

DEFENSE NUCLEAR FACILITIES SAFETY BOARD

November 16, 1993

MEMORANDUM FOR: G. W. Cunningham, Technical Director

COPIES: Board Members

FROM: A. F. De La Paz

SUBJECT: Report on Safety Analysis Issues at the Pantex Plant

1. **Purpose:** This report documents the present status of a DNFSB staff review of safety analysis issues at the Pantex Plant. This review was conducted from September 14-16, 1993, by Defense Nuclear Facilities Safety Board (DNFSB) staff members F. Bamdad, A. De La Paz, J. DeLoach, M. Moury, and J. Roarty.
2. **Summary:** The Pantex Plant has made significant improvements since the DNFSB staff review last year including the Safety Analysis Reports (SAR) upgrade program, other new safety initiatives, and improvement of personnel capabilities. However, many of the efforts are in their infancy and will require additional review by the staff. The following specific comments are provided:
 - a. **Safety Analysis:** A major focus of the SAR effort at Pantex has shifted from developing SARs for individual facilities to the development of modular SARs, where similar facilities will be grouped into five functional areas and fifteen modules. This upgraded SAR format is intended to take advantage of common facility features while retaining facility-specific analysis of safety issues. Careful implementation of this methodology will be required to ensure that facility specific safety issues are not inappropriately generalized in the modular SAR.
 - b. **Risk Management Department Initiatives:** Several safety initiatives by the Risk Management Department, including improved nuclear criticality safety training and the development of interim operational safety requirements are being developed. Most of these programs are in their infancy.
 - c. **Personnel Resources:** The DNFSB staff noted that significant improvements have been made in expanding and enhancing the staff within the Battelle Risk Management and Safety Departments at the Pantex Plant. This includes a dedicated staff member for nuclear criticality safety. Battelle is also developing a program that attempts to integrate Environment, Safety and Health (ES&H) support into line management.
3. **Background:** The DNFSB staff previously reviewed the Pantex Safety Analysis Report (SAR) Upgrade Program on two occasions, March 10-13, 1992, and August 11-14, 1992.

The DNFSB forwarded the results of these reviews to the Secretary of Energy in a DNFSB staff trip report dated September 11, 1992. Concerns raised at that time included the lack of technical expertise at the Pantex Plant in the area of nuclear safety (including criticality safety), the application of nuclear safety-related orders at the Pantex Plant, the preparation of operational safety requirements (including the definition of limiting conditions for operation) given that SARs for many of the Pantex Plant facilities were written to older standards or did not exist, and the use of the unreviewed safety question process at the Pantex Plant. Also, the DNFSB staff was concerned with removal of nuclear criticality safety alarm systems from the Pantex Plant and the lack of sufficient technical bases for limited consideration of nuclear criticality events during nuclear explosives activities.

On December 31, 1992, the DNFSB issued a letter to DOE requesting that DOE report on actions completed and planned to address nuclear criticality safety observations made by the March 1992 DOE Technical Safety Appraisal (TSA). On March 3, 1993, DOE provided the status and technical justification for each of the six TSA observations.

In the area of DOE Standards, the DNFSB issued Recommendation 93-1 which addresses standards (including DOE Orders and consensus industry standards) utilization in facilities that assemble, disassemble, and test nuclear weapons. DOE submitted a revised implementation plan for this recommendation in August 1993. Proper implementation of recommendation 93-1 will address the concerns raised by the staff in the previous review.

In follow-up to the remaining issues, the staff assessed the progress made by Pantex in upgrading technical staff capabilities, nuclear criticality safety initiatives, and preparation of operational safety requirements during this review.

4. Discussion/Observations:

a. Safety Analysis:

1. Safety Analysis Reports: Battelle personnel are completing SARs to the requirements of DOE Albuquerque Operations Office (DOE-AL) Order 5481.1B for the previously defined five "nuclear facilities" at Pantex. One of these SARs has been approved by DOE: Zone 4 activities. The remaining four SARs are either nearing completion, or have been submitted to DOE for approval.

The SAR upgrade effort at Pantex is focused on the completion of modular SARs, where similar facilities will be grouped into five functional areas and fifteen modules. Pantex has classified 22 facilities as "nuclear facilities" for the purpose of SAR and safety documentation development. This new classification adds weapon assembly and disassembly bays and cells to the nuclear material storage facilities previously classified as nuclear facilities. This reclassification has not been approved by the DOE Office of Defense Programs (DOE-DP) and is still under review. SARs will be prepared for these 22 "nuclear facilities" and 77

additional non-nuclear facilities, all to the requirements of DOE Order 5480.23, *Nuclear Safety Analysis Reports*, using a graded approach. As part of the Pantex SAR Upgrade Program, Nuclear Explosive Safety Study activities, as specified in DOE Order 5610.11, *Nuclear Explosive Safety*, will be included in the Functional SARs. The DNFSB staff expects that appropriate risk assessment reports, as discussed in item 3., below, will also be included in the authorization bases for applicable facilities.

The following specific concerns are provided concerning the upgrade of Pantex SARs.

- (a) The upgraded SAR format is intended to take advantage of common facility features while retaining facility-specific analyses of safety issues. Careful implementation of this methodology is required to ensure that the expediency of evaluations does not degrade to duplication of accident and safety evaluations. This is extremely important for facilities which are similar, yet may have unique safety features, such as disassembly bays and cells.
 - (b) Battelle personnel stated that the updated SARs will only include point estimates for the probability of occurrence, as well as the consequences. No plan was presented to perform any uncertainty evaluations. This is contrary to the practice in the commercial nuclear power industry probabilistic risk assessments where uncertainty evaluations are included and the results are used in comparison of the assessment results to the Nuclear Regulatory Commission (NRC) safety goals (e.g., NUREG-1150). The DNFSB staff is concerned with the Battelle approach due to the trend noted throughout the DOE weapons complex to evaluate accidents based upon probability estimates with minimal concern for accidents with a probability of occurrence of less than $10E-6$ per year. This could lead to being inconsistent with the "defense in depth" concept articulated in Section IV of the NRC Policy Statement on Safety Goals for the Operations of Nuclear Power Plants (51 FR 30028 dated August 21, 1986).
2. Unreviewed Safety Question Determination Process: Mason and Hanger - Silas Mason Company (M&H) has submitted an implementation plan for compliance with DOE Order 5480.21, *Unreviewed Safety Questions*. The Risk Management Department has started performing safety evaluation screening and evaluations. The Pantex Plant standard for USQs is in the review process and is expected to be finalized in October 1993. A formal plant procedure that includes the performance of USQ screening and evaluations is targeted for issue in March 1994. Since DOE has not yet approved the implementation plan for DOE Order 5480.21, the dates are tentative. DOE and M&H personnel stated that they intend to implement DOE Order 5480.21 plant wide, not just for the nuclear facilities. However, a graded approach will be used for the non-nuclear facilities.

3. Risk Assessments per DOE Order 5610.11: The DNFSB staff was informed that the risk assessments required by Chapter IX of DOE Order 5610.11, *Nuclear Explosive Safety*, will be performed by the national laboratories for weapons entering the Qualification Evaluation for Dismantlement (QED) Program. These risk assessments are applicable to Pantex operations with nuclear explosives. Battelle appears to want to include these risk assessment reports as part of the authorization basis for the facilities that handle specific nuclear explosives. The W48 DMSO dissolution process is the first risk assessment being performed. It is scheduled for completion by the end of November to support the W48 Nuclear Explosive Safety Study.
 4. Technical Safety Requirements (TSRs): As part of the implementation plan for DOE Order 5480.22, *Technical Safety Requirements*, Battelle plans to complete TSRs to the requirements of this order for the 22 nuclear facilities as part of the SAR Upgrade Program. For the remaining non-nuclear facilities, safety envelope summary documents will be completed, such as the building standards and tables of system status and operability.
- b. Risk Management Department Initiatives:
1. Interim Measures for SARs: Battelle is taking steps to identify systems important to safety prior to DOE approval of upgraded SARs (to the requirements of DOE Order 5480.23). Under this interim measure, systems for a given facility would fall under one of three categories: critical, important, and balance of plant, depending upon the consequences of their failure during an accident. A failure modes and effects analysis (FMEA) will be performed for the systems to identify components which would need to be included in an active surveillance and/or preventive maintenance program. Using FMEAs for the selection of critical, important, and balance of plant systems is highly dependent upon the quality of system reliability data. Battelle personnel stated that they have had some difficulty locating reliability data and have had to develop it on their own. The DNFSB staff is concerned that such specific data is not widely available for Pantex Plant systems and therefore the results might have large uncertainty. Battelle personnel should aggressively utilize reliability data resources that exist in the DOE nuclear weapons complex as much as practicable. These identified components, as well as specific conditions necessary to define the operability of these components, will be documented in IOSRs. The IOSRs will be further carried down into the applicable building safety standards, pre-operational checklists, and the preventive maintenance database. At this time 36 sets of IOSRs are being developed. Eight of these will be completed by the end of the year with the balance being completed near the end of 1994.
 2. Integrated Risk Management Program (IRMP): This program (and plan) describes all environment, safety, and health requirements which are applicable

to Pantex facilities and operations. Its primary purpose is to show how DOE regulations and requirements flow down to DOE orders, and subsequently down to Pantex Plant standards and procedures. The DNFSB staff was informed that initial training had been completed for facility managers and shift supervisors on the IRMP. The DNFSB staff will conduct spot interviews with Pantex Plant personnel in the future to assess the adequacy of this training.

- c. Personnel Resources: The DNFSB staff noted that significant improvements have been made in expanding the staff within the Battelle Risk Management and Safety Departments at the Pantex Plant. This includes a dedicated staff member for nuclear criticality safety. Battelle is also developing a program that attempts to integrate Environment, Safety and Health (ES&H) support into line management. Approximately 20 ES&H specialists will be cross trained in all ES&H areas. Following their training, they will be assigned as direct support to a facility manager. This will provide the facility manager with one point of contact for ES&H issues, as opposed to requiring him to contact different personnel for different issues. The specialists will have the rest of the ES&H organization as a resource to draw on. Individual specialists are planned to be in place by the end of this year.
- d. Nuclear Criticality Safety: M&H has submitted to DOE an implementation plan for DOE Order 5480.24, *Nuclear Criticality Safety*. The implementation plan includes a compliance self-assessment to the requirements of the order and the referenced American Nuclear Society standards, as modified by the order, and plans for an enhanced training program for the operators. Included within this assessment is an effort to perform a quantitative risk assessment to determine the probability of occurrence of an inadvertent nuclear criticality accident at the Pantex Plant. Battelle personnel noted that, based upon this assessment, they know that they are not in full compliance with DOE Order 5480.24. The DNFSB staff will review this assessment.

The DNFSB staff noted that Battelle now has one full-time dedicated staff member to nuclear criticality safety. This staff member's duties include developing a Pantex capability to perform nuclear criticality safety evaluations.

The nuclear criticality reviews supporting the Nuclear Explosive Safety Study group are prepared by the design laboratories. The DNFSB staff observed that the Battelle Risk Management Department did not appear to be fully aware of NESSG criticality issues. Specifically, the Chairman of the Criticality Safety Committee at the Pantex Plant was not aware of some of the criticality safety efforts in support of B83 weapon activities that were discussed with the design laboratories in the meeting. It may be appropriate for the design laboratories to provide this information directly to Battelle.

5. Future Staff Actions:

- a. The DNFSB staff will follow up on the review of samples of the IOSRs (and bases)

and building standards documents, as well as the training of operations personnel in the use of these documents.

- b. The DNFSB staff will review the upgraded Pantex Plant SARs as they become available.
- c. The DNFSB staff will review the results of the risk assessments performed per DOE Order 5610.11, as well as the use of the results of the risk assessments by personnel at the Pantex Plant.
- d. The DNFSB staff plans further reviews of nuclear criticality safety training and criticality safety evaluations performed by Pantex Plant personnel, as well as the Pantex Plant implementation plan for DOE Order 5480.24. Also, upon completion of the quantitative risk assessment justifying the lack of need of criticality accident alarms at Pantex, the DNFSB staff will review this assessment.