DEFENSE NUCLEAR FACILITIES SAFETY BOARD

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September 21, 1999

Brigadier General Thomas F. Gioconda
Acting Assistant Secretary for Defense Programs
Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585-0104

Dear General Gioconda:

The Department of Energy (DOE) and its contractor at Pantex during the past year have responded in a very substantial way to Defense Nuclear Facilities Safety Board (Board) observations and suggestions for the upgrading of lightning protection measures during operations with explosives. However, as indicated by the enclosed Board staff report, further upgrade efforts appear warranted. The report is provided for your consideration and a basis for such staff to staff dialogues as may be useful. The Board calls your attention especially to the questionable lifting of some restrictions previously placed upon operations during lightning warnings.

The Board wishes to be advised of the path forward DOE and its contractor develop to continue the upgrade of the lightning program at Pantex. If you have questions on this matter, please call.

Sincerely,

John T. Conway
Chairman

c: Mark B. Whitaker, Jr.

Enclosure

99.2353

DEFENSE NUCLEAR FACILITIES SAFETY BOARD

Staff Issue Report

August 23, 1999

MEMORANDUM FOR: G. W. Cunningham, Technical Director
J. K. Fortenberry, Deputy Technical Director

COPIES: Board Members

FROM: W. White

SUBJECT: Lightning Protection for Nuclear Explosive Operations at Pantex

This report documents an issue reviewed by the staff of the Defense Nuclear Facilities Safety Board (Board). Staff members W. Andrews, C. Martin, A. Matteucci, and W. White met with representatives of the Department of Energy (DOE), Mason and Hanger Corporation (MHC), and Sandia National Laboratories (SNL) at the Pantex Plant on July 27–28, 1999, to discuss recent developments related to lightning protection at Pantex.

Background. In September 1997, the Board requested that DOE prepare a detailed technical report providing a comprehensive analysis of the hazards posed to nuclear explosive operations by lightning, the controls necessary to prevent and mitigate those hazards, and the path forward for implementing and preserving the identified controls. In response, DOE formed a lightning protection project team tasked to define a technically justifiable lightning protection control scheme for Pantex nuclear explosive operations. As discussed in detail in previous staff reports, MHC has made significant progress in implementing certain engineered and administrative controls for lightning protection in nuclear explosive bays and cells at Pantex. In May 1999, DOE submitted the first draft of the requested report to the Board. In the transmittal letter, DOE committed to providing a detailed path forward on lightning protection as part of a deliverable for the Board's Recommendation 98-2, due in June 1999. The last path forward supplied to the staff by DOE was in an April 1999 project plan.

Issue. Despite the progress made during the past 2 years, DOE and MHC continue to struggle with the development and implementation of administrative controls for lightning protection at Pantex. In their current state, those administrative controls are scattered throughout various facility and program procedures, plant standards, engineering instructions, engineering procedures, and standing orders. Determining which operations are allowed during lightning warnings and which must be shut down can involve a complicated search of multiple site documents.

Many of the key analyses (e.g., for roof slot bonding, transportation carts, vacuum chambers) required of SNL in the Lightning Protection Project Plan are overdue. Completion of these analyses might allow certain administrative controls to be replaced, in part, by more

rigorous engineered controls. Given the limited personnel resources available and the lack of prioritized requirements from DOE or MHC, however, there is no firm commitment on the part of SNL to complete these analyses in the near future.

Recently, MHC's efforts to implement administrative controls for transportation during lightning warnings have been further complicated by increasingly restrictive direction from SNL, the design laboratory for many of the electrical circuits in nuclear weapons. In a letter of June 29, 1999, SNL issued the following recommendation to DOE: "Sandia recommends that nuclear weapons, in any configuration, not be transported in unprotected areas during lightning warnings or lightning storms." This represents a more conservative position than that taken by SNL in a letter of September 23, 1998, to MHC, which identified several weapon configurations for which MHC was allowed to take some credit for lightning protection.

The logical corollary to the June 29, 1999, recommendation (that nuclear weapons in any configuration should be in a protected area during lightning warnings) has an even greater impact on MHC's attempts to identify adequate lightning protection controls for Pantex operations. During lightning warnings, this corollary would require shutting down such Zone 12 operations as vacuum chamber activities, purge and backfill, and hoisting, in addition to the transportation operations specifically addressed by SNL's recommendation. The corollary would also have a significant impact on Zone 4 staging activities. The bonding and isolation controls implemented in most Zone 12 facilities have not been implemented in Zone 4. Therefore, all of Zone 4 must be considered an unprotected area. It is not practical, however, to remove all nuclear explosives from Zone 4 during lightning warnings.

DOE and MHC Path Forward. MHC's response to SNL's recommendation was not to evaluate ongoing operations and initiate changes necessary to implement the recommendation. Instead, MHC offered DOE a Justification for Continued Operations (JCO) that actually lifted several restrictions already in place related to nuclear explosive operations during lightning warnings. The only justification offered in the JCO for relaxing lightning controls was the lack of technical basis accompanying the SNL recommendation. Also worth noting is that MHC chose to forward this JCO to DOE for approval despite strongly worded objections by MHC's nuclear explosive safety personnel, who pointed out the lack of a technical analysis supporting the MHC position.

According to local Amarillo Area Office personnel, DOE has requested that MHC retract this JCO and revise it to allow exceptions to SNL's recommendation only when supported by some technical analysis (operations involving mechanical safe and arm detonators, for example). DOE has also requested that MHC provide some justification for continued staging operations in Zone 4 and supply more detailed information on the operational impact of strict compliance with the SNL recommendation. At the time of the meeting between the Board's staff and DOE and MHC, there was no schedule for revision of the JCO. In the interim, MHC will continue to operate under its varied collection of procedures, standards, instructions, and standing orders. As a long-term solution, MHC will revise its recently issued Technical Safety Requirements to reflect the controls identified in the JCO.

In addition to the path forward proposed by DOE, MHC could prioritize specific requests to SNL to complete technical analyses that might allow some of the more restrictive administrative controls to be replaced, at least in part, by engineered controls. Given the absence of any credited controls for Zone 4 staging operations (assuming the traditional lightning protection systems are ineffective, and the full-up weapons cannot be credited with protecting themselves), it would also be prudent for MHC to complete analysis (through SNL) of Zone 4 facilities for lightning protection. It would be advisable as well to implement any required engineered (bonding) or administrative (isolation distance) controls as soon as possible. To expedite closure of the lightning protection issue, DOE could encourage better communication between MHC and SNL, and it could assist both contractors with prioritizing and scheduling remaining work.

Conclusion. The analysis and control of lightning-related hazards to nuclear explosives at the Pantex Plant is hampered by incomplete evaluations, and incomplete facility and procedural modifications. Completion of this analysis, which is largely the responsibility of SNL, is lagging behind the schedule in the Lightning Protection Project Plan. In the interim, SNL has produced correspondence concluding that some activities and weapon configurations are sufficiently protected from lightning to allow continued operations during electrical storms. SNL has also provided a more conservative input suggesting that virtually no transportation of nuclear explosives be conducted during lightning warnings.

During the past 2 years, MHC has implemented many safety improvements suggested by the lightning protection project team to enhance lightning protection at Pantex. However, the physical facility modifications are not complete, and MHC has not addressed lightning protection upgrades in Zone 4. Additionally, the convoluted system of procedures that directs Pantex operations during lightning warnings has not been clarified sufficiently to ensure that the actions expected of all workers will be carried out. Finally, MHC recently proposed a JCO that is not conservative, and suggests relaxing controls beyond the limits justified by any current analyses from either SNL or MHC.

DOE has taken action to ensure that MHC develops a JCO that is reasonable, but allows only technically justified exceptions from SNL's recent conservative input. It is important that MHC implement its lightning protection strategy in a simple, comprehensive, and consistent manner such that the procedures will be reliably executed. Finally, it appears that DOE should provide additional guidance to SNL to ensure that the analyses that are key to the final resolution of this issue are completed as soon as possible.