

DEFENSE NUCLEAR FACILITIES SAFETY BOARD

August 28, 2009

TO: T. J. Dwyer, Technical Director
FROM: D. L. Burnfield and M. T. Sautman, Site Representatives
SUBJECT: Savannah River Site Weekly Report for Week Ending August 28, 2009

F-Canyon: After preparing the site over the weekend, the HazMat team returned to A-Line to recover from last week's concentrated nitric acid spill. In addition to acid suits and supplied air, they wore their neoprene gloves under the acid suit sleeves to prevent acid from leaking past glove folds. After neutralizing spilled acid with soda ash, a large plastic funnel (i.e., catch containment) was placed under the tap to collect any remaining liquid and drain it via Tygon™ tubing to a stainless steel drum on the ground. Although the work instructions said to place the drill bit in a bag with absorbent pads, HazMat and Deactivation and Decommissioning (D&D) personnel decided to remove the drill bit using the funnel rather than their gloves and let the bit sit in the funnel while the liquid drained. After doing this, the HazMat team exited the area because they were approaching their stay time. Shortly afterwards, other personnel monitoring the scene with binoculars noticed that the liquid was not draining through the tubing but filling up the large funnel so that the drill bit was immersed in acid. In addition, brown fumes were being generated and bubbles could be seen in the liquid. Operations managers decided to evacuate the area. Several minutes later, observers noticed that the bottom of the funnel had failed and all of the contained liquid had spilled onto the scaffold. The Fire Department called in a second HazMat team. As happened during the first spill, confusion over the significance of the spill led the Area Emergency Coordinator to issue a Remain Indoors Protective Action for all of F-Area even though industrial hygiene technicians at the Incident Command Post did not detect any elevated air concentrations. The HazMat teams made two more entries to cap the tap, drain the remaining liquid from the hose, neutralize spilled liquids, and close the collection drum. SRNS will be calling a time out for most American Recovery and Reinvestment Act work at SRS to refocus attention on 1) safety and 2) work planning and control. (See 8/21/09 report).

The planning and review of the initial acid spill and failed recovery had many breakdowns. The work package assumed an uninterrupted draining sequence leaving management to decide the steps for stopping and resuming draining. Although the manufacturer instructions state to tighten the packing gland follower on the tapping tool to 25 ft-lbs, the D&D organization only required this to be wrench tight because the line was not pressurized and they also applied Teflon™ tape to the follower. Material incompatibilities with nitric acid were ignored. Until the actual equipment is inspected, it is not known if the observed chemical reaction was due to nitric acid reacting with the funnel or drill bit. The drill bit is carbon steel. The funnel is made of sheets of polyvinyl chloride (like a glovebag) attached to a nylon drain fitting/screen with a Buna-N gasket. SRS testing done to support FB-Line D&D found that nylon drain assemblies and their gaskets were rapidly attacked by 64% nitric acid and concluded that nylon drain fittings should not even be used for short-term exposures. The report recommended the use of Teflon™ or 304 stainless steel and suggested that bag seams sealed with solvent cement (like these were) be water leak tested to determine if observed discoloration affected the integrity of their seals. While the initial tapping work instruction stated that stainless steel was to be used for the tap and drain container, D&D Operations decided to use the plastic funnel as the primary containment without any involvement by Engineering during the development of the Assisted Hazards Analysis or work instructions for the recovery. Although the Material Safety Data Sheet said to avoid contacting nitric acid with most metals, the drill bit was allowed to contact (and later be submerged) in nitric acid. (Any dilution of the acid could significantly increase the reaction rate because the corrosion rate of carbon steel increases by ~650 as the concentration of nitric acid drops from 15 to 6M.) Before the first spill, there were indications that the acid was incompatible with the equipment. When the polystyrene HEPA filter T connectors became deformed, Engineering allowed their continued use, but required them to be changed daily. The tapping AHA also did not discuss any nitrocellulose hazards, including the potential of nitric acid vapors contacting the cellulose HEPA filter media.