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Subject: Red Alert Update- Acid Spray Burns Operator

**Title: Red Alert Update- Acid Spray Burns Nuclear Chemical Operator**

Date February 24, 2000 Identifier 1999-RL-HNF-0038 Update 1

**Lessons Learned Statement-** Two significant lessons learned surfaced during the investigation of this accident

1. Chlorinated Polyvinyl Chloride (CPVC) piping is vulnerable to impact if not properly supported and protected. Although CPVC piping is quite strong and resilient, it is only plastic. Without proper support, it will break with application of relatively small forces. Additionally, CPVC should not be used in a system that normally operates above a temperature of 120 degrees F due to severe reduction in service life at elevated temperatures.

2. A rigorous drill program is invaluable in preparing operators for responding to casualties. During interviews with operators after the event, many of them commented on how prepared they were to respond to the event because of the training and drills that they had received and performed. The injured operator specifically mentioned that she knew how to get to the safety shower and how long she needed to be under the water as a result of participating in similar drills.

**Discussion of Activities-** A Nuclear Chemical Operator (NCO) at the Effluent Treatment Facility (ETF) was cleaning an area near an operating 92% sulfuric acid pump. As she bent down to pick up a cloth, the drain line broke and sprayed her with 92% sulfuric acid. The operator immediately moved to an adjacent safety shower where she began flushing her skin and removing her contaminated clothing. She used a Plant Auxiliary (PAX) phone to summon help. She had been wearing the prescribed personal protective equipment for housekeeping activities in that area. Emergency response personnel transported the injured employee by ambulance to a local hospital for treatment. She suffered 1st and 2nd degree burns over 24% of her body -- primarily to one arm, one leg and on one side of her face. She was transferred to Harborview Burn Center in Seattle for additional treatment because she was not experiencing the amount of pain normally associated with acid burns of this type, indicating possible nerve damage. Some of her burns were treated with skin grafts. The spill occurred in a radiological buffer area so surveys of the operator and ambulance were performed. No radiological contamination was found and no chemicals were released from the facility.

**Analysis-** The chemical berm area is difficult to work in because of the many various systems, structures, and components and marginal illumination. This condition may have contributed to the operator bumping the pipe. The 92% sulfuric acid system had routinely been operated above the temperature alarm setpoint. Alarm response procedures were carried out but no further actions were taken even though the temperature remained above the alarm setpoint. Continued operation at elevated temperatures in contact with strong acid caused the CPVC pipe to lose approximately 60% of its original strength as reported by laboratory analysis of the failed

pipe. The use of long sleeve shirts and full-length trousers or long sleeve, full-length coveralls could have reduced the amount of material which contacted the employee's skin and the severity of the resultant burns. Standard personal protective equipment (PPE) may not be adequate to prevent injury in high-risk areas in the event of an accident. Alerting other operations personnel was delayed due to the lack of a shower activation alarm. Cold water in safety showers is uncomfortable and may result in employees not rinsing affected areas with large quantities of water. Additionally, the cold water may complicate emergency medical treatment in the event the injured employee goes into shock.

**Recommended Actions-** Additional PPE, including chemical goggles instead of safety glasses, should be required for entry into areas such as the acid/caustic pumping berm and the hydrogen peroxide berm. These areas should be distinctly marked and posted with PPE requirements. Flow activation alarms should be installed on all safety showers. The alarms should provide for both audible and visual local and remote indication in a normally manned location such as the Control Room. Water tempering device(s) appropriate for the chemicals reasonably expected to be encountered in the facility may be installed on facility safety showers. Medical review of such devices is required by OSHA and ANSI standard Z358.1-1998, Emergency Eyewash and Shower Equipment

Estimated Savings/Cost Avoidance N/A

Priority Descriptor RED/Urgent

Functional Categories (DOE) Occupational Safety & Health

Functional Categories (Hanford specific) N/A

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Name of Authorized Derivative Classifier Not required.

Name of Reviewing Official John Bickford

Keyword(s) acid spray, burns, sulfuric acid

References Occurrence report RL--PHMC-200LWP-1999-0010 Accident Investigation Report, Sulfuric Acid Spill and Resulting Injury at 200 Area Effluent Treatment Facility