CODE

4.12.1.3 When precast members are incorporated into a structural system, the forces and deformations occurring in and adjacent to connections shall be included in the design.

4.12.1.4 Where system behavior requires in-plane loads to be transferred between the members of a precast floor or wall system, (a) and (b) shall be satisfied:

(a) In-plane load paths shall be continuous through both connections and members.
(b) Where tension loads occur, a load path of steel or steel reinforcement, with or without splices, shall be provided.

4.12.1.5 Distribution of forces that act perpendicular to the plane of precast members shall be established by analysis or test.

4.12.2 *Prestressed concrete systems*

4.12.2.1 Design of prestressed members and systems shall be based on strength and on behavior at service conditions at all critical stages during the life of the structure from the time prestress is first applied.

4.12.2.2 Provisions shall be made for effects on adjoining construction of elastic and plastic deformations, deflections, changes in length, and rotations due to prestressing. Effects of temperature change, restraint of attached structural members, foundation settlement, creep, and shrinkage shall also be considered.

4.12.2.3 Stress concentrations due to prestressing shall be considered in design.

4.12.2.4 Effect of loss of area due to open ducts shall be considered in computing section properties before grout in post-tensioning ducts has attained design strength.

4.12.2.5 Post-tensioning tendons shall be permitted to be external to any concrete section of a member. Strength and serviceability design requirements of this Code shall be used to evaluate the effects of external tendon forces on the concrete structure.

COMMENTARY

R4.12.1.5 Concentrated and line loads can be distributed among members provided the members have sufficient torsional stiffness and shear can be transferred across joints. Torsionally stiff members such as hollow-core or solid slabs will provide better load distribution than torsionally flexible members such as double tees with thin flanges. The actual distribution of the load depends on many factors discussed in detail in LaGue (1971), Johnson and Ghadiali (1972), Pfeifer and Nelson (1983), Stanton (1987, 1992), *PCI Manual for the Design of Hollow Core Slabs and Walls* (PCI MNL 126), Aswad and Jacques (1992), and the *PCI Design Handbook* (PCI MNL 120). Large openings can cause significant changes in distribution of forces.

R4.12.2 *Prestressed concrete systems*

Prestressing, as used in the Code, may apply to pretensioning, bonded post-tensioning, or unbonded post-tensioning. All requirements in the Code apply to prestressed systems and members, unless specifically excluded. This section contains specific requirements for prestressed concrete systems. Other sections of this Code also provide specific requirements, such as required concrete cover for prestressed systems.

Creep and shrinkage effects may be greater in prestressed than in nonprestressed concrete structures because of the prestressing forces and because prestressed structures typically have less bonded reinforcement. Effects of movements due to creep and shrinkage may require more attention than is normally required for nonprestressed concrete. These movements may increase prestress losses.

Design of externally post-tensioned construction should consider aspects of corrosion protection and fire resistance that are applicable to this structural system.