

United States Government

Department of Energy

memorandum

DATE: December 10, 1996

REPLY TO:
ATTN OF: EH-53 (R. Sastry, 301-903-4664)

SUBJECT: Chemical Safety Concerns / Search of Occurrence Reporting and Processing System (ORPS)

TO: Distribution

Significant Occurrences

November, 1996**Class 1:**[Los Alamos](#) - explosion in testing oven due to unknown cause[Livermore](#) - failure of chemical reactor causes hot spray**Class 2:**[Brookhaven](#) - employee sprayed by pressurized chemicals[Fernald](#) - nitrogen dioxide release

These occurrences are further described below with additional information, including Occurrence Report (OR) numbers, provided in the [Attachment](#).

A search of ORPS for occurrences having chemical safety relevance conducted for the month of November 1996 produced 34 reports representing potential chemical safety concerns. These occurrences are listed in the [Attachment](#). Nine occurrences were categorized as "Unusual" and the remainder identified as "Off-normal". The Office of Environmental Management (EM) was Cognizant Secretarial Office (CSO) for 14 occurrences; Defense Programs (DP) also reported 14; Nuclear Energy (NE) had four; and Energy Research (ER) and Uranium Enrichment (UE) one each. This CSO designation may change after the distribution of this monthly memorandum, and this change will be reflected in Quarterly and Annual Reviews.

In order to determine which chemical safety occurrences represent more important (significant) Levels of Concern, a classification scheme has been developed. The definitions of these Classes are as follows:

Class 1 Occurrences characterized by an injury or exposure requiring hospital treatment, or confirmed, severe environmental effect; also occurrences that had the potential to cause these effects with all safety barriers down, except, for example, that no one was nearby to be injured or exposed, or escaped in time, or the climatic conditions were favorable;

Class 2 Occurrences characterized by minor injury (first aid) or exposure, or minor environmental damage; also occurrences that were near misses (where one additional safety barrier remained to

prevent consequences) to those in Class 1;

Class 3 Potential precursors to the occurrences in Class 1 or 2;

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Class 4 Minor occurrences such as leaks, spills, or releases, which may be significant in their frequency

4 of occurrence though not in their consequences.

There were two Class 1 and two Class 2 occurrences reported during November. There were 15 Class 3 occurrences. Among the Class 3 occurrences were a lid blowing off of a pressurized waste storage drum at Oak Ridge, explosives shipment problems at Pantex, INEL, and LLNL, and a magnesium/water reaction in a furnace at Savannah River. There were also three reports from Pantex concerning blast door interlock malfunctions.

Summary of Class 1 and Class 2 Occurrences:

Explosion in Testing Oven (DP): (ALO-LA-LANL-CMR-1996-0038) On November 14, 1996, at Los Alamos National Laboratory, there was an explosion and small fire in the Chemistry and Metallurgy Research Facility. No personnel were injured. The room contains equipment for studying the evolution of gasses from various materials. To perform the work, analysts must heat the materials in ovens. The materials are placed in heavy, stainless steel vessels prior to being placed in the ovens. At the time of the explosion, one vessel was being heated in an oven for analysis of evolved gasses. Inspection of the room revealed that the steel vessel had exploded and completely destroyed the oven and associated analysis equipment. Evidently, a fireball emanated from the vessel when it exploded, and the fireball ignited combustible material associated with the oven (insulation, etc.) and other combustibles in the room. The reason the explosion occurred is still under investigation.

From the Occurrence Report: "It was fortunate that this incident occurred after normal working hours when personnel were not in the immediate area around the ovens. Had there been personnel in the immediate area when the explosion occurred, the incident could have resulted in serious injuries and possibly a loss of life."

Failure of Chemical Reactor Results in Hot Spray (DP): (SAN--LLNL-LLNL-1996-0059) On November 6, during an experimental run of a molten salt chemical reactor, a mechanical failure of the reactor or attached piping occurred. This failure resulted in a spray of high temperature (up to 800 degrees Celsius) molten salt in an approximate arc of 270 degrees into the room. Three people were in the room at the time but, fortunately, were not in the path of the spray. There were no personnel injuries resulting from this incident. The purpose of this work was to develop a process for the destruction of energetic material. Only surrogate material (non-energetic material) was being run in the reactor at the time of the failure. According to **Operational Experience Weekly Summary 96-46**, the facility manager led a preliminary investigation of the event and determined that the operators' protective clothing was inadequate for this hazard. Investigators are reviewing the occurrence to determine the cause of the failure.

Chemist Sprayed with Cleaning Solution (ER): (CH-BH-BNL-BNL-1996-0018) On November 12, at Brookhaven National Laboratory, a chemist cleaning the Chemical Synthesis System was sprayed by cleaning solution (consisting of small amounts of hydrogen iodide in acetone). A nitrogen gas line normally used to purge the system of liquid was broken, which resulted in the system not being purged of the solution; therefore, the system was under a slight back pressure. When the valve was opened, a small amount of solution was expelled into the face and upper torso of the chemist. The chemist was wearing two pairs of rubber gloves, a lab coat, and safety glasses. The chemist subsequently complained

of discomfort in the nose and mouth and was transported to Medical where personnel flushed the chemist's nose, eyes, and mouth. The chemist was then re-examined and released.

Nitrogen Dioxide Release (EM): (OH-FN-FDF-FEMP-1996-0061) On November 18, at Fernald, an unexpected release of nitrogen dioxide (NO₂) occurred. Workers were performing reduction and neutralization of liquid uranyl nitrate hexahydrate (UNH). The workers were wearing full anti-contamination clothing, including chemical-resistant sleeve-aprons, and a full-face air-purifying respirator with combination cartridges. Workers had emptied the contents of one poly-drum into two steel mixing drums. One mixing drum was placed under an exhaust ventilation hood and the other mixing drum was placed to the side. As reduction and neutralization efforts were being conducted on the first mixing drum, the NO₂ alarm sounded. Later, the review of monitor output showed a peak concentration at the source of 28.7 ppm [Ed Note: 20 ppm is the Immediately Dangerous to Life and Health (IDLH) level for NO₂]. The source of the NO₂ was a reaction occurring in the second mixing drum and not from the drum being neutralized. The workers immediately placed the two mixing drums into a specially lined container and evacuated the Exclusion Zone. There was no indication of any worker exposure to hazardous levels of NO₂ and personnel involved had no exposure-related complaints.

Additional information regarding these occurrences and others will be discussed in an upcoming Quarterly Review. As occurrence reports are finalized, lessons learned will be communicated.

[Signature of]

Rama Sastry
Office of Field Support

[Attachment](#)

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Web page design: Joseph Kahn