CODE

25.4.8.2 Seven-wire strand shall be bonded at least ℓ_d beyond the critical section except as provided in 25.4.8.3.

25.4.8.3 Embedment less than ℓ_d shall be permitted at a section of a member, provided the design strand stress at that section does not exceed values obtained from the bilinear relationship defined by Eq. (25.4.8.1).

COMMENTARY

embedment lengths twice those required by Eq. (25.4.8.1) closely matched the flexural performance of similar pretensioned girders with strand fully bonded to ends of girders. Accordingly, twice the development length is required for strand not bonded through to the end of a member. Subsequent tests (Rabbat et al. 1979) indicated that in pretensioned members designed for zero tension in the concrete under service load conditions (refer to 24.5.2), the development length for debonded strands need not be increased by a factor of 2. For analysis of sections with debonded strands at locations where strand is not fully developed, the procedure outlined in 21.2.3 is provided.

R25.4.8.3 Figure R25.4.8.3 shows the relationship between steel stress and the distance over which the strand is bonded to the concrete represented by Eq. (25.4.8.1). This idealized variation of strand stress may be used for analyzing sections within the development region (Martin and Korkosz 1995; PCI MNL 120). The expressions for transfer length and for the additional bonded length necessary to develop an increase in stress of $(f_{ps} - f_{se})$ are based on tests of members prestressed with clean, 6.4, 9.5, and 12.7 mm diameter strands for which the maximum value of f_{ps} was 1900 MPa (Kaar and Magura 1965; Hanson and Kaar 1959; Kaar et al. 1963).

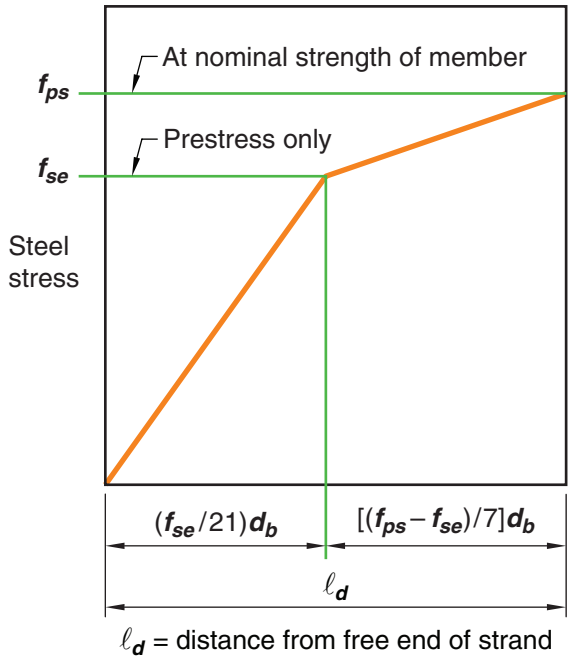

Fig. R25.4.8.3—Idealized bilinear relationship between steel stress and distance from the free end of strand.