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# FAST FACTS:

## Carbon Fiber Reinforced Polymer Strands

**PROJECT LOCATION:** Harrison County, Ohio

**AGENCY** Ohio Department of Transportation

**URL:** *aii.transportation.org*
(select *Carbon Fiber Reinforced Polymer Strands*)

**PROJECT NAME:** Removal and Replacement of Bridges over Clendening

**PROJECT DESCRIPTION:** This project replaced two prestressed concrete box beam bridges (HAS-799-0391, New Structure File Number 3410000) and (HAS-799-0453, New Structure File Number: 3410001) with two new single-span precast box beam bridges with composite decks. One of the two bridges, HAS-799-0391, was constructed with carbon fiber composite cable strands and stainless steel rebars, while the other bridge, HAS-799-0453 was constructed with traditional steel strands and epoxy coated steel rebars.

**PROJECT PURPOSE AND NEED:** Box beam bridges are typically replaced 30-40 years after construction. The primary cause of deterioration in box beam bridges is corrosion of beam reinforcing steel and prestressed strands. Corrosion of steel triggers distresses, including cracks, spalling, leakage, and delamination, and may eventually lead to catastrophic failure. The goal of Ohio DOT was to increase the service life of box beam bridges to 100 years using non-traditional materials, and thereby, minimize the whole life costs of bridges.

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| **OVERALL BUDGET / COST ESTIMATE:** | $2,999,550 |
| **WHAT WAS UNIQUE ABOUT THIS PROJECT?** | HAS-791-0391 was Ohio DOT's first bridge project that utilized beams with CFCC prestressing strands. Ohio DOT constructed two cohort bridges: one with conventional steel strands and epoxy coated steel rebar and another with CFCC strands and stainless steel. |
| **DESCRIBE TRADITIONAL APPROACH:** | The traditional approach utilized box beam non-composite bridges with conventional steel strands and epoxy coated steel rebar and asphalt concrete wearing surface. |
| **DESCRIBE NEW APPROACH:** | The new approach utilized box beam composite bridge with CFCC strands and stainless steel rebar, high early strength grout for shear keys, transverse post-tensioning of box beams, and concrete wearing surface. |
| **TOP INNOVATIONS EMPLOYED:** | Carbon Fiber Composite Cable strands for box beams. Each strand is a braid of 7 wires of carbon fibers. Each wire contained carbon fibers of 7-micrometer diameter size twisted with epoxy resin. Stainless steel reinforcement in beams and deck used for added corrosion resistance. |
| **PRIMARY BENEFITS REALIZED TO DATE:** | Excellent performance to date. |
| **OTHER BENEFITS REALIZED / EXPECTED:** | Improved resistance to corrosion, longer service life, and lower lifecycle costs. |
| **PROJECT START DATE / SUBSTANTIAL COMPLETION DATE:** | January 2017 – May 2018 |
| **AFFILIATIONS:** | State DOT, FHWA |
| **PROJECT CONTACT:** | Omar Abu-Hajar<br>*omar.abuhajar@dot.state.oh.us*<br>614-387-1257 |
| **LINK TO ATTACHMENTS:** | Calculations, Inspection Report |

Completed bridge with a view of the finished deck.

Side view of completed bridge.

Prestressed concrete box beam casting bed with hardened steel couples shown at photo bottom.

An interior beam launching operation from the transporter to beam seat.

Prestressed concrete box beam casting bed with the CFCC strand and the bottom stainless steel U-rebars used for shear reinforcement installed in place.

Prestressed concrete box beam being launched onto the designated beam seat, the rectangular elastomers are for sealing the space between beams to allow for continuous grouting of the post tensioning duct.

Prestressed concrete box beam being launched onto the designated beam seat, the rectangular elastomers are for sealing the space between beams to allow for continuous grouting of the post tensioning ducts. The tubular foam at beam bottom is for sealing the edges to hold the grout between the beams.