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perpendicular to the flexural reinforcement in accordance with 24.4.3 or 24.4.4.

24.4.2 If shrinkage and temperature movements are restrained, the effects of ***T*** shall be considered in accordance with 5.3.6.

24.4.3 *Nonprestressed reinforcement*

24.4.3.1 Deformed reinforcement to resist shrinkage and temperature stresses shall conform to Table 20.2.2.4(a) and shall be in accordance with 24.4.3.2 through 24.4.3.5.

24.4.3.2 The ratio of deformed shrinkage and temperature reinforcement area to gross concrete area shall be greater than or equal to 0.0018.

24.4.3.3 The spacing of deformed shrinkage and temperature reinforcement shall not exceed the lesser of **5*h*** and 450 mm.

24.4.3.4 At all sections where required, deformed reinforcement used to resist shrinkage and temperature stresses shall develop f_y in tension.

24.4.3.5 For one-way precast slabs and one-way precast, prestressed wall panels, shrinkage and temperature rein-

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it is acting as assumed in the design. The provisions of this section are intended for structural slabs only; they are not intended for slabs-on-ground.

R24.4.2 The area of shrinkage and temperature reinforcement required by 24.4.3.2 has been satisfactory where shrinkage and temperature movements are permitted to occur. Where structural walls or columns provide significant restraint to shrinkage and temperature movements, the restraint of volume changes causes tension in slabs, as well as displacements, shear forces, and flexural moments in columns or walls. In these cases, it may be necessary to increase the amount of slab reinforcement required by 24.4.3.2 due to the shrinkage and thermal effects in both principal directions (PCI MNL 120; Gilbert 1992). Top and bottom reinforcement are both effective in controlling cracks. Control strips during the construction period, which permit initial shrinkage to occur without causing an increase in stress, are also effective in reducing cracks caused by restraint.

Topping slabs also experience tension due to restraint of differential shrinkage between the topping and the precast elements or metal deck (which has zero shrinkage) that should be considered in reinforcing the slab. Consideration should be given to strain demands on reinforcement crossing joints of precast elements where most of the restraint is likely to be relieved.

R24.4.3 *Nonprestressed reinforcement*

R24.4.3.2 The minimum ratios of deformed bar or welded wire reinforcement area to gross concrete area of 0.0018 is empirical but has been used satisfactorily for many years. The resulting area of reinforcement may be distributed near the top or bottom of the slab, or may be distributed between the two faces of the slab as deemed appropriate for specific conditions. Previous editions of the Code permitted a reduction in shrinkage and temperature reinforcement for reinforcement with yield strength greater than 420 MPa. However, the mechanics of cracking suggest that increased yield strength provides no benefit for the control of cracking. If crack width or leakage prevention is a design limit state, refer to ACI 224R or ACI 350M for recommended reinforcement ratios.

R24.4.3.4 Splices and end anchorages of shrinkage and temperature reinforcement are to be designed to develop the specified yield strength of the reinforcement in accordance with Chapter 25.

R24.4.3.5 For precast, prestressed concrete members not wider than 3.6 m, such as hollow-core slabs, solid slabs, or