

# REFERENCE CARDS

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**KEYWORDS:** architecture; Awards Program; bridges; buildings; precast concrete; prestressed concrete; structures.

**ABSTRACT:** Twelve outstanding projects were named winners in the 1985 PCI Awards Program. Among these projects were three office buildings, a county library, a convention center, two housing projects, three bridges, a parking garage, and a substation. Brief descriptions and jury comments are given for each project.

**REFERENCE:** "PCI Awards Program Winners," PCI JOURNAL, V. 30, No. 5, September-October 1985, pp. 25-37.

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**KEYWORDS:** bridges; construction; design (structural); environment; erection; geometry control; precast concrete; post-tensioned construction; prestressed concrete; progressive placement method; production; segmental construction.

**ABSTRACT:** Several innovative design and construction techniques were used to build the Linn Cove Viaduct — a 1243 ft (379 m) long, S-shaped precast prestressed segmental concrete bridge — situated in one of the most scenically beautiful regions of the United States. Three major factors contributed to the structure's complexity: environmental constraints and inaccessibility of the site and the vertical and horizontal alignment. Due to these restrictions a system was devised to construct the bridge from the top down and forward. In the progressive placement method precast segments were transported across the previously built deck, assembled into final position and then post-tensioned.

**REFERENCE:** Muller, Jean M., and Barker, James M., "Design and Construction of Linn Cove Viaduct," PCI JOURNAL, V. 30, No. 5, September-October 1985, pp. 38-53.

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**KEYWORDS:** beams; code provisions; design (structural); partially prestressed concrete; prestressed concrete; stresses; ultimate moment capacity.

**ABSTRACT:** The stress  $f_{ps}$  in the prestressing steel at ultimate moment capacity of partially prestressed concrete beams is investigated both experimentally and through the use of a computerized nonlinear analysis. An extensive parametric evaluation was undertaken. The findings clarify the effects on  $f_{ps}$  of various parameters such as the type of section, the reinforcing index, the partial prestressing ratio, concrete strength, prestressing and reinforcing steel grades, and different amounts of compression reinforcement. Sensitivity of  $f_{ps}$  to the variation of certain parameters is also studied. The results of the nonlinear analysis are compared with the ACI 318-83 equation, other proposed equations, and experimental results. Some recommendations are put forth and a modified equation to predict  $f_{ps}$  is proposed. Application of the proposed method is illustrated with the aid of a numerical example.

**REFERENCE:** Harajli, Muhamed H., and Naaman, Antoine E., "Evaluation of the Ultimate Steel Stress in Partially Prestressed Flexural Members," PCI JOURNAL, V. 30, No. 5, September-October 1985, pp. 54-81.

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**KEYWORDS:** beams; design (structural); prestressed concrete; prestressing steel; prestress losses; relaxation.

**ABSTRACT:** Relaxation of prestressed steel in a concrete member is of smaller magnitude than the intrinsic relaxation which occurs in a tendon stretched between two fixed points. A reduced relaxation value should be employed in the calculation of prestress loss and the corresponding deformation. In this paper, a graph and an equation are presented for a relaxation reduction coefficient to be employed as a multiplier to the intrinsic relaxation for use in prestressed concrete design. A numerical example is included to show how the method can be applied.

**REFERENCE:** Ghall, Amin, and Trevino, Jose, "Relaxation of Steel in Prestressed Concrete," *PCI JOURNAL*, V. 30, No. 5, September-October 1985, pp. 82-94.

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**KEYWORDS:** beams; design (structural); prestressed concrete; reinforcement; research; torsion; torsion theories; torsional strength.

**ABSTRACT:** Results of thirteen symmetrically prestressed concrete rectangular beams tested under pure torsion are presented. All beams had essentially the same concrete strength, concrete cross-sectional area and  $m$ , the ratio of the yield force of the longitudinal reinforcement to the yield force of the transverse reinforcement per unit volume, was approximately equal to 2.0. The layout, type, and strength of reinforcement was similar in all beams; the principal variables studied were aspect ratio and amount of reinforcement. The behavior of the beam is compared to the behavior predicted by the space truss with spalling of the concrete cover, the space truss with softening of the concrete, and skew bending. It is shown that the torsional strength of beams with moderate to heavy reinforcement is essentially independent of the aspect ratio. Designers should be aware that this is contrary to the predictions of all three theories and in some cases could lead to unsafe design.

**REFERENCE:** El-Degwy, Wael M., and McMullen, Arthur E., "Prestressed Concrete Tests Compared With Torsion Theories," *PCI JOURNAL*, V. 30, No. 5, September-October 1985, pp. 96-127.

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**KEYWORDS:** bearing pads; buildings; creep; compressive strength; design (structural); elastomeric pads; performance; precast concrete; research; shear strength.

**ABSTRACT:** This summary report is a condensation of a study on elastomeric bearing pads for use in precast concrete building construction. This work included a survey of PCI producers to identify problems and practices, and a review of recent literature. Limited laboratory testing on unreinforced chloroprene (Neoprene) pads, and random oriented fiber and duck layer reinforced elastomeric pads was undertaken with respect to long term compressive creep, shear compression, and uniform and nonuniform compression. Parking structures in five cities were inspected to determine actual field performance of bearing pads under out-of-door conditions. As a result of this work, new design recommendations have been proposed. Bearing pad thickness design has been modified to allow thinner pads with subsequently larger shape factors, generally based upon allowing the pad thickness to be 1.4 times the anticipated movement of the end of the precast member. Previous design concepts generally required 2.0 times the end-of-member movement for the pad thickness.

**REFERENCE:** Iverson, James K., and Pfeifer, Donald W., "Bearing Pads for Precast Concrete Buildings," *PCI JOURNAL*, V. 30, No. 5, September-October 1985, pp. 128-154.

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