

CODE

18.2.4 *Strength reduction factors*

18.2.4.1 Strength reduction factors shall be in accordance with **Chapter 21**.

18.2.5 *Concrete in special moment frames and special structural walls*

18.2.5.1 Specified compressive strength of concrete in special moment frames and special structural walls shall be in accordance with the special seismic systems requirements of Table 19.2.1.1.

18.2.6 *Reinforcement in special moment frames and special structural walls*

18.2.6.1 Reinforcement in special moment frames and special structural walls shall be in accordance with the special seismic systems requirements of **20.2.2**.

COMMENTARY

R18.2.4 *Strength reduction factors*

R18.2.4.1 **Chapter 21** contains strength reduction factors for all members, joints, and connections of earthquake-resistant structures, including specific provisions in **21.2.4** for buildings that use special moment frames, special structural walls, and intermediate precast walls.

R18.2.5 *Concrete in special moment frames and special structural walls*

Requirements of this section refer to concrete quality in frames and walls that resist earthquake-induced forces. The maximum specified compressive strength of lightweight concrete to be used in structural design calculations is limited to 35 MPa, primarily because of paucity of experimental and field data on the behavior of members made with lightweight concrete subjected to displacement reversals in the nonlinear range. If convincing evidence is developed for a specific application, the limit on maximum specified compressive strength of lightweight concrete may be increased to a level justified by the evidence.

R18.2.6 *Reinforcement in special moment frames and special structural walls*

R18.2.6.1 Nonprestressed reinforcement for seismic systems is required to meet **20.2.2.4** and **20.2.2.5**. Starting with ACI 318-19, **ASTM A706** Grades 550 and 690 reinforcement is permitted to resist moments, axial, and shear forces in special structural walls and all components of special structural walls, including coupling beams and wall piers. ASTM A706 Grade 550 reinforcement is also permitted in special moment frames. Results of tests and analytical studies presented in **NIST (2014)** and **Sokoli and Ghannoum (2016)** indicate that properly detailed beams and columns of special moment frames with ASTM A706 Grade 550 reinforcement exhibit strength and deformation capacities similar to those of members reinforced with Grade 420 reinforcement. The use of Grade 690 reinforcement is not allowed in special moment frames because there is insufficient data to demonstrate satisfactory seismic performance.

To allow the use of ASTM A706 Grades 550 and 690 reinforcement, the 2019 Code includes limits for spacing of transverse reinforcement to provide adequate longitudinal bar support to control longitudinal bar buckling. In special moment frames, the use of Grade 550 reinforcement requires increased joint depths to prevent excessive slip of beam bars passing through beam-column joints (18.8.2.3).

The requirement for a tensile strength greater than the yield strength of the reinforcement (20.2.2.5, Table 20.2.1.3(b)) is based on the assumption that the capability of a structural member to develop inelastic rotation capacity is a function of the length of the yield region along the axis of the member. In interpreting experimental results, the length of