Operating Experience Summary

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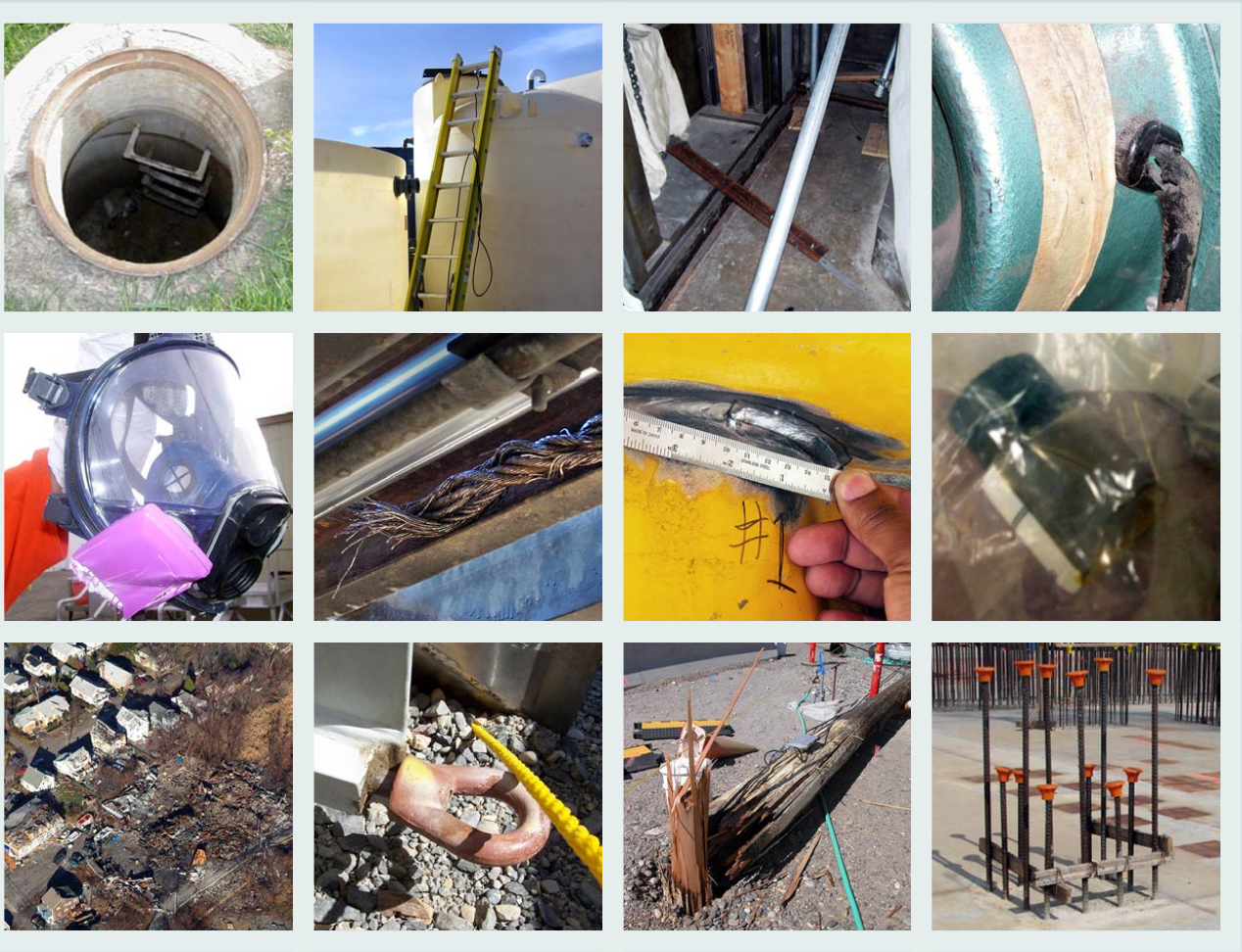

NRC Identifies Problems with Concrete Placement

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On October 22, 2008, the Nuclear Regulatory Commission (NRC) issued Information Notice 2008-17, *Construction Experience with Concrete Placement*. The purpose of the Notice was to inform current and potential nuclear plant applicants for early site permit, combined license, or standard design certification about the importance of considering lessons learned from construction experience when planning for and constructing new nuclear power plants or fuel cycle facilities. (NRC Information Notice 2008-17)

Inspections at new nuclear facility construction sites have repeatedly identified a lack of contractor oversight and poor quality control in the placement of concrete, as demonstrated by the following examples cited in the Notice.

Concrete Placement Issues at Olkiluoto 3 in Finland

A July 10, 2006, investigation report issued at the Olkiluoto 3 Nuclear Power Plant in western Finland (Figure 1-1) identified several contributing factors that resulted in plant construction delays. During placement of the reactor building concrete basemat, Teollisuuden Voima Oy (TVO), the licensee, detected inconsistencies in concrete from different truckloads and confirmed that plasticizer caused the variation. Additional problems involved water-cement ratios outside of design requirements and changes in the composition of the concrete made by the contractor without TVO's knowledge. Testing on the concrete indicated that the concrete met minimum standards. An investigation of site operations found that

Figure 1-1. Olkiluoto 3 Nuclear Power Plant (foreground) as it will appear when completed in 2012

the delays were also caused by lack of communication and defined responsibilities and by poor quality control. Although the concrete was ultimately found to be acceptable, the construction delays had a negative impact on public confidence.

Concrete Mixing Issues at Mixed Oxide Fuel Fabrication Facility

In September 2007, an NRC inspector observed problems with concrete placement at the Mixed Oxide (MOX) Fuel Fabrication Facility (MFFF) construction site (Figure 1-2) at the Savannah River Site. Based on the rejection of five truckloads of concrete by Shaw AREVA MOX Services (the applicant) because concrete slumps were outside the design value, the concrete batch plant, which was operated by a contractor, was inspected. The NRC inspector determined that chemical plasticizer and water in excess of both the manufacturer's recommendation and the design specification were being added to the design mix at the plant. The addition was made without

procedural guidance and was not documented. In response to the NRC report, the applicant assumed responsibility for concrete testing at the batch plant, provided immediate quality assurance coverage of all batching operations, ensured that batch plant procedures were written or revised as necessary, and consulted independent experts for recommendations for improvement.

In January 2008, at the MFFF construction site, a concrete reinforcement steel bar fractured near a bend location because of work-hardening during the bending process. An NRC inspection in February 2008 identified problems with bent rebar, primarily in the foundation of the facility. NRC inspections of the reinforcing steel vendor revealed five non-conformances: (1) inadequate surveillance of rebar fabrication; (2) inadequate audits of sub-suppliers; (3) failure to verify adequacy of design in the dedication of commercial grade items; (4) failure to write a corrective action process condition report for a significant condition adverse to quality; and (5) failure to properly disposition a code deficiency. An inspection of the MFFF yielded no findings. The applicant had already issued more than 80 condition reports addressing problems with vendor parts and had increased oversight of vendor activities.

Figure 1-2. Concrete mat and rebar installation during construction of MFFF

Concrete Placement Issues at Flamanville 3 in France

In March 2008, an inspection by the Autorite de Surete Nucleaire (ASN) revealed several problems with reinforcement steel bars and concrete placement for the basemat of the fuel storage buildings at the Electricite de France (EDF) Flamanville 3 European Pressurized Reactor construction site (Figure 1-3). The inspection revealed improperly spliced and tied rebar and reinforcing steel placement that did not conform to approved procedures and design requirements. Despite these deficiencies, the concrete contractor had initiated concrete placement. ASN was able to verify that corrective actions had been taken before concrete had actually been placed in the area.

Figure 1-3. Flamanville 3 construction site and circular basemat for reactor containment

In another case at the Flamanville 3 site, the concrete reinforcement and placement did not follow construction specifications and drawings. A review of site conformance records indicated that some aspects of the work were flagged as potential nonconformances, with specific notations, but follow-up actions were not tracked. Accordingly, ASN requested the licensee to provide additional information, including assurances that prior concrete placements were free of design-requirement inconsistencies with regard to the issue of improperly spliced and tied rebar and nonconforming reinforcing steel placement. Where implementation did not match the construction specifications and drawings, ASN asked the licensee to document and validate the alternate methods and explain the reasons for failing to follow approved construction procedures. ASN also requested information about the causes leading to the failure, so deficiencies identified in field records could be tracked and closed.

On May 21, 2008, EDF informed ASN about the lack of stirrups in the reinforcement steel of the basemat of the safeguard auxiliary buildings. Beyond the technical nonconformance, ASN considered the main issue to be the licensee's quality management system. A preliminary analysis of the root causes indicated that the nonconformance had not been corrected before concrete placement, even though both the subcontractors and the licensee had identified the lack of stirrups in time to do so. Consequently, ASN stopped concrete placement of all buildings relevant to safety until the licensee provided detailed plans that identified managerial and organizational enhancements to support improved oversight of field activities and facilitate field task tracking. In addition, the licensee was required to submit a technical analysis of the nonconformance and proposed correction.

On June 17, 2008, ASN authorized resumption of concrete placement on all buildings at Flamanville 3 except for the basemat of the safeguard auxiliary buildings until ASN reviewed the technical analysis of the nonconformance and the proposed correction. The placement of concrete for the safeguard auxiliary buildings was permitted to resume in July 2008.

The NRC archive of Information Notices can be accessed at http://www.nrc.gov/reading-rm/doc-collections/gen-comm/info-notices/.

A search of the ORPS database identified the following similar events.

- In May 2008, an NRC Inspection Report and Notice of Violation was received following an inspection of the MOX Fuel Fabrication Facility construction site. Inspectors discovered that Shaw AREVA MOX Services failed to ensure that reinforcing steel bars being used in the MOX Aqueous-Polishing Building met the minimum bend diameter specified in American Concrete Institute (ACI) 349-97. Shaw AREVA MOX Services also failed to provide adequate resolution to justify the use of nonconforming number 11 reinforcing steel splices that did not meet the design or ACI code requirements. (ORPS Report NA--SRSO-MOXS-MOX-2008-0003)
- In January 2006, during a concrete placement review for the Highly Enriched Uranium Materials Facility at the Y-12 National Security Complex, the contractor discovered that four placements of the top section of a wall were missing the required reinforcing steel. Also, floor-to-wall dowels were missing at another location. The concrete placement work was stopped pending evaluation. A dedicated quality control representative was assigned to inspect work as it progressed for conformance to the approved shop drawings and design documents. (ORPS Report NA--YSO-BWXT-Y12NUCLEAR-2006-0005)

Construction managers and project managers must ensure that a commitment to quality is applied early in construction projects to make certain that facilities are constructed in accordance with the design documents and can be operated in conformance with all applicable licenses and regulations. Concrete placement problems can be avoided by ensuring the correct installation of rebar (in accordance with the approved drawing details) and by complying with applicable American Concrete Institute codes.

KEYWORDS: Concrete, construction, foundation, rebar, quality assurance, quality control

ISM CORE FUNCTIONS: Provide Feedback and Continuous Improvement

Avoiding Concrete Placement Problems

- Inspect concrete batch plant operations and check truck mixer quality (e.g., slump tests).
- Ensure proper rebar bending.
- Ensure there are appropriate controls during concrete placement and consolidation using vibrators.
- Perform quality control checks of the rebar installation prior to concrete placement.
- Visually inspect concrete placement activities.
- Ensure concrete testing (e.g., cylinder samples and compressive strength breaks).

TSR Violations—Improper Control of Combustible Materials

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Recently, a number of Technical Safety Requirement (TSR) administrative control violations involving improper control of combustible materials have been reported to DOE's Occurrence Reporting and Processing System (ORPS). The combustible loading limits in TSRs are carefully calculated to ensure that combustibles in a facility will not compromise its ability to withstand a fire or contribute to the spread of a fire. Violations of the combustible loading controls result in a potentially dangerous facility condition, and correcting them is essential to ensuring the safety of workers, the public, and the environment.

Seven TSR violations occurred at the Oak Ridge Environmental Restoration Operations K-25 facility in July 2008. Because weaknesses had been identified in combustible material controls, facility management increased the number of walkdowns performed during this timeframe, and combustibles were found stored in proximity to hazardous materials in all seven cases. Several of the reported events are discussed below.

On July 31, 2008, personnel performing a walkdown identified issues related to the extended storage of diesel-powered equipment within 50 feet of hazardous materials (i.e., chemicals). There was no hot work in progress at the time this violation was identified; however, in the event of a fire, the location of the combustible liquids could have had negative consequences both onsite and offsite. (ORPS Report EM-ORO--BJC-BJK25ENVRES-2008-0019; final report issued November 18, 2008)

Investigators determined that the superintendent consulted with his nuclear safety representative about the regulations applicable to shipping containers, but he erroneously believed that when the chemicals were in containers the Specific Administrative Control (SAC) requirement in the TSR for "no extended storage of diesel-powered equipment within 50 feet" no longer applied. Based on this misunderstanding, the superintendent took no action to bring the condition into compliance.

Personnel identified a similar TSR violation during a walkdown on July 31, 2008, when they found crates containing chemicals stored within 25 feet of material at risk, which exceeded the limits of TSR administrative controls for combustible materials. In this case, the superintendent also misunderstood guidance from the nuclear safety representative and believed that once the chemicals were in shipping containers the TSR no longer applied. No hot work was being performed in the area, and the hazardous materials were moved to an area where there were no combustibles within 25 feet. (ORPS Report EM-ORO--BJC-K25ENVRES-2008-0017)

Investigators learned that the superintendent, foreman, and workers were not required to have TSR-specific training and that even though the superintendent was aware of the controls required by the TSR, he did not understand how they applied to his work. As a result, the superintendent provided incorrect information to the workers.

A July 25, 2008, walkdown led to finding approximately 25, 5-gallon plastic containers of mercury stored near combustible solids and flammable liquids. In this case, lack of training was identified as a root cause, and an inadequate work package was among the contributing causes. (ORPS Report EM-ORO--BJC-K25 ENVRES-2008-0014)

Although small amounts of mercury do not have significant consequences, the plastic containers used to store the mercury were combustible. Investigators determined that none of the workers or supervisory personnel had been trained on TSR

controls for storing and packaging mercury, and did not realize that plastic could contribute to the spread of fire, so they relied on the controls established in the work package. However, the work package did not indicate that bringing individual containers together consolidated the materials at risk and did not state that the storage of multiple containers in close proximity is considered to be consolidation. In addition, the work package did not provide adequate direction on control of combustibles or flammables.

Combustibles (lumber and debris, wooden crates, and pallets) in proximity to hazardous materials, as well as hazardous materials staged near a road without use of required vehicle barriers, were also found during the July walkdowns at the K-25 facility. Based on these recurring events, an analysis was performed to determine causal factors. Results of the analysis included the following findings.

- Management Methods—Management policy guidance and expectations were not well defined, understood, or enforced. Employees exhibited a lack of understanding of policies and expectations, and there was erosion in the level of knowledge of facility managers (likely related to attrition and turnover). Roles and responsibilities regarding execution of TSR requirements were also not well understood.
- Communications—Instructions were misunderstood because they were too long and were communicated orally instead of in writing. Communications between work groups was also less than adequate. In one case, a decision was made about work priorities without regard for, or knowledge about, the impact on other TSR compliance activities.
- Training—Training deficiencies were identified as a major contributor to the events analyzed. Deficiencies included lack of appropriate training, tasks not identified for training, training requirements not identified, and training not developed or conducted. Some training courses, including the combustible controls course, had been discontinued.
- Work Organization and Planning—Although SACs are included in every work package, they were not written in a user-friendly format, were difficult to understand, and could be misinterpreted. In addition, if a work package does not include direction to use a combustibles permit, a permit is not issued and an inspection is not performed to verify that SACs for combustible materials are used.

An example of the tragic consequences that can result from improper combustible storage is the May 1, 2002, fire at a Third Coast Industries automotive fluids blending and packaging plant in Friendswood, Texas, where a relatively small fire quickly spread and destroyed the entire facility. A Chemical Safety Board (CSB) Investigation Digest report on the fire can be accessed at http://www.csb.gov/completed_investigations/docs/CSB_ThirdCoastFINAL.pdf.

The fire, which began as a small fire on an outdoor worktable located between two warehouses, quickly grew to a flaming pool of liquid 65 to 80 feet wide and engulfed two semi-trailers full of empty drums. The flames also surrounded a 6,000-gallon tank wagon that contained synthetic motor oil, heating the oil and igniting flammable vapors vented from the tank. The intense heat ultimately resulted in the tank melting into several puddles of aluminum. Flames also surrounded several 2,000-gallon blending tanks, which collapsed and spilled their contents into the fire (Figure 2-1). Pipelines from nearby storage tanks also ruptured (Figure 2-2).

All of these burning fluids flowed toward the tank farm through a cracked and broken dike wall and ignited the storage tanks. Eventually the fire spread to other warehouses at the plant, breaching metal walls and consuming all the remaining fuel at the site.

Figure 2-1. Collapsed blending tanks

Figure 2-2. Melted storage tanks post-fire

The fire, which burned for more than 24 hours, consumed 1.2 million gallons of combustible and flammable liquids. In its aftermath, some 900,000 gallons of liquid waste and 2,500 cubic yards of contaminated soil and debris had to be removed for disposal. In addition to the total destruction of the plant, a small business nearby was destroyed, many local residents were evacuated, a local school was closed, and neighboring homes sustained heavy smoke damage. Fortunately, no employees, firefighters, or local residents were injured during the incident, and there were no fatalities.

Among other findings, the CSB investigators determined that Third Coast did not have a management system in place to identify or analyze serious fire hazards (e.g., a finding of "problematic location of flammable and combustible materials"). The CSB also determined that the facility did not have adequate measures in place to contain or control fires and limit the spread of a fire (e.g., the tank truck containing combustible materials was located too close to blending and packaging materials).

A November 18, 2008, Lessons Learned (Lesson ID: 2008-OR-BWY12-1106) discussed a fire at Y-12 in which stored combustibles were ignited when a faulty infrared heater ignited a pallet of absorbent pads placed directly beneath it. The pads ignited an adjacent cardboard box of protective clothing and then spread to materials including groundskeeping equipment stored in the facility. Some of the stored equipment contained gasoline, which was consumed in the fire. The fire burned for about 62 minutes, and estimates to restore the facility, replace its contents, and perform cleanup activities ranged from $200,000 to over $500,000. Had the material in this facility been properly stored, a failure such as this would have resulted in the hot metal debris landing on a concrete floor with no resultant fire. Four other locations at Y-12 were inspected to determine if a similar situation existed, but there were no combustibles stored under the heaters in these areas, and administrative controls were in place to ensure the areas directly underneath the heaters were maintained free of combustibles.

The administrative controls related to combustible loadings are in place to provide an additional barrier against a potentially dangerous situation in which a fire is fueled by combustible materials and spreads throughout a facility or results in a release to the environment. DOE-STD-1186-2004, *Specific Administrative Controls*, provides guidance for SACs developed to provide preventive or mitigative functions for potential accident scenarios. The Standard states:

> Fire accident scenarios have the potential to release large amounts of hazardous materials, including radioactive and chemical materials. If a facility's fire protection system design assumes that the combustible loading does not exceed a certain level, then required controls to ensure this level is not exceeded are expressed as an [S]AC. There are instances where an [S]AC may be the most important control.

The textbox on the following page, taken from the Standard, lists a number of methods for enhancing human performance with regard to SACs. The Standard can be accessed on the DOE website or at http://www.tpub.com/content/doe2/std11862004/std118620040001.htm.

These events illustrate the importance of implementing all combustible loading requirements and ensuring that TSR administrative controls are followed. Appropriate training and retraining in TSR administrative controls are essential to continued safety, particularly when attrition has resulted in a workforce that is less knowledgeable about such controls and their purpose. Communicating instructions properly and ensuring they are understood, as well as flowing down management expectations effectively, will also provide assurance that workers understand policies, requirements, and the need to adhere to them.

KEYWORDS: TSR, combustible loading, administrative controls, SAC, combustibles, fire

ISM CORE FUNCTIONS: Analyze the Hazards, Develop and Implement Hazard Controls, Perform Work within Controls

Methods for Improving Worker Adherence to Specific Administrative Controls

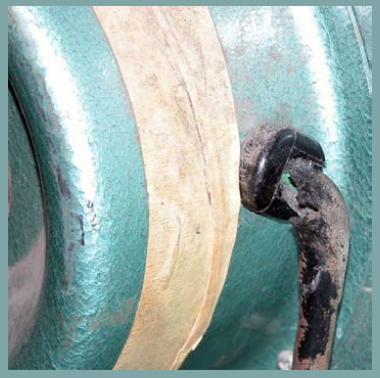
- Reader/worker/checker systems
- Independent verification
- Positive feedback systems
- Interlocks
- Warning signs and barriers
- Alarms and monitors
- Human factor analysis
- Operator training and certification
- Continuing training and re-qualification
- Abnormal event response drills
- Ergonomic considerations in procedures
- Dry runs for non-routine operations
- Double staffing or direct supervision for hazardous operations
- Human Reliability Assessment

– Taken from DOE-STD-1186

Issue 2008-01	Article Title	Event	Lessons Learned
	Confined Space Events Result in Industry Fatalities	A supervisor found two workers dead inside a 20,000-gallon tank at a dry cleaning plant in Linden, New Jersey. (N/A)	*Recognize confined spaces and areas in which an oxygen-deficient atmosphere exists, and ensure procedures and checklists address hazard identification and mitigation.*
	Recognizing Changed Conditions—An Important Safety Practice	Two lessons learned address how changes in conditions or work tasks can impact safety and the necessity of staying within the scope of work. (Lessons Learned Identifier LL-2007-LLNL-28)	*Identify and address even minor changes in conditions or work scope, and ensure that work does not proceed until all hazards are identified, communicated, and controlled.*
	Type A Accident Investigation of the Mixed Waste Spill at Hanford Tank Farms—Part 3: Emergency Management and Response	Response to the accident in the areas of incident command, event categorization, notification and communication, and radiological consequence assessment were effective overall, but there were weaknesses in emergency response to the spill. (ORPS Report EM-RP--CHG-TANKFARM-2007-0009)	*Ensure that emergency response procedures provide specific steps to take in any abnormal event, including high-probability, low-consequence events.*

Issue 2008-02	Article Title	Event	Lessons Learned
	Near Miss—Worker Falls Into Empty Effluent Tank When Ladder Shifts	A subcontractor worker installing bolts to secure a lid on a plastic waste-water tank fell more than 6 feet into an empty, adjacent tank when the extension ladder he was using shifted unexpectedly. (ORPS Report EM-RL--PHMC-GPP-2007-0007)	*Secure ladders to prevent any unexpected movement or sliding across a smooth surface.*
	Hazards of Blind Penetrations Contacting Concealed Utilities	A carpenter securing a storage cabinet to a sheetrock wall drilled into an energized electrical conduit providing 120-volt power to an electrical receptacle. (ORPS Report SC--PNSO-PNNL-PNNLBOPER-2007-0012)	*Proceed with caution when performing blind penetrations, perform pre-job walkdowns, mark all piping and conduits, and discuss hazards.*
	Type A Accident Investigation of the Mixed Waste Spill at Hanford Tank Farms—Part 4: Industrial Hygiene/ Medical Factors	Some workers reported odors, experienced symptoms or health effects, or expressed concerns about their potential exposure to the waste chemicals from the spill. (ORPS Report EM-RP--CHG-TANKFARM-2007-0009)	*Ensure that industrial hygiene responses to abnormal conditions are well coordinated and that monitoring is accomplished as quickly as possible following an event.*

Issue 2008-03	Article Title	Event	Lessons Learned
	Look Out Below— The Hazards of Falling Objects	A worker on a subcontractor survey crew dropped a 7-pound, metal flat bar for a laser sight instrument from a scaffolding platform that landed near a carpenter working directly below. (ORPS Report EM-RP--BNRP-RPPWTP-2007-0020)	*Ensure that workers are protected from the hazards of falling objects and that those working on the ground are aware of overhead work.*
	Unauthorized Equipment Operation Shuts Down Facility Processes	An on-coming shift operator altered the position of valves in a cooling water system without authorization, causing a series of low-level alarms in the control room and the shutdown of H-Canyon processes. (ORPS Report EM-SR--WSRC-SUD-2008-0001)	*Unauthorized equipment operation can change the known configuration of facility systems.*
	Type A Accident Investigation of the Mixed Waste Spill at Hanford Tank Farms—Part 5: Management Systems	Management failed to apply lessons learned from previous contamination and vapor exposure incidents and contractor oversight and design reviews were inadequate to identify deficiencies in the pump system design. (ORPS Report EM-RP--CHG-TANKFARM- 2007-0009)	*Implement effective corrective actions based on lessons learned, ensure that in-depth quality assurance audits and surveillances are timely, and provide effective program oversight.*

Issue 2008-04	Article Title	Event	Lessons Learned
	Missed Opportunities to Identify a Hazard Result in Electrical Shock	A subcontractor maintenance worker plugged a metal-bodied welding rod oven into an electrical outlet that was not protected by a ground fault circuit interrupter (GFCI) and received an electrical shock when he tried to unplug it. (ORPS Report EM-RL--WCH-ERDF-2008-0001)	*Always inspect power cords and test the GFCI before plugging electrical equipment into a receptacle.*
	Office of Independent Oversight Review of Non-Radiological Workplace Exposure Monitoring	The Office of Independent Oversight evaluated the effectiveness of the Department's workplace monitoring programs for nonradiological hazards at eight sites, identifying many positive attributes but concluding that much remained to be done.	*N/A*
	Type A Accident Investigation of the Mixed Waste Spill at Hanford Tank Farms—Part 6: Corrective Actions	Overview of the corrective actions developed to address the Judgments of Need for each of the deficient program areas identified post-accident.	*Reviewing applicable programs, processes, and procedures and implementing corrective actions may deter a similar event.*

Issue 2008-05	Article Title	Event	Lessons Learned
	Near Miss—Worker Pinned Between Manlift and Overhead Pipe	A subcontractor painter working from a boom lift while cleaning pipe hangers with an electric grinder was caught between the lift and an overhead pipe when the cord of the grinder looped around a toggle switch on the control panel, causing the boom to rise. (ORPS Report EM-RP--BNRP-RPPWTP-2008-0008)	*Ensure that all hazards are identified and addressed before a task requiring work from a manlift begins.*
	Prevent an Accident—Secure That Load Before You Transport	A 1,260-pound pump assembly loaded on a flatbed semi-trailer fell off the bed of the truck and landed on the ground. (ORPS Report EM-RL--PHMC-FSS-2008-0004)	*Understand the dynamics of loads under transport and ensure that all loads are properly secured before transport.*
	Residual Flammable Vapors in PVC Pipe Cause Explosion	A subcontractor welder was performing a hot tap into a carbon steel pipe when the heat from the acetylene torch ignited residual vapor trapped inside attached polyvinylchloride piping and caused an explosion. (ORPS Report SC--SSO-SU-SLAC-2007-0011)	*Avoid making assumptions about work tasks on the basis of previous experience with similar tasks and identify and address potential hazards before work begins.*

Issue 2008-06	Article Title	Event	Lessons Learned
	Hoisting Cable on Leased Truck Breaks	A teamster was unloading waste containers from a recently leased shuttle truck with a lift deck when the hoisting cable broke, recoiled toward the windows in the cab of the truck, and broke out about a third of the glass in the upper part of the passenger side rear window. (ORPS Report EM-RL--WCH-REMACT-2008-0004)	*Thoroughly inspect equipment, particularly leased equipment, before use.*
	Radio Frequency Interference Triggers Nuclear Plant Shutdown	Signals from a worker's digital camera caused an emergency shutdown of the reactor at the Indian Point Power Plant (N/A)	*If items such as digital cameras, cell phones, PDAs, and other wireless electronic devices are permitted in areas where safety systems are installed ensure that adequate shielding is in place.*
	Preliminary Notice of Violation Issued for Violations Related to Y-12 Uranium Chip Fire	DOE issued a Preliminary Notice of Violation and levied a $123,750 civil penalty against Babcock and Wilcox Technical Services Y-12, LLC for a uranium machine turnings (chips) fire at Y-12 in which more than 100 workers received radiation doses from smoke inhalation and airborne material from the fire. (ORPS Report NA--YSO-BWXT -Y12NUCLEAR-2007-0012)	*When working with pyrophoric materials in gloveboxes, it is essential that all hazards are addressed in procedures and all necessary work controls are in place.*

Issue 2008-07	Article Title	Event	Lessons Learned
	Industry Tower Crane Collapses Lead to Savannah River Site Crane Shutdown	A crane operator noticed cracks in the protective coating on two legs of the turntable supports of a tower crane while performing a routine daily inspection, and had the crane shut down. (ORPS Report NA--SRSO-MOXS-MOX-2008-0004)	*Before using a tower crane, it is essential that it be properly inspected. Precautions should be taken to ensure that weather-related events, such as wind or lightning, do not impact safe operation of equipment and that all electrical components meet applicable codes.*
	Can It Happen Here? SRS Takes Proactive Steps to Minimize Potential for a Liquid Radioactive Waste Spill	Savannah River Site (SRS) management conducted a self-assessment of the SRS Tank Farm programs to determine the potential for an event similar to the spill at Hanford. (N/A)	*Sharing lessons learned and applying them at other sites enhances safety across the Complex.*
	Legacy Beryllium Contamination at Lawrence Livermore National Laboratory	Seven workers handling ductwork were potentially exposed to legacy beryllium. (ORPS Report NA--LSO-LLNL-LLNL-2007-0059)	*If there is even a minimal chance that they may be exposed to beryllium, workers should not assume that a work area is "clean," but should take a more conservative approach and wear appropriate PPE.*

Issue 2008-08	Article Title	Event	Lessons Learned
	Plutonium Spill at Boulder NIST Facility	A guest researcher broke a glass bottle containing a sample of plutonium sulfate tetrahydride, spilling the plutonium, then handled the material and spread contamination in the work area, on his body, and outside the laboratory. (N/A)	*Working visitors, students, and guests should have all requisite training to safely perform the tasks to which they are assigned, should be properly mentored, and should understand all emergency actions and reporting requirements.*
	Unsafe Liftgate Operation Results in Worker Injuries	An equipment supplier worker sustained a "buckle fracture" (incomplete fracture) and a laceration of the right forearm when his arm was caught between two sections of a truck liftgate mechanism. (ORPS Report EM-SR--WSRC-FSSBU-2008-0005	*Liftgate users need to follow manufacturers' instructions and obey posted warning and caution signs.*
	Addressing the Health and Safety of an Aging Workforce	It is important to evaluate equipment, facilities, and work processes and make any necessary changes to address the health and safety issues that accompany an aging population. (N/A)	*Consider the physical changes that come with age in job planning and ensure that measures are in place to address these changes and mitigate any resulting hazards.*

Issue 2008-09	Article Title	Event	Lessons Learned
	Chemical Safety Board Completes Investigation of Danvers Explosion	The Chemical Safety Board (CSB) issued the final report on their investigation into an explosion at the CAI ink manufacturing facility in Danvers, Massachusetts, in which 10 local residents were injured and 24 homes and 6 businesses were demolished. (N/A)	*Perform hazard analyses, implement proper controls, ensure that all procedures are followed to the letter, and use checklists to ensure that essential steps are not overlooked when performing hazardous tasks.*
	Worker Receives Electrical Shock from Oven Thermocouple	A researcher investigating a spurious temperature reading from a laboratory oven thermocouple received a "small buzz" when he touched the thermocouple wire. (ORPS Report SC--PNSO-PNNL-PNNLBOPER-2008-0012)	*Workers who are unqualified to work on equipment should not be permitted to make modifications to existing equipment, and all such work should be performed based on accurate information and diagrams provided by manufacturers or vendors.*
	Ensure Your Job Hazards Analysis Covers All Activities of the Job, Including Cleanup	Three subcontract workers were exposed to respirable silica during concrete-floor grinding operations that exceeded the assigned protection factor of their half-face air purifying respirators. (ORPS Report NA--SS-SNL-NMFAC-2008-0013)	*Analyze the hazards throughout all phases of the work activity and ensure that controls to protect workers are maintained until job completion.*

Issue 2008-10	Article Title	Event	Lessons Learned
	Three Recent Events Involved Failed Rigging and Lifting Hardware	An overloaded synthetic sling failed and struck a waste handling technician across the hand, forearm, and chest. (ORPS Report EM-CAFO--WTS-WIPP-2008-0012)	*Follow an approved lift plan, ensure that the rigging selection and lifting hardware are correctly and properly configured for the lift, and conduct a physical check of the load to verify its configuration and placement of rigging.*
	Worker's Death Linked to Mesothelioma	A millwright craftsperson employed at Sandia National Laboratory since 1971 died of complications associated with mesothelioma. (ORPS Report NA--SS-SNL-NMFAC-2008-0017)	*The use of proper safety equipment (e.g., respirators) is the most important safeguard for ensuring that workers are not exposed to asbestos.*
	Time to Take Cold Weather Protection Measures	Sites across the Complex should take steps to protect essential systems during inclement weather and remind employees to be wary while walking on icy sidewalks and in parking lots and driving in hazardous conditions. (ORPS Reports SC--FSO-FNAL-FERMILAB-2008-0001; NA--YSO-BWXT-Y12NUCLEAR-2008-0001; NA--LASO-LANL-PHYSTECH-2008-0006; SC-ORO--ORNL-X10BOPLANT-2008-0001)	*Freeze protection plans must be initiated before the onset of winter weather and employees should be reminded to be wary when walking or driving on snow- and ice-covered parking areas, sidewalks, and roads.*

Issue 2008-11	Article Title	Event	Lessons Learned
	Always Check for Overhead Lines When Moving Large Equipment	An equipment operator was moving an excavator out of a construction area when the excavator boom hit an overhead communication line, pulling down two poles and exposing underground electrical lines. (ORPS Report EM-RL--PHMC-PFP-2008-0005)	*Exercise extreme caution when working from or moving equipment near overhead power lines.*
	Propane-Fueled Forklift Trucks—A Potential Carbon Monoxide Hazard	Washington State Department of Labor investigation of an apparent forklift-related carbon monoxide poisoning in which 28 workers were taken ill. (N/A)	*Propane-fueled forklifts that will be operated indoors should be regularly inspected and maintained, and operators should be made aware of the potential for hazardous carbon monoxide emissions.*
	Effective Flowdown of Hazardous Energy Controls to Subcontractor Workers	A number of recent events across the Complex involved vendors and subcontractors failing to implement required hazardous energy controls. (ORPS Report EE-GO--NREL-NREL-2008-0010)	*Provide oversight for subcontractor and vendor workers and flow down all safety requirements to ensure that they are aware of and follow all site procedures.*

Issue 2008-12	Article Title	Event	Lessons Learned
	NRC Identifies Problems With Concrete Placement	NRC issued Information Notice to inform current and potential nuclear plant applicants for early site permit, combined license, or standard design certification about the importance of considering lessons learned from construction experience when planning for and constructing new nuclear power plants or fuel cycle facilities. (N/A)	*Ensure that a commitment to quality is applied early in construction projects to make certain that facilities are constructed in accordance with the design documents and can be operated in conformance with all applicable licenses and regulations.*
	TSR Violations—Improper Control of Combustible Materials	Violations of the combustible loading controls result in a potentially dangerous facility condition and correcting them is essential to ensuring the safety of workers, the public, and the environment. (ORPS Report EM-ORO--BJC-K25ENVRES-2008-0019)	*TSR administrative controls are essential to continued safety, particularly when attrition has resulted in a workforce that is less knowledgeable about such controls and their purpose. Communicating instructions properly and ensuring they are understood, as well as flowing down management expectations effectively, also provide assurance that workers understand policies, requirements, and the need to adhere to them.*

The Office of Health, Safety and Security (HSS), Office of Analysis publishes the Operating Experience Summary to promote safety throughout the Department of Energy (DOE) Complex by encouraging the exchange of lessons-learned information among DOE facilities.

To issue the Summary in a timely manner, HSS relies on preliminary information such as daily operations reports, notification reports, and 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 Dr. Robert Czincila, (301) 903-2428, or e-mail address Robert.Czincila@hq.doe.gov, so we may issue a correction. If you have difficulty accessing the Summary on the Web (http://www.hss.energy.gov/csa/analysis/oesummary/index.html), please contact the Information Center, (800) 473-4375, for assistance. We would like to hear from you regarding how we can make our products better and more useful. Please forward any comments to Robert.Czincila@hq.doe.gov.

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Commonly Used Acronyms and Initialisms

Agencies/Organizations	
ACGIH	American Conference of Governmental Industrial Hygienists
ANSI	American National Standards Institute
CPSC	Consumer Product Safety Commission
DOE	Department of Energy
DOT	Department of Transportation
EPA	Environmental Protection Agency
INPO	Institute for Nuclear Power Operations
NIOSH	National Institute for Occupational Safety and Health
NNSA	National Nuclear Security Administration
NRC	Nuclear Regulatory Commission
OSHA	Occupational Safety and Health Administration

Units of Measure	
AC	alternating current
DC	direct current
mg	milligram (1/1000th of a gram)
kg	kilogram (1000 grams)
psi (a)(d)(g)	pounds per square inch (absolute) (differential) (gauge)
RAD	Radiation Absorbed Dose
REM	Roentgen Equivalent Man
TWA	Time Weighted Average
v/kv	volt/kilovolt

Job Titles/Positions	
RCT	Radiological Control Technician

Authorization Basis/Documents	
JHA	Job Hazards Analysis
JSA	Job Safety Analysis
NOV	Notice of Violation
SAR	Safety Analysis Report
TSR	Technical Safety Requirement
USQ	Unreviewed Safety Question

Regulations/Acts	
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
D&D	Decontamination and Decommissioning
DD&D	Decontamination, Decommissioning, and Dismantlement
RCRA	Resource Conservation and Recovery Act
TSCA	Toxic Substances Control Act

Miscellaneous	
ALARA	As low as reasonably achievable
HEPA	High Efficiency Particulate Air
HVAC	Heating, Ventilation, and Air Conditioning
ISM	Integrated Safety Management
MSDS	Material Safety Data Sheet
ORPS	Occurrence Reporting and Processing System
PPE	Personal Protective Equipment
QA/QC	Quality Assurance/Quality Control
SME	Subject Matter Expert