CODE

COMMENTARY

For a structural steel attachment, if only the specified yield strength of the steel is known, the expected strength should be taken as approximately 1.5 times the specified yield strength. If the actual yield strength of the steel is known, the expected strength should be taken as approximately 1.25 times the actual yield strength.

Under earthquake conditions, the direction of shear may not be predictable. The full shear should be assumed in any direction for a safe design.

17.10.2 Provisions of this chapter shall not apply to the design of anchors in plastic hinge zones of concrete structures resisting earthquake-induced forces.

R17.10.2 The possible higher levels of cracking and spalling in plastic hinge zones are beyond the conditions for which the nominal concrete-governed strength values in this chapter are applicable. Plastic hinge zones are considered to extend a distance equal to twice the member depth from any column or beam face, and also include any other sections in walls, frames, and slabs where yielding of reinforcement is likely to occur as a result of lateral displacements.

If anchors must be located in plastic hinge regions, they should be detailed so that the anchor forces are transferred directly to anchor reinforcement that is designed to transmit the anchor forces into the body of the member beyond the anchorage region. Configurations that rely on concrete tensile strength should not be used.

17.10.3 Post-installed anchors shall be qualified for earthquake-induced forces in accordance with ACI 355.2 or ACI 355.4M. The pullout strength, N_p, and steel strength in shear, V_{sa}, of post-installed expansion, screw, and undercut anchors shall be based on the results of the ACI 355.2 Simulated Seismic Tests. For adhesive anchors, the steel strength in shear, V_{sa}, and the characteristic bond stresses, τ_{uncr} and τ_{cr}, shall be based on results of the ACI 355.4M Simulated Seismic Tests.

R17.10.3 Anchors that are not suitable for use in cracked concrete should not be used to resist earthquake-induced forces. Qualification of post-installed anchors for use in cracked concrete is an integral part of the qualification for resisting earthquake-induced forces in ACI 355.2 and ACI 355.4M. The design values obtained from the Simulated Seismic Tests of ACI 355.2 and ACI 355.4M are expected to be less than those for static load applications.

17.10.4 Anchor reinforcement used in structures assigned to SDC C, D, E, or F shall be deformed reinforcement and shall be in accordance with the anchor reinforcement requirements of 20.2.2.

17.10.5 *Tensile loading design requirements*

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17.10.5.1 If the tensile component of the strength-level earthquake-induced force applied to a single anchor or anchor group does not exceed 20 percent of the total factored anchor tensile force associated with the same load combination, it shall be permitted to design a single anchor or anchor group in accordance with 17.6 and the tensile strength requirements of Table 17.5.2.

R17.10.5.1 The requirements of 17.10.5.3 need not apply if the applied earthquake-induced tensile force is a small fraction of the total factored tensile force.

17.10.5.2 If the tensile component of the strength-level earthquake-induced force applied to anchors exceeds 20 percent of the total factored anchor tensile force associated with the same load combination, anchors and their attachments shall be designed in accordance with 17.10.5.3. The

R17.10.5.2 If the ductile steel element is ASTM A36 or ASTM A307 steel, the f_{uta}/f_{ya} value is typically approximately 1.5, and the anchor can stretch considerably before rupturing at the threads. For other steels, calculations may need to be made to ensure that similar behavior can occur.