REFERENCE CARDS

KEYWORDS: box girders; bridges; bulb-tee girders; construction; interchanges; piles; precast concrete; prestressed concrete; segmental construction; transportation structures; tunnels.

ABSTRACT: This article provides an overview of the monumental efforts of Massachusetts transportation officials, their engineering consultants, and multitudes of construction industry professionals to ease congestion, improve motorist safety, and address issues of environmental quality in the heart of Boston, Massachusetts. The Central Artery/Tunnel Project is the largest highway construction job ever undertaken in the United States, involving many diverse types of precast concrete construction.

REFERENCE: Chandra, Vijay, and Ricci, Anthony L., "Central Artery/Tunnel Project: A Precast Bonanza — Part 1," PCI JOURNAL, V. 45, No. 3, May-June 2000, pp. 14-20.

KEYWORDS: bridges; cable-stayed bridges; construction; connections; design (structural); erection; pedestrian bridges; precast concrete; prestressed concrete; production; transportation structures.

ABSTRACT: An all-precast, prestressed concrete cable-stayed pedestrian bridge was constructed to transport workers across a busy four-lane highway to a major industrial park complex in San Pedro Sula, Honduras. In designing the 30.8 m (101 ft) long structure, special attention was given to creating an aesthetic harmony between the bridge and the entrance canopy as well as the other buildings in the industrial park. The purpose of this article is to present the design options, architectural concept, design considerations and particularly the design of connections, construction highlights, and especially the role that nearly 150 precast concrete components played in erecting the bridge. It is concluded that the design concepts and construction method, which proved to be efficient and economically successful in Honduras, can be applied in other parts of the world.

REFERENCE: Zhenqiang, Li, and Ramirez C., Rigoberto, "Precast Prestressed Cable-Stayed Pedestrian Bridge for Bufalo Industrial Park," PCI JOURNAL, V. 45, No. 3, May-June 2000, pp. 22-33.

KEYWORDS: chlorides; corrosion; durability; high strength concrete; high performance concrete; performance; permeability; precast concrete; prestressed concrete; reinforcing bars; saltwater environment; state-of-the-art paper; water-cementitious ratio.

ABSTRACT: This paper reviews chloride permeability issues for conventional and high performance concrete so as to provide realistic design and specification guidance for the construction of concrete structures in harsh environments. This review briefly discusses cracking issues of high strength, high performance concretes, a significant detrimental issue created by restraint to thermal and shrinkage contractions during the first 60 days of a structure's life and by the high modulus of elasticity and the low creep factors inherent with high performance concretes. The last portion of the paper reviews the five-year (1993 to 1998) Federal Highway Administration (FHWA) study at Wiss, Janey, Elstner Associates, Inc. (WJE) on high performance, corrosion-resistant steel reinforcing bars that can provide 75 to 125 years of design life, even in the presence of cracks in the concrete when exposed in harsh saltwater environments.

REFERENCE: Pfeifer, Donald W., "High Performance Concrete and Reinforcing Steel with a 100-year Service Life," PCI JOURNAL, V. 45, No. 3, May-June 2000, pp. 46-54.

KEYWORDS: architectural precast concrete; architecture; buildings; construction; curved façade; erection; design (structural); façade; multistory buildings; parking structures; precast concrete; prestressed concrete; wall panels.

ABSTRACT: Architectural precast concrete panels and exposed aggregate cladding, inlaid with granite, provided the exterior façade for this 30-story office building in downtown Charlotte, North Carolina. The lower three floors of the building were clad with granite whereas the upper floors were clad with architectural precast concrete. The frame of the building is structural steel with steel columns encased in concrete. Adjacent to the building is an all-precast, prestressed concrete 10-story parking structure which can accommodate 1043 vehicles. The total cost of precast concrete components for both structures was about $7.25 million. This article discussed the role that precast concrete played in the design, production and erection of this prestigious project.

REFERENCE: Stewart, Howard, Hanvas, Steven M., and Gleich, Harry A., "Curved Precast Façade Adds Elegance to IJL Financial Center and Parking Structure," PCI JOURNAL, V. 45, No. 3, May-June 2000, pp. 34-45.

KEYWORDS: analysis; beams; bridges; deflections; design (structural); girders; high performance concrete; high strength concrete; precast concrete; prestressed concrete; Super-T beams.

ABSTRACT: This investigation studied the use of high performance concrete in precast, prestressed concrete Super-T highway bridge beams. A parametric study was undertaken to investigate the structural and economic aspects of using high performance concrete. It was found that high performance concrete does offer some savings when used in beams with geometry consistent with that currently used in practice. High performance concrete may also offer indirect cost savings because it permits a reduction in the weight of beams. It was also found that high performance concrete may permit the use of beams with shallower section and reduce overall deflections.

REFERENCE: Mendis, Priyan, Nicholls, Scott, and Duffield, Colin, "Optimum Use of High Performance Concrete in Prestressed Concrete Super-T Bridge Beams," PCI JOURNAL, V. 45, No. 3, May-June 2000, pp. 56-65.

KEYWORDS: analysis; beams; bridges; computer method; buildings; design (structural); girders; prestressed concrete; section properties; software; torsion properties; wall assemblies.

ABSTRACT: In this paper, Prandtl's membrane analogy has been extended to facilitate the calculation of the properties of typical prestressed concrete sections. This method is particularly useful for computing the St. Venant torsional constant, *J*, of typical prestressed concrete girders or to compute all the cross-sectional properties of any irregular shaped open cross section. The membrane analogy requires the evaluation of the volume of the fictitious soap bubble. The computation of the volume of the soap bubble based on the membrane analogy is accomplished by numerically solving the governing differential equation (using the finite difference technique) for the ordinates and summing the volumes of each parallelepiped shape under an average ordinate. Application of the method is illustrated for typical bridge girders and building wall assemblies.

REFERENCE: Yoo, Chai H., "Torsional and Other Properties of Prestressed Concrete Sections," PCI JOURNAL, V. 45, No. 3, May-June 2000, pp. 66-72.
