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Subject: Green Alert: Reducing Contamination Events

Project Hanford Lessons Learned

Title: **Reducing Contamination Events during Facility Deactivation**

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Lessons Learned Statement:

When performing deactivation of former nuclear chemical separations facilities, personnel contamination events can be successfully avoided by proper hazard analysis, root cause analysis and the application of corrective actions.

Keeping some forms of contamination moist can aid in controlling their spread.

Discussion of Activities:

Summary: During deactivation of the B-Plant Facility, increased frequency of clothing and skin contaminations occurred as services were isolated from the facility. Prompt management and worker action reduced the frequency of contaminations dramatically.

Details: Deactivation of the B-Plant chemical separation facility involves removing chemicals and residual liquids from piping systems, tanks and vessels, stabilizing sources of chemical and radioactive contamination, isolating waste generating sources, and securing electrical equipment, ventilation, and all building utilities (including water and steam). The facility is then placed in deactivation status, awaiting the start of decommissioning. The B-Plant process canyon at the start deactivation was highly radioactively contaminated from earlier process operations. As sources of water were isolated, contamination on the canyon floor and in process cells began drying out. The physical characteristics and the behavior of the contamination changed unexpectedly. It became mobile and flighty, resulting in significantly increased number of clothing and skin contamination from singular and minute radioactively contaminated particles. Facility management noting the adverse trend in contamination events, immediately secured further canyon entries, critiqued the events and initiated root cause analysis.

Analysis: The critique of the events determined that personnel were careful in the doffing of their protective clothing and that isotopic analysis of samples from the contamination events was consistent with the facility isotopic characterization. Facility management organized an external evaluation group consisting of management, exempt, and bargaining unit personnel from various facilities that had resolved similar contamination issues. The following process improvement practices were implemented:

- Retraining personnel in donning and doffing anticontamination clothing. To enhance the training, phosphate laundry detergent was sprinkled on the protective clothing and a black light was used to indicate areas of potential cross contamination during undressing.
- Using new protective clothing for the inner set to reduce the chance of transference from previously contaminated laundered clothing.
- Laundering the inner set of protective clothing prior to initial use to "tighten the weave" of the clothing to reduce potential for particle migration and subsequent personnel contamination.
- Applying static guard on modesty clothing before donning protective clothing.
- Planning and executing an employee sponsored integrated decontamination plan, involving the use of fixative, decontamination solvents and sweeping compounds.
- Refining egress practices and further training of undressing assistants.
- Surveying personnel in their modesty clothing prior to donning of protective clothing.
- Surveying personnel prior to removing their inner pair of protective clothing.

Any contamination specks identified on the inner pair of protective clothing were "fixed" with masking tape prior to removal of the protective clothing. · Removing the "door sweeps" at the bottom of the airlock doors used for personnel entry and egress to the canyon. This resulted in increasing the airflow from the clean egress undress areas into the canyon.

During root cause analysis the lack of humidity in the canyon was identified as one of the underlying cause for the increase of personnel contamination events. As a result, work site "misting" was implemented for work in the canyon. Hand held misting bottles were used for localized work and fogging/sprinkler systems were used for large-scale tasks. The resulting increase in canyon humidity reduced the tendency of particulate contamination to "go airborne". The advantages gained from the canyon decontamination effort and the canyon misting process was twofold: it significantly reduced airborne radioactivity and it reduced the potential for personnel contamination.

Since these radiological work practice improvements were implemented, there have been only three personnel clothing events out of 2,000 entries. The three personnel clothing events occurred within a one-week period and were all prior to successfully completing the canyon decontamination. After the canyon was decontaminated and periodic washdowns initiated, no additional personnel contaminations in the canyon have occurred. This is a significant improvement in that the facility is now executing over 15 personnel entries a day into the High Radiation Area, High Contamination Area, Airborne Radioactivity Area. This is the highest level of "in-canyon" personnel activity in the post-processing history of the facility.

Recommended actions: When adverse trends are noted, management should take prompt action to identify the causes and institute root cause analysis, develop corrective actions and track the execution of corrective actions through completion and verification of the corrective actions effectiveness.

Effects of isolating services and the resulting potential changes to the work environment, which may affect the physical characteristics and behavior of the facility contamination, should be anticipated and the effects analyzed for incorporation into work plans.

Estimated Savings/Cost Avoidance: $15,000 per skin contamination when considering occurrence investigation and reporting and the time lost from the job (est. half day) by the worker, coworkers, radiological controls personnel, and management.

Priority Descriptor: GREEN/Good Work Practice
Functional Categories (DOE): Conduct of Operations, Radiation Protection
Functional Categories (Hanford specific): N/A
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