REFERENCE CARDS

KEYWORDS: architecture; buildings; dormitory; erection; fabrication; glass fiber reinforced concrete; wall panels.

ABSTRACT: Glass fiber reinforced concrete (GFRC) architectural panels were used very effectively to clad the new residence hall for the School of the Art Institute of Chicago. Located in the city's historic Loop area of downtown, the new structure blends well with the adjacent 1924 building to which it now connects. Highly detailed panel designs that replicate older Chicago architecture combine with large window areas to create a design that makes the two buildings complement each other. The ease of handling of the thin, durable, lightweight panels helped the project keep to the planned fast-track schedule. At the site, the panels could be attached efficiently and quickly to the structural frame. This article discusses the design concept and features of the building, the advantages of GFRC, panel design and color characteristics, panel fabrication and installation, and cost considerations.

REFERENCE: Soenksen, Harry, and Tolson, James E., "GFRC Panels Give Terra Cotta Look to Chicago Art Institute Residence Hall," PCI JOURNAL, V. 47, No. 1, January-February 2002, pp. 14-25.

KEYWORDS: box beams; bridges; computer program; design (structural); girders; Pennsylvania; precast concrete; prestressed concrete; reinforcement; software.

ABSTRACT: Recent implementation of the LRFD (Load and Resistance Factor Design) and metric specifications for bridges in Pennsylvania resulted in significant design changes. To shorten the design path, the authors contributed to the development of a computer-based preliminary design software (QUIKBEAM99) that generates several potential solutions for a given bridge span and bridge width. These solutions are selected from PennDOT's extensive inventory of geometric shapes. The program yields the section sizes, volume of precast concrete, the required release strength and the number of strands. These parameters allow the rapid selection of an optimum solution for a given case. The paper details the various steps used in the procedure development, which was sponsored by the Prestressed Concrete Association of Pennsylvania. Based on statistical analyses, it is found that the adopted approach (multiple linear regression) predicts the major parameters of concrete strength and number of strands within a small relative error.

REFERENCE: Aswad, Alex, Djazmati, Basel, and Aswad, G. Gus, "Optimal Sizing of Prestressed Bridge Superstructures in Pennsylvania by LRFD," PCI JOURNAL, V. 47, No. 1, January-February 2002, pp. 26-37.

KEYWORDS: connections; dapped-end beams; design (structural); double tees; precast concrete; prestressed concrete; reinforcement; research; testing.

ABSTRACT: Prestressed concrete (PC) dapped-end beams have been used in buildings and parking structures as they provide an efficient and economical construction system. The re-entrant comer of a dapped-end beam develops a severe stress concentration, which makes it the weakest point of the connection. Reinforcing schemes and associated methods of design, which combine simplicity of application with economy of fabrication and provide the margin of safety required by present building codes, have been developed. This paper describes the experimental validation of an alternative reinforcing detail for the dapped ends of prestressed double tees, which satisfies the requirements of the design method contained in the PCI Design Handbook, Fifth Edition.

REFERENCE: Nanni, Antonio, and Huang, Pei-Chang, "Validation of an Alternative Reinforcing Detail for the Dapped Ends of Prestressed Double Tees," PCI JOURNAL, V. 47, No. 1, January-February 2002, pp. 38-49.

KEYWORDS: design (structural); openings; post-tensioning; precast concrete; prestressed concrete; reinforcement.

ABSTRACT: This paper describes an analytical investigation of the behavior and design of walls with rectangular openings under vertical post-tensioning and gravity loads. Critical regions in the wall panels where bonded mild steel reinforcement is needed are identified and a design approach is proposed to determine the required panel reinforcement. The effects of opening length, opening height, wall length, and initial stress in the concrete due to post-tensioning and gravity loads are considered. An example is included to demonstrate the proposed design approach.

REFERENCE: Allen, Michael G., and Kurama, Yahya C., "Design of Rectangular Openings in Precast Walls Under Vertical Loads," PCI JOURNAL, V. 47, No. 1, January-February 2002, pp. 50-67.

KEYWORDS: analysis; bridges; bulb-tee girders; design (structural); girders; high performance concrete; I-girders; lightweight concrete; span length; weight.

ABSTRACT: The maximum lengths for simple-span pretensioned concrete composite girders using high strength lightweight concrete (HSLWC) were investigated analytically using concrete strengths of 8, 10, and 12 ksi (55, 69, and 83 MPa) and prestressing strands of 0.6 in. (15.2 mm) diameter. The use of HSLWC produced spans up to 4 percent longer than the same section made with high strength normal weight concrete (HSNWC). Overall, the advantages of lightweight concrete with compressive strengths up to 12 ksi (83 MPa) include lower girder weight, relief from special permitting requirements, and longer span lengths.

REFERENCE: Meyer, Karl F., and Kahn, Lawrence F., "Lightweight Concrete Reduces Weight and Increases Span Length of Pretensioned Concrete Bridge Girders," PCI JOURNAL, V. 47, No. 1, January-February 2002, pp. 68-75.

KEYWORDS: bridge decks; bridges; fiber reinforced polymer; prestressed concrete; reinforcement; research; slabs; testing.

ABSTRACT: Half-scale models of a prestressed concrete bridge were constructed and tested to failure. The test specimens consisted of one simple span and two overhanging cantilevers. Five different strengthening techniques were investigated including near surface mounted Leadline bars, C-Bars, CFRP strips and extemally bonded CFRP sheets and strips. Ultimate capacity, failure mechanism and cost analysis of various strengthening techniques for concrete bridges are presented. The applicability of a nonlinear finite element analysis of post-tensioned bridge slabs strengthened with near surface mounted FRP reinforcement is enumerated.

REFERENCE: Hassan, Tarek, and Rizkalla, Sami, "Flexural Strengthening of Prestressed Bridge Slabs with FRP Systems," PCI JOURNAL, V. 47, No. 1, January-February 2002, pp. 76-93.

KEYWORDS: buildings; codes; design (structural); model codes; precast concrete; prestressed concrete; seismic design.

ABSTRACT: The seismic code development process that was in place in the United States for many decades is undergoing dramatic changes. These changes and their possible impact on seismic design provisions for precast concrete structures in the U.S. model codes are discussed.

REFERENCE: Ghosh, S. K., "Seismic Design Provisions in U.S. Codes and Standards: A Look Back and Ahead," PCI JOURNAL, V. 47, No. 1, January-February 2002, pp. 94-99.