

## Department of Energy

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DNF SAFETY BOARD

The Honorable John T. Conway  
Chairman  
Defense Nuclear Facilities Safety Board  
625 Indiana Avenue, NW  
Suite 700  
Washington, D.C. 20004-2901

Dear Mr. Chairman:

Thank you for your March 9, 2000, letter concerning the K-Area Materials Storage (KAMS) project at the Savannah River Site (SRS). We have reviewed the issues raised in your letter and those included in your staff's report, dated February 16, 2000. A major issue raised in your letter and the staff's report involves the lack of capability within KAMS "to open, inspect, or repackage containers, and no capability to provide confinement in the unlikely event that one or more containers should fail."

In working to establish the KAMS storage capability at the SRS for the accelerated movement of Rocky Flats Environmental Technology Site plutonium, a fundamental requisite was established that a plutonium release from a stored package could not be tolerated. To meet this requirement several conditions, barriers, and restrictions need to be met, to include:

- The plutonium must be packaged, and certified to be packaged, in accordance with the Department's long-term plutonium storage criteria (DOE-STD-3013-99, of which the Board participated in its development and review).
- The stabilized and long-term packaged plutonium will be stored in a shipping package (the 9975) that provides two additional containment vessel barriers and an overpack drum system to further protect the containment vessels.
- Plutonium package handling equipment (forklift and pallet truck) have been designed to preclude the possibility of a plutonium release.
- Fire safety improvements and combustible loading limits have been established such that the worst credible fire would not threaten the integrity of the plutonium packages containment systems.
- Inadvertent criticality is not a credible event.

As indicated in your letter, the KAMS storage area has no containment ventilation system. A thorough safety analysis for plutonium storage in KAMS, relying on the above conditions, has been completed and concludes that a release of plutonium from a stored package is "beyond extremely unlikely." Within the



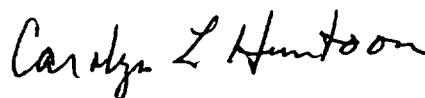
realm of probabilities, this equates to less than one chance in a million. The Department and the nuclear industry have used this threshold as a reasonable limit to meet safety goals and objectives. Additional protective measures could be implemented. However, such measures are beyond what is prudent for the KAMS mission.

While we believe a plutonium release within KAMS to be beyond extremely unlikely, it is conceivable that 9975 plutonium storage packages could become damaged or exhibit characteristics that would warrant further inspection and/or repackaging. As indicated in the Board staff's report, current plans are to segregate damaged or suspect packages and develop an appropriate response plan within 24 hours. A damaged 9975 shipping/storage package can be transferred to existing plutonium handling facilities, e.g., FB-Line or Building 235-F, for repackaging into an undamaged 9975 package. Additionally, the Department intends to proceed with establishing a plutonium stabilization and packaging system within Building 235-F to prepare SRS plutonium for long-term storage. This capability, expected to be available by January 2007, can provide for the long-term repackaging of suspect KAMS stored plutonium. In the interim, even though it is anticipated that FB-Line nuclear material stabilization activities will be complete prior to 2007, FB-Line will have the capability to receive, inspect, and if necessary, open 3013 packaged plutonium. If opened, this plutonium would be packaged for interim storage pending the availability of the Building 235-F capability.

To address the above and the additional issues raised in the Board staff's report, enclosed is an Issue Resolution Paper. I believe it fully addresses the issues to allow their resolution and details appropriate plans and actions to ensure the safe storage of plutonium within the KAMS facility.

If you have further questions, please contact me at (202) 586-7710, visit our home page at [www.em.doe.gov](http://www.em.doe.gov), or contact Mr. Mark Frei, Deputy Assistant Secretary for Project Completion at (202) 586-0370.

Sincerely,



Carolyn L. Huntoon  
Assistant Secretary for  
Environmental Management

Enclosure

## ISSUE RESOLUTION PAPER

### Defense Nuclear Facilities Safety Board Issues with the K-Area Materials Storage Facility

Issue #1: The K-Area Materials Storage (KAMS) facility has no capability to open, inspect, or repackage containers.

A fundamental requirement for the storage of plutonium in KAMS relies on plutonium being appropriately stabilized and packaged in accordance with the Department of Energy's (DOE's) long-term plutonium storage criteria, DOE-STD-3013-99. This standard was developed to ensure the safe storage of plutonium materials for up to 50 years. Additional protection and containment is provided by employing the 9975 shipping package. The 9975 package provides two additional containment barriers plus overpack protection (from potential thermal and impact events), while providing spacing for nuclear criticality safety, and provides other safety benefits to include facilitating handling and reducing radiation exposures.

The restrictions on the ability to open or repackage containers received or stored in KAMS was a conscientious approach to establish, on an accelerated schedule, safe and secure storage for Rocky Flats Environmental Technology Site (RFETS) surplus non-pit plutonium to support early RFETS closure. As the Board recognizes, KAMS itself does not have a confinement system. As a result, it was important to ensure that the containers used to store plutonium in KAMS were sufficiently robust to survive the full range of credible accidents in the facility. The 3013/9975 package combination configuration provides, as documented through the authorization basis, that a release of plutonium within KAMS under all credible accident conditions is beyond extremely unlikely. For the purpose of the safety analysis review, and in accordance with DOE's *Preparation Guide for U.S. DOE Non-reactor Nuclear Facility Safety Analysis Reports*, DOE-STD-3009-94, the term "beyond extremely unlikely" means that the probability for such an accident to occur is less than one in one million chances per year.

Although KAMS will not have the capability to open and repackage plutonium containers, each plutonium-containing 9975 shipping package received in KAMS will be inspected prior to placement in the storage facility and will be periodically inspected while in storage. Should a container exhibit some damage or other suspect characteristic, it will be segregated and an appropriate response plan will be developed within 24 hours. A damaged or suspect package could be shipped to one of the F-Area plutonium handling facilities for repackaging into another 9975 package, and if necessary, the 3013 container could be opened in FB-Line and the plutonium characterized to determine a proper path for its safe storage. DOE has determined that development of an overpack container to provide additional defense-in-depth control is unwarranted at this time.

Issue #2: Provide KAMS with the capability and procedures necessary to address a small number of leaky containers as an immediate response.

As indicated in response to issue #1, above, DOE has concluded that the probability of a container leaking plutonium is beyond extremely unlikely. Developing additional protection measures over and above the current defense-in-depth approach would not be cost effective, and would dilute valuable resources required to address other safety and programmatic responsibilities. The current requirement to isolate a suspect container and developing a response plan within 24 hours is sufficient to address the safe handling and management of a suspect package or damaged 9975 package.

Issue #3: Develop surveillance and maintenance programs for the DOE-STD-3013 containers and the 9975 shipping packages.

In accordance with the requirements of DOE-STD-3013-99, DOE is establishing a complex-wide integrated surveillance program. For 3013 containers stored in KAMS, the surveillance program will be a cooperative effort between the Savannah River Site (SRS) and the Los Alamos National Laboratory (LANL). The program will be established before the current October/November 2000 expected receipt of material within KAMS. The envisioned program will incorporate a combination of fundamental gas generation testing, nondestructive testing (such as radiography), and a small number of destructive tests. The gas generation tests will be performed at LANL on materials in the Material Identification and Surveillance (MIS) program. The MIS program addresses the requirements of DOE-STD-3013-99. Nondestructive tests at the SRS will likely be performed in an F-Area facility. Initial destructive tests will be performed at LANL on materials shipped there from RFETS.

For the 9975 shipping package, while a Certificate of Compliance for transportation may only be valid for two years, this certificate is not relied upon in using the 9975 shipping packages for safe storage within KAMS. Several studies have been completed to evaluate the performance of the 9975 shipping package components in an interim- to long-term storage function. These studies resulted in DOE's conclusion that the 9975 package can withstand the expected environmental conditions and protect the workers and the environment for at least a 10-year KAMS storage duration. During the KAMS storage period, DOE will measure various stored 9975 package properties, such as associated with the elastomer seals and the Celotex<sup>®</sup>, as opportunities arise to determine if the 9975 packages can be safely stored for longer than 10 years, should a longer storage duration become necessary.

**Issue #4:** Make the material control and accountability (MC&A) equipment, primarily the neutron multiplicity counter, available before receiving material for storage in KAMS.

It is expected that the first shipments of plutonium into KAMS will now occur in the October/November 2000 time-frame. The KAMS MC&A equipment will be installed and be functional by July 2000. The final determination of operational readiness, however, is dependent on the receipt of package "standards" from RFETS, to arrive with the first KAMS shipment.

Although the MC&A equipment could add to the defense-in-depth measures for safe storage of plutonium within KAMS, it is not relied upon within the nuclear criticality safety analyses, but for confirmation that plutonium is present within the received package. DOE fully expects that plutonium packaged for storage within KAMS will meet the 9975 Safety Analysis Report for Packaging shipping requirements (maximum of 4.4 kilograms of plutonium). In addition, DOE will require shippers to document in approved Criticality Safety Evaluations that an overbatching event greater than 1 kilogram of plutonium is beyond extremely unlikely (probability of less than  $1E-06$ /year). From the nuclear criticality safety evaluation, DOE has determined that having one extra kilogram of isotopically pure plutonium-239 packaged in every 3013 container stored within KAMS would maintain a safe configuration under all accident conditions, including a fully flooded infinite array of 9975 packaged plutonium.

**Issue #5:** Provide an enhanced facility maintenance program due to the existing age (45 years) of Building 105-K and the potential for greater than 10 years of plutonium storage in KAMS.

DOE does not believe an enhanced facility maintenance program is warranted to ensure the safe operation and storage of materials within Building 105-K. During the development of the Building 105-K Basis for Interim Operations, all credible accidents were analyzed. As indicated, these analyses conclude that a plutonium release to be beyond extremely unlikely. This would include accidents or events related to the "aging" facility, and damage from roof cracks or from a potential fire due to aging electrical equipment. The only "operational" component relied upon for KAMS is the concrete structure. DOE does not foresee any substantial change to the integrity of the structural concrete during the expected ten year or potentially greater KAMS operating life. Nevertheless, DOE will continue its existing surveillance and inspection program in accordance with facility and safety management requirements.

In addition, during KAMS modifications, pro-active measures were taken to address the risk associated with Building 105-K. These measures included the installation of a new roof coating system, the removal of the top 70 feet of the Building 105-K exhaust stack, the removal of unnecessary structures that could become a hazard in the rare case of an earthquake, and the removal of exposed wiring located in the storage areas that could become a fire hazard.

**Issue #6:** Reduce the inventory of combustibles and remove the heavy hoist in the actuator tower. In the interim, provide periodic roving watch coverage of the area.

DOE believes the actions to remove additional combustibles and the hoist, or to require a periodic roving watch in these areas are not warranted.

During the KAMS design and safety analyses process, a potential accident scenario was identified involving the retired K-Reactor “forest” hoist collapsing during an actuator tower fire. The scenario involved a fire that consumed all combustible materials in the tower causing the structural steel that supports the hoist to weaken, allowing the hoist to fall through the roof of the process room damaging plutonium containers stored in KAMS. Two main alternatives were considered to remedy this potential accident scenario: (1) remove the combustible materials, and (2) coat the structural beam supporting the hoist with an approved fire retardant to preserve the strength of the steel in the event of a fire.

Considering the safety merits of each option, the KAMS project schedule to support RFETS, and costs, DOE decided to coat the beam to ensure its integrity in the event of any fire. Additionally, during modifications for KAMS, a transient combustibles inspection program was conducted and all transient combustibles were removed. Removing the remaining combustibles, primarily a considerable number of 1950-vintage control and safety rod drive motor cables, would expose workers to known PCB's in a large percentage of the cables.

The action taken to coat the beam with fire retardant, a standard industrial practice, to mitigate the potential effects of a fire event is highly conservative. First, the actuator tower calculation used the smallest cross-section in the tower, essentially neglecting any credit for heat to expand to significantly larger sections of the space. Second, the heat load used to calculate the fire duration included a considerable number of transient combustibles that have since been removed. The heat load also includes the combustibles from areas that can communicate through the facility ventilation ductwork. And finally, credit is not provided for a vent installed in the roof of the actuator tower, providing additional defense-in-depth, to remove a substantial amount of heat in the event of an actuator tower fire.

A periodic roving watch for this area is not advisable. Access to the actuator tower area will be strictly limited and controlled. DOE believes that limiting access is an effective safety control to prevent the establishment of unfavorable conditions. Controlled (semiannual) surveillances of Building 105-K areas, to include the actuator tower, are performed as required by the facility's transient combustible program required by the Technical Safety Requirements.

**Issue #7:** Integration of security and KAMS operations has safety implications and warrants review during the Operational Readiness Review (ORR) process, and the interface between the security force and the fire department should not delay response to a medical emergency.

Balancing worker safety and security needs has historically been a concern for DOE facilities that store and process Special Nuclear Material (SNM). The dilemma is to delay ingress of personnel to prevent access by unauthorized personnel to SNM and yet provide the ability for emergency personnel to respond to a fire or medical emergency with minimal delay. Recently, and in support of the planned KAMS startup, an evaluation was performed on how emergency medical and fire department personnel access KAMS and other SRS facilities where SNM is stored or processed and the SNM attractiveness levels meet specific requirements in DOE Orders. The evaluation addressed the need to balance both the prevention of unauthorized access to SNM and the Occupational Safety and Health Act requirement to provide prompt medical service and first aid to workers in a facility. The results of the evaluation highlight the average response times to various SRS facilities for emergency personnel and actions taken by WSRC to ensure actual response times are kept to a minimum.

Emergency access requirements have been established for KAMS and result in approximately a 45-second delay to the emergency vehicle. This is based on performance tests conducted at the K-Area entry control facility. While DOE accepts this delay as an acceptable balance to protect SNM and respond to emergencies, we will continue to search for alternate methods of identifying emergency response personnel for granting appropriate access to further enhance response times.

**Issue #8:** Receipt inspections should eventually be moved to another location to avoid introducing unconfirmed containers within close proximity to the eventual large inventory of plutonium to be placed within KAMS.

DOE plans to move receipt inspections outside of the initial storage area when Phase II construction activities are completed and security integrity for the new receipt inspection location can be assured. This could be as early as December 2000, well before any "large inventory" of plutonium containers would be placed within KAMS. This will minimize personnel exposures in accordance with As Low As Reasonably Achievable (ALARA) practices and allow for a more efficient receipt process.

Issue #9: Use stronger pallets in advance of a potential decision to proceed with triple stacking to eliminate the risks and worker exposure with transferring containers in KAMS to stronger pallets.

DOE is continuing to evaluate the triple stacking option to provide expanded storage capacity for the SRS and the DOE complex. No decision has been made at this time. However, as a result of the 9975 package drum lid closure redesign, new pallets will be required for KAMS. To preserve the triple stacking option and eliminate the risk and exposure from re-palletizing the packages, DOE will ensure the new pallets can accommodate triple stacking.