3″ Boron Recovery Relining

Industry: Nuclear Location: USA Project Manager: Carl Beitner cbeitner@elitepipeline.com

Introduction to Project

In October of 2013, Elite Pipeline Services performed at a 3'' Cleaning and Cured in Place Piping (CIPP) project at a nuclear power plant. The certified team of EPS technicians were able to successfully execute their plans for this specialty re-lining project despite the challenges they faced on the jobsite.

Elite Pipeline Services was called in to assess the project after plant technicians had performed an air test on the 3'' cast iron pipe, which was 36′ long. They did this by inserting inflatable plugs in the upstream and downstream pipe inlet and outlet. The plugs were then inflated, and the goal was to pressurize the pipe with 5 psi and hold that air pressure. They found that they were able to inflate up to 5 psi. However, the pressure would immediately decrease when it was shut off. After this discovery, it was believed that this loss of pipe integrity could be due to leakage past the joints. This is where EPS was called in to further assess the pipeline and install CIPP liner.

This specialty relining project involved a 3'' cast iron drain pipe in a drained manhole structure. The boron valve gallery pit was upstream and the pipe drained down to the PG (Primary Grade) tank pit. The plant had to remove the concrete tunnel plug to access the pit. Since this was a high rad area, an L-shaped containment tent had to be built for us. This tent was roughly 20′x 8′ and 8′x 8′ feet at the base of the L.

Project Details: Inspection and Cleaning

The following paragraphs detail Elite Pipeline Service's work performance and challenges faced throughout the project.

The first step we took was to pump contaminated water out of the pit and manage infiltration by pumping water to the auxiliary system. As a result, we found water infiltration from heavy rains that had taken place.

Our next task was to perform an as found video inspection. The as found video showed that all 36′ of the pipe had large amounts of loose scale, ranging from a quarter of the pipe to 100% blockage. We concluded that the cast iron had slowly degraded and flaked over time.

Our next step was to clean the pipe. We mechanically cleaned and removed debris without using water or air, which would have generated large amounts of contaminated wet waste and possible air-borne activity. Spiral brushes and a mechanical auger were used to remove the debris. We gradually removed and collected the debris into rad bags. We would place 2-3 handfuls of debris into rad bags and pass it to the Health and Physics Department (HP). HP would then frisk the debris to find levels from 0-300 millirem per hour. It took EPS six days to remove all scale from the 3'' pipe.

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Project Details: Installation of Liner

After inspecting and cleaning the pipe, it was now time to install a CIPP liner. EPS technicians used a super-flex 4.5mil felt liner with a two-component resin, which consisted of a one-component hardener and a one-component silicate resin, which can withstand temperatures in excess of 325° Fahrenheit without softening. They had approximately one hour work time to mix and then invert the liner.

Elite personnel had to wear double PCs and hoods outside the containment tent while mixing the resins and wetting out the felt liner. A resin slug was then poured into the felt liner, with a vacuum pump installed on the opposite side. The mixture ran through a series of rollers and impregnated the felt liner with the resin.

Project Details: Inversion of Liner

Next, the EPS technicians passed the wetted-out liner in to the high rad containment tent to other fully dressed EPS personnel. Using the inversion process, they inverted the liner into the pit and began the pipe inversion. They inverted the full 36′ long 3′′ liner from the PG pit to the boron valve gallery. EPS technicians then shut the air off, inserted a cal tube into the felt liner, and inverted the cal tube approximately 40′, which went about 4′ beyond the felt liner. They left the tube inflated for 18 hours.

The next day, we deflated the cal tube and removed it from the newly formed 3′′ pipe. It was reinstated and any excess new pipe was cut off. We then performed our as left video inspection, which completed the process with the new pipe.

Project Details: Challenges Faced

Elite Pipeline Services' technicians had faced the challenge of full pipe blockage, managing heavy water infiltration, managing dose, and working in a high rad area with unknown levels of contamination in the pipe. Also, the resin material being used was heat activated, which means the warmer the temperature, the faster it will cure. This was especially challenging as we were working in high temperatures outside of a high rad area, which was enclosed by the L-shaped tent. Another challenge was wearing double PCs and PAPH hoods in a high rad area throughout the process. Our final challenge was inverting the liner from the surface into the tunnel, through the pipe gallery, into the existing 3′′ cast iron pipe.

Results

Despite the challenges this specialty re-lining project presented, our team was able to successfully inspect, assess, and repair the damaged cast iron pipeline, while managing water infiltration. This process took us approximately two weeks, which we are proud to say we completed with no personal contamination, receiving less than 100 millirems.

Lessons Learned

EPS technicians always strive to learn and improve from each project. Here are a few things they learned here: Bring as little equipment into the RCA as possible to complete the project. Make sure all residue is removed from equipment in order to reduce contamination. Premeasure resins prior to bringing them into the RCA in order to reduce RCA waste.

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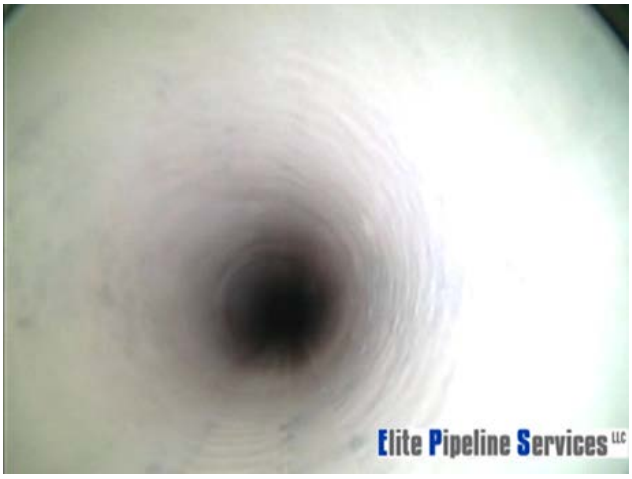

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Questions and Answers

Q: Great information, I am wondering about a liner installed, post “pipe air test”, did the site perform a final air test to validate piping integrity conditions?

A: Thank you for the response. EPS completed a visual video inspection from structure to structure, which the engineer reviewed. If the engineer had come across any questionable areas or noted any flaws, we would have then performed an air test.

Q: Was the subject piping straight, or did it have elbows?

A: The subject lining for this particular project was straight. However, we just finished a project for a fuel building basement that had 9 Elbows and 9 lateral re-instatements on a 3" line. This will be detailed in a future publication if we get approval from the plant. In short, EPS technicians had to wear PAPH hoods and respirators every day for approximately 60 days. It was 100% lined, with zero airborne activity and zero contamination released in our working area. We also pulled two drums of debris from the pipe, which removed 250 -300 MR of debris from that system.

Q: How far can the inversion process shoot a liner?

A: In all depends on the size, how many elbows, and what type of access we have. If I had to give you footage, it would be between 50’ and 200’.

Q: What is the life expectancy on that liner?

A: Most manufacturers say 50 years.

Q: Can you do elbows with that lining method?

A: Yes, you can do elbows. Again, the amount of elbows depends on what size, what degree of bend (22 degree, 45 degree, 90 degree, or long sweet 90 degree) all can be lined through. Depending on what type of liner you use, there may be some wrinkles around the elbow.