

Time-dependent losses in prestressed, continuous composite beams

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Abstract: Iterative one-step, iterative step-by-step, and noniterative step-by-step approaches for calculating prestress losses due to shrinkage, creep, and steel relaxation for partially prestressed, continuous concrete/steel composite beams are presented. A simplified method that accounts for the aging effect on losses is also formulated. The method is based on exploiting the noniterative step-by-step approach to accumulate the losses through an infinite number of time intervals. It provides a simple yet accurate explicit formula for determining shrinkage and creep losses. This simplified method can be used for estimating the prestress losses of any prestressed concrete member. An example is included to show the application of the proposed simplified method for partially prestressed continuous composite beams and to demonstrate its accuracy for design purposes. A parametric study is conducted on the given, taking into account geometrical and material properties, so illustrate the validity of the proposed method relative to the iterative one-step and the iterative step-by-step methods. It is concluded that the proposed method is in close agreement with the more rigorous iterative procedures.