Department of Energy
National Nuclear Security Administration
Washington DC 20585

May 30, 2013

OFFICE OF THE ADMINISTRATOR

The Honorable Peter S. Winokur
Chairman
Defense Nuclear Facilities Safety Board
625 Indiana Avenue NW, Suite 700
Washington, DC 20004

Dear Mr. Chairman:

The Defense Nuclear Facilities Safety Board (DNFSB) issued a letter on February 25, 2013, to the National Nuclear Security Administration (NNSA) Administrator regarding the fire protection program at Pantex. The letter requested a report and briefing within 90 days of receipt of the letter. The letter expressed concerns with management of known deficiencies within the fire systems, the timeliness of actions to correct deficiencies, and maintaining operability and reliability of the safety-class fire protection system.

Protection of the public, workers, and the environment is paramount in everything we do at Pantex. As such, we place priority on maintaining operability and reliability of the safety-class fire protection system. We know there are some aging fire protection system components that will need to be replaced in order to sustain long-term operability and reliability of the system. Where appropriate, projects are in place to enhance the reliability and increase the safety margin of the safety-class fire protection system. One example is the high-pressure fire loop (HPFL) project, which, when complete, will add additional reliability by providing water to nuclear facilities through High-Density Polyethylene (HDPE) piping and redundancy with the addition of water supply tanks and diesel fire pumps. In addition, the design for the Det-Tronics® Flame Detection Upgrade Project is 90 percent complete, and installation is scheduled to begin in September 2013. Meanwhile, the contractor, Babcock & Wilcox (B&W), maintains a stock of critical components that is expected to last until 2017, and works with the manufacturer to support the refurbishment of failed detector components through December 2015. We are using expense funds to address other known long-term component replacements such as lead-in piping, deluge valves, and replacement of the flame detection systems.

In the interim, until the upgrades are completed, operations at Pantex can be conducted safely with adequate fire protection. NNSA continuously monitors the material condition and operability of the systems and does not allow nuclear

explosives operations in any facility with an inoperable fire protection system. In addition, B&W tracks and trends issues as they arise. Trending analysis helps the contractor recognize potential issues and take action to remediate them before nuclear safety is impacted. Some interconnected ramps are not protected with automatic suppression. The NNSA Production Office is more cognizant of the need for formal documentation and requires B&W to request formal exemptions where needed.

NNSA agrees that the initial Unreviewed Safety Question for the HPFL project should not have been limited to the hazards associated with the construction of the new pump and tank. We recognize the importance of integrating safety into the design of the HPFL pump and tank project and are taking action to ensure this is the case for the new pumps. We are confident that the transition plan for this project has identified the testing and equipment configuration necessary to ensure that the HPFL does not jeopardize the operability and reliability of the fire protection systems.

The enclosed report provides responses to the points raised in your letter. NNSA is prepared to brief the Board on June 4, 2013. If you have any questions concerning this letter, please contact me or have your staff contact Dr. Jerry McKamy at (301) 903-7980.

Sincerely,

Neile L. Miller
Acting Administrator

Enclosure

cc w/enclosure:
M. Lempke, NA-00
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S. Erhart, NA-00-NPO

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APR 2 9 2013

Mr. Steven C. Erhart
Manager
U.S. Department of Energy
NNSA Production Office
P.O. Box 2050
Oak Ridge, TN 37831

Subject: B&W Pantex Response to Defense Nuclear Facilities Safety Board (DNFSB) Letter Dated February 25, 2013 and the Attached Report, Fire Protection Systems, Dated December 17, 2012

Re: Letter from Peter Winokur to Neile Miller, Fire Protection Systems, at Pantex Plant, Dated February 25, 2013

Dear Mr. Erhart:

This letter transmits B&W Pantex's response to the Defense Nuclear Facilities Safety Board (DNFSB) review findings documented in Reference 1.

The DNFSB performed a review on the elements of the B&W Pantex fire protection program from July 24 - 26, 2012. The DNFSB report stated that the B&W Pantex fire protection program showed excellence in many areas; however, cited that other areas require improvement. Areas of concern included the High Pressure Fire Loop; fire protection system upgrades; fire protection system inspection, testing, and maintenance; and errors in the application of the Unreviewed Safety Question process.

The enclosed report addresses the DNFSB concerns, improvements being made to the fire protection systems to address aging infrastructure, and the processes in place to ensure safe and reliable operations.

If you have any questions, please contact me at extension 6200 or Dennis Huddleston at extension 6508.

Respectfully,

John D. Woolery
General Manager

Enclosure: As stated

PROJ-13-1220184-627-GM

cc w/encl: K. Waltzer, NPO
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B&W Pantex Response Report
Fire Protection Systems, Pantex Plant
April 25, 2013

Introduction

The Defense Nuclear Facilities Safety Board (DNFSB) performed a review of elements of the Pantex Plant's fire protection program during July 24-26, 2012. The DNFSB also performed a follow-on review, which requested clarification on specific issues and additional documents. The follow-on review and teleconference was held on September 13, 2012. As a result of these reviews, a transmittal letter dated February 25, 2013, and a subsequent report were received.

The DNFSB report stated that the Pantex fire protection program showed excellence in many areas, but cited other areas require improvement. The following response was developed to address the DNFSB letter and attached report.

Fire Protection System Operability

High Pressure Fire Loop

Report

The DNFSB report cited that Pantex has nearly completed the line-item funded High Pressure Fire Loop (HPFL) project. The project is to replace approximately 17,850 feet of underground ductile iron piping with high density polyethylene (HDPE) piping. The report stated that only one sprinkler lead-in was replaced under the HPFL replacement project.

Response

There have been six nuclear facility sprinkler lead-ins replaced; two were replaced during the HPFL replacement project and four during past failures. Three facility lead-ins are currently scheduled to be replaced, with construction to start in June 2013. In addition, two lead-ins were replaced in other areas in support of nuclear operations, bringing the total lead-ins replaced to eleven.

Fire Protection System Upgrades

Issue

The DNFSB report cited, "An extended replacement schedule for HPFL and lead-ins will require reliance on the existing older piping that continues to fail."

Response

The HPFL system is designed to continually self-monitor for pressure integrity. Should pressure loss occur, it is recognized by a pressure switch and a fire pump will automatically start at a predetermined set pressure. This provides notification to the emergency services dispatch center. An investigation is performed immediately by the fire department, with support from the Nuclear

Facility Manager, maintenance personnel, and engineering personnel as required. Large system leaks that could affect system operability have never gone undetected and have been discovered and isolated in less than 30 minutes. In addition, the pressure is monitored and tracked on the system by a recorder, and the data is reviewed weekly with an increased frequency when warranted based on off-normal results. The system engineer reviews cycle time of the jockey pump, which is an indicator of piping conditions. If abnormal cycles are observed, the HPFL is investigated for leaks.

Historically leaks in the underground piping have resulted from holes in the piping, not catastrophic breaks. During the HPFL upgrade project, all exposed piping (mostly lead-in piping) was validated for integrity. This ensured adequacy of the existing piping prior to connection to new piping. During these validations, the majority of failed piping discovered was pit corrosion, which indicated an approximate one inch to two inch hole in the piping. Pantex performed an evaluation, which demonstrated the expected flow from a two inch hole to be approximately 1,250 gallons per minute (gpm). As a conservative assumption, the additional 1,250 gpm leak has been calculated into the water supply and facility hydraulic calculations. Also, hydraulic calculations for critical facilities only consider the flow from a single diesel fire pump. This approach ensures that required design flow can be met with only one pump operational.

Additional cathodic protection has been added to the systems by diametrically isolating the underground piping from the building piping with isolation connections at the building lead-in flange. This eliminated the continuous electrolysis circuit on the piping which will slow down corrosion of the piping.

Issue

The DNFSB report cited, "Spare parts for the existing fire detection system are projected to be exhausted in 2017. Beyond this, reliance on salvaged parts will void the equipment's Underwriters Laboratory listing and result in questionable reliability. National Fire Protection Association (NFPA) 72, *National Fire Alarm and Signaling Code*, requires that fire alarm equipment be "listed" for its intended purpose. Other consequences of an extended replacement schedule may include the need to coordinate the installation of new equipment with continued operation of existing obsolete equipment pending its replacement, the need to accommodate the installation of a multiplicity of equipment models due to changes in technology over an extended replacement project, the need to maintain a greater variety of spare parts, and the need to train maintenance technicians on each of the various types and models of equipment in use."

Response

Where failures of the Det-tronics Flame Detection System Modules are experienced, Pantex maintains a stock of critical spare parts. At the current failure rate, the critical spare parts are expected to last until 2017. The Det-tronics Flame Detection Modules are currently being supported by Det-tronics through December 2015. Pantex worked with the manufacturer to extend the support to December 2015, and is working directly with the manufacturer to have the failed components refurbished. When a failure occurs, the defective parts are sent back to the manufacturer to be repaired. The use of refurbished parts on the existing system was discussed

with the manufacturer and the detector system modules will continue to carry the Factory Mutual (FM) approval. The refurbished detector system modules will continue to meet specification per the original design.

The Det-tronics systems are self-monitoring and notify site personnel when the system is off-normal so immediate actions can be taken. Currently, all failures that have occurred on the Det-tronics systems have been indicated at the continuously monitored emergency services dispatch center. In addition, the Det-tronics system is part of the suite of controls put in place to mitigate a fire. Other controls include fire barriers, combustible controls, ignition controls, approved cabinets, approved containers, flammable vapor controls, and operator actions. If a Det-tronics system was to catastrophically fail prior to being replaced, items of concern would be relocated and the facility would be removed from service.

The Det-tronics Flame Detection System upgrade project is currently 90 percent complete with the design. It is anticipated the project will begin construction on the first facility in September 2013. The new design takes the transition from the old equipment to the new equipment into account and is laid out so a single bay/cell can be changed out without affecting the existing system. Pantex recognizes the need to train personnel on new equipment. Training which is provided by the manufacturer is required for all maintenance personnel in order to qualify them on each new system. If new models are required during the upgrade, then additional training will be provided.

Issue

The DNFSB report cited, "These projects are ongoing and will take years to complete at the anticipated rate under the Capability Based Facilities and Infrastructure (CBFI) program. The staff is concerned that the use of CBFI funding source may result in a replacement schedule extending 10 or more years and may result in diminished fire safety. These concerns would be mitigated by more timely replacement of aging fire protection systems and associated components."

Response

Pantex is working closely with the National Nuclear Security Administration (NNSA) to ensure funding for replacement projects are given high visibility. Near term, the NNSA is implementing Readiness in Technical Base and Facilities and CBFI programs. Pantex will utilize these programs to replace end-of-life systems such as flame detection (Det-tronics) and radiation alarm monitoring systems. In addition, Pantex has identified three line item projects, which address the remaining HPFL loop and lead-ins (Bay and Cell Fire Protection Lead-In Project, Production Support Fire Protection Lead-in Project, and Zone 11 High Pressure Fire Loop Project).

Pantex utilizes several methods to reduce impacts and continues to perform required inspection, testing, and maintenance of fire protection systems, as well as conduct tracking and trending of issues as they arise. From trending analysis, the Cognizant System Engineer (CSE) is able to recognize potential issues and take action to remediate any issues prior to it affecting nuclear safety. This was demonstrated last year after failure of a solenoid valve was detected during

testing. In the months prior, the CSE discovered an issue with a solenoid valve and increased the testing frequency of the device. Due to the increased testing frequency, an additional indicator was discovered during preventive maintenance. The two failures identified a trend and immediate actions were initiated that paused operations and placed material in a safe and stable configuration until the solenoid valves were replaced. This heightened awareness, tracking and trending, and due diligence with regards to preventive maintenance extends to each of the critical fire protection systems. Pantex is aware of the potential single-point failure created by having a single solenoid valve and has required dual solenoid valves be installed during the upgrade of the Det-tronics Flame Detection System Modules.

In addition, Pantex has identified the impacts due to aging systems and has taken action to reduce or eliminate any negative effects to nuclear safety. An example of this is the existing safety class deluge fire suppression system valves, which were identified as obsolete in 2008. In response, Pantex worked with site maintenance personnel to develop and implement a replacement program. To date, 16 new deluge valves have been installed, which accounts for approximately 34 percent of the total deluge valves. Additional valves are being replaced when the three year full flow testing is required; this includes three valves in July 2013.

With the programs and processes in place today to monitor the fire protection systems' health, equipment, and component replacements and upgrades, Pantex is confident that any system degradation will be promptly detected and corrected in a timely manner and where correction is not timely, operations will remain in a safe and stable condition, material of concern will be removed, and the facility will be taken out of service.

Fire Protection Inspection, Testing, and Maintenance (IT&M)

Recent Fire Water Supply Impairments

Issue

The DNFSB report cited a concern with the unplanned impairment of a single fire pump which required impairment in excess of 14 days followed by a second fire pump impairment extending ten days. As stated by the report, "This series of events indicates that Pantex may not be treating the operation and maintenance of safety-class fire protection systems with an appropriate level of priority, and in accordance with the requirements of NFPA 25, *Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems*, Chapter 15, Impairments."

Response

Pantex places high priority on safety critical structures, systems, and components. Repairs of this nature are designated and given high priority. In both of the cited events, Pantex displayed urgency to fix these unplanned issues. The issues were tracked daily in the integrated plan of the day meeting until they were resolved. In both instances, compliance with NFPA 25, *Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems* was maintained because a single diesel fire pump and tank is sufficient to provide the required system demand. The basis for the single diesel fire pump was documented in the recovery plan to further

demonstrate the system capability in the degraded state. The regular preventive maintenance was up-to-date and performed for all operable fire pumps. In addition, an electric fire pump was available to support the diesel fire pump. Although the electric fire pump is not currently credited as a critical component of the HPFL, it has the capability to supply the worst-case single fire demand. Facility managers were made aware of the unique configuration for the HPFL to ensure appropriate actions were taken, should further impairments be required. The operational water storage tank level was continually self-monitored through the fire alarm system and any low-level water condition would be reported to the emergency services dispatch center. The fire alarm system has a 24-hour battery backup in the event a facility power failure occurred. This is to ensure low-level alarms and fire pump status signals will be immediately addressed.

During a repair of to the diesel fire pump cooling system, the Limiting Conditions of Operation (LCO) was entered. During restoration, a mainline control valve failed in the closed position, which prevented exiting the LCO. Work on restoring the HPFL pump could not start until the receipt of a new valve. During the installation of the new valve, which was already ten days into the 14 day window, it was discovered that the mechanical joint fitting had to be replaced. This fitting was unavailable, which required a redesign of the repair. The arrangement required some fabrication in the facility due to the layout of the piping. All material was reviewed, quality was established, and material was properly purchased from qualified vendors to meet NQA-1 requirements for a safety class system.

The second incident, in August 2012, consisted of a leaking fuel pump on the diesel driver, which rendered the pump inoperable. A repair part was ordered. Due to a thorough receipt inspection process, it was identified that the wrong part was received. This caused an additional delay; however, it was repaired and placed back into service four days prior to the expiration of the LCO.

The availability of only having two pumps and tanks and the potential to be limited by a single credited fire pump following impairment was identified by Pantex during the conceptual design of the HPFL replacement project. During the current HPFL pump and tank upgrade project, this limitation is being corrected by installing three new pumps with two tanks. In addition, one of the existing pump and tank facilities will remain in service. This will provide Pantex with the capability to work on one pump and maintain a minimum of two pumps and tanks at all times. The new pumps and tanks are projected to be in-service by December 2013.

Unreviewed Safety Question (USQ) Process for HPFL Design

Issue

The DNFSB cited that the negative USQ determination may have been inappropriate because it was based, in part, on the use of components equivalent to the existing components when components have been found to be not equivalent.

Response

The DNFSB report indicated the USQ performed on the process for the HPFL design should have resulted in a positive conclusion determination. The USQ indicated the proposed activity was issuance of a Design Change Proposal (DCP). The final report submitted with the DCP described that the new facilities would co-exist with the current facilities for some period of time and that new weekly, quarterly, and annual operation, maintenance, and calibration procedures would need to be created. The USQ acknowledged that the changes to the Documented Safety Analysis (DSA) to add the new tank and pump facilities as safety class systems would be addressed by a future USQ or DSA change package. The initial USQ was specifically limited to the hazards associated with the construction of the new pump and tank facilities, such as the use of a crane that could fall on equipment important to safety. As planned by the project, the USQ did not address the startup and introduction of the new pumps and tanks to the existing HPFL. The post-indicator-valves (PIV) and isolation valves which isolate the new pumps from the HPFL are currently closed and locked pending implementation of the new pumps and tanks into the existing DSA.

The new pumps and tanks were assumed to be a like-for-like replacement to the existing pumps and tanks, which was reflected in the USQ determination. The higher pressures of the pumps and tanks were not properly reviewed against the DSA. While the original USQ determination should have evaluated the impacts of the higher pressures created by the new pumps and tanks, the new pumps and tanks have not been placed into service. In addition, a transition plan has been developed which identifies the additional controls necessary to bring the system on line. The controls were part of the design for the new system not to exceed the existing system pressure rating but were not looked at from a DSA standpoint for over pressure. A startup plan is in the works to complete the startup activities. The startup plan will address these concerns and will use functional tests to verify proper operations.

Issue

The DNFSB cited, "The two new suction tanks for the fire water are taller than the existing tanks, which will result in higher tank suction head pressure, which in turn may result in higher pump discharge pressure. In addition, the new fire pumps are capable of producing higher discharge pressures than the existing pumps. Both of these conditions could potentially subject the existing older HPFL and lead-in piping to higher water pressure than they can withstand."

Response

Pantex has taken appropriate measures to ensure the new pump and tank arrangement is capable of safely operating within the existing design parameters of the older HPFL piping and building fire sprinkler system components. Each diesel-driven fire pump is equipped with a Variable Speed Pressure Limiting Control (VSPLC) designed to provide a capacity of 2,500 gpm at 145 pounds per square inch (psi) to the underground HPFL piping. The VSPLC monitors the combined tank head and pump discharge pressure at each pump and adjusts the diesel driver revolutions per minute to ensure the output of the pump remains at approximately 87 percent of the upper limit of the rated working pressure of 175 psi. The increased tank size and potential

increase in head pressure is negligible due to the VSPLC. This was verified through performance testing.

In addition, a pressure relief valve (PRV) is installed and set to ensure the output of each diesel-driven fire pump will never exceed the upper limit of the rated working pressure of all new and existing components attached to the HPFL. The PRV only opens when the system exceeds the set pressure and slowly begins to close off and fully closes when the pressure reduces to approximate churn or "no-flow" pressure output of each diesel-driven fire pump. This was verified through performance of functional testing. This function ensures full pump discharge to the underground piping when called upon in a fire event.

Based on the design and installation of the diesel-driven fire pumps, redundancy is provided to ensure the newly installed diesel-driven fire pumps operate in the normal system working pressure of the HPFL. These items will maintain the HPFL system below the rated pressure. The PRV and the pump controllers are independent items.

Issue

The DNFSB report cited, "The relief valve for each of the new diesel-driven fire pumps releases water to a drain instead of retuning water to the tank. Thus, should the relief valve open for an extended period of time, water normally available for fire control would be lost. This condition could result in the volume of water available for fire control being less than that required for successful fire suppression."

Response

The relief valves of the new pump and tank facilities discharge exterior to the pump facility. The possibility of a single relief valve failing open and limiting the available water is only applicable to one of the new pump facilities. This is due to two diesel-driven fire pumps taking water from a single water supply tank. Using only one tank with two fire pumps will not be allowed without entering the LCO. The implementation of the new pump and tank facilities into the DSA will eliminate single-point failure possibilities due to redundancy and additional controls being implemented.

Issue

The DNFSB report cited, "B&W designers did not perform hydraulic calculations to ensure that modifications to the system (elbows, tees, new piping) did not negatively affect hydraulic performance. Instead they made the unsubstantiated assumption that hydraulic performance must improve since the HDPE piping has less friction loss than existing ductile iron piping."

Response

Pantex created a calculation of the entire existing system prior to the upgrade. The analysis utilizes the existing ductile iron piping in the system. This calculation confirmed all Technical Safety Requirements for the facility's fire sprinkler system demand can be met with the Zone 11 diesel pump with a 1,250 gpm leak in the system. A comparison calculation was conducted and

documented in the design basis document for the HPFL upgrade project. This calculation demonstrated that HDPE piping, with additional gate valves and tee's, has less friction loss than the existing ductile iron piping based on flow characteristics and piping diameter. The upgrade project installed piping in the same areas as the existing system piping. The use of horizontal directional drilling as the installation method for the project eliminated some fittings in the system creating better hydraulic design than calculated.

Issue

"The Board's staff identified two cases in the design and piping layout where single-point failures could result in degradation of the fire water system' s performance. First, failure of the relief valve to operate properly on the diesel-driven fire pump could result in either system overpressure or loss of water. Second, failure of the discharge check valve for any non-operating pump could result in pressure loss."

Response

To be fully operable, the existing DSA requires two diesel-driven fire pumps, each provided with a dedicated water supply tank. This configuration provides redundancy and prevents the single-point failure of a relief valve from degrading the system. If one pump and dedicated tank become inoperable, the LCO is implemented. Restoral of the second tank/pump is required within 14 days or a written recovery plan is prepared and submitted to continue operations. This limits the amount of time a single-point failure can be experienced. Failure of a check valve is highly unlikely and when a pump is taken out of service the pump is isolated from the HPFL by a control valve.

In addition, Pantex has installed two new pump facilities. The startup effort is underway to implement these facilities into the existing DSA. These facilities were installed to eliminate the risk of single-point failure even with a single pump and dedicated supply tank impaired.

Areas Lacking Automatic Sprinkler Protection

Issue

The DNFSB report expressed concerns with areas lacking automatic sprinkler protection. As stated by the report, "DOE Order 420.1B, Facility Safety requires the installation of automatic fire extinguishing systems in all significant facilities. During field observations, the Board's staff identified a ramp area that lacked automatic fire sprinklers. B&W personnel subsequently provided documentation that identified seven unsprinklered ramps, at least three of which are open to a sprinklered ramp that is used to transport nuclear explosives. Since all ramps are interconnected without fire rated separations, all ramps must be considered part the same fire area and be protected by an automatic fire extinguishing system."

Response

Ramps are not considered significant facilities, per DOE O 420.1B. The unsprinklered ramps do not have a life safety concern or property loss issue because no operations or work activities are

performed in these areas; they are used as covered passageways to transport people and material. Nuclear facilities are protected from a fire in the ramp by a fire barrier. The areas in the ramp without sprinkler protection are documented in the DSA and are not credited to mitigate the effects of a fire. When nuclear material is present in the ramps during transportation activities, it is protected from fire by a suite of controls in the DSA. This suite of controls does not include the fire sprinkler system. To ensure programmatic compliance with DOE Orders and NFPA, Pantex has documented the ramp areas lacking sprinkler protection in the Fire Hazards Analysis.