

THE TWO-PIECE BOX CULVERT

A two-piece precast concrete box culvert replaces Ohio's failing steel structures.

precast solutions – Fall 2006

By Bridget McCrea

When Darrell Eades grew tired of watching road crews muscle around with four-sided box culverts, he set out on a mission to find something that would be easier to install, yet sturdy and durable enough to withstand the punishment they were bound to receive while buried underground.

"Most of the time we had to use a crane to set them and do a lot of jockeying around to get them together tightly," said Eades, bridge superintendent for Madison County Engineers in London, Ohio.

Four years ago, Eades found the answer in a two-piece precast concrete box culvert being produced by Scioto Valley Precast of Chillicothe, Ohio. Since then, he's been specifying the two-piece precast concrete culvert for steel culvert replacements in the county. Eades said preexisting steel products have not lived up to expectations and in some cases have needed replacement after only 20 years. He now specifies precast concrete for all culvert-type projects and for anything that goes under the road.

Eades said the innovative dual-piece design allows for better maneuverability and installation, shaves off project time and results in a solid, rugged product that's built to last.

"Because they come in two sections, we're able to set them with an excavator," said Eades. "Up to a certain size culvert, that completely eliminates the need for a crane."

Overall, Eades said he's impressed with the precast product and the manufacturing processes that allow engineers like himself to complete projects in a timely, efficient fashion. "Our guys really like the ease of handling and the fact that installation is finished in no time at all," said Eades. "It's a fast operation that's also very economical."

Ingenious idea

The two-piece culverts that caught Eades' attention four years ago are the brainchild of Jim Bumen, owner of Scioto Valley Precast. In business for 30 years making septic tanks and box culverts, Bumen landed on the idea 10 years ago after seeing precasters in California and Arizona using a similar design.

Instead of an industry standard four-sided, one-piece box culvert, the precaster makes two-piece culverts of various sizes. Because the culverts come in two pieces, they are easier to install in remote locations where larger trucks and equipment could not normally reach.

"We were having trouble getting cranes into a lot of job sites at the time," Bumen said. "I revamped the design that was being used by other companies and came up with this."

Today, Scioto Valley Precast offers the culverts in sizes ranging from 3 feet to 16 feet, all of which are manufactured in two different pieces. While a standard 10-foot by 6-foot box culvert weighs roughly 26,000 pounds, Scioto Valley Precast splits the weight with two 13,000-pound halves. With this significant loss in product weight, lighter cranes can be used for installation, and overall maneuverability can be gained throughout the process. The company also produces a 3-foot span box in 1-, 2- and 3-foot heights that contractors are using to replace plastic pipe installed for smaller culverts under rural roads throughout southern Ohio. Because of the minimal amount of ground cover over the plastic pipe, a majority of that product has failed and is in need of replacement.

The smaller diameter plastic pipes also have a tendency to clog – collecting a large amount of debris – whereas the wider precast box sections can handle the traffic loads and typically do not have the same issue with debris.

Bumen said the company has sold various 8-foot by 2-foot culverts to government customers in northwestern Ohio where culverts are used in a series to carry the water. "The previous products were plugging up with debris coming off the corn and bean fields," Bumen said. "We're the only precaster in the state that produces a 1- or 2-foot-high box that the municipalities can use to create better drainage."

The two-piece variation tends to be more forgiving when it comes to unfavorable ground conditions. "The installers don't have to fool around with pulling and pushing together very much to get better joints," Bumen said. "We stagger the joints from the top and bottom like a concrete block wall, so we're actually making a beam that can be easily set even in very soft material."

The two-piece culverts are also easier to produce, said Bumen, who enjoys being able to go from making 8-foot by 4-foot culverts to 8-foot by 6-foot culverts in less than 10 minutes.

Demand for the products, on which Bumen has decided not to seek patent protection due to the complexities of the process, is growing despite the fact that Scioto Valley Precast has no sales staff.

"We just went out to the counties and showed them the product, and now they don't even want to go back to the one-piece design. They're specifying the two-piece culvert," said Bumen, who has watched company sales pick up year after year as a result of the innovative product. "I only wish I'd done this sooner."

Dividing them in two

Throughout Ohio, engineers are specifying the two-piece box culverts for their water retention, storm drainage, water storage and holding tank projects, hoping that the product will help reduce the time and hassle involved with installing the bulky items. With a wide variety of sizes to choose from, engineers are designing underpasses, service tunnels, bridges and watertight holding tanks that include the two-piece variety manufactured by Scioto Valley Precast.

In Gallia County, Paul Hutchins, assistant engineer, said the municipality has been using two-piece culverts since 1998. He said many bridges made of galvanized pipe and older, single-lane bridges (some with wooden decks) are in need of major repairs in Ohio. He said these older structures are good candidates for the two-piece precast concrete box culverts.

"You don't need as much ground cover over the concrete as you do for galvanized pipe," said Hutchins. "You can get by with a lot less."

Don Carnes, a Ross County engineer in Chillicothe, Ohio, is also sold on two-piece precast culverts and has been specifying them on county projects for five years. "It definitely provides more stability because the joints are wrapped and offset, thus eliminating the need for vertical joints," he said. "That results in a stronger, more stable structure overall."

Originally introduced to the concept by Bumen himself, Carnes specifies the two-piece culverts when a project calls for a size that the precaster makes. The structures require a smaller crane for installation, and have so far posed no challenges for Carnes, who uses them mainly for the county's drainage structures.

"We use them instead of a beam bridge if the size is adequate," said Carnes, who sees the speed of delivery and installation as significant advantages. "We can excavate the site one day, set it the next and have the road open to traffic by the second evening. These products are a great innovation for what we're doing."