



Department of Energy
Under Secretary for Nuclear Security
Administrator, National Nuclear Security Administration
Washington, DC 20585



June 05, 2020

The Honorable Bruce Hamilton
Chairman
Defense Nuclear Facilities Safety Board
625 Indiana Avenue, NW, Suite 700
Washington, DC 20004

Dear Chairman Hamilton:

On December 12, 2019, during a Public Meeting conducted by the Defense Nuclear Facilities Safety Board (Board), National Nuclear Security Administration (NNSA) management committed to revising the Implementation Plan for Recommendation 2019-1, *Uncontrolled Hazard Scenarios and 10 CFR 830 Implementation at the Pantex Plant*. The purpose of this letter is to provide you with Revision 1 of the Implementation Plan. Consistent with Board Members' requests made during the Public Meeting, this revision was developed in close coordination with your staff. The scope of the revision includes the following:

- Added commitments for NNSA to approve of some deliverables (e.g., safety basis submittals and the Pantex Plant Unreviewed Safety Question Procedure);
- Included additional actions and background information related to how potential 'Falling Man' hazard scenarios are addressed;
- Augmented actions associated with improving the Special Tooling Program, to include (a) identifying safety factor, dynamic testing, and nondestructive examination criteria in Chapter 18 of the Sitewide SAR, and (b) improving the level of detail in work packages for Special Tooling;
- Included additional commitments related to (a) periodically communicating the status of each action, (b) providing closure evidence for each action, and (c) conducting a federal review to ensure each action was properly executed; and,
- Identified actions that have been completed since Revision 0 of this Implementation Plan was issued.

NNSA is confident that executing the actions identified in Revision 1 of the Implementation Plan, in tandem with numerous other actions already underway, will result in achieving long-term improvements to the structure, content, maintenance, and implementation of the Pantex Safety Basis. If you have any questions, please contact Mr. Geoffrey L. Beausoleil at (865) 576-0752.

Sincerely,

Lisa E. Gordon-Hagerty

Enclosure



Implementation Plan for the Defense Nuclear Facilities Safety Board Recommendation 2019-1

Uncontrolled Hazard Scenarios and
10 CFR 830 Implementation at the
Pantex Plant

June 2020 | Revision 1

APPROVED FOR PUBLIC RELEASE

This document has been approved for release to the public by:

Name / Title: Scott A. Hawks, NPO Classification Officer

Date: 06/10/2020

This document has been reviewed by a Pantex DC/UNCI-RO and has been determined to be UNCLASSIFIED and contains no UCNI. This review does not constitute clearance for Public Release.

Name: Brian Rhodes/NPO-10 Date: 05/05/2020

**Implementation Plan for the Defense Nuclear Facilities Safety Board
Recommendation 2019-1**

Revision 1

Uncontrolled Hazard Scenarios and 10 CFR 830
Implementation at the Pantex Plant

June 2020

APPROVALS

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REVISION LOG

Revision No.	Date	Description	Pages Affected
0	June 2019	Initial issue	All
1	June 2020	<p>Key changes made in this revision include the following:</p> <ul style="list-style-type: none"> • Added actions associated with NNSA approval of some deliverables (e.g., safety basis submittals and the Pantex USQ Procedure, CD-3014). • Included additional actions and background information related to how ‘Falling Man’ hazards are addressed. • Added actions associated with improving the Special Tooling Program, to include (a) identifying safety factor, dynamic testing, and nondestructive examination criteria in Chapter 18 of the Sitewide SAR and (b) improving the level-of-detail in work packages for Special Tooling. • Included additional information in Section 4 related to (a) periodically communicating the status of each action, (b) providing closure evidence for each action, and (c) conducting a federal review to ensure each action was properly executed. • Identified actions that have been completed since Revision 0 of this Implementation Plan. 	All

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ABBREVIATIONS

CAP	Corrective Action Plan
CNS	Consolidated Nuclear Security, LLC
COA	Condition of Approval
DNFSB	Defense Nuclear Facilities Safety Board
DOE	U.S. Department of Energy
DSA	Documented Safety Analysis
EOC	Extent-of-condition
HAR	Hazard Analysis Report
IP	Implementation Plan
ISI	In-service Inspection
IVR	Implementation Verification Review
JCO	Justification for Continued Operation
LTA	Less Than Adequate
NDE	Non-Destructive Evaluation
NNSA	National Nuclear Security Administration
NPO	NNSA Production Office
Pantex	Pantex Plant
PIE	Problem Identification and Evaluation
PISA	Potential Inadequacy of the Documented Safety Analysis
SAC	Specific Administrative Control
SBS	Safety Basis Supplement
SME	subject matter expert
SS-21	Seamless Safety for the 21 st Century
SSC	Structure, System, or Component
TSR	Technical Safety Requirements
USQ	Unreviewed Safety Question
USQD	Unreviewed Safety Question Determination

EXECUTIVE SUMMARY

The purpose of this Implementation Plan (IP) is to identify actions the U. S. Department of Energy (DOE) National Nuclear Security Administration (NNSA) is taking to address Defense Nuclear Facilities Safety Board (DNFSB or the Board) Recommendation 2019-1, *Uncontrolled Hazard Scenarios and 10 CFR 830 Implementation at the Pantex Plant*, which was issued on February 20, 2019. The documented safety analyses as implemented to support nuclear explosive operations at the Pantex Plant (Pantex) ensure the public, environment, and workers are adequately protected. NNSA agrees with the Board that actions are warranted to further reduce the safety risks inherently posed by nuclear explosive operations. The following actions identified in this IP include:

- Enhancing documentation and implementation of safety controls for specific hazard scenarios
- Executing comprehensive extent-of-condition reviews to assure compliance with DOE-NA-STD-3016, *Hazard Analysis Reports for Nuclear Explosive Operations*, and DOE-STD-3009, *Preparation Guide for U.S. Department of Energy Nonreactor Nuclear Facility Documented Safety Analyses*
- Revising Pantex procedures to adopt DOE guidance related to maintenance and implementation of safety basis documents
- Adopting best practices to enhance elements of the special tooling program
- Developing and delivering additional training for safety basis engineering personnel

Many of these actions were initiated during the fall of 2018, and significant progress has been made during the past several months to drive improvements in the content, implementation, and maintenance of the Pantex documented safety analyses.

1. Purpose

The purpose of this Implementation Plan (IP) is to identify actions National Nuclear Safety Administration (NNSA) is taking to address Board Recommendation 2019-1, *Uncontrolled Hazard Scenarios and 10 CFR 830 Implementation at the Pantex Plant*, which was issued on February 20, 2019. The hazard controls derived in the documented safety analyses (DSAs) and implemented to support nuclear explosive operations at the Pantex Plant (Pantex) ensure the public, environment, and workers are adequately protected. NNSA agrees with the Board that, along with actions already initiated and completed, additional actions can be taken to further reduce the safety risks inherent to nuclear explosive operations at Pantex.

2. Background

Pantex is the primary site for assembly and disassembly of nuclear weapons in the United States. Pantex operations include support of nuclear weapon life extension programs, dismantlement campaigns, and component testing and reliability programs. In addition, Pantex operations include requalifying plutonium “pits” (i.e., the core of a nuclear weapon) for future use.

In 2001, DOE issued 10 CFR Part 830, *Nuclear Safety Management*, which includes requirements for developing DSAs and deriving hazard controls that ensure workers, the public, and the environment are adequately protected. During the decade that followed, personnel responsible for managing and operating Pantex developed these DSAs and associated hazard controls.

In parallel with this multi-year effort, Pantex personnel also began implementing other fundamental safety improvements to Pantex operations. One of these initiatives was adopting Seamless Safety for the 21st Century (SS-21) principles, which included simplifying processes, reducing hazards (e.g., reducing the number of steps in which explosive components are lifted), and improving procedures. Other examples of safety improvements made during this timeframe included: (a) installing conductive flooring and making other equipment modifications intended to prevent the buildup of electrostatic charge during operations, and (b) upgrading emergency lighting, fire protection, and hoisting equipment in nuclear facilities.

These improvements made during the 2000s (development and implementation of new DSAs, implementation of SS-21 principles, and other safety upgrades) inarguably and immeasurably improved the nuclear safety posture at Pantex.

In a July 2010 letter to DOE, the Board identified multiple weaknesses in the DSAs for Pantex operations. One of the identified weaknesses was the practice of screening scenarios from further evaluation based on a very low probability of occurrence that was determined by combining a Pantex initiating event frequency with the Design Agency weapon response. Pantex personnel made multiple improvements to the content, maintenance, and implementation of DSAs subsequent to receiving the July 2010 letter.

During 2017 and 2018, the NNSA Production Office (NPO) identified weaknesses in (a) the content of the effective (approved and implemented) safety basis documents at Pantex and (b) the quality of individual safety basis submittals. While actions were taken in real time to address specific individual issues, Pantex management (both federal and contractor) recognized that more comprehensive programmatic improvements were warranted.

The first step of the comprehensive response was to develop a Safety Basis Supplement (SBS) that fulfilled two primary objectives. The first objective of the SBS was to provide a framework for analyzing

and addressing legacy issues in the Pantex safety basis associated with scenarios previously determined to not require application of safety controls despite being identified as credible in the analysis. In short, execution of the SBS will ensure that these scenarios are identified and either (a) controlled or (b) determined to be incredible. The SBS requires that any scenarios that could not be binned (i.e., the scenario is determined to be credible and existing controls are not already in place to prevent or mitigate the hazard) be addressed via the Pantex Problem Identification and Evaluation (PIE) process (this process ensures that appropriate operational restrictions and compensatory measures are formally identified and implemented while resolving any potential safety issues associated with the adequacy of safety controls). The second objective of the SBS was to identify several Specific Administrative Controls (SACs) for preventing hazardous consequences that could result from “Falling Man” scenarios (i.e., potential scenarios involving production technicians falling and tripping into sensitive components during weapon assembly or disassembly operations). These new SACs were implemented in all active nuclear explosive bays and cells by the end of February 2019. The SBS was approved by NNSA in September 2018.

The second step of the comprehensive response was to develop a corrective action plan, RPT-0020, *Corrective Action Plan for DSA Quality Issues* (referred to as the CAP), which includes numerous actions for improving the Pantex safety basis development process and addressing legacy weaknesses in the currently effective safety basis documents. Execution of this plan will facilitate achieving a step-function improvement in the overall quality of the Pantex safety basis. This CAP was approved by NNSA in November 2018. On February 20, 2019, the Board approved Recommendation 2019-1, which includes the following five Sub-recommendations:

1. Implement compensatory measures to address all of the deficiencies described in two reports appended to the Recommendation.
2. Perform an extent-of-condition (EOC) evaluation of the Pantex safety basis.
3. Implement actions to ensure process design and engineering controls that eliminate or protect a unit from impact and falling technician scenarios.
4. Ensure the design, procurement, manufacturing, and maintenance of special tooling is commensurate with its safety function.
5. Train safety basis personnel to ensure future revisions to the safety basis comply with 10 CFR 830 requirements.

NNSA recognizes the importance of correcting the weaknesses identified in Recommendation 2019-1 and on April 16, 2019, DOE accepted the Recommendation. The purpose of this IP is to identify actions NNSA is taking to address each of the Board’s five Sub-recommendations. This IP was developed in coordination with senior leadership representing DOE Headquarter elements, NNSA field office personnel, and the contractor responsible for managing and operating Pantex (Consolidated Nuclear Security, LLC).

Underlying Causes

In Recommendation 2019-1, the Board deems that “deficiencies exist within the processes used to ensure operations at Pantex have a robust safety control strategy – the safety basis is inadequate and credible accident scenarios with high consequences exist with insufficient or no controls.”

A series of causal analysis sessions employing a senior-level “performance excellence team,” in addition to subject matter experts (SMEs) in safety analysis and special tooling, were conducted to identify corrective actions that result in sustainable long-term improvements and prevent recurrence of the identified issues. The causal analysis was used to perform an in-depth evaluation of four of the five Sub-recommendations provided by the Board and determine the contributing factors and root causes of the issues. The fifth Sub-recommendation regarding training was covered under the evaluation of the other four Sub-recommendations. The analysis identified the following contributing factors and root Causes.

In some cases, the causal analysis identified factors that contributed to more than one of the issues, as identified by the Board in the Sub-recommendations. The causal analysis team mapped the Cause Codes found in DOE-STD-1197-2011, Occurrence Reporting Causal Analysis, dated September 2011, to the issues in the implementation plan. Based on the Cause Analysis results, the Causal Analysis Team identified the Root Cause as “Differing Interpretation of Existing Requirements.” The Causal Analysis has two major branches, one is the Documented Safety Analysis (DSA) and the other is Tooling. The DSA branch identified four areas: Design/Engineering Problem, Human Performance Less Than Adequate (LTA), Management Problem, and Communications LTA. The Tooling branch identified four areas: Design/Engineering Problem, Equipment/Material Problem, Human Performance LTA, and Management Problem using the various cause codes listed below.

- Design/Documentation LTA
- Skill Based Error
- Rule Based Error
- Change Management LTA
- Written Communications Method of Presentation LTA
- Written Communication Content LTA
- Written Communication Not Used
- Design Input LTA
- Design Output LTA
- Design/Installation Verification LTA
- Inspection/Testing LTA
- Knowledge Based Error
- Management Methods LTA
- Resource Management LTA

3. Resolution for Each Sub-Recommendation

Recommendation 2019-1 includes five specific Sub-recommendations that are addressed by this IP.

Board Sub-recommendation 1: *Implement compensatory measures to address all the deficiencies described in Appendix 1 and Appendix 2.*

Issue Description and Resolution with Milestones and Deliverables

Appendices 1 and 2 of Recommendation 2019-1 are reports authored by the Board’s staff (last updated in July 2018). These reports identified several issues related to development, maintenance, and implementation of safety basis documents at Pantex. These issues were binned into seven categories, each of which are discussed below.

Issue 1.1, *Weapon-specific Concerns Identified in Hazard Analysis Reports*

Recommendation 2019-1 states the following:

The Board’s staff team reviewed the hazard disposition tables and related hazard and accident analyses located in the approved hazard analysis reports (HARs) for B61, W76, [W78,] W87, and W88 operations to identify the controls relied upon to prevent hazard scenarios from resulting in high order consequences. While the safety bases identify

adequate controls for the vast majority of credible hazard scenarios, the Board's staff team identified credible hazard scenarios with unscreened weapon responses for inadvertent nuclear detonation and high explosive violent reaction for which the safety bases either do not define credited safety controls or for which the credited safety controls are not sufficient.

Pantex personnel reviewed each of the weapon-program-specific scenarios identified by the Board's staff. The results of these reviews are as follows:

- The B61 and W88 scenarios were all addressed by revisions to the subject DSAs that were submitted to NNSA in January 2019 and approved by NNSA in March 2019 and February 2019, respectively.
- The W76 scenarios were all reviewed and addressed by November 2018 via execution of the EOC reviews described below in the section related to Board Sub-recommendation 2.
- The W78 scenarios—which included applicability to scenarios in both the Sitewide SAR and the Transportation SAR—were all reviewed by November 2018 via execution of the EOC reviews described below in the section related to Board Sub-recommendation 2. The associated scenarios in the Sitewide SAR and the Transportation SAR were all addressed by September 2019 via execution of the EOC reviews described below in the section related to Board Sub-recommendation 2
- The W87 scenarios identified in Appendices 1 and 2 of the Recommendation were all reviewed by August 2019 via execution of the EOC reviews described below in the section related to Board Sub-recommendation 2.

While executing these EOC reviews, credible scenarios that lacked credited controls were addressed via the Pantex PIE process. Specifically, the PIE process is a formal mechanism for ensuring that appropriate operational restrictions or compensatory measures are implemented while resolving any potential safety issues associated with the adequacy of safety controls.

Action 1.1.1: Review and disposition specific issues identified by the Board within documented safety analyses that cover B61 operations.

Deliverable: Letter submitting a revision of the B61 HAR to NPO

Completion Date: March 2019 **[Complete]**

Completion Criteria: Letter documenting NPO approval of the revised B61 HAR by March 2019 **[Complete]**

Action 1.1.2: Review and disposition specific issues identified by the Board within documented safety analyses that cover W76 operations.

Deliverable: Letter submitting Tables to NPO that document the W76 EOC review

Completion Date: December 2019 **[Complete]**

Completion Criteria: Letter by December 2020 that documents NPO review and concurrence on the Tables.

Action 1.1.3: Review and disposition specific issues identified by the Board within documented safety analyses that cover W78 operations.

Deliverable: Letter submitting Tables to NPO that document the W78 EOC review

Completion Date: January 2020 **[Complete]**

Completion Criteria: Letter by December 2020 that documents NPO review and concurrence on the Tables.

Action 1.1.4: *Review and disposition specific issues identified by the Board within documented safety analyses that cover W87 operations.*

Deliverable: Letter submitting Tables to NPO that document the W87 EOC review

Completion Date: August 2019 **[Complete]**

Completion Criteria: Letter by December 2020 that documents NPO review and concurrence on the Tables.

Action 1.1.5: *Review and disposition specific issues identified by the Board within documented safety analyses that cover W88 operations.*

Deliverable: Letter submitting a revision of the W88 HAR to NPO

Completion Date: February 2019 **[Complete]**

Completion Criteria: Letter documenting NPO approval of the revised W88 HAR by February 2019 **[Complete]**

Action 1.1.6: *Review and disposition specific issues identified by the Board within documented safety analyses that cover Transportation and Sitewide operations.*

Deliverable: Letter submitting Tables to NPO that document the Transportation SAR and Sitewide SAR EOC reviews

Completion Date: September 2019 **[Complete]**

Completion Criteria: Letter by December 2020 that documents NPO review and concurrence on the Tables.

Issue 1.2, *Timeliness of Annual Updates to Documented Safety Analyses*

Recommendation 2019-1 states the following:

CNS has struggled to complete and obtain NPO approval of the yearly updates required by 10 CFR § 830.202. Starting in 2015, NPO has not approved the annual updates CNS has submitted for the Sitewide SAR. In 2016, CNS was unable to meet the annual DSA update requirements for the Sitewide and Transportation SARs and the W76 and W78 HARs. As NPO rejected CNS's submittals, a backlog developed. This process culminated in three rejected submittals and five approvals total in 2017. Overall, this resulted in 11 of 16 SARs and HARs not being approved for annual updates in 2017. In particular, the Sitewide SAR has not been successfully updated and approved via the annual update process since 2014.

The Board's concern was based on data collected during 2017. At that time, a number of Pantex DSAs had not been updated within the past year, most notably the Sitewide SAR. As of February 2019, all Pantex DSAs have been updated within the past year consistent with the requirements of 10 CFR § 830.202.

A contributing cause to DSAs not being updated on an annual basis was that additional changes, some fairly complex, were occasionally included in these "Annual Update" DSA change packages. To preclude recurrence of this issue, this IP will include an action for revising Pantex procedures to codify the expectation that "Annual Update" DSA change packages be submitted within 12 months and be limited to changes previously developed and made effective via both the Pantex change control process and the Pantex Unreviewed Safety Question (USQ) process.

Action 1.2.1: *Bring all Pantex documented safety analyses into compliance with the 10 CFR 830 requirement of being updated annually.*

PPC Deliverable: Letters submitting revisions of all 16 Pantex DSAs to NPO (HARs/SARs)

Completion Date: February 2019 **[Complete]**

Completion Criteria: Letter documenting NPO approval of the revised Pantex DSAs by April 2019 **[Complete]**

Action 1.2.2: *Revise Pantex procedures to explicitly capture the expectation that “Annual Update” documented safety analysis change packages be submitted within 12 months and limited to previously approved changes.*

Deliverable: Revised *Safety Analysis Engineering Manual*

Completion Date: September 2019 **[Complete]**

Issue 1.3, *Discrepant-as-found Conditions and the Unreviewed Safety Question Process*

Recommendation 2019-1 states the following:

The site USQ procedure, approved by NPO, does not comply with the requirements of 10 CFR 830 or recommendations of DOE Guide 424.1-1B ... In situations when a "discrepant as-found condition" is observed for a [Technical Safety Requirement]-related control, the procedure allows returning the system to the original condition as described in the documented safety analysis (DSA) within three days without having to declare a PISA, formally notifying DOE, performing an extent of condition review, or implementing any compensatory measures.

During the past several months, several improvements have been made to the Pantex USQ Program via development and implementation of CD-3014, *Pantex Plant Unreviewed Safety Questions Procedure*, Issue 20. One of the improvements was to clarify the Pantex PIE process question regarding SACs. Specifically, CD-3014 allowed Pantex personnel to process SAC deficiencies using the PISA process rather than developing a TSR change package. The Pantex USQ Program is compliant with 10 CFR 830 requirements and consistent with the general guidance contained in DOE Guide 424.1-1B, *Implementation Guide for Use in Addressing Unreviewed Safety Question Requirements*. 10 CFR 830 states, “It is appropriate to allow a short period of time (hours or days but not weeks) to investigate the conditions to confirm that a safety analysis is potentially inadequate before declaring a PISA.”

The focus of this Board concern, as captured in the Recommendation, centers on treatment of “discrepant as-found conditions.” In general, these conditions do not represent inadequacies in the DSA; rather, they reflect a non-conformance with the DSA (rare exceptions to this generality occasionally surface). This is clear in DOE Guide 424.1-1B, which states, “[i]f the corrective action is to bring the item into conformance ... then it may be reportable under Occurrence Reporting and Processing System requirements, but it would not require a Unreviewed Safety Question Determination (USQD).” Upon discovering a "discrepant as-found condition," Pantex procedures drive the following actions to be taken:

- Take actions to ensure operations are in a safe condition
- Notify DOE
- Determine causes, perform EOC reviews, and take necessary corrective actions

As an action of this IP, NNSA will ensure that Pantex procedures are revised to explicitly state these actions are required.

Action 1.3.1: *Revise Pantex Plant Unreviewed Safety Question Procedure to ensure the following actions are required to be taken upon identification of a “discrepant as-found condition:”*

- *Actions are implemented to ensure safe conditions*
- *Notifications are made to DOE*
- *Causes are determined, extent-of-condition reviews are executed as required, and corrective actions are implemented*

Deliverable: Letter submitting a revision of the Pantex USQ Procedure (CD-3014)

Completion Date: April 2019 **[Complete]**

Completion Criteria: Letter documenting NPO approval of the revised Pantex USQ Procedure (CD-3014) by April 2019 **[Complete]**

Action 1.3.2: *Revise Pantex Plant Unreviewed Safety Question Procedure to clarify the Pantex PIE process question regarding SACs.*

Deliverable: Letter submitting a revision of the Pantex USQ Procedure (CD-3014)

Completion Date: April 2019 **[Complete]**

Completion Criteria: Letter documenting NPO approval of the revised Pantex USQ Procedure (CD-3014) by April 2019 **[Complete]**

Issue 1.4, *Timeliness in Dispositioning Justifications of Continued Operations*

Recommendation 2019-1 states the following:

Contrary to DOE G 424.1-1B, NPO and CNS revise existing JCOs instead of issuing new ones, thereby extending the expiration date and reliance on the compensatory measures beyond a year ... Some JCOs last for several years without updating the relevant safety basis document, relying on compensatory measures without implementing rigorous controls (e.g., engineered design features).

The Board identified three specific Justifications for Continued Operation (JCOs) in its Recommendation that were effective for multiple years:

- PX-JCO-14-04, *Justification for Continued Operation for W80 ESD*
- PX-JCO-14-05, *Justification for Continued Operation for B61 ESD*
- PX-JCO-17-09, *Justification for Continued Operation for W88 Uncased HE Operations*

All three JCOs have been archived and the applicable safety basis documents have been updated to include the subject analysis and controls. Currently, there are three JCOs that are effective at Pantex, and all were developed and initially issued within the past year.

JCOs are required to identify any compensatory measures necessary for ensuring operations can be performed safely and adequate protection is provided for workers and the public. DOE agrees that, consistent with DOE Guide 424.1-1B, the life of JCOs should be as short as practical while allowing sufficient time to perform necessary safety analysis and implement necessary controls. As a best practice at Pantex, outstanding JCOs are regularly reviewed and DOE approval is obtained for any JCO that is extended or remains in place for more than a year. DOE recognizes that granting of these extensions should be the rare exception.

Action 1.4.1: *Revise Pantex Plant Unreviewed Safety Question Procedure to require the contractor organization to obtain NNSA approval/concurrence for any JCOs that are unable to be archived within a year of being initially approved by NNSA.*

Deliverable: Letter submitting a revision of the Pantex USQ Procedure (CD-3014)

Completion Date: April 2019 **[Complete]**

Completion Criteria: Letter documenting NNSA approval of the revised Pantex USQ Procedure (CD-3014) by April 2019 **[Complete]**

Issue 1.5, Periodicity for Revalidating Implementation of Administrative Controls

Recommendation 2019-1 states the following: “Contrary to DOE Guide 423.1-1B, CNS does not re-assess procedural controls via implementation verification reviews (IVRs) every three years.”

Pantex procedures currently require implementation of administrative controls to be reviewed and re-verified every five years, contrary to the suggestion of DOE Guide 423.1-1B, *Implementation Guide for Use in Developing Technical Safety Requirements*, that implementation of administrative controls be re-verified every three years. The Guide states that its purpose is to provide supplemental information rather than imposing additional requirements. That said, NNSA encourages its contractors across the nuclear complex to adopt best practices. As an action of this IP, the results of all past IVRs¹ of administrative controls at Pantex (which, as noted above, are performed at least every five years) will be reviewed. If these reviews demonstrate that administrative controls at Pantex are prone to degradation, NNSA will evaluate the cost and benefit of requiring that the implementation of all administrative controls be re-verified every three years.

Action 1.5.1: *Review Safety Basis Control Owner Assessment reports generated during the past 5 years to determine how often these assessments identify degradation of control implementation.*

Deliverable: Report documenting review

Completion Date: July 2020

Action 1.5.2: *Based on the review conducted associated with Action 1.5.1 above, determine the appropriate frequency of Safety Basis Control Owner Assessments and, if necessary, develop appropriate revisions to Pantex business processes and supporting procedures.*

Deliverable: Revised Pantex Business Processes and Procedures

Completion Date: October 2020

Completion Criteria: Letter documenting NPO concurrence with the frequency of Safety Basis Control Owner Assessments by December 2020

Issue 1.6, Crediting Safety Management Programs

Recommendation 2019-1 states the following:

CNS has identified key elements of safety management programs, or the falling man awareness protocol, as the controls relied upon for preventing high order consequences for

¹ At Pantex, re-verifying the implementation of safety controls (including both engineered and administrative controls) is achieved through execution of Safety Basis Control Owner Assessments. In order to re-verify the implementation of controls every five years, implementation of roughly 20% of the total population of controls is re-verified each year.

some of the hazard scenarios that the staff review team identified as lacking credited controls. However, relying on key elements of safety management programs does not provide a level of protection equivalent to an engineered [Structure, System, or Component (SSC)] or a properly implemented Specific Administrative Control (SAC), and does not comply with codified expectations in DOE directives.

Multiple SACs for preventing “Falling Man” scenarios have been identified. As noted above, these new SACs were implemented in all active nuclear explosive bays and cells by the end of February 2019.

As an action of this IP, NNSA will ensure that all Pantex documented safety analyses are reviewed to identify and address any instances in which elements of Safety Management Programs are solely relied upon for preventing or mitigating scenarios that could potentially result in high-order consequences (e.g., inadvertent nuclear detonation, aerosolized dispersal, or high explosive violent reaction).

Action 1.6.1: Review all Pantex documented safety analyses, identify all instances in which elements of Safety Management Programs (SMPs) are relied upon for preventing or mitigating accident scenarios (i.e., instances in which SMPs are credited to reduce the consequence or frequency of an accident) that could potentially result in high-order consequences (e.g., inadvertent nuclear detonation or aerosolized dispersal), and revise applicable DSAs (HARs or SARs).

Deliverable #1: Report documenting review

Completion Date: February 2020 **[Complete]**

Deliverable #2: Letters submitting revisions of applicable DSAs

Completion Date: August 2021

Completion Criteria: Letters documenting NPO approval of the revised DSAs by November 2021

Issue 1.7, *Timely Disposition of Conditions of Approval (COAs)*

Recommendation 2019-1 states the following: “NPO and CNS have been unable to resolve several legacy conditions of approval.”

In the reports appended to the Recommendation, the Board’s staff acknowledged that “... [the contractor organization] has committed to working down a set of ‘legacy’ COAs that existed prior to the creation of NPO [in 2012]” and that “... there were 40 COAs in this category, and 5 currently remain open” (note: there were actually six open COAs). A plan and schedule for resolving these six outstanding conditions of approval has been issued. Five of the six legacy COAs have been resolved with the submittals of revisions of applicable DSAs.. The sixth requires facility modifications before it can be closed, and this work is not scheduled to be completed until FY21. Lastly, it is also worth noting that Pantex procedures were previously revised (e.g., Work Instruction 02.01.06.02.01, *(U) Develop and Control Documented Safety Analyses*) to include additional formal mechanisms for tracking and closing COAs to prevent recurrence of COAs languishing.

Action 1.7.1: Disposition the six “legacy” open conditions of approval.

Deliverable #1: Letter that identifies the schedule for addressing open legacy COAs

Completion Date: February 2019 **[Complete]**

Deliverable #2: Letters submitting revisions of applicable DSAs

Completion Date: September 2022

Completion Criteria: Letters documenting NPO approval of the revised DSAs by January 2023

Board Sub-recommendation 2: *Perform an extent-of-condition evaluation of the Pantex safety basis (including the procedures for development and configuration control of the safety basis documents) and implement subsequent corrective actions to ensure compliance with DOE regulations and directives.*

Issue Description and Resolution with Milestones and Deliverables

As discussed above, a framework has been developed for analyzing existing scenarios in the Pantex safety basis that are identified as credible but for which safety controls had not been identified because the scenarios were evaluated to have a very low probability of occurrence. This framework called for using seven categories to determine whether either of the following is true:

- a) Controls already exist to prevent or mitigate the hazard but are not properly identified or mapped to the subject scenario, or
- b) A documented basis exists for determining that the scenario is not credible.

Also discussed above, a schedule was created for performing EOC reviews of all 16 Pantex DSAs with the purpose of identifying and binning all of the credible uncontrolled scenarios into the seven categories. Any scenarios that could not be binned (i.e., the scenario is credible and existing controls are not already in place to prevent or mitigate the hazard) are to be addressed via the Pantex PIE process. Specifically, the PIE process is a formal mechanism for ensuring that appropriate operational restrictions or compensatory measures are implemented while resolving any potential safety issues associated with the adequacy of safety controls.

The subject EOC reviews were completed for all Pantex DSAs by the end of Calendar Year 2019. The resultant tables document controls which are included in the associated TSR and are subject to the USQ process.

To address weaknesses related to procedures for development and configuration control of the safety basis documents, actions are included in this IP to: (a) develop a project plan with near-term, mid-term, and long-term actions for improving the processes Pantex personnel use to develop new and revised DSAs and (b) make improvements to the *Pantex Safety Analysis Engineering Manual*.

In addition, actions to improve the training of Safety Analysis Engineering personnel are included below in the section that covers Sub-recommendation 5. These actions will also serve to improve “development and configuration control of the safety basis documents,” as suggested per this Board Sub-recommendation (i.e., Board Sub-recommendation 2).

Action 2.1.1: Perform Extent-of-Condition (EOC) reviews on all 16 Pantex documented safety analyses to identify and address all credible scenarios for which safety controls had not been identified.

Deliverable: Letters submitting Tables to NPO that document EOC reviews

Completion Date: March 2020 **[Complete]**

Completion Criteria: Letters by December 2020 that document NPO review and concurrence on the Tables developed and submitted

Action 2.1.2: Revise each of the 16 documented safety analyses to properly address each scenario identified while performing the EOC reviews associated with Action 2.1.1.

Deliverable #1: Letter that identifies the schedule revising each of the 16 DSAs

Completion Date: June 2020

Completion Criteria: NPO review and concurrence on the schedule for revising the 16 DSAs by September 2020.

Action 2.1.3: *Develop a project plan for making necessary improvements to the configuration management processes Pantex personnel use in developing new and revised documented safety analyses.*

Deliverable: Safety Basis Document Generation Process Improvements, PLN-0101

Completion Date: March 2019 **[Complete]**

Action 2.1.4: *Revise the Pantex Safety Analysis Engineering Manual to make necessary improvements related to development of the documented safety analyses.*

Deliverable: Revised *Safety Analysis Engineering Manual*

Completion Date: December 2019 **[Complete]**

Board Sub-recommendation 3: *Implement actions to ensure process design and engineering controls (including the use of special tooling) eliminate or protect a unit from impact and falling technician scenarios, including those scenarios identified in Enclosure 1.*

Issue Description and Resolution with Milestones and Deliverables

The safety basis at Pantex includes analysis of ‘Falling Man’ scenarios. These Falling Man scenarios are those in which technicians conducting nuclear explosive operations could trip and fall into a sensitive nuclear component, and potentially impact that component with whatever the technician might be carrying at the time. To prevent or mitigate many of these scenarios, the Pantex safety basis identifies hundreds of engineered controls, Special Tooling identified as a safety-class design feature, for which specific Performance Criteria have been identified to ensure installed tooling can withstand the Falling Man impact and protect the subject sensitive component.

As discussed above, in addition to these engineered controls, improvements to other safety protocols have been realized for preventing significant consequences that could result from Falling Man scenarios. Specifically, several SACs have been designed to preclude operators from falling into sensitive weapon configurations. These new SACs were implemented in all active nuclear explosive bays and cells by the end of February 2019. These controls address all Falling Man scenarios, including those identified by the Board’s staff in the report identified as Enclosure 1 of Recommendation 2019-1.

Action 3.1.1: *Develop a safety basis document that includes safety controls that address Falling Man scenarios, including those identified by the Board’s staff in the report identified as Enclosure 1 of Recommendation 2019-1.*

Deliverable: Letter submitting a Safety Basis Supplement for Legacy Issues Associated with Documented Safety Analysis at Pantex (SB-SBS-942190 Revision 1)

Completion Date: September 2018 **[Complete]**

Completion Criteria: Letter documenting NPO approval of the Safety Basis Supplement by October 2018 **[Complete]**

Action 3.1.2: *Implement safety controls identified in Action 3.1.1 for all active nuclear explosive operations at Pantex.*

Deliverable: IVR Memo for DSA Change Package AB-18-58

Completion Date: February 2019 **[Complete]**

Action 3.1.3: *Request and develop a Central Technical Authority position on the adequacy of the Falling Technician Model currently utilized at Pantex.*

Deliverable #1: Memorandum requesting Central Technical Authority position

Completion Date: June 2020

Deliverable #2: Memorandum documenting Central Technical Authority position

Completion Date: October 2020

Action 3.1.4: Perform Extent-of-Condition (EOC) reviews on all 16 Pantex documented safety analyses to identify and address all credible impact scenarios for which safety controls had not been identified.

Deliverable: Letters submitting Tables to NPO that document EOC reviews

Completion Date: March 2020 **[Complete]**

Action 3.1.5: Develop Justifications for Continued Operation to address each inadequately controlled impact scenario identified while performing the EOC reviews associated with Action 3.1.4.

Deliverable: Letters submitting Justifications for Continued Operation to NPO for approval

Completion Date: June 2020 **[Complete]**

Completion Criteria: Letters documenting NPO approval of the Justifications for Continued Operation by September 2020

Action 3.1.6: Revise administrative controls associated with Falling Man scenarios to ensure they are compliant with the requirements of DOE Standard 1186-2016, Specific Administrative Controls.

Deliverable: Letters submitting a revision of applicable Safety Basis Supplement (SBS) to NPO

Completion Date: March 2021

Completion Criteria: Letters documenting NPO approval of the revised SBS by July 2021

Board Sub-recommendation 4: *Ensure the design, procurement, manufacturing, and maintenance of special tooling is commensurate with its safety function (see Enclosure 1).*

Issue Description and Resolution with Milestones and Deliverables

On October 17, 2018, the Board sent the Secretary of Energy a letter that identified five weaknesses within the special tooling program. Significant effort was expended to revamp and improve the Pantex special tooling program in the 2004 – 2006 timeframe. Below is additional information regarding the five weaknesses identified by the Board and actions taken and planned to make improvements to the Pantex special tooling program.

Issue 4.1, *Application of the Special Tooling Design Manual*

The Board's staff identified instances where requirements and guidance of the Pantex Special Tooling Design Manual were not being met (note: no DOE Directives or Industry Consensus Standards exist that identify detailed requirements specific to the design, fabrication, inspection, and maintenance of "tooling"). Subsequent to the on-site review performed by the Board's staff in September 2017, all deviations from the manual were reviewed to confirm that continued use of the subject tools meet the applicable requirements and ensure the safety of ongoing operations. The Tooling design staff is trained and qualified to DOE O 426.2, *Personnel Selection, Training, Qualification, and Certification Requirements for DOE Nuclear Facilities*, requirements applicable to technical staff. This training includes covering the requirements of the manual. While employed safety factors are typically 3 to 1 or greater, load conditions and safety factors are currently at the discretion of the design engineers based on

their training; however, the subject procedure is being revised to require management approval for deviations to the required standard safety factors not relied upon in the DSA.

Action 4.1.1: Review each individual deviation from the Pantex Special Tooling Design Manual identified by the Board's staff to confirm that continued use of the subject tools meets the applicable requirements and ensures the safety of ongoing operations.

Deliverable: Report documenting review

Completion Date: October 2019 **[Complete]**

Action 4.1.2: Revise the Pantex Special Tooling Design Manual to apply a consistent yield safety factor and require management/designee approval for deviations from standard safety factors.

Deliverable: Revised *Pantex Special Tooling Design Manual*

Completion Date: September 2020

Action 4.1.3: Revise Chapter 18 of the Sitewide Safety Analysis Report to include both (a) standard safety factors to be used in the design of Special Tooling and (b) criteria for when dynamic testing of special tooling should be conducted as part of the design process.

Deliverable: Letter submitting revision of Chapter 18 of the *Sitewide Safety Analysis Report*

Completion Date: October 2020

Completion Criteria: Letter documenting NPO approval of the revised Chapter 18 of the *Sitewide Safety Analysis Report* by December 2020

Issue 4.2, Weld Quality and Application of Non-destructive Evaluation Techniques

The Board's staff expressed concern that other Non-Destructive Evaluation (NDE) techniques should be used to inspect welds. The Pantex Welding and Supplier Quality programs ensure that welds are performed and inspected by qualified personnel in accordance with code requirements. The welding program has been enhanced within the last five years to include assigning qualified welding engineers to oversee the program. In addition, qualified weld inspectors perform oversight of vendors that supply tooling to Pantex. In December 2018, an independent welding expert travelled to Pantex to review the welding program as applied to tooling. This expert concluded that the program was consistent with industry requirements and guidance and provided two areas for improvement: (a) evaluating potential application of additional industry welding codes and standards and (b) adopting additional NDE techniques beyond current Pantex practices. These recommendations are incorporated as actions in this IP.

Action 4.2.1: Execute an independent review of the observations made by the Board's staff related to the Pantex welding program, with the focus on identifying any inconsistencies between the Pantex program and industry requirements and guidance.

Deliverable: Memorandum documenting a Review of DNFSB October 17, 2018 Letter to U.S DOE Secretary Perry

Completion Date: December 2018 **[Complete]**

Action 4.2.2: Evaluate application of additional industry welding codes and standards to enhance the Pantex welding program for special tooling.

Deliverable: Report documenting evaluation

Completion Date: October 2019 **[Complete]**

Action 4.2.3: *Revise both the Pantex Special Tooling Program and Pantex Welding Program to adopt recommendations made in the evaluation performed for Action 4.2.2 above.*

Deliverable: Revised program manuals

Completion Date: September 2020

Action 4.2.4: *Revise Chapter 18 of the Sitewide Safety Analysis Report to include nondestructive examination requirements for welds in Special Tooling.*

Deliverable: Letter submitting revision of Chapter 18 of the *Sitewide Safety Analysis Report*

Completion Date: October 2020

Completion Criteria: Letter documenting NPO approval of the revised Chapter 18 of the *Sitewide Safety Analysis Report* by December 2020

Issue 4.3, Preventive Maintenance and In-service Inspection Programs for Special Tooling

The Board's staff expressed concern that Pantex relies on "skill-of-the-craft" for proper execution of special tooling inspection, maintenance, and testing activities to ensure tooling meets applicable safety requirements. Pantex tools are currently fabricated, tested, and maintained by trained and qualified journeymen mechanics and electricians. All tooling is inspected by specialized tooling inspectors prior to being released for initial use. The tooling is also inspected subsequent to being modified or repaired. Formal in-service inspections (ISIs) are prescribed by design engineering personnel and procedurally implemented to assure continued reliable performance. Following an assessment NPO conducted in June 2018, corrective actions were developed to require ISIs be established for all new or modified safety-credited tools. The *Tooling Design Manual* is scheduled to be revised by June 2020 to incorporate this requirement. For existing tooling, there is an action to review and make necessary improvements to ISIs. In-service inspections of special tooling are performed through a controlled process that provides adequate and repeatable elements for trained and qualified craft technicians. This process includes maintenance work orders for each specific tool, tool design documents for requirements (e.g., drawing, support data sheet, etc.), and PX-3107-T form to document completion and acceptance.

Action 4.3.1: *Revise the Pantex Special Tooling Design Manual to incorporate a requirement that ISIs be identified for new or modified safety-credited tools.*

Deliverable: Revised *Pantex Special Tooling Design Manual*

Completion Date: September 2020

Action 4.3.2: *Review in-service inspection requirements for existing special tooling and issue a plan that includes a schedule for making improvements.*

Deliverable #1: Plan based on documented review that includes the scope and schedule for ISI improvements

Completion Date: June 2020

Deliverable #2: Letters submitting revisions of applicable DSAs

Completion Date: June 2023

Completion Criteria: Letters documenting NPO approval of the revised DSAs by September 2023

Action 4.3.3: *Develop business processes and supporting procedures to improve the level-of-detail required to be included in maintenance and inspection work packages for Special Tooling, consistent with the Special Tooling Integrated Corrective Action Plan to address NPO concerns regarding compliance with the Quality Assurance and Nuclear Maintenance Programs.*

Deliverable: Revised Pantex Business Processes and Procedures

Completion Date: June 2021

Issue 4.4, *Special Tooling Performance Criteria as Identified in Documented Safety Analyses*

The Board’s staff expressed concern that the safety basis documentation contains a general safety factor requirement rather than tool-specific performance criteria (i.e., a general design criteria rather than “several 100” specific performance criteria). There are actions for establishing expectations associated with identification of performance criteria for special tooling and that those expectations are implemented for all special tools.

Action 4.4.1: Establish expectations for identifying performance criteria for special tooling, and issue a plan that includes a schedule implementing those expectations for all special tools.

Deliverable #1: Report documenting expectations and schedule for implementation

Completion Date: December 2019 [**Complete**]

Deliverable #2: Letters submitting revisions of applicable DSAs

Completion Date: December 2022

Completion Criteria: Letters documenting NPO approval of the revised DSAs by March 2023

Issue 4.5, *Special Tooling Loading Conditions*

The Board’s staff identified concerns related to analysis and performance testing associated with mechanical impact scenarios for low-probability events. An *Implementation Plan for Procurement of Safety- Related Special Tooling to NQA-1* (IPLAN-0085) was developed to adopt NQA-1 (in addition to NAP-24A) for special tooling credited in the applicable DSA. This change will provide specific acceptance requirements and criteria to procured special tooling or tooling components that will provide additional assurance of the performance of the credited safety function for special tooling. Separately, Pantex has and is planning further destructive testing of special tools to confirm design modeling and analysis techniques used by Pantex tooling designers are appropriately conservative.

Action 4.5.1: Perform destructive testing of two special tools to validate the modeling and analysis techniques used by Pantex tooling designers are appropriately conservative.

Deliverable: Report documenting results of destructive testing

Completion Date: February 2020 [**Complete**]

Action 4.5.2: Develop business processes and supporting procedures to improve procurement, acceptance, and special tooling supplier quality, consistent with the subject Implementation Plan (Implementation Plan for Procurement of Safety-Related Special Tooling to NQA-1, IPLAN-0085).

Deliverable: New Business Processes and Procedures that codify expectations for Commercial Grade Dedication that are consistent with NQA-1 requirements

Completion Date: October 2020

Board Sub-recommendation 5: *Train safety basis personnel to ensure future revisions to the safety basis comply with 10 CFR 830 requirements.*

Issue Description and Resolution with Milestones and Deliverables

The training and qualification process for new safety analysis engineers at Pantex requires completing courses 604.65, *Documented Safety Analysis Development*, and 517.17, *USQ Evaluator Qualification*

Course. These courses are focused on elements of Subpart B of 10 CFR 830 and include guidance for developing and implementing safety basis documents, responding to the discovery of a PISA, and performing USQDs. There are several actions associated with improving training for safety analysis to ensure alignment with DOE requirements (e.g., 10CFR830, DOE-STD-3009, DOE-STD-NA-3016, DOE-STD-1186, etc.), including updates to courses 604.65 and 517.17. In addition, the Pantex USQ process was recently revised, approved by DOE, and implemented. This revision included multiple improvements including: (a) new screening and exemption criteria, (b) use of a new USQ database, (c) an expert USQ process, and (d) guidance for developing SBS.

There are also actions to revise the *Pantex Safety Analysis Engineering Manual* that governs the work of the Safety Analysis Engineering department. This revision will include additional guidance and expectations associated with the development of safety basis documents. All Pantex analysts will be trained to the new requirements and guidance contained in the revised manual.

In addition to these initiatives, additional training improvement actions included in this IP:

- Update qualification cards for safety analysis engineers
- Update training materials for courses related to the roles and responsibilities of Safety Analysis Engineering
- Utilize training courses available through the DOE's National Training Center

Action 5.1.1: *Simplify the Pantex Plant Unreviewed Safety Questions Procedure and conduct training for Evaluators and Peer Reviewers on the new revision.*

Deliverable: Revised procedure (CD-3014) and evidence of completed training for Evaluators and Peer Reviewers

Completion Date: April 2019 **[Complete]**

Action 5.1.2: *Develop and conduct improved training courses for USQD authors and reviewers.*

Deliverable: Lesson plans and evidence of completed training for SAE analysts

Completion Date: June 2019 **[Complete]**

Action 5.1.3: *Update the training materials for the following courses. The majority of these courses have already been updated and training has been provided.*

Course Number	Course Title
CR 517.17	USQ Evaluator Qualification Course
CR 517.67	USQ Evaluator Re-qualification Course
CR 500.61	Expert USQD Evaluator
CR 604.64	DSA for Engineers, Project Managers, & Manufacturing
CR 604.65	Document Safety Analysis Development
CB 563.73	USQ Screener Refresher
CR 563.73	USQ Screener Initial
CB 583.00	USQ Screener
TBD	CASTLE-PX Training

Deliverable: Revised training courses

Completion Date: August 2020

Action 5.1.4: *Revise the following qualification cards to incorporate recent lessons learned.*

Qual Card Number	Qual Card Title
QC 607.30	USQ Screener Qual Card
QC 526.64	USQ Evaluator Qual Card
QC 604.91	AB Analyst I Qual Card
QC 604.93	AB Analyst III Qual Card
QC 604.13	USQ Independent Reviewer
QC 500.62	Expert USQ Evaluator
QC 500.63	Expert USQ Independent Reviewer

Deliverable: Revised Qualification Cards

Completion Date: December 2019 [**Complete**]

Action 5.1.5: *Incorporate DOE National Training Center training courses into the required curriculum for SAE analysts:*

National Training Center Safety Basis Courses	
Course Number	Course Title
SBA-100DE	Nuclear Facilities Safety Basis Fundamentals
SBA-110DE	Documented Safety Analysis Safe Harbors
SBA-120DE	Hazard Identification, Categorization, and Evaluation Fundamentals
SBA-130DE	Accident Analysis and Control Selection
SBA-140DE	Safety Design Basis Document Development
SBA-150DE	Technical Safety Requirements (TSR) Development
SBA-160DE	USQ Process

Deliverable: Revised curriculum

Completion Date: December 2019 [**Complete**]

4. Organization and Management

Overall execution of this IP is the responsibility of the NPO Manager. Completion of the individual tasks identified within this IP is the responsibility of NPO's Assistant Manager of Nuclear Safety and Engineering. All actions identified in this IP will be entered and tracked in the Pantex Issues Management System (i.e., the Pantex PER/ESTARS systems). A SharePoint Site will be maintained that provides the status of each action and closure evidence. Periodic meetings will be held to brief NPO management and the DNFSB's Resident Inspectors on the status of executing this IP. NNSA is committed to conduct formal reviews to evaluate the adequacy of each individual action included in this IP. Planning, scheduling, and documentation of these reviews is captured in NNSA's ePegasus system. . "Completion Criteria" have been added to the actions that require additional NPO documentation to close. The DNFSB's Resident Inspectors have access to the Pantex Issues Management System, the SharePoint

Site, and ePegasus.

NNSA will provide written notification to the Board if any IP deliverables will not be completed by the schedule specified in the IP or if NNSA determines that the scope of any IP actions needs to be modified. NNSA will brief the Board annually to summarize progress made on completing the actions identified in this IP. Six months after completing the final action of this IP, NNSA will initiate an effectiveness review of all actions taken.

5. References

1. 10 CFR 830, *Nuclear Safety Management*, U.S. Department of Energy, Washington, D.C.
2. DOE G 423.1-1B, *Implementation Guide for Use in Developing Technical Safety Requirements*, U.S. Department of Energy, Washington, D.C. Mar. 18, 2015.
3. DOE G 424.1-1B, Chg 2, *Implementation Guide for use in Addressing Unreviewed Safety Question Requirements*, U.S. Department of Energy, Washington, D.C. Jun. 12, 2013.
4. DOE letter from L. E. Gordon-Hagerty to B. Hamilton, DNFSB, *Acceptance of DNFSB Recommendation 2019-1*, dated April 16, 2019.
5. DNFSB letter from P. S. Winokur to T. P. D'Agostino, DOE, *Review of Hazard Analysis Reports at the Pantex Plant*, dated July 6, 2010.
6. DNFSB letter from B. Hamilton to J. R. Perry, DOE, *Pantex Plant Special Tooling Program Review*, dated October 17, 2018.
7. DNFSB Recommendation 2019-1, *Uncontrolled Hazard Scenarios and 10 CFR 830 Implementation at the Pantex Plant*, dated February 20, 2019
8. DNFSB letter from B. Hamilton to J. R. Perry, DOE, *Uncontrolled Hazard Scenarios and 10 CFR 830 Implementation at the Pantex Plant*, dated February 20, 2019.
9. NPO letter from Beausoleil, G., NPO, letter to Smith, M., CNS, "2017 TIMM Report - Second Triannual Report," dated August 28, 2017.
10. RPT-0020, *Corrective Action Plan for DSA Quality Issues*, September 2018.
11. SB-SBS-942190, *Safety Basis Supplement for Legacy Issues Associated with Document Safety Analyses at Pantex*, September 2018