

# Concrete box culvert repair with polyurethane grouts

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**Client:** National Cemetery Administration

**Design Consulting Engineer:** URS Group Inc.

**Grout Contractor:** Applied Foam Technologies (now Applied Polymerics)

**Situation:** Jefferson Barracks National Cemetery, just south of St. Louis, is one of the nation's largest military burial sites. Established shortly after the Civil War, it covers 331 acres (134 hectares) and 188,000 graves. The cemetery sits on the banks of the Mississippi River, and a planned expansion in 2011 revealed that box culverts running alongside the expansion area were experiencing significant groundwater infiltration.



URS Group concluded that more than 100 joints would require repair in the 10' wide x 5' tall and 8' wide x 5' tall culverts. Some of the joints had opened as much as 3 inches, causing the rubber water stop to fall out of the joints.

**Challenges:** Limited access was the biggest challenge. All the material, equipment and personnel could only reach the work site through a small number of manholes or the ends of the culvert. Cold weather conditions provided an additional challenge.

**Solution:** Applied Foam Technologies was contracted to do chemical grouting to seal the leaks and restore the culverts. Given the wide gaps, the activated oakum technique was used: dry oakum was soaked in **Hydro Gel SX**, then packed into the gaps. Hydro Gel SX is a hydrophilic polyurethane resin that forms a structural foam or flexible gel—depending on

resin to water ratio—when activated with water. This was followed by injection of Prime Flex **900 XLV**, an extremely low viscosity, hydrophilic polyurethane resin. Repaired leaks were then sealed with **Prime Gel 2200** epoxy gel.

**Outcome:** More than 100 joints were ultimately repaired and fully sealed. No residual leaks remained. The total material used included: 720 gallons of Prime Flex 900 XLV, 540 gallons of Hydro Gel SX, 14 – 50# boxes of oakum and 60 gallons of Prime Gel 2200.



*Leaking manholes add to the groundwater infiltration*



*Some culvert joints were open as much as three inches.*



*Limited access through culvert ends and few manholes was a challenge.*



*Prime Flex 900XLV is twin streamed with water to seal culvert leaks*