Department of Energy
Washington, DC 20585

July 15, 1996

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

Dear Mr. Chairman:

I am responding to your May 10, 1996, letter regarding your concerns about the new Special Nuclear Material Component Staging Facility at Pantex (Building 12-116), and other concerns such as the generic pit analyses and the Department of Energy (DOE) position on pit cladding. In your letter, you requested our plans to resolve these issues. The following responses address the comments/concerns identified in your letter:

Generic Pit

- It is correct that Design Laboratory analyses in 1994 indicated that the generic pit was not bounding for criticality considerations. In consideration of that fact; however, laboratory criticality analyses for specific weapon systems were documented in Nuclear Explosives Safety Study (NESS) Reports, and are used to identify multiple barriers that ensure criticality excursions cannot occur. Further, action was taken in March 1995 to evaluate the laboratory calculations by performing verification criticality analyses. As of December 1995, three weapons systems analyses were completed. These were exhaustive analyses conducted by Mason and Hanger-Silas Mason that included normal and accident scenarios, including damaged pit models and flooding both externally and internally with various stages of internal material suspension. DOE reviewed these analyses and determined their acceptability for reference in the Pantex safety documents for out of container control. DOE intends to have all weapons systems analyzed to include operational handling activities. Expeditious resolution is being sought for all these analyses.

- The "Pantex Plant Criticality Safety Program Analysis," (PPCSPA) was completed in February 1996. The PPCSPA, coupled with laboratory analyses, validated the continued justification for the Pantex position that criticality alarm systems and criticality detection systems are not required. The PPCSPA also linked previous analyses and parametric studies to clearly demonstrate that criticality incidents

requiring the defeat of multiple barriers at Pantex are "beyond incredible" (less than $1x10^{-6}$). Operations are performed in accordance with the applicable requirements with an ample margin of safety (factor of several hundred).

- Generic weapon configurations are used in each facility Safety Analysis Report (SAR) to establish a safety operating envelope which is based upon bounding consequence analyses. The generic referenced pit mass is primarily focused on dispersion consequences. Consequence analyses will define facility operating limits and controls that are reflected in the facility Technical Safety Requirements (TSRs) and weapons specific controls, such as those for material-at-risk.

- Future system operations will be reviewed by a Unreviewed Safety Question Determination (USQD) to ensure that the operation can be conducted within the safety operating envelope established by facility Safety Basis Documentation. The USQD process is to be conducted against an approved SAR or other approved Safety Basis Documentation. Approved Safety Basis Documentation has not been established for Building 12-116, and therefore the USQD process does not yet apply.

Pit Cladding

- Pit cladding is a design feature of the nuclear weapon and provides defense-in-depth for worker safety against plutonium release. As a design feature, its integrity and vulnerability vary with each specific weapon system. Although cladding is the primary feature preventing plutonium release, other barriers to release include the weapon assemblies (casing, etc.) and pit containers. In addition to barriers, Pantex operational procedures mandate external surveys prior to opening staging containers to monitor for potential release of plutonium. Periodic surveillance and environmental controls provide an added margin for operations when barriers are not in place, such as dismantlement operations. A breach in the pit cladding has been extremely rare and has resulted in insignificant consequences to the immediate and surrounding areas.

- The release of plutonium from pits has been analyzed in SARs for several Pantex nuclear staging facilities. The results of these analyses are typified by the Amarillo Area Office Position Paper on Pit Cladding (dated October 26, 1995). This position paper examines the release of 0.020gm of oxidized plutonium from the interior of a pit through a pit tube failure or other similar mechanism. The paper concluded that there are insignificant consequences to the public or to workers from such a release. As such, pit environmental limits are identified as defense-in-depth features and not facility TSRs.

- A minor release such as that described above occurred at the Pantex Plant in 1992 during a dismantlement operation. As a result of this release, concern has been raised about the effect of elevated temperatures, thermal cycling, and/or thermal shock on the integrity of pit cladding. At the request of the Pantex Plant, the weapons development laboratories recommended maximum staging temperatures for some systems. The intent of this request was to provide defense-in-depth from possible radiation exposure to personnel from a pit whose cladding had failed during staging. Since the primary staging container is not considered hermetically sealed, a failed pit staged in such a container could potentially experience oxidation over an extended period of time through a "breathing" phenomenon. This phenomenon was identified in a report published (circa 1994) by the Los Alamos National Laboratory (LANL) that discussed an event involving plutonium encased in a metal tube with a faulty closure weld. At the time of encapsulation, the tube had been placed in a secondary container whose lid was closed with plastic tape. After approximately 4 years of storage, the exterior surface of the secondary container was found to be contaminated and the inner container had swollen causing the end-cap weld to burst. Subsequent examination revealed that a significant amount of the metallic plutonium had oxidized and swelled against the container wall resulting in container failure. Pantex; therefore, thought it prudent to consider more rigid control on the staging environment. The primary environmental consideration and the one most readily controlled and monitored is pit temperature. A program was established at the Pantex Plant in 1995 for monitoring and maintaining pit and internal vault temperatures in Zone 4. A representative sample of pit cladding temperatures are measured directly and empirically correlated with internal vault temperatures. Other controls, in addition to those already placed on pit vault ventilation, heat sink, and pit containers, do not provide much additional assurance of pit cladding integrity. Supplemental actions have been taken for those pits that were determined to require more rigorous temperature control. For example, two magazines in Zone 4 are presently air conditioned in order to control temperature of W48 pits. These are the only pit types currently requiring special environmental controls.

- The Zone 4 Safety Evaluation Report dated December 1992 evaluated the integrity of the sealed pit system. Integrity of the sealed pit is monitored during its stockpile lifetime through a Stockpile Evaluation Program (SEP) that is designed to assess the long-term reliability of nuclear explosives in the inventory. A review of a number of selected Rocky Flats Reports on pit testing and discussions with the DOE Albuquerque Operations Office, LANL, and Lawrence Livermore National Laboratory personnel indicated that since the inception of the SEP, no pit corrosion

problems have been identified as safety issues. The initial expected lifetime of a pit was approximately 25 years (i.e., 5 years production, 15 years service, and 5 years retirement). The SEP has demonstrated that the quality of these pits is assured for up to an additional 25 years, for a total service life of approximately 50 years. To assure continued long-term corrosion integrity for pits retired from the stockpile, an interim Pit SEP has been developed and implemented. This program selects between 10 and 20 pits annually for evaluation. Two pits are sent to LANL for destructive testing, while the remaining pits are kept at Pantex for nondestructive evaluation (visual examination, leak testing, weight checks, etc.). The plan is to continue to select pits based on pit materials and characteristics in order to obtain a comprehensive database. Additionally, some of the oldest pits are selected including those experiencing the worst storage conditions. Based on the results of these evaluations, there is no reason to believe that long-term corrosion could lead to a consequence to the public. In fact, data collected so far has provided additional confidence with regard to pit integrity. Results of these evaluation/surveillance programs will continue to be reviewed against current controls and any changes considered necessary to assure pit cladding integrity will be evaluated for implementation.

- Based on results of the above evaluations and surveillances, obtaining pit manufacturing and service records to determine if some pits may be more at risk than others, does not appear warranted. Moreover, there would not be any basis other than qualitative estimates to correlate these data to pit cladding condition or failure probability. Since a pit repackaging program is underway to transfer all pits into the welded closure AT-400A containers, information obtained by retrieving historical pit manufacturing or service records for identifying problem pits would be superseded in the surveillance and repackaging processes. Controlling pit staging temperature is considered to provide the necessary assurance against cladding failure during staging, until the pits are repackaged in the AT-400A containers or otherwise dispositioned. DOE anticipates starting the repackaging process later this calendar year.

The following responses address the Building 12-116 specific concerns and additional comments/concerns identified by your staff in the trip report:

Mission

- The original mission of Building 12-116 was to inspect, package, and stage Special Nuclear Material (SNM) components, tritium reservoirs, Radioisotopic Thermal Generators (RTGs), and secondaries.

- The planned current mission includes inspecting, packaging, and storing strategic reserve SNM components, staging tritium reservoirs, RTGs, and secondaries, and possible repackaging SNM components into AT-400A containers. An increase in pit staging capacity is also being evaluated.

- The scope of the facility backfit program (which includes the ventilation system) will be modified to meet new mission requirements. Any proposed modifications and mission requirements will be reviewed and approved by DOE prior to construction. Conservative safety system designations and classifications are incorporated in the preliminary designs, but the final decisions are based on the hazard and accident analyses. Safety-class designations are for those Structures, Systems, and Components (SSCs) that are necessary to maintain off-site consequences below Evaluation Guideline levels. Safety-significant designations are for those SSCs that provide defense-in-depth to prevent uncontrolled releases and protect workers. The review and approval process will be supported using continually updated Preliminary Hazards Analyses (PHA). PHA results will be folded into the Final Safety Analysis Report (FSAR). The current direction adequately reflects analysis support for Key Decisions. The present schedule for submittal of the draft PHA is the third quarter of FY97 and the FSAR is scheduled for the third quarter of FY98. Even if there are schedule slippages, these documents must be completed prior to facility operations.

- DOE is taking steps to expedite the engineering analysis and make decisions as soon as possible, specifically to determine feasibility of the AT-400A repackaging program in Building 12-116.

Criticality, Hazard, and Accident Safety Analyses

- Currently, Pantex uses Monte Carlo Neutron Photon, Version 4A for nuclear criticality analysis. This computer code has been verified and validated (V&V) in accordance with the applicable recommendations of American National Standards Institute/American Nuclear Society (ANSI/ANS) 10.4, which exceeds the minimum requirements of ANSI/ANS 8.1. No formal analyses are performed on computer codes that have not been formally V&V in accordance with these standards and Department procedures. Efforts have begun to V&V the Diffusion Accelerated Neutral Particle Transport System code package. However, the Pantex Nuclear Criticality Safety (NCS) Program is in full compliance with the applicable requirements of ANSI/ANS 8.1, as required by DOE Order 5480.24. While it may be

useful to use a fully validated discrete ordinates code to supplement the validation of a rigorous Monte Carlo code, such comparisons should not be considered sufficient for validation. Some comparison of different codes may be consistent with ANSI/ANS 8.1, but these activities are not required by this national standard. NCS evaluations (including analyses and computer models) are independently reviewed by experienced NCS evaluators. The evaluation process procedures specifically spell out the roles of the evaluators and the independent reviewers. It is via this review process that all data and assumptions are checked and validated to ensure they are appropriate, reasonable, and correct. Additional research or analysis is sometimes required to validate this information. However, the use of a computer code, by itself, should not be used to replace the evaluator. Assumptions must be validated by experienced evaluators, using all resources required to arrive at an accurate, quality answer.

- A Hazards Analysis Reports (HAR) standard rewrite task team has been formed to more explicitly define the HARs intended purpose and scope, as well as, to provide additional guidance on the level of analytical detail needed to address potential nuclear explosives operations hazards. The task team will determine if the HAR will address weapons components, such as pit cladding.

- HARs will provide operational equivalent requirements [Nuclear Explosives Safety Rules, Operational Safety Controls] for weapons operations developed under the Seamless Safety (SS21) Process. Operational equivalent requirements are also derived from the NESS process. The requirement for HARs or equivalent documents for weapons components staging/storage, such as in Building 12-116 and Zone 4, is being evaluated. Specific HAR requirements should include:

  1. Weapons operational hazards analyses to provide input to the USQD process; and

  2. Analyses to determine operational safety system requirements to ensure that weapon-specific accident initiators are prevented, mitigated, or eliminated and to ensure that operations meet the bounding safety limits approved for the facility SARs.

Building Structure and Staging Systems

- According to the construction records, by the Corps of Engineers, low concrete strength tests were observed during the early phase of Building 12-116 construction.

The Architect-Engineer's onsite representative and the Corps of Engineers took immediate steps to rectify the situation of low concrete strength tests. The subsequent review of test results revealed compressive concrete strength higher than the specified values. It was found that the contractor was in full compliance with American Concrete Institute 318 code requirements and that Building 12-116 had met the design criteria.

- Structural analysis for the SNM Building 12-116 as performed by Brookhaven National Laboratory (BNL) was based on a simplified configuration. DOE concurred in the assumptions of using a rigid mat instead of spread footings and of neglecting subgrade layering effect due to soil-structure interaction. The BNL concluded that the seismic response is less than 20% of the total dead and live load stresses; therefore, it does not govern the load combination. To confirm DOE's position on this issue, additional analyses conforming to the detailed configuration are being performed by BNL and will be adequately documented and reviewed.

- The scope of the backfit project includes a PHA that will include appropriate evaluations of the Stage Right storage configuration. This includes the determination of whether seismic restraints are needed.

- The adequacy of seismic restraints (bracing and anchorage) for equipment/cabinets in various configurations and modes of operation will be addressed in the design phase, the PHA, and the FSAR.

- The design basis tornado and associated missiles for Building 12-116 exceeds the requirements contained in the current DOE-STD-1020-94. DOE is reviewing the tornado hazard methodology used in the Nuclear Regulation (NUREG/CR-4461), "Tornado Climatology of the Contiguous United States," May 1986, to determine if there are significant methodology differences between that stated in the NUREG and the methodology used by DOE to generate the tornado hazard curves referenced in DOE STD-1020-94. Once the DOE review is completed, a decision will be made to determine if revisions to site specific tornado hazard estimates are necessary. Additionally, in accordance with DOE Order 420, DOE has a plan to conduct a review of the Natural Phenomena Hazard assessment for the Pantex site. If the assessment identifies any significant change in data, it will be appropriately analyzed, documented, and resolved. Building penetrations due to missile impacts were taken into account during the building's design phase. The margins of safety for penetration are sufficient not to be affected, considering the new climatology data.

Other Observations

- DOE has determined that the alpha alarm interlock logic will remain the same as currently installed for mitigation of plutonium releases. Thus, ventilation will continue to be automatically secured in bays, upon receipt of an alpha alarm. However, studies are continuing to evaluate the merits of maintaining ventilation to assure that the High Efficiency Particulate Air filter can continue functioning.

- Review panels/groups have been established to assure consistency with national standards for the review of Pantex process or operational procedures and changes. Design laboratories provide support to the HAR process in the form of hazards assessments and the maintenance and operating contractor addresses potential interface gaps with the laboratories. Also, design laboratories provide leadership to the SS21 process. This process is designed to assure that no gaps exist between the required operational controls and the facility safety basis (HAR/SAR interface). Additionally, the Headquarters Technical Safety Review Panel is responsible for the review and recommendation for approval of Pantex Nuclear Explosives Facility FSARs. This panel is acutely aware of the need to assure that no gaps exist between the HAR/NESS and the SAR processes.

If you have any questions, please call me or have your staff contact Daniel Rhoades of my staff at (301) 903-3757.

Sincerely,

Victor H. Reis
Assistant Secretary
for Defense Programs

cc: M. Whitaker, S-3.1