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Subject: Blue Alert- Work Scope Issues

Title- Blue Alert-Recognizing What is Included in Your Work Scope

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LESSONS LEARNED- Because certain types of work such as research and development, decontamination and decommissioning, and work with legacy materials inherently involve unknown hazards, work planners should consider establishing hold points for these types of work activities to ensure that workers periodically evaluate current conditions against established hazard controls and work authorization documents.

EVENT SUMMARY- A worker received an uptake of radioactive material while handling legacy materials in a fume hood. Although the job was not intended to include opening containers, the worker opened two containers because she assumed they were empty. After discovering radioactive material inside the containers, the worker repackaged the material and placed the new containers in a corner of the room. Health Physics Operations personnel determined that the repackaged materials created a high radiation field.

In a subsequent event involving overpressurization of a glovebox and widespread area contamination in a laboratory at the same facility, workers repeatedly encountered unanticipated conditions that were not analyzed or controlled in the original work planning process. Several workers were contaminated during the course of the study.

In both occurrences, workers were unnecessarily exposed to radiological hazards because they failed to stop work when they encountered unexpected conditions, and because actions taken in response to the unexpected conditions were treated as routine work.

BACKGROUND- Legacy materials were being stored in a fume hood that was needed for programmatic activities. A radiological work permit was developed to catalog, sort, and inventory the materials in preparation for disposal. None of the containers, which were mostly glass and plastic, were to be opened. Because no significant radiological hazards were anticipated, no continuous air monitors or extremity dosimeters were required.

The last two items to be inventoried were stainless steel cans. One can had a lead liner and a label stating it contained americium; the other can was not labeled. Because nearly all the containers removed from the hood were empty, the worker assumed the cans were also empty. The worker opened both cans without assistance and without a radiological control technician (RCT) present, although she had been verbally instructed to have an RCT present when working in the hood.

The cans contained neptunium and americium. The worker repackaged the contents in new unshielded containers, which she placed on a 55-gallon drum in the corner of the room. The worker surveyed herself after repackaging the material and detected contamination on her

personal clothing. Her nasal smear results were also positive, and a radiation dose assessment indicated the worker received a 0.8 rem CEDE. The DOE annual whole-body limit is 5 rem.

Surveys indicated beta/gamma radiation levels of 2.5 R/hr on contact and 450 mR/h at one foot from the cans. The high-radiation field would not otherwise have been identified because routine radiological surveys were not performed in the room, which had not been used for programmatic work for many years.

The glovebox pressurization occurrence was related to a waste treatability study involving waste from the Portsmouth Gaseous Diffusion Plant. Although the elemental analysis data for the waste listed technetium-99, the study team leader was not aware that the waste was highly contaminated with technetium-99.

During the study, a team member became contaminated with technetium-99, and the work was moved from fume hoods to gloveboxes. Uranium precipitate work was performed in one glovebox, and a high-temperature furnace for calcining work was moved into another glovebox. The precipitate work generated ammonium nitrate fumes that condensed on the glovebox HEPA filter and interfered with the magnahelic gauge readings for the glovebox.

After the team discovered that the amount of highly enriched uranium in the Portsmouth waste was nearly twice what was measured through previous assay data, the team leader reduced the amount of waste handled in the gloveboxes to stay below the nuclear criticality limits established for the gloveboxes. The new uranium level was not reported to line or facility management.

All waste byproducts from the study were to be discarded to the Laboratory's radioactive liquid waste treatment facility. However, the technitium-99-contaminated byproduct solution did not meet the facility's waste acceptance criteria. The team decided to use a ferrous ammonium sulfate precipitate process to treat the byproduct waste in an attempt to meet the acceptance criteria. This treatment generated additional waste solution but did not reduce the beta activity to an acceptable level. Therefore, the team decided to evaporate the solution to convert it into solid waste.

ANALYSIS- Although radiological hazards were recognized during work planning activities for the material disposal initiative and the treatability study, the magnitude of the hazards was not understood until after workers became contaminated. The worker handling the legacy chemicals frequently monitored her hands and feet but did not ensure that an RCT was present because she felt that it was not necessary. After the can contents were identified, neither the worker nor her supervisor took any action to notify an RCT, measure dose rates, or establish additional radiological controls for the repackaging activities, which were not covered under the radiological work permit generated for the inventory work. Because the treatability study team leader did not realize the team was treating technetium-contaminated waste, no beta survey instruments were required for the work until after a team member was contaminated.

Work was repeatedly performed outside the scope of the original work control plan. The treatability study team planned to perform the majority of their work on laboratory benches and in fume hoods. When the work was moved to gloveboxes, no hazard analyses were performed

although the move introduced a potential ignition source and precipitates into the glovebox systems. The potential for airborne releases from the study work was also overlooked, although one of the fume hoods the team used and the area ventilation system did not have HEPA filters installed. Additionally, the precipitation and evaporation of the byproduct solutions was undertaken as routine work although it was not anticipated or analyzed when the study proposal was developed.

Workers were focused on completing their work in as timely a manner as possible, and they viewed all of the tasks necessary to accomplish the work as basically one job regardless of whether the particular task had previously been identified and analyzed. All the workers routinely handled radiological materials and considered the tasks undertaken in response to the unanticipated radiological conditions within the scope of their normal duties. The fact that the disposal initiative and the treatability study inherently involved unknown conditions also made it more difficult for the workers to recognize when conditions existed that were outside the scope of their authorized work activities.

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DOE FUNCTIONAL CATEGORY Conduct of Operation
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REFERENCES Chemistry and Metallurgy Research (CMR) Facility Room 4064 Glovebox Incident Investigation Report
Occurrence Report ALO-LA-LANL-CMR-1998-0041
Occurrence Report ALO-LA-LANL-CMR-1999-0020

FOLLOW-UP ACTIONS- Information in this report is accurate to the best of our knowledge. As a means of measuring the effectiveness of this report, please contact the originator of significant action(s) taken as a result of this report or of any technical inaccuracies you find. Your feedback is appreciated.