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BRISTOL CULVERT UPGRADE TO RELIEVE FLOODING

VMS Construction installs a half-mile of new concrete culvert for DOT along Routes 6 and 69 to remediate a chronic drainage problem.

By Paul Fournier

VMS Construction crew guides concrete junction boxas it is lowered by crane into pit in Bristol, Conn., as part of flood control culvert project forConnecticut DOT.

Chronic flooding of portions of a busy arterial in the city of Bristol, Conn., will be eliminated with the completion of major drainage improvements by the state's Department of Transportation (DOT).

VMS Construction Company of Vernon, Conn., has a $5.6-million contract with DOT to install about 3,500 feet of drainage improvements along Route 6/69. Flooding has plagued sections of the roadway for many years, according to Juan Ruiz, transportation engineer for DOT's District 1 Construction.

"There's a lot of local flooding, especially near the railroad crossing because of undersized drainage in that area. Sometimes there's 10 inches of standing water," Ruiz said. The railroad track, owned by Springfield Terminal, a subsidiary of Pan Am Railways, is still used but carries only freight trains these days.

VMS' contract includes the installation of approximately 2,700 feet of large concrete box culvert that is being supplied by manufacturer Concrete Systems Inc. of Hudson, N.H., plus about 800 feet of 12-inch to 42-inch-diameter reinforced concrete pipe provided by the Wauregan, Conn., facility of Hanson Pipe and Precast.

Utilities Galore

One of the biggest challenges facing the contractor is the installation of large concrete structures among the myriad underground utilities typical of an older city. Located in central Connecticut about 20 miles south of Hartford, Bristol was incorporated as a town in 1785, became a city in 1911 and is now the state's ninth largest city. Home for 62,000 people and 1,800 businesses – including ESPN headquarters – the city has a mix of underground infrastructure – some ancient, some very new – serving residential and commercial needs.

Owner: *Connecticut Dept. of Transportation*

General Contractor: *VMS Construction Company*

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Marino's 150-ton Demag AC395 crane begins the pick of 29-ton junction box as it prepares to lower the box into pit at Route 6/69 intersection.

A John Deere 624J with a side-dump bucket places stone into bucket of John Deere 330C for placement in pit.

"There are extensive existing utilities, such as water mains, sewer lines, gas lines and even level three fiber optics," said Victor Serrambana Jr., P.E., president of VMS Construction. "Dealing with them is the toughest part of this job."

Serrambana and his project manager, Lynn Stabnick, have to run a flexible operation in order to maintain production while at the same time accommodating the schedules of utility companies. He cited an example:

"We started installing box culvert at the downstream end of the job," he said. "But as we got past the first intersection the crew had to stop because the utility company couldn't relocate the gas line at that time. So we leapfrogged the crew to the middle of the job and started installing box culvert there."

Later, the crew had to go back to the lower end of the job and pick up where they had left off, he said. Such interruptions lead to another challenge: With contractor and utility company crews periodically moving to different locations along the culvert alignment, detours for the artery's high-volume traffic have to be carefully worked out in advance.

"The city has been very cooperative in setting up detours. They come up with ideas of how to set detours, and the state goes along with it," he said.

Threading a Culvert

Threading a large concrete culvert through a maze of utilities while keeping the structure on line and grade requires high-precision engineering layout. According to project manager Stabnick, DOT has done just that.

"The state has done a pretty good job of locating all utilities," she said. This was extremely important, considering that the size of the culvert ranges from three feet by three feet to three feet

six inches by eight feet in cross section. Whenever possible, she said, DOT had designed the culvert to pass over or under existing utilities. Those utilities passed over by culvert may be encased in steel sleeves. At the railroad crossing, DOT's design calls for the culvert to run beneath the tracks, with a three-foot soil layer between the top of the culvert and the bottom of the tracks.

In cases when passing over or under an obstructing utility isn't possible, DOT has designed offsets. If the utility is a water main or sewer, VMS crews relocate the pipe. In one instance, the contractor relocated a 20-inch water main. For fiber optics, gas main or overhead power lines, utility companies are called in. And in one case a subcontractor, Airway Electric, had to be brought in to relocate a traffic light pole that happened to be right in the middle of a proposed junction box.

The contractor relies on CAT 345B and John Deere 330 excavators as the principal digging machines for culvert and junction boxes, with a Hitachi 50 excavator performing utility relocations.

Deep Hole for Megabox

While the largest concrete culvert sections are heavy – about 10 tons for the 3.5-foot by 8-foot sections – they are dwarfed by some of the 16 junction boxes made by CSI for the job. Designed to transition culvert from one size to larger or smaller culvert, or from pipe to culvert, these precast structures weigh up to three times that of the biggest culvert sections. The largest of the junction boxes was installed in late July 2009 at the intersection of Route 6, Route 69 and Maple Street. This CSI box measured 17 feet 2 inches by 13 feet 10 inches by 7 feet 10 inches tall and had an 8-inch-thick bottom slab and sidewalls. It weighed approximately 29 tons. Two of the manufacturer's Kenworth 18-wheel flatbeds delivered the wide-load junction box and its 12-inch-thick cover slab to the job site, which at the time was experiencing a soaking rain.

VMS had employed the CAT 345B to excavate a 21-foot by 17-foot by 10-foot pit to receive the junction box, using slide rail shoring provided by SBH Trench Shoring Co. to support the excavation. According to company president Bill Edgerly, the slide rail system consisted of stacked 2.4-meter and 1.4-meter (about eight-foot and four-foot, respectively) panels to produce the desired depth of support.

"The contractor used the slide rail system to make sure excavation wouldn't undermine the adjacent road," explained Edgerly. Abnormal precipitation during July in this area had saturated the ground, worrying some about the possibility of soil movement.

Crews placed a geotextile fabric on the bottom of the pit and covered it with a 12-inch layer of crushed stone to serve as a stable base for the box.

John Deere 330C excavator deposits more bedding stone for junction box.

Demag crane operator eases junction box into pit, which was supported by slide rail system to prevent undermining of adjacent road at rain soaked site.

With heavy rain falling, crew waits for junction box slated to be lowered into pit supported by SBH Slide Rail System.

A Cautious Lift

For the pick, VMS hired Marino Crane, a Barnhart Northeast division located in Middletown, Conn. Marino delivered a 150-ton-capacity Demag AC395 hydraulic crane with a 197-foot maximum-height boom to do the lifting. The operator positioned the crane a safe distance from overhead power lines. Then, as a police detail controlled traffic at the busy intersection, the Demag raised the box off the flatbed truck, slowly swung its heavy burden and eased it down into the pit.

The 14-ton cover slab was similarly lifted from the second flatbed but was placed on the ground near the pit. It would be placed on top of the box once VMS had poured a concrete pipe invert inside the structure. In spite of heavy traffic, downpour and the proximity of power lines, the pick itself went without incident and took but a few minutes.

Extensive Restoration

Generally, VMS has been fielding three crews for this project: one to install culvert and drainage pipe, one to relocate utilities and one for restoration work. The latter effort is a major one. It entails milling the 40-foot-wide road asphalt pavement to a depth of two inches, and replacing the material with new hot mix asphalt. It also involves constructing new five-foot-wide concrete sidewalks, curbs and a two- to three-foot-wide bituminous concrete snow shelf between the sidewalk and the street.

VMS has been doing restoration work to the satisfaction of the town and its merchants, according to DOT's Ruiz. He pointed out overall job progress has been excellent and that while the contract calls for a September 2010 finish, about 90 percent of the culvert installation had already been completed by late July of this year.