

2015 Project Achievement Award Winner

Every Minute Counts: Accelerated Bridge Construction in the Fast Lane

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The new precast concrete box culvert/bridge on Michigan's M-142 over Phillip Drain exemplifies [Accelerated Precast Construction \(APC\)](#)¹ to quickly replace culverts and small bridges in ways emulating ABC (Accelerated Bridge Construction).

The award-winning M-142 project in 2014 called for removal of the existing bridge, installation of a cofferdam with sheet piling, installation of a 48-foot long by 24-foot wide by 12-foot tall precast concrete box structure, all associated end treatment, and all associated road reconstruction. The project had a completion date of 14 days, regardless of the weather. Minimizing user delays and traffic disruption were a priority for MDOT, as M-142 is the major artery in the area. Another consideration was the Huron County Fair that was scheduled for July 27. The contractor guaranteed that the road would be open to the 1000s hoping to attend the annual fair.

Engineers at [Fisher Contracting Co.](#)² wanted every element of the bridge crossing to be manufactured as precast to complete the project within the strict timeline that the schedule allowed. The schedule did not accommodate any cast-in-place elements, and Fisher needed to eliminate uncertainty associated with curing time.

A complete precast crossing was approved by working with [MDOT's bridge design division](#)³, as well as the regional project engineer. The 24-foot x 12-foot boxes were cast in 4 foot sections that weighed 52,000 lbs. each, designed to MDOT's HL-93 Modified Design requirements. The design is based on 1.2 times the current AASHTO LRFD Bridge Design specification loading with the exception that the design tandem portion of the HL-93 load definition is replaced by a single 60 KIP axle load before the application of the 1.2 factor. For the end treatments, 120 feet of 4 foot wide by 2 foot high footings were precast in four sections for the wingwalls and end box sections to rest on. Eighty-five feet of precast cut off walls were manufactured in four sections and placed at the outside ends of the precast apron slabs. The apron slabs were cast in two sections and were pinned and grouted to the cutoff wall footings. The 18-foot tall wingwalls had concrete earth anchors attached to the backside. Each wingwall was precast in two sections. The inner sections were bolted to the end box sections with a pair of 1-inch thick galvanized steel plates. The outer sections were bolted and plated to the adjoining inner wingwall segments. Due to the required height of the headwalls, on top of an already 14.5-foot tall (outside) box section, the headwalls had to be cast separately from the box sections. L-shaped, 6-foot tall precast headwalls were match-cast to the top deck of the end box sections and bolted to the top using 1-inch diameter stainless steel bolts, nuts and washers that were threaded into stainless steel anchors cast into the top slab of the end box sections. All precast was supplied by [Northern Concrete Pipe Inc.](#)⁴

The date for delivery of boxes to the site was set for July 14. The entire project was successfully completed in 12 days and 8 hours, well ahead of the required timeline. The construction contractors appreciate the great time savings that precast offers, because they can't afford to spend weeks forming, pouring and curing when precast is available. The case for APC, using precast concrete boxes for small bridges and culverts, is illustrated with the M-142 bridge over Phillip Drain.

LINKS

1. concretepipe.org/web/magazine/2014fallcpnews.html (Editorial)
2. fishercompanies.net/?page_id=25
3. michigan.gov/mdot/
4. ncp-inc.com/index.shtml

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- **Concrete Pipe Design Manual** concretepipe.org/pipe-box-resources/design/design-manual
- **Concrete Pipe News** concretepipe.org/category/concrete-pipe-news

Photos: Courtesy of Fisher Contracting



4-foot box sections that weighed 52,000 lbs. each were designed to MDOT's HL-93 Modified Design requirements.



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