DEFENSE NUCLEAR FACILITIES SAFETY BOARD

June 9, 1995

MEMORANDUM: G. W. Cunningham, Technical Director

COPIES: Board Members

FROM: Joe Sanders

SUBJECT: AT400A Pit Storage and Shipping Container Design and Repackaging

1. **Background:** In December 1992, the Pantex Zone 4 Safety Analysis Report Technical Safety Review Panel recommended replacing the current pit storage container, ALR8, with containers certified for offsite transportation. The AT400A pit storage and shipping container is a modification of the Department of Energy designed AT400R Russian fissile storage container. It is being developed by Sandia National Laboratory/New Mexico in cooperation with the other laboratories. The expectation is to eventually repackage all pits into these AT400A containers for an intermediate period of approximately 20 - 40 years until a final disposition option is chosen and exercised.

2. **Design Description:** A cutaway view of the AT400A container is provided in Figure 1. The AT400A is composed of a pit holding fixture located within an inner, welded containment structure made of stainless steel. This is then located in a stainless steel overpack. The containment structure is designed to house all current pits. To achieve this, the pit holding fixture will be pit type-specific. The holding fixture also serves to transfer decay heat away from the pit so as to not exceed pit design temperature limits (typically between 150 and 200 degrees Fahrenheit). Furthermore, the fixture incorporates a shock-resisting system so that moderate external shocks to the container (i.e., 4 ft drops on a hard surface) as specified in 10 CFR71.71, *Nuclear Regulatory Commission Regulations for Packaging and Transportation of Radioactive Material - Normal Accident Conditions*, should not damage the pit.

   The containment structure is a 304L stainless steel pressure vessel that is designed to provide containment during both *Normal Accident Conditions* (10CFR71.71) and *Hypothetical Accident Conditions* (10CFR71.73), the difference being that the pit is expected to fail during the latter conditions. The containment will be backfilled with dry inert gas, welded (hermetically sealed), and leak tested. It will have a sample tube to allow sampling of the gas backfill to ensure the pit has not been breached. The containment structure will also have a fitting to provide simplified handling using robotic devices.

   The overpack is the outermost container housing the containment structure. The overpack is a flanged and bolted enclosure which provides access to the containment vessel for surveillance and gas sampling. The overpack acts as the shipping container and, as such, is designed to provide a level of mechanical and thermal shock mitigation to prevent failure of the containment vessel. Specifically, the entire system is designed to maintain containment of the radioactive materials (i.e., plutonium and/or uranium) during the postulated hypothetical transportation accident conditions specified in 10CFR71.73. These include: (a) 30 foot drop onto an unyielding surface, (b) 40 inch drop onto a spike, (c) 30 minute exposure to a 1475° F fire, and (d) submersion in water to a gauge pressure of 21 psi. To satisfy these design conditions, the overpack is constructed of stainless steel filled with polyurethane foam.

   The entire system will be analyzed to evaluate its ability to provide adequate radiation shielding and criticality prevention for all different pit types. The design, analyses, and testing program will be completed and documented in the Safety Analysis Report for Packaging (SARP). Upon approval by the Nuclear Regulatory Commission, a transportation certificate will be issued.

3. **Pit Repackaging:** Repackaging of pits from their current containers into AT400As will occur at Pantex. The final specific location(s) and method(s) of repackaging have not yet been determined. Manual repackaging is initially expected to occur in Building 12-99, Bays 2 and 4, beginning in early 1996. Figure 2 provides a pictorial description of this operation. Before repackaging, each pit will be inspected, cleaned (if necessary), weighed, and leak checked. Presumably, anomalous conditions will be noted and those pits set aside for further evaluation. The expected annual throughput of a single manual repackaging line is 1000 pits (assuming one shift). At a minimum, an Unreviewed Safety Question Determination (USQD) will be required for performing welding operations in Building 12-99.

   Repackaging operations in Building 12-99 may eventually be replaced by either manual or robotic repackaging lines in Building 12-116 (Special Nuclear Material Component Staging Facility). Figure 3 provides a pictorial description of this operation. Several uncertainties impact this decision. Deficiencies in the design of Building 12-116 are resulting in modifications/upgrades and the facility startup date is uncertain. Furthermore, the facility was not designed to house pit repackaging operations. Bays previously designed to house secondaries would require modification due to the presence of plutonium. For example, several bays share a common ventilation system; bays housing plutonium require individual filtered ventilation systems. Lastly, the technology to support robotic pit repackaging operations is still under development and will require extensive validation.

   Either manual or robotic repackaging lines may be installed in Building 12-116. Ideally, the robotic system is preferred because it has a higher throughput than manual repackaging (approximately 3000 verses 1000 pits per year) and would significantly reduce personnel radiation exposure.

4. **Prioritization for Repacking:** Pits from the W48 and B54 weapons will receive priority in repackaging; presumably, they will be repackaged first and second, respectively. The W48 pits have been selected based on their design and temperature sensitivity. The B54 pits have been selected based on their design and the potential corrosion identified on some units. Following these, prioritization will include factors such as design age, expected long term stability, and radiation levels. Unless other considerations require near-term repackaging, pit types producing higher radiation levels will be postponed to allow development and installation of robotic repackaging operations.

5. **Staff Issues and Followup Items:** The staff has reviewed the design of the AT400A pit storage and shipping container. This container is a significant improvement over the current container design for the following reasons: (a) it provides a hermetically sealed (welded) containment for the pits rather than a confinement; (b) it is backfilled with dry inert gas to substantially reduce the likelihood of corrosion during long-term storage; (c) a gas sampling system allows non-destructive sampling and inspection of the containment gas to verify the integrity of the pit; and (d) the container is designed to provide improved radiation shielding over the previous design.

   The staff has the following issues:

   a. A substantial amount of useful pit aging surveillance data will be available during pit repackaging operations. While a set of surveillance and preparation activities will be performed, including visual inspection, cleaning, weighing, and leak checking, it may be prudent to consider other inspection techniques such as enhanced optical inspection techniques and radiography on some or all of the pits to supplement this database.

   b. Rocky Flats is not considering performing pit repackaging operations onsite. This is puzzling given the significant number of pits currently stored at the site and the absence of planning to move these pits offsite in the near future.

c. The staff will review the final design of the repackaging operations and associated facilities to evaluate their safety. This will include methods for inspection and certification of containment vessel welds.