



Frequently Asked Questions

Shrinkage and Temperature Reinforcement in Two-Way Post-Tensioned Slabs

Answers from the PTI DC-70 Special Topics Committee

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Q Are there any code requirements for shrinkage and temperature reinforcement in two-way post-tensioned slabs?

A No. Shrinkage and temperature requirements in ACI 318-08¹, Section 7.12, apply only to one-way slabs (all code sections cited hereinafter are from ACI 318-08):

“7.12.1—Reinforcement for shrinkage and temperature stresses normal to flexural reinforcement shall be provided in structural slabs where the flexural reinforcement extends in one direction only.”

BACKGROUND

Section 10.5.4 requires a minimum area of nonprestressed reinforcement in all slabs—including two-way slabs—equal to the shrinkage and temperature requirements specified in Section 7.12.2.1; however, Section 10.5 in its entirety is excluded for all prestressed concrete members in Section 18.1.3. Thus, Section 10.5.4 applies only to nonprestressed slabs. It should also be noted that the entire Chapter 13, “Two Way Slab Systems,” does not apply to prestressed slabs, except for Section 13.7, which addresses the equivalent frame design method (refer to the exclusion of Chapter 13 in Section 18.1.3 and the exception in Section 18.12.1.)

The committee is aware of projects on which design professionals have specified nonprestressed reinforcement parallel to and between the bands in two-way post-tensioned slabs in a triangular area near the slab edge, as shown in Fig. 1.

The committee is also aware of projects on which design professionals have specified “temperature tendons” between the bands in two-way post-tensioned slabs. These tendons run the full length of the slab between bands and are specified to be at the center of the slab with no vertical curved profile, as shown in Fig. 2.

It is possible that designers who specify these arrangements of reinforcement in two-way post-tensioned slabs are influenced by Section 7.12.3.3, which requires nonprestressed shrinkage and temperature reinforcement at slab edges between shrinkage and temperature tendons spaced farther apart than 54 in. (1370 mm). However, as discussed previously, this code section applies only to one-way slabs.

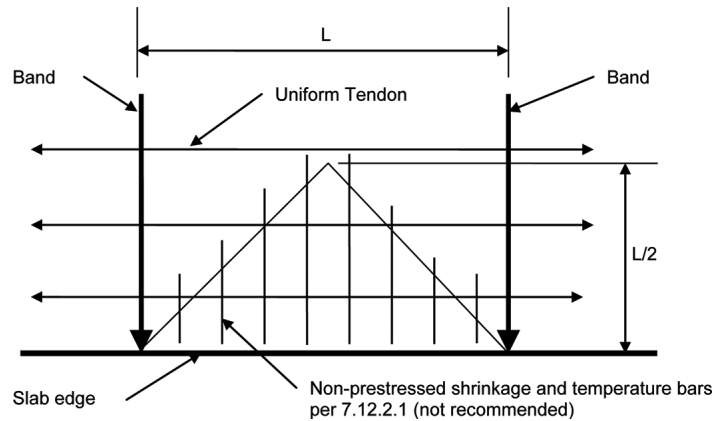


Fig. 1—Plan at slab edge of two-way slab with added S&T reinforcement.

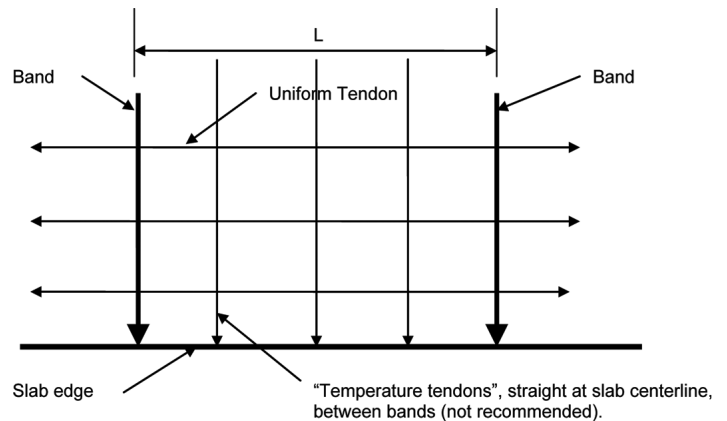


Fig. 2—Plan at slab edge of two-way slab with added temperature tendons.

Designers of two-way post-tensioned slabs are free to specify this reinforcement; however, as shown, it is not required by code, and testing has shown that it is not necessary. Testing on two-way post-tensioned slabs with a banded tendon distribution² contained neither the nonprestressed reinforcement shown in Fig. 1 nor the “temperature tendons” shown in Fig. 2. These tests demonstrated that adequate, code-conformant behavior in two-way post-tensioned slabs

with a banded tendon distribution is achieved without this reinforcement. Specifying the reinforcement between and parallel to bands shown in Fig. 1 or 2 adds cost to the slab without a known benefit.

REFERENCES

1. ACI Committee 318, "Building Code Requirements for Structural Concrete (ACI 318-08) and Commentary," American Concrete Institute, Farmington Hills, MI, 473 pp.
2. Burns, N. H., and Hemakom, R., "Test of Scale Model Post-Tensioned Flat Plate", *Proceedings*, ASCE, V. 103, No. ST6, June 1977, pp. 1237-1255.



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