

KEYWORDS: bridge; drilled shafts; high-performance concrete; lateral stability; piers; post-tensioned girders; spliced girder; supergirder; tendons.

ABSTRACT: This article describes the design and construction of the Old 99 (Riverside) Bridge, an 850-ft-long (260 m), 72-ft-wide (22 m), five-span, post-tensioned, spliced-girder bridge over the Skagit River in Washington State. In 2004, this bridge won a PCI Design Award. The bridge's superstructure comprises recently developed Washington State Department of Transportation W95PTG "supergirder" sections. These precast concrete girder sections were transported to a staging area close to the site, where they were spliced into single pieces that produced maximum spans of 180 ft (55 m). After delivery to the site, the post-tensioned girders were erected on top of the piers with no intermediate temporary supports. High-performance concrete (HPC), with design strengths of 7.5 ksi (52 MPa) and 10 ksi (69 MPa), was specified for the cast-in-place splices and precast supergirder segments, respectively. The use of HPC allowed a high initial post-tensioning force to be applied to the precast concrete girders. Special attention was paid to the lateral stability during erection and time-dependent camber of the assembled girders.

REFERENCE: Nikzad, Khashayar; Trochalakis, Theo; Seguirant, Stephen J.; and Khaleghi, Bijan, "Design and Construction of the Old 99 Bridge—An HPC Spliced-Girder Structure," *PCI Journal*, V. 51, No. 1, January–February 2006, pp. 98–109.

DISCUSSION NOTE

The Editors welcome discussion of reports, articles, and problems and solutions published in the *PCI Journal*. The comments must be confined to the scope of the article being discussed. Please note that discussion of papers appearing in this issue must be received at PCI headquarters by April 1, 2006.

KEYWORDS: admixture; albedo; American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE); building rating systems; construction; corrosion; design (mechanical); design (structural); durability; energy; Energy Star; energy use; environment; fly ash; green buildings; Green Globes; holistic/integrated design; landfill; Leadership in Energy and Environmental Design (LEED); life cycle; natural resources; noise resistance; recycling; silica fume; slag cement; sustainability; thermal mass; toxicity; urban heat island effect; UV resistance; waste management.

ABSTRACT: Sustainability is often defined as development that meets the needs of the present without compromising the ability of future generations to meet their own needs. While other building materials may have to alter their configurations, properties, or both to be applicable to sustainable structures, precast concrete's inherent properties make it a natural choice for achieving sustainability with today's new buildings. In this paper, sustainability concepts are outlined and different rating systems for evaluating sustainable design are introduced. Finally, ways are provided in which precast concrete meets or exceeds one rating system's requirements to achieve sustainability.

REFERENCE: VanGeem, Martha, "Achieving Sustainability with Precast Concrete," *PCI Journal*, V. 51, No. 1, January–February 2006, pp. 42–61.

KEYWORDS: Brundtland Report; cement kiln; design (structural); emissions; energy consumption; environment; fire resistance; fly ash; natural resources; precast concrete; primary materials; reinforced concrete; sustainability.

ABSTRACT: Adam Neville's guest editorial discusses some considerations for sustainability in the concrete industry.

REFERENCE: Neville, Adam, "Some Aspects of Sustainability," *PCI Journal*, V. 51, No. 1, January–February 2006, pp. 72–75.

KEYWORDS: college; column covers; double tees; load-bearing panels; low-e glass; medical; prefabrication; raker beams; rapid delivery; reveal patterns; self-consolidating concrete; shear walls; spandrel beams; utility ducts; voided concrete slabs; white aggregate concrete.

ABSTRACT: Located near Tampa Bay in southwestern Florida, the Lake Erie College of Osteopathic Medicine (LECOM) at Bradenton is a new 109,000 ft² (10,130 m²), innovative, problem-based learning facility for 600 medical students. Built for \$25 million, the all-precast concrete, three-story structure was delivered on a compressed schedule, with medical students arriving for classes in September 2004 only 14 months from the onset of design. Planning and building LECOM from the outside in toward the center, a rapid delivery team made maximum use of economies of precast concrete prefabrication, production, and erection schemes. This precast concrete solution proved superior to cast-in-place concrete and structural steel alternatives in aesthetic appeal, total project cost, structural durability, and particularly in its remarkably rapid completion. With white-aggregate concrete encompassing a blue central skylight, this impressive medical education center offers state-of-the-art wireless classrooms and forensic laboratories in a striking facility that is both architecturally beautiful and thoroughly modern.

REFERENCE: Padgett, Steve; Fawley, Rick; Thomas, Tom E.; Temple, Richard; Nesmith, Robbie; and Allen, Ron, "All-Precast Concrete Design Delivers On-Time Opening for Florida's LECOM Medical Students," *PCI Journal*, V. 51, No. 1, January–February 2006, pp. 82–97.

KEYWORDS: bed setup; industrial engineering; inventory reduction; lead time reduction; lean manufacturing; management; plant layout; problem solving; production; rapid improvement events; standardized tasks; sustainability; total preventative maintenance; value-added operations; value stream mapping; visual controls; waste reduction; workplace organization.

ABSTRACT: This article presents an overview of lean manufacturing, a process by which precast concrete plants can reduce waste and improve their production operations. The authors describe eight types of waste that can be eliminated and identify seven principles that can substantially improve success in the application of lean manufacturing. Many examples from the industry are given to show how waste can be eliminated and plant operations improved. Although only a few PCI member companies are currently using lean manufacturing, those that are applying these techniques show decreased production costs, a reduction in rework, and enhanced production capacity.

REFERENCE: Ray, Bill; Ripley, Paul; and Neal, Doug, "Lean Manufacturing—A Systematic Approach to Improving Productivity in the Precast Concrete Industry," *PCI Journal*, V. 51, No. 1, January–February 2006, pp. 62–71.

KEYWORDS: anchorage bond; bond slip; dry cast; flexural stresses; flexure-shear cracking strength; high-strength concrete; high-strength reinforcement; hollow-core; one-way slabs; precast concrete; reinforced concrete member; shear lag; shear reinforcement; shear strength; slip forming; web-shear cracking strength.

ABSTRACT: Reinforced concrete members without shear reinforcement can fail at loads less than those predicted by ACI 318-05, Eq. 11-3. Thus, there is an additional requirement for minimum shear reinforcement if V_u exceeds $0.5\phi V_c$. This requirement, however, is waived for slabs, including hollow-core units. Concern has been raised recently over the lack of shear reinforcement in deep, one-way slabs, particularly those using high-strength concrete and/or high-strength reinforcement. Several U.S. precast concrete manufacturers have chosen to conduct shear tests on hollow-core units with depths greater than 12 in. (300 mm). This paper presents the results of shear strength tests performed by three U.S. manufacturers as well as European research relating to hollow-core shear strength. The European and U.S. test data are compared and recommendations on further research are presented.

REFERENCE: Hawkins, Neil M. and Ghosh, S. K., "Shear Strength of Hollow-Core Slabs," *PCI Journal*, V. 51, No. 1, January–February 2006, pp. 110–114.

KEYWORDS: architectural spandrels; double tees; environment; green buildings; inverted tee beams; Leadership in Energy and Environmental Design (LEED); locally manufactured materials; parking structure; precast columns; sustainability; vehicle impact barriers.

ABSTRACT: An all-precast/prestressed concrete solution was used to build a multipurpose, three-story, government office building and adjoining two-level parking structure, utilizing environmental and energy conservation guidelines.

REFERENCE: Nasser, George D., "United States Department of Transportation Facility, Lakewood, Colorado," *PCI Journal*, V. 51, No. 1, January–February 2006, pp. 76–79.

KEYWORDS: architectural precast; corrosion; design (structural); durability; natatorium; prestressed concrete; rapid delivery; single tees.

ABSTRACT: Both structural precast, prestressed concrete and architectural precast concrete were used effectively to build an attractive, two-story, 32,000 ft² (3070 m²) swimming pool facility for a well-known high school in a north-west suburb of Chicago, Ill.

REFERENCE: Nasser, George D., "Elk Grove High School Natatorium, Elk Grove, Illinois," *PCI Journal*, V. 51, No. 1, January–February 2006, pp. 116–119.
