



UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
REGION I  
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*Endorsement*  
8005140506

FEB 19 1980

MEMORANDUM FOR: James H. Sniezek, Fuel Facility and Materials Safety  
Inspection

FROM: Boyce H. Grier, Director, Region I

SUBJECT: PROPOSED BULLETIN

Region I recommends that the attached bulletin be issued to fuel facility licensees who may receive shipments of plutonium.

*James M. Allan*  
Boyce H. Grier  
Director

UNITED STATES NUCLEAR REGULATORY COMMISSION  
OFFICE OF INSPECTION AND ENFORCEMENT  
WASHINGTON, D. C. 20555

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IE Bulletin 80-

UNLOADING PLUTONIUM OXIDE FROM SHIPPING CONTAINERS AND PACKAGING SHIPPED  
PLUTONIUM

Description of Circumstances:

There were two reported accidents in 1979 which occurred while packages containing "plutonium oxide" were being removed from shipping containers. Both accidents demonstrated the need for the use of suitable equipment and procedures while unloading packages of "plutonium oxide" from shipping containers. The report for one of the accidents points out a need for repackaging the plutonium oxide which has been shipped, especially that shipped in an FL-1A-1 shipping container.

On March 13, 1979, a plutonium oxide storage can ruptured as it was being removed from a shipping container, and airborne plutonium contamination was spread within a storage facility at Hanford, Washington. Three persons received minor clothing contamination. No significant internal depositions occurred.

On October 25, 1979, plutonium oxide storage cans ruptured as they were being removed from the inner canister of a shipping container, and airborne plutonium contamination was spread at the Savannah River Plant in South Carolina. Five persons assimilated plutonium in their lungs from this accident. The amounts were all well below permissible limits.

The sources of the pressurized gases causing the rupture of the cans and the contamination were different in the two accidents. In the March 13 accident it appears that heat buildup in the insulated 5791 shipping container caused the vaporization of moisture present in the material and/or the formation of  $\text{NO}_2$  and  $\text{O}_2$  from the thermal decomposition of residual  $\text{PuO}_2 (\text{NO}_3)_2$  left in the material by incomplete calcination of the plutonium nitrate during processing. In the October 25, 1979 accident, it appears that helium gas used during the leak checking of the seal of the pressure vessel of the shipping container entered the inner canister of the shipping container through weld defects and pressurized the entire contents of the inner canister. When the end of the inner canister was removed, the inner canister vented rapidly, the cans holding the plutonium oxide did not, thus causing a differential pressure across the cans and plastic bags holding the plutonium oxide.

In both accidents the shipping containers performed their function in that the packaged material was transported safely within the barriers provided by the containers. However, the shipping containers contributed to both accidents.

The packages of material removed from the shipping containers were not in the same condition as the packages placed inside the shipping containers. The investigators of both accidents recognized this, and among their recommendations, they recommended that containers be opened under strictly controlled conditions to provide adequate radiological protection to personnel. This protection was recommended to be provided by ventilated enclosures, such as gloveboxes.

The investigation report for the October 25 accident pointed out a serious consideration for packages of plutonium oxide which have been packaged in an FL-10-1 shipping container. A shipping container is assumed to contain four cans, and each can contains 800 grams of  $\text{PuO}_2$  with a heat generation rate of 6.75 watts per can. The total heat loading of 27 watts is within the certificate of compliance limit of 30 watts. The calculated equilibrium temperature distribution within the FL-10-1 shipping container was as follows:

CALCULATED TEMPERATURE DISTRIBUTION WITHIN FL-10-1 SHIPPING CONTAINERS

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Location	Temperature (°C)
$\text{PuO}_2$ Centerline	231
Paint Can Surface (Containing $\text{PuO}_2$ )	223
Food Can Surface (Containing $\text{PuO}_2$ )	148
Spacer Food Can Surface (Empty)	117
Inner Surface of Foam	68
Outer Surface of Drum	27
Ambient	25

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This report also points out that plastic bags are routinely used in the packaging of plutonium oxide as containment barriers. Often these bags are made of polyvinyl chloride (PVC). This report points out further that PVC is reported to degrade at temperatures greater than 100°C with release of HCl and an accompanying darkening in color. Consequently, if a package of  $\text{PuO}_2$  depends on plastic, PVC in particular, as a containment barrier, and the package was held in an FL-10-1 shipping container for a period of time, the integrity of the package for containment of the plutonium oxide is highly suspect. If storage of such cans of plutonium oxide is required, the plastic bags initially used can not be considered to be containment barriers and other suitable barriers must be provided.

## Action to be Taken by Licensees:

All licensees receiving, unloading, handling and storing PuO<sub>2</sub> from shipping containers, especially the FL-10-1 shipping containers, must take the following action to provide adequate radiological protection for personnel.

1. Determine if plastic containment barriers of PuO<sub>2</sub> packages may have been degraded at the elevated temperatures encountered in the shipping container. If so, repackage the PuO<sub>2</sub> to provide the necessary containment barriers to allow safe handling and storage of the PuO<sub>2</sub>.
2. Provide adequate procedures to provide for the safe removal of PuO<sub>2</sub> from packages transported in shipping containers.
3. Provide adequate equipment for the safe removal of PuO<sub>2</sub> from packages transported in shipping containers.
4. Items 1 and 2 should be accomplished prior to the receipt and unloading of any packages of PuO<sub>2</sub> at your facilities. Report in writing within 45 days your plan of action and schedule with regard to item 3. Reports are to be submitted to the Director of the appropriate NRC Regional Office and a copy should be forwarded to the NRC Office of Inspection and Enforcement, Division of Fuel Facilities and Materials Safety Inspection, Washington, D. C. 20555.

Approved by GAO, B180225 (R0072); clearance expires 7-31-80. Approval was given under a blanket clearance specifically for identified generic problems.