The Office of Environment, Safety and Health and its Office of Nuclear and Facility Safety (NFS) publishes the Operating Experience Weekly Summary to promote safety throughout the Department of Energy (DOE) complex by encouraging feedback of operating experience and encouraging the exchange of information among DOE nuclear facilities.

The Weekly Summary should be processed as an external source of lessons-learned information as described in DOE-STD-7501-96, *Development of DOE Lessons Learned Programs*.

To issue the Weekly Summary in a timely manner, the Office of Operating Experience Analysis and Feedback (OEAF) relies on preliminary information such as daily operations reports, notification reports, and, time permitting, conversations with cognizant facility or DOE field office staff. If you have additional pertinent information or identify inaccurate statements in the summary, please bring this to the attention of Dick Trevillian, 301-903-3074, or Internet address dick.trevillian@hq.doe.gov, so we may issue a correction.

Readers are cautioned that review of the Weekly Summary should not be a substitute for a thorough review of the interim and final occurrence reports.

Operating Experience Weekly Summary 97-10

February 28 through March 6, 1997

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EVENTS

1. FAILURE TO INERT GLOVEBOX RESULTS IN UNREVIEWED SAFETY QUESTION

On February 27, 1996, at the Mound Plant, management and operations contractor personnel determined there was an unreviewed safety question because a room glovebox was not inerted as required by the final safety analysis report. A Tritium Operations operator discovered the discrepancy during a safety evaluation for a proposed repackaging operation to remove plutonium-239 parts contaminated with tritium stored in the glovebox. Investigators determined engineers did not conduct a safety analysis when they disconnected the inert gas system when process work in the building ceased. Failure to maintain equipment and systems as required by the authorization basis lowers the margin of safety. (ORPS Report OH-MB-EGGM-EGGMAT01-1997-0004)

The final safety analysis report specifies that gloveboxes must be inerted to prevent combustion. Investigators determined the inerting system had been inoperable for several years. The plutonium-239 parts were not handled for several years; however, they were inspected visually during required surveillances. Investigators also determined the glovebox was not equipped with the required oxygen or tritium monitors when the operator conducted the repackaging evaluation. Engineers conducted an unreviewed safety question screening to ensure that installing the required oxygen and tritium monitors on the glovebox would not adversely affect a structure, system, or component as described in the existing safety analysis. They determined the monitors could be safely installed and installed them.

The newly installed oxygen monitor indicated the oxygen concentration inside the glovebox was approximately 19 percent (about the same concentration of oxygen as found in air). The tritium monitors indicated a tritium concentration of 160,000 microcuries/cubic meter. Investigators believe the atmosphere in the glovebox has been static for some time and most of the tritium is in the form of tritium oxide. Engineers conducted an unreviewed safety question screening. The results of this screening were positive because the oxygen content increased the probability of combustion occurring in the glovebox.

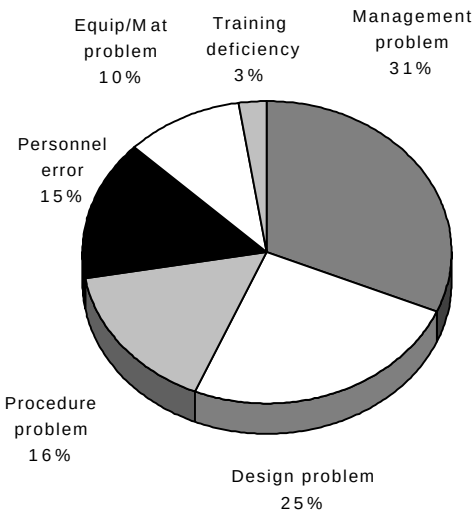
The management and operations contractor developed a plan to remove these plutonium-239 parts from the glovebox and the building. The contractor is awaiting approval from DOE.

NFS reported unreviewed safety question screenings in 14 Weekly Summaries in 1996.

- Weekly Summary 96-51 reported that on December 12, 1996, at the Oak Ridge site, managers in the Enriched Uranium Operations organization confirmed an unreviewed safety question for waste stored in a fissile material storage area. During a walk-through, licensing personnel found potentially hazardous, inadequately characterized, classified waste materials in a storage room. A hazards screening performed before the 1994 facility shutdown did not include the room or its contents. (ORPS Report ORO--LMES-Y12NUCLEAR-1996-0026)

- Weekly Summary 96-47 reported that on November 12, 1996, at the Rocky Flats Environmental Technology Site, technical services engineers identified two potential unreviewed safety questions caused by undocumented modifications. The shift manager terminated nuclear operations in the affected rooms until the unreviewed safety questions are resolved. (ORPS Report RFO--KHLL-771OPS-1996-0179)

Operating Experience Analysis and Feedback (OEAF) engineers reviewed the Occurrence Reporting and Processing System (ORPS) database for potential unreviewed safety questions across the DOE complex and found 440 occurrence reports. Figure 1-1 shows facility managers reported management problems, design problems, procedure problems, and personnel errors as the major root causes that led to unreviewed safety question screenings. Thirty-two percent of the management problems were the result of inadequate administrative control. Other management problems accounted for 30 percent of the management problems.



Management Problem	Percent
Inadequate administrative control	32
Other management problem	30
Policy not communicated or enforced	23
Work organization/Planning deficiency	9
Improper resource allocation	5
Inadequate supervision	1

Figure 1-1. Distribution of Root Causes for All Unreviewed Safety Questions Across the DOE Complex[1]

These events illustrate the importance of thoroughly reviewing facility authorization bases before performing modifications, procedures, or operational changes; before facility equipment is removed or is made inoperable; and before the facility mission is changed. These reviews are necessary to ensure the facility is not placed in an unsafe condition. DOE 5480.21, *Unreviewed Safety Questions*, establishes program requirements that allow contractors to make changes to plant and procedures without prior DOE approval. The Order states that the following three criteria are used to identify unreviewed safety

[1] OEAF engineers screened the ORPS database for All Narrative "unreviewed safety question@" and found 440 occurrence reports. Based on a random sample of 70 reports, OEAF engineers determined that each slice is accurate within ±1.7 percent.

questions when changes are made to the facility: (1) if the probability of occurrence or the consequences of an accident that is analyzed in the safety analysis report are changed; (2) if the possibility of an accident of a different type than analyzed in the report may be created; and (3) if the margin of safety, as defined in any technical specification, is reduced. DOE-EM-STD-5502-94, *Hazard Baseline Documentation,* provides guidance on the development and review of documentation identifying radiological and non-radiological hazards.

KEYWORDS: authorization basis, unreviewed safety question

FUNCTIONAL AREAS: compliance, licensing

2. PERSONNEL CONTAMINATED DURING UNAUTHORIZED LABORATORY WORK

On February 26, 1997, at the Lawrence Berkeley National Laboratory, a researcher spilled a small amount of Orthosphosphate P-32 while opening a vial. The spill resulted in skin, clothing, and internal contamination of the researcher and contamination to the clothing of two other people. The surrounding area and equipment were also contaminated. The work was being conducted in a laminar-flow biohood in a laboratory room. Neither the biohood nor the room was authorized for the radioisotope work. The activity of the radioisotope was ten times the authorized amount for the laboratory, and the chemical form was not authorized. Unauthorized laboratory work resulted in personnel contamination and the spread of contamination throughout the work area. (ORPS Report SAN--LBL-LSD-1997-0002)

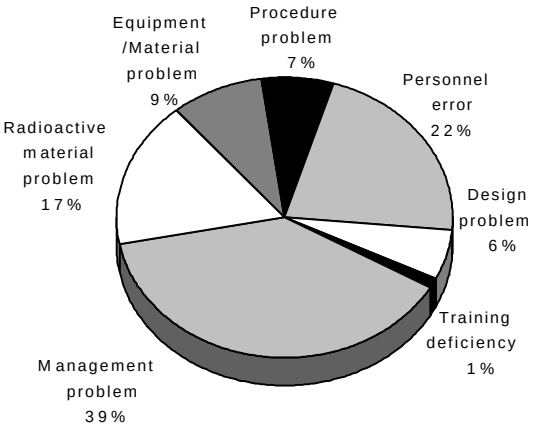
Radiation Protection Program personnel immediately responded to the affected room and surveyed the research area and personnel. They determined personnel skin and clothing contamination to be 150,000 dpm/100 cm^2 and laboratory-area contamination to be up to 1,000,000 dpm/100 cm^2. The contamination was confined to three adjacent rooms within the laboratory suite. Radiological control technicians bagged the contaminated personal clothing for disposal and decontaminated the skin to non-detectable levels. Bioassay (urine) testing confirmed that the researcher received an uptake of 2.3 nCi, which is equivalent to 0.15 microrem.

The laboratory director notified research supervisors and employees that radiation work authorization in the laboratory was temporarily suspended. The suspension will remain in effect until the Berkeley Laboratory Radiation Safety Committee, in conjunction with the affected division and the Environment Heath and Safety division, performs a thorough investigation to determine radiation exposures, root causes, and corrective actions. They will review the adequacy of the researcher's training and understanding of safe laboratory practices.

Investigators determined there were failings in the system of checks and balances for procuring hazardous materials and chemicals. The researcher was able to order the P-32 without authorization. Ordering this radioisotope would have required management reviews and identification of cautions specific to the material. One important consideration was that this material can pressurize when it warms up. Investigators also determined the person who received the shipment misread the manifest and thought the quantity, listed as 1 (for 1 vial), was the radioactivity of the material (1 millicurie). The vial

actually contained 10 millicuries of P-32. This resulted in the researcher having ten times the authorized quantity of the radioisotope.

Operating Experience Analysis and Feedback (OEAF) engineers reviewed the Occurrence Reporting and Processing System (ORPS) database for reports with a nature of occurrence code for personnel contamination. Figure 2-1 shows the distribution of root causes reported by facility managers for these events. Personnel error represented 22 percent of the root causes, and management problems accounted for 39 percent. Inadequate administrative control accounted for 38 percent of the management problems.



Management Problem	Percent
Inadequate administrative control	38
Other management problem	26
Work organization/Planning deficiency	19
Policy not adequately communicated	15
Improper resource allocation	1
Inadequate supervsion	1

Figure 2-1. Distribution of Root Causes for Personnel Contamination[1]

These events underscore the importance of having trained and qualified personnel in the laboratory. Laboratories contain ovens, open flames, hazardous chemicals, and radioactive materials; therefore new hires, students, post-graduate students, and the like, should be able to demonstrate their proficiency with safe laboratory practices and their knowledge of laboratory procedures. Managers and supervisors must strictly enforce laboratory policies and procedures to prevent personnel injuries and contamination. The ease with which the researcher was able to acquire unauthorized material also emphasizes the need to establish and enforce controls for procurement of chemicals and radioisotopes.

U.S. National Research Council publication ISBN 0-309-05229-7, *Prudent Practices in the Laboratory: Handling and Disposal of Chemicals,* 1995, states: “While the experiments may be prepared and conducted by the laboratory workers, it remains the responsibility of the laboratory supervisor to determine what level of experiment planning is appropriate and to be accountable for necessary training, documentation, and compliance with regulations.” Department of Labor, Occupational Safety and Health Administration regulation 29 CFR 1910.1450, *Occupational Exposure to Hazardous Chemicals in*

[1]OEAF engineers screened the ORPS database for personnel contamination events using nature of occurrence code 04B and all final reports from 01/01/95 through 03/06/97. This search found 617 reports containing 684 occurrences.

Laboratories, provides direction on using chemicals and includes information about signs and labels, spills and accidents, basic rules and procedures, and training and information. NFS issued DOE/EH-0420, Safety Notice 94-03, "Events Involving Undetected Spread of Contamination," in September 1994. The notice provides guidance, good practices, and corrective actions to prevent the spread of contamination. Safety Notice 94-03 can be obtained by contacting the Info Center, (301) 903-0449, or by writing to ES&H Information Center, U.S. Department of Energy, EH-74, Suite 100, Century XXI, Third Floor, Germantown, MD 20874.

KEYWORDS: laboratory, spill, contamination, training and qualifications

FUNCTIONAL AREAS: radiation protection, chemistry, training and qualifications

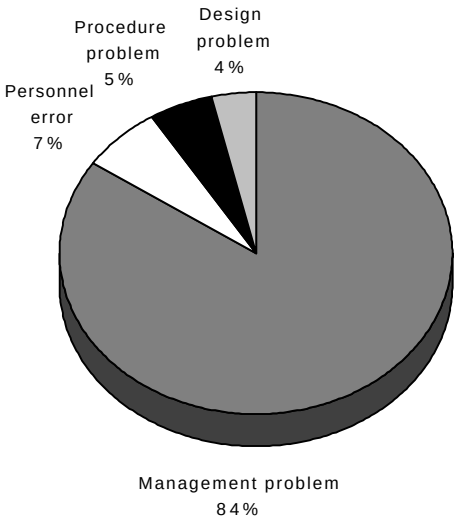
3. INADEQUATE WORK PLANNING RESULTS IN AN OPEN DRAIN LINE DURING PRESSURE TEST

On February 24, 1996, at the Hanford Tank Farms, operators attempting to pressure test an underground process pipeline inadvertently drained 2,450 gallons of water into a double-contained receiver tank. During the initial valve line up for the water fill of the pipe, an operator incorrectly positioned a drain valve in the temporary water supply piping, allowing water to flow to the receiver tank. The operator used a 20-foot reach rod to position the valve and thought it was in the closed position. The receiver tank was to be used as the final drain tank for the water at the completion of the pressure test. There were no adverse effects on personnel safety or the environment. Investigators determined that the temporary valve and reach rod were not configured according to the expected facility convention and were not labeled to indicate the difference. Investigators also determined that inadequate work planning and failure to recognize other equipment inadequacies contributed to this event. Failure to properly plan work creates the potential for injury or equipment damage. (ORPS Report RL--PHMC-TANKFARM-1997-0025)

Investigators determined the reach-rod valve handle indication was different from the normal convention: in the closed position, the handle was in line with the piping instead of perpendicular to the piping. Investigators also determined the work procedure did not include guidance on the use of level instruments to monitor receiver tank level or how frequently to monitor the tank level. The procedure also failed to state the maximum volume of water to be used. Investigators also determined the person in charge continued to fill the line after operators recognized that level instruments for the receiver tank were malfunctioning. One and a half hours after the operators started adding water to the process line, they determined approximately 1,800 gallons of water had been added instead of the projected 1,600 gallons; 30 minutes later, they had added a total of 2,200 gallons. When they realized the line was still not full two hours later, the person in charge stopped the test and notified management.

Based on the results of a critique, the Tank Farm manager directed the operators to stop work and notify the shift manager when results are not as expected. He also directed (1) instrument technicians to repair the receiver tank level indication, (2) maintenance workers to correct the valve configuration on the test assembly, and (3) operators to properly identify the closed position of the valve. In addition, the work procedure will be changed to require monitoring tank levels, checking instrument operability before beginning the test, and limiting water usage.

Operating Experience Analysis and Feedback (OEAF) engineers searched the Occurrence Reporting and Processing System (ORPS) database for events with work planning deficiency as the direct cause and found 400 occurrence reports. Figure 3-1 shows facility managers reported management problems as the root cause for 84 percent of work planning issues across the DOE complex. Further review shows that 65 percent of the management problems were reported as work organization or planning deficiencies.



Management Problem	Percent
Work organization/Planning deficiency	65
Inadequate administrative control	17
Policy not communicated or enforced	9
Other management problem	7
Improper resource allocation	1
Inadequate supervision	1

Figure 3-1. Distribution of Root Causes for Work Planning Issues Across the DOE Complex[1]

This event underscores the importance of using effective work control practices and adequate job planning. It also illustrates the importance of communication between work planners and working groups to ensure that activities are specifically identified in work packages and appropriate limits are defined. DOE facility managers should review their work processes to ensure that (1) groups with functional responsibilities are involved in the planning process, (2) all work groups are subject to the same work control system, and (3) the interfaces between work groups are identified and controlled.

DOE-STD-1069-94, *Guideline to Good Practices for Maintenance Tools and Equipment Control at DOE Nuclear Facilities*, states that instructions should be provided for the use of special tools, test rigs, lifting and rigging equipment, welding equipment, safety devices, personnel protective equipment, and mock-ups. It also states that the instructions should be written so as to improve tool and equipment use and enhance job performance and efficiency.

[1] OEAF engineers screened the ORPS database for direct cause “6b” (work planning deficiency) and found 400 occurrence reports.

DOE-STD-1050-93, *Guideline to Good Practices for Planning, Scheduling and Coordination of Maintenance at DOE Nuclear Facilities*, section 3.1.1.3, states that the primary objective of work planning is to identify all technical and administrative requirements for a work activity and to provide the materials, tools, and support activities needed to perform the work. Section 3.1.1.3 also provides the key elements of an effective planning program.

KEYWORDS: work control, work planning, procedures

FUNCTIONAL AREAS: work planning

4. POTENTIAL RELEASE OF AIRBORNE RADIOLOGICAL MATERIAL DUE TO PRESSURIZATION OF BUILDING

On February 19, 1997, at Hanford, environmental restoration surveillance and maintenance workers observed indications of pressurization of an inactive facility and a potential release of airborne radiological material. A radiological control technician took an air sample in the general area of cell egress to determine if there was a release. The sample was misplaced, and managers cannot determine whether a release occurred. The facility has no official hazards classification. Failure to control radiological samples or surveys and obtain timely analysis creates the potential for possible undocumented releases and unanticipated radiological exposures. Failure to properly classify nuclear facilities may result in unidentified hazards, unanalyzed accidents, and risks to personnel and the environment. (ORPS Report RL--BHI-DND-1997-0004)

Investigators reported the building is connected to the another plant's ventilation system and is normally maintained slightly below atmospheric pressure. Investigators determined the facility has no authorization basis and is scheduled for decontamination and decommissioning. The building contains a canyon section with several cells that have airborne radiological contamination. The environmental restoration contractor responsible for decontamination and decommissioning of the facility submitted a preliminary hazards analysis of the facility to DOE on February 28, 1997. The preliminary hazards analysis specifies this building as a Hazards Class 3 facility.

Investigators believe high winds caused the change in building pressure. Because of the deteriorated state of the facility, enough wind to cause a change in differential pressure of the cell could have entered through an exterior wooden door. Investigators also believe that because of the poor material condition of the facility, the potential increase in pressure may have caused a radiological release.

Investigators determined the radiological control technician took an air-grab sample, placed it in a source locker, but did not label it. They believe that another radiological control technician may have disposed of the sample during a house-cleaning activity. Investigators also determined that communications were unclear between the radiological engineer and the radiological supervisor and radiological control technician concerning the urgency for the air sample. They also determined there is no procedural guidance on linking survey records, counting logs, and air sample logs.

The project support radiological control manager will develop a method to link survey requests, survey records, counting logs, and air sample logs to ensure the samples can be

cross-referenced with the radiological survey or sample requirements. The radiological control manager will direct changes to the radiological survey and sample procedures when a method for linking surveys and samples is in place.

The environmental restoration manager directed surveillance and maintenance workers to (1) cover the external doors of the building with plastic, (2) verify the roof vents are blocked off, and (3) seal doors leading to the outside by applying foam. He also directed them to verify facility differential pressure after each of these actions. The environmental restoration manager will evaluate the need for additional engineering controls to ensure confinement of the nuclear material.

DOE/EH-0256T, *Radiological Control Manual*, section 114, states that there should be a site-specific radiological control manual that invokes the requirements of the *DOE Radiological Control Manual*. The manual should state management polices, requirements, expectations, and objectives for the site radiological program and should include site-specific additions. Additions and supplements to address unique situations or to provide more detailed direction may be included if the additions do not conflict with or diminish the requirements of the DOE manual. Where a site has multiple facilities, there should be one manual for the site and one radiological control organization. Subcontractors shall comply with the site-specific radiological control manual.

DOE 5480.23, *Nuclear Safety Analysis Reports*, states that it is DOE policy that nuclear facilities and operations be analyzed to (1) identify all hazards and potential accidents associated with the facility and the process systems, components, equipment, or structures and (2) establish design and operational means to mitigate these hazards and potential accidents. The results of these analyses are to be documented in safety analysis reports. DOE-STD-1027-92, *Hazard Categorization and Accident Analysis Techniques for Compliance with DOE Order 5480.23, Nuclear Safety Analysis Reports*, provides a graded approach to the preparation of safety analysis reports for nuclear facilities. The standard discusses the facility's stage in its life cycle and states that all safety analysis reports should furnish information about subsequent stages of the facility life cycle, including end-of-life decontamination and decommissioning. Facility managers should review their facility safety analysis reports to ensure they address subsequent states of the facility life cycle.

KEYWORDS: hazard analysis, unreviewed safety question, Price-Anderson act

FUNCTIONAL AREAS: licensing/compliance