CODE

16.2.1.7 Design of a connection with multiple components shall consider the differences in stiffness, strength, and ductility of the components.

16.2.1.8 Integrity ties shall be provided in the vertical, longitudinal, and transverse directions and around the perimeter of a structure in accordance with 16.2.4 or 16.2.5.

16.2.2 *Required strength*

16.2.2.1 Required strength of connections and adjacent regions shall be calculated in accordance with the factored load combinations in Chapter 5.

16.2.2.2 Required strength of connections and adjacent regions shall be calculated in accordance with the analysis procedures in Chapter 6.

16.2.2.3 For bearing connections, N_{uc} shall be (a) or (b), but need not exceed $N_{uc,max}$, where $N_{uc,max}$ is the maximum restraint force that can be transmitted through the load path of a bearing connection multiplied by the load factor used for live loads in combinations with other factored load effects.

(a) For connections not on bearing pads, N_{uc} shall be calculated simultaneously with V_u using factored load combinations in accordance with 5.3.6. The restraint force shall be treated as a live load.
(b) For connections on bearing pads, N_{uc} shall be 20 percent of the sustained unfactored vertical reaction multiplied by a load factor of 1.6.

16.2.2.4 If the friction coefficient for a bearing material has been determined by results of tests, $N_{uc,max}$ shall be permitted to be determined by multiplying the sustained unfactored vertical reaction by the friction coefficient and a load factor of 1.6.

COMMENTARY

R16.2.1.8 Appendix B of the *PCI Design Handbook* (PCI MNL 120) provides a review of structural integrity and minimum integrity ties for precast concrete bearing wall structures.

R16.2.2 *Required strength*

R16.2.2.3 Bearing connections subjected to sustained loads will experience volume change restraint forces due to the effects of creep, shrinkage, and temperature change. Sustained loads are dead loads and any other permanent loads such as soil loads or equipment loads that may be included with live loads. Section 5.3.6 prescribes the general consideration for restraint of volume change and differential settlement in combination with other loading but does not define a specific load factor for precast concrete bearing conditions. Load factors are provided with these provisions. $N_{uc,max}$ provides a capacity-design limit.

For mechanical connections, steel-to-steel contact, or other high-friction bearings, the horizontal force is usually due to volume change restraint. Such bearing connections will experience volume change restraint forces due to the effects of creep, shrinkage, and temperature change. Because the magnitude of volume change restraint forces acting on bearing connections cannot usually be determined with a high degree of accuracy, it is required to treat the restraint force N_{uc} as a live load in 16.2.2.3(a) when using the factored load combinations of 5.3.6 and multiplied by 1.6 in 16.2.2.3(b).

Common precast concrete bearing connections use elastomeric pads or other structural bearing media that limit transferred forces by pad deformation or slip. The limiting load of such connections can be taken as 20 percent of the sustained unfactored reaction, as recognized by 16.2.2.3(b).

R16.2.2.4 Bearings explicitly designed for low friction, such as polytetrafluoroethylene (PTFE)-faced sliding bearings, may reduce volume change restraint forces. If the friction coefficient has been reliably determined for a bearing material considering service conditions such as temperature, aging, and exposure, that information can be used to calculate the maximum restraint force.