

# DEFENSE NUCLEAR FACILITIES SAFETY BOARD

February 3, 1994

**MEMORANDUM FOR:** George W. Cunningham, Technical Director

**FROM:** Davis Hurt

**SUBJECT:** Application of the Draft Plutonium Storage Standard to Building 707  
Resumption - Rocky Flats

1. **Purpose:** The purpose of this memorandum is to bring to the Board's attention the fact that the proposed calcination operations in Building 707 at the Rocky Flats Plant will not comply with the terms of the standard. The memorandum explains the areas of non-compliance and discusses steps that could be taken to bring them into compliance. There are processing issues and container issues.
2. **Background:** The Department of Energy (DOE) has developed a draft standard on long-term storage of plutonium metals and oxides. (Our most current copy is attached to this memorandum.) As of this writing, the standard is still circulating within DOE; and is expected to be issued for public comment within a month. My colleagues and I have discussed the draft standard with many plutonium processing engineers from around the Complex. It appears that the standard in its present form enjoys considerable support, and final standard is expected to be very similar to the draft version.
3. **Discussion:**
  - a. Processing Issues
    1. **Temperature:** The draft standard would require that thermal stabilization be conducted at 1,000°C. The Building 707 calciners will reach a maximum temperature of approximately 500°C. The staff discussed the possibility of reaching a higher temperature with Rocky Flats personnel. The Rocky Flats position is that the calciners were not designed to operate much above 500°C, and have never been operated much above 500°C. (At this point, the staff has not sought to confirm that assertion.) It is not obvious why the calciners could not be heated to 1,000°C, but there would clearly have to be a detailed evaluation of safety and operational issues involved, as well as testing at the higher temperature. Those activities would presumably delay resumption.

2. **Hold Time:** The draft standard would require that the peak temperature be maintained for 1 hour. The Building 707 calciners will not maintain their peak temperature for any specific time, and will normally begin cooling the material down as soon as the peak is reached. As with the basic temperature issue, evaluation and testing would be required to determine if the calciners could be safely held at 1,000°C for an hour.
  3. **Moisture:** The draft standard would require that the stabilized oxide be cooled, handled, and packaged in an atmosphere having a moisture content of 100 ppm or less. The moisture content of the air in the Building 707 Module J glove boxes is not controlled or measured, and will certainly be much higher than 100 ppm. Only a few of the rooms or glove boxes in Building 707 ever had engineered moisture controls, and the tightest limit was about 600 ppm (in the pit assembly area). A significant amount of new equipment would probably have to be installed to meet this requirement, probably including not just dehumidifiers but new glove boxes that would prevent in-leakage of room air.
- b. Container Issues: The container issues are academic unless the processing issues are addressed first. It would not be safe to put improperly processed oxide in containers that comply with the standard (hermetically sealed containers) because of the potential for gas generation and overpressurization. The Rocky Flats plan is to put the calcined plutonium oxide in a slip-lid can, tape the lid, remove the can from the glove box in a plastic bag by way of a bag-out port, put the bagged-out container in a second plastic bag, place the whole assembly in a second slip-lid can, and tape the lid. There are basically two container issues:
1. **Sealing:** The draft standard would basically require two nested, hermetically sealed, leak-testable, plastic-free containers. The Rocky Flats plan is to use two slip-lid cans. The standard would allow a lower-grade container (not leak-testable or hermetically sealed, for example) to serve as an innermost container if it were overpacked with two qualified containers. But even the lower-grade container would have to be "sealed", which would seem to disqualify the slip-lid cans. For overpacking to be a viable option, Rocky Flats would have to use a sealed container, such as a screw-lid can or food-pack can.

It is possible that Rocky Flats does not possess containers that would qualify as one of the two hermetically sealed containers called for by the standard. For all practical purposes, a qualified container would have to be welded shut or have a bolted lid with a metal gasket. Rocky Flats sometimes uses bolted-lid "pressure cookers" to provide air-tight storage, but they normally have an elastomer gasket, which would disqualify them. It is probably possible to fit the pressure cookers with a metal gasket, but Rocky Flats may not have enough pressure cookers to accommodate all of the stabilized oxide. And they may not have enough storage space in the vaults

to accommodate so many pressure cookers, which are much larger than the outer slip-lid cans.

2. Plastic: Even if a qualified, sealed container could be used in Building 707, there is the question of how to get the container out of the glove boxes without using plastic bags. Any container handled in the glove boxes will presumably get contaminated with loose plutonium oxide. The draft standard would not allow organic material of any kind in any of the containers, so the bag-out methods used at Rocky Flats for contamination control would create a problem. It would not be allowable to directly overpack a bagged-out container with a qualified container even if the bagged-out container itself were sealed and otherwise acceptable.

Once such a container is bagged out, it would eventually have to be bagged back into the glove boxes for decontamination and removal by other means. There are two downdraft tables in Building 707 for removing items from the glove boxes without plastic bags, but the tables are not located in Module J, and there is no provision at present for decontaminating the outside of the containers anyway.

c. Options:

There are two possible courses of action: postpone processing until all terms of the standard can be complied with, or proceed according to plan, recognizing that the product will not be qualified for long-term storage. Each course of action has some disadvantages.

Postponing processing means living with the risks posed by the duct residues and other potentially unstable plutonium oxides for some additional time. How long is hard to predict. As discussed above, some fairly major changes in apparatus and infrastructure would be required to comply with the standard. At some sites, it would probably be possible to add the necessary new equipment and develop new procedures within a few months. Recent history suggests that it would take far longer at Rocky Flats, possibly several years. As a generality, the staff has advocated faster action at Rocky Flats to stabilize plutonium in storage. Even though the duct residues and impure oxides are not among the most dangerous materials in storage, and even though the start-up of the Building 707 calciners is only a small step toward stabilizing the total inventory of impure oxides, it is the only significant step on offer for the near future.

The disadvantages of proceeding with the current plan are of two sorts. The more tangible problem is that the material will definitely have to be re-processed later, with all of the negative consequences that implies in terms of radiation exposure, risk of accidents, and contribution to site effluents. When the Board considered Building 707 resumption last year, the draft standard did not exist, and it was possible to hope that the calciner product would be compatible with future long-term storage standards (although many

people had doubts). It is no longer possible to hope that. The less tangible, but no less important, problem with proceeding is the bad example it sets. The first plutonium processing activity at Rocky Flats since the 1989 shutdown will not comply with an important and directly applicable new standard.

**Attachment:**

**Department of Energy Criteria for Storage of Plutonium Metals and Oxides (Draft), January 12, 1994**