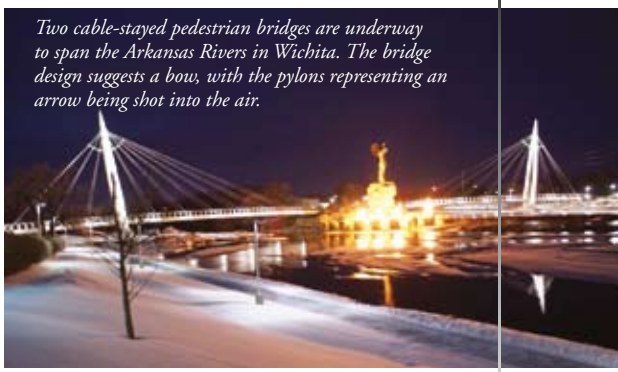
Kansas K-beams are typically used, but the use of T-shaped walls and box beams are offering new applications for concrete



Two cable-stayed pedestrian bridges are underway to span the Arkansas Rivers in Wichita. The bridge design suggests a bow, with the pylons representing an arrow being shot into the air.

Wichita Projects Expand City's CONCRETE USAGE

By James Armour

The City of Wichita constructs bridge projects using a variety of materials. Each situation is evaluated for the site logistics and benefits provided. The result is that more than 50 percent of the bridges we erect use concrete, often with Kansas Department of Transportation K-beams for the precast, prestressed concrete members. The Kansas K-beams have a similar cross section to the AASHTO I-beams. Today, our concrete projects involve some unusual designs, including a large number of precast concrete T-shaped walls and a drainage project using concrete bridge components that we are constructing in conjunction with Sedgwick County.

Our typical bridge projects are approximately 160 to 200 ft long and are designed as overpasses above roadways. Usually, these occur where freeways intersect with roadways that we need to keep at grade level. The bridges typically include a cast-in-place concrete deck with a 1- to 2-in.-thick silica fume topping to provide a durable surface.

Working with consultants on each project, we have used precast concrete components on a wide range of designs because it has proven to be advantageous, particularly for shorter spans. Generally, we have enough lead time to allow us the option of using any material. We usually don't need to take advantage of the speed of erection that precast concrete can provide. However, speed of construction is a critical element in our considerations, as we try to reduce traffic disruptions as much as possible.

The city is currently building two asymmetric cable-stayed pedestrian bridges with lengths of 331 and 251 ft across the Big Arkansas and Little Arkansas Rivers, respectively. The superstructure consists of match-cast, two-cell, box girder segments 32 ft long, 12 ft 4 in. wide, and 4 ft deep at the longitudinal centerline. Each segment weighs 57 tons. The segment are erected on falsework and post-tensioned longitudinally by four tendons before the stay cables are attached and falsework removed. Specified compressive strength for the concrete is 6500 psi. A 1½-thick silica fume concrete overlay is cast on the segments after the stay cables are attached.

Match-cast segments are being used for the cable-stayed pedestrian bridge.

Two recent projects have involved unusual concrete applications that have extended the ways in which we use concrete. The first of these is the use of precast concrete T-shaped walls to aid in a $100-million railroad improvement program following the merger of the Union Pacific and Burlington Northern Santa Fe railroads. The goal was to elevate the tracks at the site of at-grade crossings to reduce disruptions to traffic.

Using T-shaped walls allows us to cast the sections in advance and have them ready when the train tracks are detoured from the construction site. The T-shaped walls then are placed and backfilled to create a retaining wall as high as 30 ft. The new tracks are placed on the retained area. Several thousands of these T-shaped wall sections are being used on the project, which began in 2004 and will continue until June 2008.

The second project underway is in conjunction with county officials and involves the use of precast concrete box beams as drainage pipes for the new arena being built in downtown Wichita. The project, which required countywide approval, features 9- by 5-ft box segments that connect the arena roadway with the river about a half-mile away.

This project also gave us the opportunity to upgrade the existing storm sewers to alleviate drainage problems in the downtown area. The larger cross-section of the precast box beams ensures a smoother flow of water than a traditional pipe with a smaller diameter. The second phase of that work began in February, with the project scheduled for completion by fall, 2007.

These examples of some of the different ways the city uses concrete components show the diversity of the projects we are involved with and the ways we can use the material to our advantage for applications other than as beams to create bridge spans.

James Armour is City Engineer for the City of Wichita, Kansas.