

WHAT'S NEW IN ACI 318-08?

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The current issue of the American Concrete Institute (ACI) Standard “*Building Code Requirements for Structural Concrete (ACI 318-08) and Commentary*”¹ contains several changes from the previous edition (ACI 318-05)² which will influence design practices for post-tensioned concrete members. They all appear in Chapter 18 of the Code, and are discussed as follows:

SECTION 18.8.2 — the requirement for providing a minimum flexural capacity of 1.2 times the cracking moment M_{cr} has been waived for **ALL** members with unbonded tendons. In previous editions of the code the $1.2M_{cr}$ requirement was waived for two-way prestressed slabs; now it is waived for all members with unbonded tendons. The requirement now only applies to prestressed concrete members with bonded tendons. This is an important change for the post-tensioning industry, not because it will affect design practices, but because it will remove liability on the part of engineers who have commonly ignored the $1.2M_{cr}$ requirement in the design of beams, girders, and one-way slabs. There is published basis for ignoring the requirement; ACI Committee 423 has recommended that this requirement be waived for **all** members with unbonded tendons for many years.³ [Now the waiver appears officially in the Code.]

SECTION 18.10 — significant changes were made in the requirements for inelastic redistribution of factored moments. In previous editions of the Code moment redistribution was accomplished by increasing or decreasing factored elastic **negative** moments within certain limits, and maintaining statics within the adjacent spans. A decrease in the elastic negative moment resulted in inelastic behavior in the negative moment region. An increase in the elastic negative moment resulted in inelastic behavior in the positive moment region. While the permissible amount of inelastic behavior was limited for negative moments, no such limits existed for positive moments.

Code requirements for moment redistribution now involve direct reductions to both negative and positive moments, with the same percentage limits for adjusting both negative and positive moments. This change will not have a big effect on the design of most post-tensioned members, but engineers (and programmers) need to be aware of it.

SECTION 18.12.4 — clarifications were made on how the 125 psi minimum average prestress requirement is applied in two-way slabs with changes in slab thickness. When the slab thickness change occurs parallel to the tendon or tendon group, the 125 psi minimum must be maintained for the entire cross-sectional area tributary to the tendon or tendon group. When the slab thickness change occurs perpendicular to the tendon or tendon group, the 125 psi minimum applies to both the thicker and the thinner slab. This change originated from a formal request for a code interpretation submitted to ACI by a practitioner.

SECTION 18.12.6 — this is a new section which clarifies integrity steel requirements for two-way slabs with unbonded tendons. A minimum of two ½-inch diameter (or larger) tendons are required to pass over each column in both directions. The tendons must pass within the column longitudinal reinforcement. Outside the column, the two integrity tendons must pass below all orthogonal tendons in spans adjacent to the column. This is not very different from previous editions of the code. The biggest change is the minimum size (½ -inch) specified for the two integrity tendons, in previous editions a minimum tendon size was not stated.

SECTION 18.12.7 — this new section offers a loophole to **18.12.6** for unbonded slabs where geometry or other constraints make conformance to **18.12.6** difficult or impossible. In this case the integrity steel requirements must be satisfied with bonded non-prestressed reinforcement conforming to **13.3.8.5**. This section also applies to two-way prestressed slabs with bonded tendons.

Sections **18.16.4**, **R18.16.4**, **R18.21.4** — for corrosion protection the Code now references ACI 423.7, the unbonded tendon material specification. The reference is:

18.29. Joint ACI-ASCE Committee 423, “*Specification for Unbonded Single-Strand Tendon Materials and Commentary (ACI 423.7-07)*”⁴, American Concrete Institute, Farmington Hills, MI, 2007.

Those involved in the design and construction of unbonded post-tensioned concrete structures should be aware that the ACI 423.7 tendon specification is now a part of the ACI Building Code, which becomes **law** when it is incorporated into a model building code and adopted by ordinance into a local code.

WHAT’S COMING? — Code changes are being processed by Committee 318 at the time of this writing which will further affect design practice for post-tensioned concrete members, and will appear in the next edition of the Code (ACI 318-11). They include

- Changes to requirements for prestressed shrinkage and temperature reinforcement in monolithic one-way post-tensioned beam and slab framing;
- Changes to the permissible stresses in post-tensioned tendons immediately before and after transfer of prestress force, and
- Requirements for minimum non-prestressed bonded reinforcement for two-way prestressed slabs with bonded tendons.

ACI Committee 318 has committed to a **major** reorganization of the Code which will be published in the 2014 edition (ACI 318-14). This will be the first large-scale reorganization of the Code in over 40 years. The reorganization will result in a member-based Code, wherein **all** of the requirements for each type of member governed (beams, columns, slabs, foundations, etc.) will be contained within a single Code section, rather than being scattered throughout the Code. Committee 318 feels that this will greatly improve the functionality of the Code, particularly for new users.

REFERENCES

1. *Building Code Requirements for Structural Concrete and Commentary*, ACI 318-08, American Concrete Institute, Farmington Hills, MI, 2008.
2. *Building Code Requirements for Structural Concrete and Commentary*, ACI 318-05, American Concrete Institute, Farmington Hills, MI, 2005.
3. *Recommendations for Concrete Members Prestressed with Unbonded Tendons* (ACI 423.3R-96), American Concrete Institute, Farmington Hills, 1996.
4. *Specification for Unbonded Single-Strand Tendon Materials and Commentary* (ACI 423.7-07), American Concrete Institute, Farmington Hills, 2007.

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