A section of the Coleman Bridge arrives by barge, ready to be maneuvered into place.

VIRGINIA Virginia Floats a Solution

NATION'S LARGEST DOUBLE SWING SPAN BRIDGE REPLACED IN 9 DAYS

In 1952, the $9 million, two-lane George P. Coleman Bridge (named for the Commissioner of the Virginia Department of Highways from 1913-1922) opened to traffic. An engineering feat, the new structure debuted as the largest double swing span bridge in the United States. The bridge was designed to carry 15,000 vehicles per day and did its job admirably for more than 40 years. Time, however, has a way of taking its toll on the built environment, and the Coleman Bridge was no exception.

Population Growth, Narrow Roadways, Antiquated Machinery

The Virginia Department of Transportation (VDOT) faced steep challenges as it evaluated options for improving the safety and service of the critical connector. Besides the age of the structure, population growth was driving increasing numbers of motorists to rely on the Coleman Bridge and its feeder, Route 17, for daily travel. By the mid-1990s, the bridge was carrying over 27,000 vehicles per day, nearly double the number it was intended to accommodate.

Roadway width was also a problem. The two-lane bridge was 26 feet wide with no shoulders and no median. The bridge became a bottleneck as Route 17 narrowed from a four-lane highway to a two lane river crossing. With no shoulders, even the smallest accident or breakdown created a major traffic headache. The narrow bridge also carried safety concerns – without a median or shoulders, it did not meet standards for a primary corridor such as Route 17.

Adding to the problem, the swing-span machinery that operated the bridge was antiquated and often experienced mechanical problems.

Community Concern

Opinions diverged on the ideal solution: build a tunnel, widen the bridge, build a new bridge? VDOT considered a total of 17 options. The community weighed in as well. Residents wanted traffic problems at the Coleman Bridge resolved, but they feared increased congestion during construction and excessive tolls as a result of the project.

Add to this mix the fact that the bridge was strategically located near a military installation; any construction decision had to ensure the U. S. Navy had continuous access to the critical Yorktown Naval Weapons Station upstream. A neighboring historic area, Yorktown, was also a consideration. Many residents and historic organizations rejected changes that might become visible from the Yorktown colonial battlefields.

Widen the Bridge

VDOT sought a plan that would improve traffic flow over the bridge while keeping congestion during construction to a minimum, all the while meeting a host of stakeholder concerns.

In the end, the agency chose technologies and procedures that earned the recognition of the Highways for LIFE program because they met a goal of leveraging innovative solutions to build a safer, better bridge while reducing construction time and remaining cost-effective.

VDOT decided the best option was to widen the existing bridge. This was the least costly way to improve traffic flow while accommodating environmental impact, safety, and current and future traffic demands. VDOT proposed an updated bridge that was three times as wide (74 feet) as the current structure, had four lanes, a median barrier, and full shoulders. The bridge additions would be built on existing piers and featured a concrete deck that offered motorists a smoother, safer ride than the original open steel grid deck.

Having reached a milestone decision on this hotly debated project, VDOT's challenges had just begun. A comprehensive community outreach program was needed to tackle fears and negative public opinion while agency teams searched for innovative techniques to complete the job as efficiently as possible. The next big hurdle was a significant detour.

Media Campaign Launch

VDOT had to give the public some tough news: things would get worse before they could get better. Traffic congestion would increase during construction; scheduled bridge closings promised a 60-mile detour for two 12-day periods; and, in the end, tolls would be levied to pay for the improvements.

VDOT used several creative methods to keep drivers informed and increase public buy-in surrounding the project. A Public Information Task Force was established well before work began on the bridge to craft a long-range communications plan. Surveys were conducted to identify usage patterns and optimal means of announcing construction alerts to motorists. Once work began, a toll-free, 24-hour hotline was established to field feedback from motorists and answer questions. Another toll-free number provided current traffic conditions at the bridge. Radio advisories and electronic message signs updated bridge activity. Public meetings were held throughout the project, and news releases were continually supplied to media outlets. A local newspaper even published a weekly column –"Coleman Hotspots"– to keep drivers informed. Three newsletters were sent to every address in the seven surrounding counties, and VDOT officials made regular television appearances with bridge news.

VDOT worked closely with the local community to prepare for the impending bridge closure. Roads were upgraded along the detour route in the small town of West Point to handle an increased traffic load. VDOT worked with major employers in the area to increase the availability of commuting solutions like liberal leave, on-site housing, ride-sharing, and flex-time scheduling. Several commuter parking lots were improved or built so drivers could take free shuttle bus service to major employment centers. Many hotels even offered discounts to commuters during the detour.

By the time construction started, motorists were aware of how the work would affect their travel. All the while, VDOT pursued ways to limit disruption, most notably by reducing construction time.

Offsite Construction and Prefabrication

The Coleman Bridge contract was awarded to Tidewater Construction Corporation. The original plan called for two scheduled bridge closings of 12 days each, forcing a 60-mile detour around the bridge. Fortunately, refinements in the work schedule allowed Tidewater Construction to cut bridge closure time in half, compressing two 12-day closures into one.

When the team evaluated options for maintaining traffic during the truss swap out, a temporary floating bridge with a movable span and a temporary ferry service were evaluated, but could have added an estimated $15.2 million in costs. The conclusion: cut costs and closure time by building the bridge offsite 30 miles downriver at the Norfolk International Terminal, and floating the finished span into place.

The practice of floating a bridge into position is not unusual. In fact, steel trusses for the original Coleman Bridge were floated into place in the 1950s. In most cases, however, only the steel work is constructed offsite and the roadway surface, light poles, and other details are added once the steel is in position, requiring several months of additional construction. The new Coleman Bridge targeted a deadline of just 12 days to float the entire 2,540 feet of truss and swing spans into place, prefabricated with pavement, light poles, and barrier walls. In the end, it took only nine days to welcome traffic back to the Coleman Bridge, with every detail complete, including the bridge tender's house.

"The concept of floating a bridge is nothing new; we're just taking it a step further," said Jim Cleveland, a VDOT District Administrator, to a local newspaper at the time. "This is the first time a bridge even close to this size has been installed at one time with everything ready for traffic."

The Replacement

The Coleman Bridge project included the replacement of six truss spans approximately 774 meters (2,540 feet) long. The original 1210-foot approaches were two girder steel spans. The footings, columns and caps of the land piers on the approaches were widened on both sides. Prestressed concrete beams were erected and the deck slabs placed along both sides while traffic was maintained down the center. Once the trusses were switched out, traffic was directed to the widened approaches. Then the original steel girder was removed and replaced by prestressed concrete beams. Lightweight concrete was used on decking to minimize dead load on existing piers and transport barges.

VDOT tests the swing span on the Coleman Bridge prior to reopening the crossing to traffic.

Top Challenges

Project challenges were met with careful planning and teamwork. According to George M. Clendenin, P.E., State Structure and Bridge Engineer for VDOT, a major issue was whether the caissons could support the weight of the trusses. Clendenin said, "The caissons supporting the trusses were so large and so tall, most of the weight they support was their own dead load. VDOT took deep borings, performed sophisticated soils tests and performed finite element soil analysis of the caissons. It was determined that the caissons could support the weight of a widened truss. Based on this analysis, a scheme was developed to widen the existing pier caps using post tensioning."

New Coleman Bridge

Approach spans required a few months of additional work before VDOT could open the entire bridge to traffic. Praise then poured in. The new Coleman Bridge earned numerous awards, including a 2000 Merit Award from the U.S. Department of Transportation. In a press release, then-Secretary of Transportation, Rodney E. Slater, observed, "Good design means transportation facilities that help us get where we want to go safely and efficiently while enhancing the beauty and livability of our communities. The design and execution of the projects we honor today display the spirit of innovation…and the key to the success of America's transportation systems in the 21st century."