is acceptable (MacGregor et al. 1970).