2DEFENSE NUCLEAR FACILITIES SAFETY BOARD

January 21, 1999

TO: G. W. Cunningham, Technical Director

FROM: M. T. Sautman

SUBJECT: RFETS Activity Report for Week Ending January 22, 1999

Steam Hammer. B707 stationary operating engineers (SOE) were working on a steam coil on the ventilation system in B778 (a non-nuclear facility). After a lock out/tag out (LO/TO) was removed, the SOE reintroduced steam without first draining condensate from a cold steam line. This caused an extreme steam hammer in the B776 shift manager's office and residue sampling area. A preliminary inspection did not find any damage. A contributing cause of the hammer was that the B707 SOE's and the B776 shift manager had different understandings of the work scope. In order to prevent similar problems in the future, activities and equipment that impact multiple buildings will require combined pre-evolutionary briefs and separate LO/TO's for each building. B776 is also evaluating whether a drain is needed for the large standing column that is above the valve.

Combustible Residue Characterization. While the characterization data for the pyrochemical salts continues to be favorable, the data for combustible residues raises some concerns. Residue drum filters are tested to ensure that they are functioning as designed. The sampling rate depends on the expected failure rate and ranges from annual testing at an 80/15% confidence level to 100% testing quarterly. Of the 1170 filters tested in FY98, 14 were found plugged and replaced. These filters all involved drums of combustibles (i.e., Ful-Flo filters, wet combustibles, and even "dry" combustibles), mostly containing chlorinated organic solvents. Ninety-three had excessive air flow rates which suggest that the filter's efficiency may be reduced. (Some of these may have also been caused by test fitting sealing problems that have since been fixed). Inspections also identified several severely corroded filters, 3 of which were later determined to be plugged. The high flow rate and corroded filters were also on combustible drums, often containing CCl_4. It is believed that CCl_4 forms HCl and other corrosive chemicals which first degrade the adhesive used to hold the carbon filter element in the filter body. This may allow air to bypass the carbon filter element. The corrosive chemicals then continue to corrode the filter body until the filter is later plugged. In response to these findings, the testing frequencies and/or confidence levels for these residue categories are being increased. Additional actions being considered include: 1) determining the service life of the filters, 2) changing filters with high or low flow rates that could later become plugged, and 3) additional analysis of plugged filters. The contractors are also looking at ways to drive off the solvents or adding material to mitigate corrosion as part of future repacking operations. One idea would be to put bags containing granulated activated carbon and a base inside drums to absorb CCl_4 and neutralize any HCl formed. The Site Rep will be meeting with K-H to discuss how they plan to address these filter corrosion issues.

Besides filter corrosion, one combustible drum was found with a pinhole breaching the drum and several other drums have had rust spots. It has not been determined whether the pinhole was due to external or internal corrosion. An additional problem has been that when tamper indicating devices (TID) were put on old style filters, the vent hole was sometimes covered. An inspection of residue drums identified 39 drums that required a hole to be punched through the TID to unseal the vent hole. Several TRU waste drums have also been found with the vent hole covered, but a complete inspection of all TRU waste drums has not been performed.

Tests are also being performed to look at the thermal stability of HNO_3-contaminated combustible material. Small scale test results were favorable, but preliminary drum test results have raised some questions. Cotton towels were soaked with 12 N HNO_3 for 24 hours and then dried using a preheated blower. Then 16 bags each containing 1 kg of towels were placed inside an insulated 55-gallon drum containing several thermocouples. When the drum's temperature was raised to around 35-40°C, some self-heating was noticed inside the drum. As the drum temperature was slowly increased (3°C/hr), the interior of the drum peaked at a temperature of 125°C when the drum exterior was around 60-70°C. The temperature inside the drum then dropped off even as the drum was heated to 200°C. When the drum was open 24 hours after the test ended, the towels were intact, but blackened as if pyrolyzed. When removed, the towels started smoking and then ignited. The results are a little surprising considering other tests have found no change in thermal stability. One theory is that the acid attacked the oxygen linkages that bond glucose molecules together into cellulose. During heating, the acid oxidized glucose to glycaric acid which was further oxidized to yield carbon. It is proposed that much of the nitric acid had evaporated and that no nitration occurred. Test plans are being developed to test this theory and answer several other questions. This plan may include analysis of treated towels to determine their acid content and whether any nitrated material is present. Additional thermal tests may examine the impacts of changing some parameters and holding the drum at certain temperatures to see if the reaction continues on its own. Hopefully, the additional tests will identify what reactions are occurring and whether they apply to combustibles generated 10+ years ago. In any case, the experiment likely bounds actual residues since acids found in wet combustibles have usually only had a pH of 2 to 3.

Air Hose Disconnections. In B779, workers equipped with supplied air continue to size reduce the remaining gloveboxes. In the last week, there were two occasions when the air hose accidentally became disconnected from the breathing air suit. On both occasions, the worker switched to his emergency air bottle and safely exited the tent. Unlike the 5 previous disconnections involving quick disconnect fittings, both of these incidents involved threaded air fittings (although at different locations). It is believed that the fittings were loose and that subsequent movement caused the hose to twist and unscrew the fitting. A random check of other supplied air units identified one with a loose fitting. Corrective actions include checking all supplied air suits and changing the procedure so that the laundry makes sure the fittings are tight as part of their inspections.

cc: Board members