

CODE

COMMENTARY

the seismic-force-resisting system shall meet the applicable requirements in [Chapter 18](#).

4.4.6.6 Effects of nonstructural members shall be accounted for as described in [18.2.2.1](#) and consequences of damage to nonstructural members shall be considered.

4.4.6.7 Design verification of earthquake-resistant concrete structures using nonlinear response history analysis shall be in accordance with [Appendix A](#).

4.4.7 Diaphragms

4.4.7.1 Diaphragms, such as floor or roof slabs, shall be designed to resist simultaneously both out-of-plane gravity loads and in-plane lateral forces in load combinations given in [4.3](#).

4.4.7.2 Diaphragms and their connections to framing members shall be designed to transfer forces between the diaphragm and framing members.

4.4.7.3 Diaphragms and their connections shall be designed to provide lateral support to vertical, horizontal, and inclined elements.

4.4.7.4 Diaphragms shall be designed to resist applicable lateral loads from soil and hydrostatic pressure and other loads assigned to the diaphragm by structural analysis.

4.4.7.5 Collectors shall be provided where required to transmit forces between diaphragms and vertical elements.

4.4.7.6 Diaphragms that are part of the seismic-force-resisting system shall be designed for the applied forces. In structures assigned to Seismic Design Category D, E, and F, the diaphragm design shall be in accordance with [Chapter 18](#).

4.5—Structural analysis

4.5.1 Analytical procedures shall satisfy compatibility of deformations and equilibrium of forces.

4.5.2 The methods of analysis given in [Chapter 6](#) shall be permitted.

R4.4.6.6 Although the design of nonstructural elements for earthquake effects is not included in the scope of this Code, the potential negative effects of nonstructural elements on the structural behavior need to be considered in Seismic Design Categories B, C, D, E, and F. Interaction of nonstructural elements with the structural system—for example, the short-column effect—had led to failure of structural members and collapse of some structures during earthquakes in the past.

R4.4.7 Diaphragms

Floor and roof slabs play a dual role by simultaneously supporting gravity loads and transmitting lateral forces in their own plane as a diaphragm. General requirements for diaphragms are provided in [Chapter 12](#), and roles of the diaphragm described in the Commentary to that chapter. Additional requirements for design of diaphragms in structures assigned to Seismic Design Categories D, E, and F are prescribed in [Chapter 18](#).

R4.4.7.5 All structural systems must have a complete load path in accordance with [4.4.4](#). The load path includes collectors where required.

R4.5—Structural analysis

The role of analysis is to estimate the internal forces and deformations of the structural system and to establish compliance with the strength, serviceability, and stability requirements of the Code. The use of computers in structural engineering has made it feasible to perform analysis of complex structures. The Code requires that the analytical procedure used meets the fundamental principles of equilibrium and compatibility of deformations, permitting a number of analytical techniques, including the strut-and-tie method required for discontinuity regions, as provided in [Chapter 6](#).