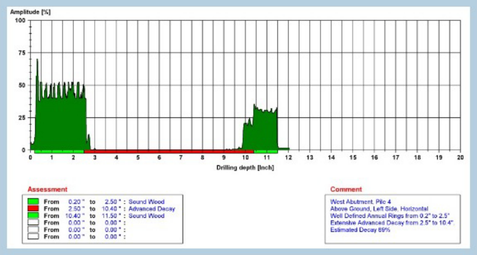
September 5, 2017

Old Bridge. New Techniques.

Experimental repairs to bridge in Christian County

Like countless bridges throughout Illinois, the TR 43 bridge over Buckhart Creek has been in service for more than seventy years. Constructed simply and inexpensively, the bridge is supported on timber piles driven into the creek bed. Over the decades, water, ice, insects and rot have taken their toll and the timber piles supporting the bridge had deteriorated to the point where officials had restricted traffic to a single lane and limited the weight of vehicles allowed to pass.

Detailed inspections were conducted with a minimally invasive non-destructive testing technique using a resistograph instrument. Basically, a cordless drill that measures the varying levels of resistance offered as a three-millimeter bit bores through the wood, the tool provides a printed graph that reflects the pattern of solid, rotted and outright missing wood inside the pile, and therefore allowing WHKS engineers to determine its remaining structural capacity. The inspections found that, although the bridge deck and beams were in good shape, there was significant deterioration in many of the timber piles. After reviewing the inspection report, Illinois DOT engineers felt this bridge was a good subject for an experimental repair method.

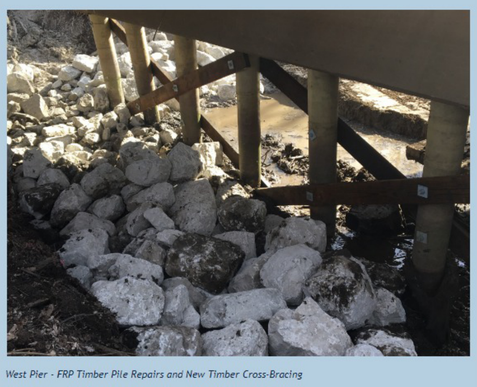


Sample Resistograph Reading

While some of the piles were repaired traditionally with steel extensions, others were treated using a new approach. After large voids were repaired with a high-strength grout, the wood pile was wrapped with multiple layers of fiber-reinforced polymer cladding. This wrapping provides structural reinforcement to the timber while sealing and protecting it from the elements into the future. While still experimental, engineers believe the technique can add significant life to old timber structures.

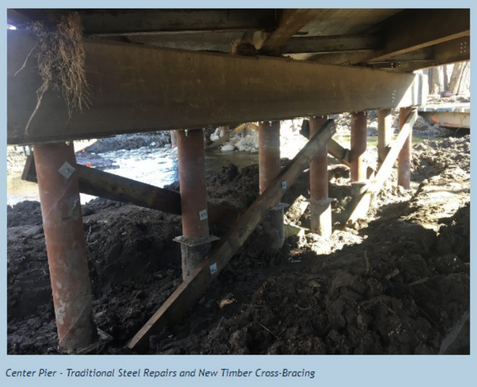
Bridge Elevation with New Steel Bridge Railing

As part of Illinois Center for Transportation's research, the project required extensive coordination with Illinois DOT and FHWA. As the first bridge in Illinois to be subject to ongoing monitoring following repairs of this sort, the work was monitored by more PhD scientists than had likely crossed the bridge in its 70 years. Ongoing observation will determine how the wrap is affected by UV rays, the impact of moisture that might be trapped in the timber and other long-term effects.



West Pier - FRP Timber Pile Repairs and New Timber Cross-Bracing

Based on early results, though, the technique offers great promise for the thousands of old timber bridges across the country.



Center Pier - Traditional Steel Repairs and New Timber Cross-Bracing