GEMS OF THE CITY: THE BRIDGES OF DAYTON, OHIO

by Stephen J. Finke, John D. Gower, Joseph R. Weinel, and Keith G. Steeber, City of Dayton, Ohio.

Construction on the six-lane, seven-span Stewart Street Bridge over the Great Miami River began in June of 2008 and its completion is expected in December of 2009. It uses spread, precast, prestressed concrete box beams on V-shaped piers.

Dayton, Ohio, located in the Miami River Valley, sits at the confluence of four waterways: the Great Miami River, the Mad River, the Stillwater River, and Wolf Creek. The City of Dayton owns and maintains 10 roadway bridges over these watercourses, with the original bridges being built between 1907 and 1927. Of those, one was built as a steel truss bridge, two as concrete-encased steel plate girder bridges, and seven as concrete arch bridges. Dayton's bridges of the 1800s were primarily steel bridges. However, with the development of street cars, it was determined that steel bridges could not support the extra weight, and in the early 1900s the decision was made to require concrete to be the main material for the construction of future bridges.

All bridges in Dayton are inspected annually. Recognizing a need to perform a more thorough evaluation of these bridges, the city hired a consultant in 1999 to inspect them, assess their condition and structural integrity, and provide recommendations (with costs) for any necessary rehabilitation or replacement. What was found was alarming: eight of the 10 bridges would need reconstruction or replacement within the next 15 years. So far, with the help of the Ohio Department of Transportation, the Ohio Public Works Commission, and the U. S. Department of Housing and Urban Development, the city has been able to fund the replacement of seven of these bridges.

One of the first tasks undertaken by the Engineering and Planning staff was to develop a philosophy for the aesthetics of the new bridges. Although most of the bridges were arches, the thinking was that it wasn't necessary that new bridges had to be arches. The philosophy that was crafted envisioned a series of high-style bridges that would strengthen unique characters of their locations. What has resulted is a design spectrum that incorporates the best of public works design traditions of Dayton's past into contemporary design approaches that represent a fresh and forward look for the city. At least three alternate bridge types were evaluated for each project, and the community was engaged in the decision making for the bridge selected. Precast, prestressed concrete beams—box beams, I-beams, and U-beams—have been used on all the bridges. Concrete's availability, durability, and low maintenance made its choice a sensible one. Features such as lighting, railing, and fascia panels have been incorporated into final designs, enhancing existing features prevalent in the surrounding neighborhoods.

Two bridges presently under construction will function as new public works landmarks on Dayton's panoramic landscape. The Stewart Street Bridge over the Great Miami River provides the significant east-west connection through southern Dayton. The six-lane, seven-span precast, prestressed concrete box beam bridge, supported on cast-in-place concrete V-shaped piers, will be the city's largest. It will feature colored, patterned concrete plazas at each corner, galvanized, painted steel railing, and decorative under-bridge lighting. The Edwin C. Moses Boulevard Bridge over Wolf Creek will be the city's most visible bridge for western downtown residents and businesses and for travelers on Interstate 75. The new two-span structure will consist of a concrete deck on prestressed concrete U-beam girders, supported by wall-type piers. The west sidewalk will present a cable-stay appearance, with a 55-ft-tall tower and 10 cable tendons. Each cable will be individually lit, and flood lighting will be provided for the tower.

It will be the aesthetic look and innovative concrete structure design that will define the next century of the city of Dayton's bridges. They will truly be the 'Gems' of the Gem City.

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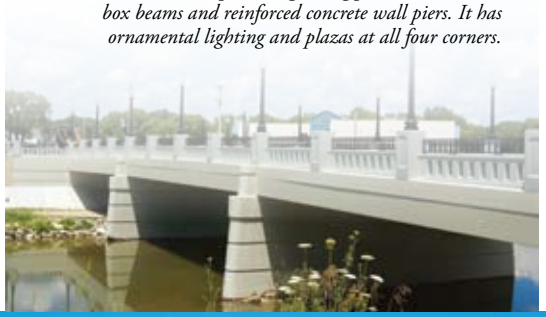
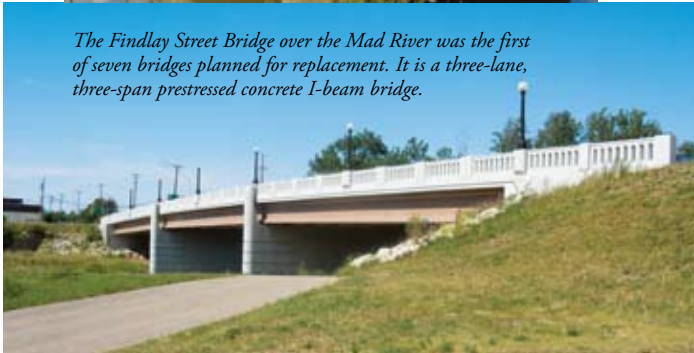
The Washington Street Bridge over the Great Miami River is a three-lane, seven-span, precast, prestressed concrete box beam bridge with precast concrete arch segments and cast-in-place concrete wall piers. It has 10-ft-wide sidewalks with decorative lighting above and below the bridge.

The Paul Laurence Dunbar Street Bridge spans Wolf Creek as a two-lane, three-span bridge using prestressed concrete box beams and reinforced concrete wall piers. It has ornamental lighting and plazas at all four corners.



This is a rendering of the Edwin C. Moses Boulevard Bridge over Wolf Creek. It will be a five-lane, two-span bridge with U-girders.

The Findlay Street Bridge over the Mad River was the first of seven bridges planned for replacement. It is a three-lane, three-span prestressed concrete I-beam bridge.



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)® 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.