

CODE

20.3.2.5 Permissible tensile stresses in prestressed reinforcement

20.3.2.5.1 The tensile stress in prestressed reinforcement shall not exceed the limits in Table 20.3.2.5.1.

Table 20.3.2.5.1—Maximum permissible tensile stresses in prestressed reinforcement

Stage	Location	Maximum tensile stress	
During stressing	At jacking end	Least of:	$0.94f_{py}$
			$0.80f_{pu}$
			Maximum jacking force recommended by the supplier of anchorage device
Immediately after force transfer	At post-tensioning anchorage devices and couplers	$0.70f_{pu}$	

20.3.2.6 Prestress losses

20.3.2.6.1 Prestress losses shall be considered in the calculation of the effective tensile stress in the prestressed reinforcement, f_{se} , and shall include (a) through (f):

- (a) Prestressed reinforcement seating at transfer
- (b) Elastic shortening of concrete
- (c) Creep of concrete
- (d) Shrinkage of concrete
- (e) Relaxation of prestressed reinforcement
- (f) Friction loss due to intended or unintended curvature in post-tensioning tendons

20.3.2.6.2 Calculated friction loss in post-tensioning tendons shall be based on experimentally determined wobble and curvature friction coefficients.

20.3.2.6.3 Where loss of prestress in a member is anticipated due to connection of the member to adjoining

COMMENTARY

R20.3.2.5 Permissible tensile stresses in prestressed reinforcement

R20.3.2.5.1 Because of the high yield strength of low-relaxation strand and wire meeting the requirements of **ASTM A416** and **ASTM A421** including Supplementary Requirement S1 “Low-Relaxation Wire and Relaxation Testing,” it is appropriate to specify permissible stresses in terms of specified minimum ASTM yield strength along with the specified minimum ASTM tensile strength. Because of the higher allowable initial prestressed reinforcement stresses permitted since the 1983 Code, final stresses can be greater. For structures subject to corrosive conditions or repeated loadings, consideration should be given to limiting the final stress.

R20.3.2.6 Prestress losses

R20.3.2.6.1 **ACI 423.10R** provides a comprehensive treatment of the estimation of prestress losses.

Actual losses, greater or smaller than the calculated values, have little effect on the design strength of the member, but affect service load behavior (deflections, camber, cracking load) and connections. At service loads, overestimation of prestress losses can be almost as detrimental as underestimation because the former can result in excessive camber and horizontal movement.

R20.3.2.6.2 Estimation of friction losses in post-tensioned tendons is addressed in the *Post-Tensioning Manual* (**TAB.1**). Values of the wobble and curvature friction coefficients to be used for the particular types of prestressing reinforcement and particular types of ducts should be obtained from the manufacturers of the tendons. An unrealistically low estimate of the friction loss can lead to improper camber, or potential deflection, of the member and inadequate prestress. Overestimation of the friction may result in extra prestressing force. This could lead to excessive camber and excessive shortening of a member. If the friction factors are determined to be less than those assumed in the design, the tendon stressing should be adjusted to provide only that prestressing force in the critical portions of the structure required by the design.

When safety or serviceability of the structure may be involved, the acceptable range of prestressing reinforcement jacking forces or other limiting requirements should either be given or approved by the licensed design professional in conformance with the permissible stresses of 20.3.2.5 and **24.5**.