



Photo 141: Internal pipe tie installed.

QuakeWrap Inc.

A QuakeWrap Inc. representative was onsite to assist and supervise Subsurface with the installation of their product. Subsurface completed the process to seal a joint, which involved using oakum rope combined with water-activated flexible foam and injecting flexible foam behind the initial seal made by the rope and foam system, prior to installing QuakeWrap's repair method.

Rain and cold weather were factors during the QuakeWrap installation. The QuakeWrap representative stated that the pipe should be completely dry for 24 hours after installation for curing. He stated that he wanted the pipe above freezing at all times. Subsurface rented an enclosed trailer for prepping the materials and kept the pipe heated to minimize the duration for proper cure. A significant moisture event delayed the QuakeWrap installation for nearly four days. After the moisture event the water was pumped out and the pipe had to be completely dry before installation.

The method used was called a wet lay-up method. The installation began by pre-saturating fabric with a resin called QuakeBond™ J300SR. Two types of fabrics were tried on two joints each. One fabric is called TB20C Carbon Fiber and the other is called VB26G Glass Fabric.

The fabric saturating process was done in an onsite job trailer. Resin was also placed on the top of the fabric. Squeegees were then used to spread the Resin and obtain complete saturation. The saturated piece of fabric was placed onto a PVC pipe to transport the saturated fabric into the pipe for installation.



Photo 142: QuakeWrap being saturated before installation

Inside the pipe a tack coat called QuakeBond™ J201TC was placed on the sides and top to hold the fabric up. The saturated fabric was then placed around the pipe. Workers used squeegees to get any wrinkles out of the material. Two layers of fabric were placed on each joint.

The installation of the QuakeWrap product is then allowed to dry. This product needed to be dry for 24 hours to properly cure. All material product data sheets are included in Appendix C.



Photo 143: QuakeBond™ J201TC Tack Coat being installed. Does not need to be placed on the bottom.



Photo 144: QuakeWrap™ TB20C Carbon Fabric being installed



Photo 145: QuakeWrap™ VB26G Glass Fabric installed

Construction Summary

Cretex Inc. performed their dry pack method on three joints. They also used conventional concrete to repair a deteriorated floor. They were on the jobsite for one day with three workers. A summary of the work performed by each contractor is included along with a timeline and weather data for the project duration.

Cretex, Inc.

- Filled bottom of three joints with a “Pipe Joint Dry Pack” concrete mix.
- Restored bottom of pipe section with steel reinforcement and a conventional concrete mix.
- Provided internal ties to Subsurface, Inc.
- No cost to the NDDOT

Subsurface, Inc.

- Built a Cofferdam.
- Cleaned out pipes by means of a pressure washer.
- Re-established joints with Verticote Supreme mortar mix where needed.
- Placed 900 XLV saturated oakum rope in joints.
- Injected 900 XLV behind the joints.
- Put a surface epoxy on the joints on the north pipeline when complete.
- Injected 985 Rigid Foam behind pipe for structural support to fill voids.
- Installed QuakeWrap's products under manufacturer representative's supervision.
- Placed internal ties between joints in pipe except on the joints where QuakeWrap's product was installed.
- The total Subsurface materials and labor was \$93,520. The 985 Rigid Foam injection cost was \$52,000 of the total cost.

QuakeWrap, Inc.

- Provided Subsurface with supervision and training for the installation of their materials.
- Provided all materials needed for QuakeWrap's repair method.
- The cost of materials and onsite supervision was \$18,910.00.

Carbon Fiber QuakeWrap



Photo 157: Carbon Fiber in 2009

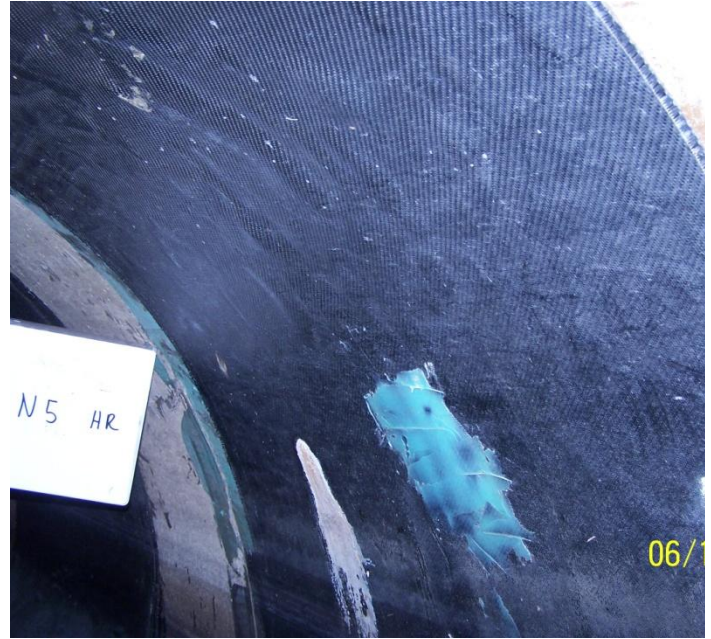


Photo 158: Carbon Fiber in 2011

Fiberglass QuakeWrap



Photo 159: Fiberglass in 2009

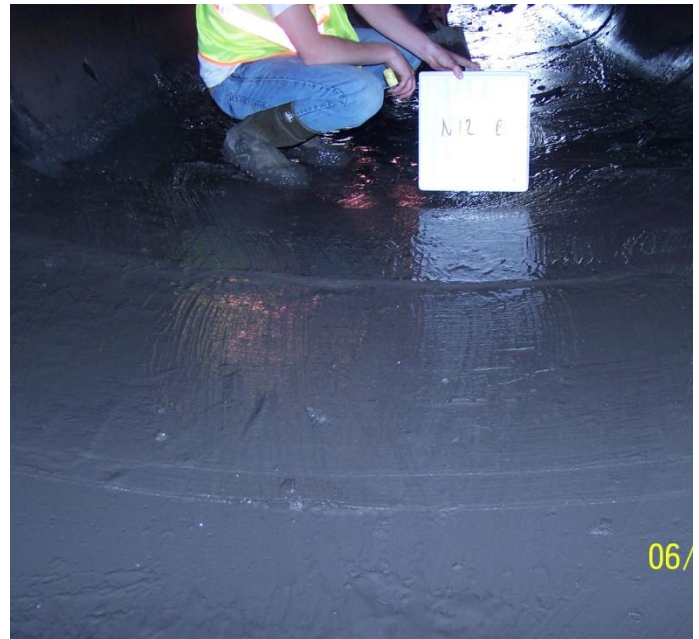


Photo 160: Fiberglass in 2011

The QuakeWrap (Carbon Fiber and Fiberglass) bonded to the concrete very well and those joints remained sealed and didn't show any signs of movement.