

# CONCRETE BRIDGES IN LEE COUNTY, FLORIDA

by Paul Wingard, Clay Simmons, and Ehab Guirguis, Lee County, Fla.

Lee County is located along the picturesque southwest Gulf Coast of Florida and includes the famous Sanibel and Captiva Islands. The Lee County Department of Transportation (LCDOT) is charged with the maintenance responsibility of 128 bridge structures within Lee County. LCDOT's bridges represent approximately 1.16% of the total number of bridges in the state of Florida.

The majority of these bridges are located in a high humidity, salt-water environment, so corrosion resistance is of utmost importance to the service lives of our bridges. LCDOT has found that bridges constructed of reinforced concrete fulfill these needs nicely and provide reliable service life to support growing traffic demands as our population continues to increase.

Twenty-eight of our 128 bridges, or 22%, are concrete box culverts crossing small to medium width canals and bodies of water where navigation is not a consideration.

Thirty-nine bridges (31%) are constructed using precast, prestressed concrete slabs. These bridges are usually located over medium-width bodies of water and small navigable canals.

Bridges over Lee County's largest bodies of water, including the newly completed Sanibel Causeway Bridges, are constructed with precast, prestressed concrete piles and beams. This is typical of the practice for such bridges located across the state of Florida. These large bridges represent an

additional 19 structures or 15% of Lee County's overall inventory. Included in this category are three functioning drawbridges.

The remainder of those qualifying as bridges according to the Federal Highway Administration (FHWA) definition as having an effective span length of 20 ft or greater, consist primarily of small concrete culverts providing crossings over such features as drainage ways. All public bridges in Lee County that meet this FHWA bridge definition are inspected by the Florida Department of Transportation (FDOT) at least once every 2 years.

With an average age of 25.7 years, we are pleased with the performance of reinforced concrete as our primary bridge construction material. None of Lee County's bridges are currently classified as structurally deficient according to FHWA/FDOT condition inspection and rating guidelines.

In addition to material selection, Lee County believes that preventative maintenance routines play a significant role in keeping the county's bridges in the best possible condition. LCDOT is fortunate to have in-house bridge repair crews, comprising seven bridge technicians that handle most required maintenance including concrete spall repairs, joint repairs, guardrail repairs, vessel fender repairs, routine substructure cleaning, and drawbridge maintenance. Qualified contractors are procured for

larger repairs and long-term comprehensive bridge rehabilitation projects.

In 2007, LCDOT completed construction of the Sanibel Causeway Bridges. The three bridges were constructed using precast, prestressed concrete bulb-tee beams. The bridges have a total length of approximately 1.6 miles and contain 6.6 miles of precast beams. They use 13,339 yd<sup>3</sup> of concrete in the superstructure, 14,087 yd<sup>3</sup> of concrete in the substructure and 28 miles of 30-in.-square, hollow, precast, prestressed concrete piles. In addition to the piles and beams, much of the substructure, the footings and columns, were also precast elements, constructed at a temporary casting yard set up close-by within Lee County.

In the future, LCDOT will continue to use concrete as our primary construction material to build new bridges as an efficient, cost-effective, and timely material for bridge construction along the Gulf Coast region of Florida.

*Paul Wingard is deputy director, Department of Transportation, Clay Simmons is division director, Department of Transportation Operations, and Ehab Guirguis is bridge engineer, all with Lee County, Fla.*



*A view from under the Sanibel Island Bridge A revealing its unique piers.*



*The Midpoint Bridge was constructed in 1997.*



*The three Sanibel Island Bridges were completed in 2007 and have a total length of 1.6 miles. Photo: Florida Aerial Services Inc.*



## Silica Fume Association

The Silica Fume Association (SFA), a not-for-profit corporation based in Delaware, with offices in Virginia and Ohio, was formed in 1998 to assist the producers of silica fume in promoting its usage in concrete. Silica fume, a by-product of silicon and ferro-silicon metal production, is a highly-reactive pozzolan and a key ingredient in high performance concrete, dramatically increasing the service-life of structures.

The SFA advances the use of silica fume in the nation's concrete infrastructure and works to increase the awareness and understanding of silica fume concrete in the private civil engineering sector, among state transportation officials and in the academic community. The SFA's goals are two-fold: to provide a legacy of durable concrete structures and to decrease silica fume volume in the national waste stream.

Some of the recent projects completed by the SFA, under a cooperative agreement with the Federal Highway Administration (FHWA), include:

- The publication of a *Silica Fume User's Manual*—the manual is a comprehensive guide for specifiers, ready mixed and precast concrete producers, and contractors that describes the best practice for the successful use of silica fume in the production of high performance concrete (HPC).
- The introduction of a Standard Reference Material (SRM)<sup>®</sup> 2696 Silica Fume for checking the accuracy of existing laboratory practices and to provide a tool for instrument calibration. This SRM is available from the National Institute of Standards and Technology (NIST).

A much anticipated research program nearing completion by the SFA is the testing of in-place silica fume concrete under service conditions. At the conclusion of this research the results will demonstrate the benefit of silica fume concrete's unparalleled long-term performance. For more information about SFA, visit [www.silicafume.org](http://www.silicafume.org).

**How to do it in Precast...**

**Q** How do you connect the rebar?

**A** Use the... **NMB Splice-Sleeve System.**

**Q** How is the moment connection made?

**A** All you need is an emulative detail, reconnect the concrete and rebar.

*Edison Bridge, Fort Myers, Florida*

*cross-section*

*Mill Street Bridge, Epping, New Hampshire*

**NMB SPLICE SLEEVE**

**SPLICE SLEEVE NORTH AMERICA, INC.**  
 192 Technology Drive, Suite J • Irvine, CA 92618-2409  
 PHONE: 949-861-8393 • FAX: 949-861-8419 • e-mail: [info@splicesleeve.com](mailto:info@splicesleeve.com)  
**WWW.SPICESLEEVE.COM**