# 4″ Fuel Building Basement Relining

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

### *Introduction to Project*

In February of 2014, Elite Pipeline Services completed a 4″ Fuel Building Drain Specialty Relining Project. The purpose of the project was to lower tritium levels surrounding the Nuclear Facility within its buried piping system.

**Scope:**

- 100ft of 4″ pipe, containing 9 branch lines.
- Pre Video Inspection.
- Contaminated lines.
- 5 EPS technicians.
- Deemed Medium Risk with possible High Risk scenarios.
- No air or water allowed for cleaning.
- Required to work in PAPH hoods/respirators.
- Proposed project length 8 weeks.
- Proposed allotted dose of 920 millirem.


The purpose of this relining project was to successfully clean and install new 4mm liners in each lateral covering 100% of the pipe configuration, including lateral connections and elbows. The resins were a two-part mixture with short curing time.

The scheduled working week was 5 X 10hr days. EPS from this point, dress out twice a day, wearing double Protective Clothing with PAPH hoods for the next 40 working days.

### *Project Details: Cleaning*

The first step of this project was to clean all of the pipe headers and branch lines. The cleaning began by using a vacuum method, but various other methods were later implemented when vacuuming was not completely successful in bringing the pipe wall to a state where it was ready to re-line. A Radiological shield box was also installed by Engineering services in the sump (lower dose rates in this area), which allowed the EPS team to easily gain access and remove debris while lowering overall dose. The sump box was a successful step for the technicians, as it separated them from the contaminated water and debris. The vacuumed debris was contained into Rad Waste Drums. (Removing and containing debris of up to 300mr during the cleaning stage)

Once vacuuming was complete, it was time to run carbide fingers in a clock wise rotation by electric cabling, followed by the vacuum to minimize airborne activity. All drain outlets were sealed during this process. This method provided us with a clean pipe wall for our resins and liners to adhere to.

Another part of the project was to clean the floor bowl drains. This was completed by cleaning and grinding in a contained unit. The contained unit was made to have the HEPA Vac and Vacuum connected to it. This contained all debris.

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### *Cleaning (Continued): ALARA Meeting*

During the cleaning period, ALARA called a meeting to revise our allowable dose rates and goals. The revised Dose went from 920 millirem down to 437 millirem. The following are some proactive steps we took with HP to reach this goal:

**1. Communication**

Wearing the PAPH hoods, it was very time consuming to communicate, walking from one side of the room to another in order to complete simple tasks. We were also walking past higher dose rate configurations. With the plant and HP, we decided to wear communication headsets under our hoods, which enabled us to stay in ALARA zones to communicate. In turn, it also made us work more efficiently and would lower our overall dose.

**2. Protective Clothing Dress Out**

EPS would dress out in the HP dress room, receive their PAPH hoods, and would then walk to the Fuel Building Basement. Technicians would then put on their hoods before entering the work zone. To lower dose HP had found EPS a designated area close by with zero dose rates, this area was then used as our final dress out area to put on the hoods. It can be time consuming putting on Hoods and Respirators for 3-5 people before going into the work zone.

**3. Sump Box**

The plant had come up with a plan to reduce dose rates in the sump area, which is where EPS technicians would spend a considerable amount of time working. Engineering constructed and installed a metal box to shield technicians from water, debris, and dose from configurations in and around this area. This was very successful.


### *Liner Installation*

The first step was to clean and epoxy coat the floor drain bowls.. The liner would then overlap upon installation to give 100% coverage in these bowls.

The first part of the relining stage was to reline the main headers, which was approximately 65ft of the total 100ft pipe system. The reline process was a pull-in system. This stage of the project was the utmost of importance to manage curing times and dose rates. EPS technicians would have to dress up in full PC's and Hoods outside the designated working area. They would then prepare the liners, wet them out, carry them down a stairwell, and then into the work zone. Once in the work zone, the liner was installed by pull and drag. It was then inflated in a psi range of 12-15kpa. Due to the heat in the basement and outside temperatures, these main headers were installed within 1hr of mixing the resins. Wearing Hoods and Respirators also affects movement and efficiency. There were no issues during these installs.

Following these installs, EPS had to tap in and reinstate the liner into the main headers to install (9) branch lines. To achieve 100% coverage in these areas, a custom made felt top hat was installed. Once wetted, pulled into place and inflated, the brim adheres within the main header. As previously mentioned, the felt liners and top hats are measured before installation. It then overlaps the painted epoxy on the floor drain bowls providing 100% coverage.

Pic 1. Reinstating through liner.

### *Liner Installation (Continued)*

In previous small diameter projects, we have completed them by using an inversion process, which is just for straight sections of pipe. We had to opt for a pull and drag lining method for this project in order to ensure 100% coverage on elbows, branch lines, and connections. This method requires three access points to pull into place. EPS required a technician on the branch line, one on the downstream, and one on the upstream. The technicians were effectively installing a T- Section midway, which requires tension on all ends before inflating. Getting this wrong can lead to failure. During cleaning and installation of the liners, EPS technicians had multiple bore scope cameras to assist on precision cleaning and accurate installs of liners.

### *Working with Contamination: EPS*

With the vast experience and training of EPS technicians, Elite has adopted an in-house, clean as you go work culture from previous HP/RP supported projects, with cleaning contaminated pipe lines in sensitive areas. We see this as an important part of successfully completing these projects working with the Plant. By cleaning the room as we go, this, in turn, lowers the time spent by HP/RP on cleaning and decontaminating our working area. This also lowers overall dose per person and for the total project. At no stage did EPS technicians look or feel like they were losing control of their working environment. By the end of this project, EPS had received high praise from Plant Personnel and HP for these actions.

### *Challenges Faced*

Elite Pipeline Services technicians faced a variety of challenges throughout this specialty relining project, some of which were out of their control. First, vacuum methods were unable to remove all debris, as it was thicker and oilier debris than originally thought. Extremely warm temperatures forced some delays for EPS, as they needed to cool the curing resins in plastic tubs full of ice prior to use. If the temperatures of the resins are high, it decreases the time to cure, and there for a shorter time to install. Managing heat was a big focus within the PC suits, it was common for techs to spend 5-10 min in ALARA zones cooling down.

### *Results*

Despite the challenges faced during this Fuel Building Specialty Relining Project, it was a complete success. 100% relined, Zero Contamination, Zero Incidents and projected was completed under the revised Dose Goal. Credit goes to our technicians on site, as some technician's onsite personally went through 80 respirators/hoods during the 40 day project by dressing up twice a day. Credit to HP and the Plant for supporting our techs every day, from dressing them to making sure that they got home incident free every night. To successfully complete a project like this requires everyone to work together as a team.

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*4mm lined elbow*

*Pre-Cleaning*


*After Cleaning*


*Post-Lining*


***Published By: Emily Goeree, Communications Coordinator***

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