Repair of **Timber Truss Bridge Substructure at Valvoline River Dock**

project location: St. Louis MO

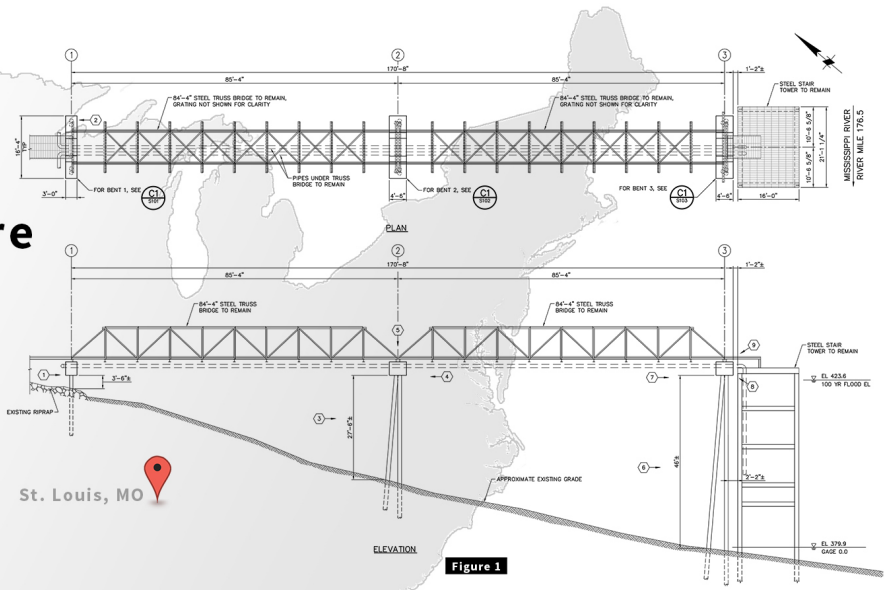

Figure 1

Problem Statement: The river environment and the dry-wet cycles had resulted in damage to the piles and spalling of concrete at the pile caps. In some locations, there were cavities as deep as 7" in the timber piles. These cavities has resulted in significant loss of load carrying capacity of the piles. The spalled concrete at pile caps had accelerated corrosion of reinforcing bars. The objective of the project was to repair and restore the original capacity of the piles and pile caps.

Design Challenges: The marine environment on this site called for a repair material that would not corrode with time and require minimal maintenance. Long term protection of the timber piles also required encapsulation in a jacket that would eliminate future moisture ingress to the piles. Furthermore the access to the tall piles especially along the river was only available through floating barges. The lifting of heavy construction materials would have added significant cost to the project. Considering these limitations the structural engineer of record selected the PileMedic® system.

Implemented Solution: A total of 18 timber piles on this project were encapsulated from a height of 5' below grade to the pile cap in PileMedic® bi-axial glass laminates. These laminates are supplied in 4-ft wide rolls. The rolls were cut in 9-ft long pieces that were coated with an epoxy paste. When wrapped around the 16-ich diameter piles, this creates a 2-ply shell with an 8-inch overlap at the end. Subsequent shells were overlapped 4-inch with the previous shell in the vertical direction. Small diameter tubes were used to inject a low viscosity resin into the annular space between the pile and the jacket. The resin fills all the voids in the timber pile. Since the resin is about 3 times stronger than the wood in compression, this operation adds significant axial capacity to the piles. The upper ends of the battered piles were wrapped together and the space between them was also filled with resin (Fig. 5). In the pile caps, the reinforcing steel were coated with corrosion inhibitor, new concrete was placed by patching and all cracks greater than 1/8" injected with low-viscosity resin. Furthermore QuakeWrap® Carbon fabrics wrapped around the pile caps to make up for the lost area in the reinforcing steel and protect against future corrosion and degradation.

Notable Features

• PileMedic® laminates are the only FRP system that allow creation of seamless impervious shell to be filled with low viscosity resin.

• The method of installation that allows wrapping a jacket of any shape or size on site eliminated the need for ordering custom made jackets in advance; This resulted in significant time and cost savings for the project.

• The use of lightweight jackets that can be installed in 4' tall increments eliminated the need for heavy lifting equipment on the barges

• Resulting in significant cost savings compared to the use of conventional material such as steel and concrete

• Encasement of the piles in these FRP jackets results in a virtually maintenance free solution that will extend the service life of the structure for decades.


Figure 2


Figure 3


Figure 4


Figure 5


Figure 6


Figure 7


Figure 8

Figure 1, Figure 2, Figure 3, Figure 4, Figure 5: Use of spacer between PileMedic jacket and voided timber piles, Figure 6: Access to the timber piles from the barge,