Office of Enterprise Assessments
Assessment of the Pantex Plant
Work Planning and Control Program

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Table of Contents

Acronyms

CAS	Contractor Assurance System
CFR	Code of Federal Regulations
CNC	Computer Numerical Control
CNS	Consolidated Nuclear Security, LLC
CRAD	Criteria and Review Approach Document
DNFSB	Defense Nuclear Facilities Safety Board
DoD	U.S. Department of Defense
DOE	U.S. Department of Energy
EA	Office of Enterprise Assessments
ESP	Explosives Safety Program
ESSP	Explosives Safety Site Plan
FY	Fiscal Year
IH	Industrial Hygiene
IPRO	Integrated Production Planning and Execution System
ISM	Integrated Safety Management
JSHA	Job Safety Hazards Analysis
MWF	Metalworking Fluid
NIOSH	National Institute for Occupational Safety and Health
NNSA	National Nuclear Security Administration
OFI	Opportunity for Improvement
OSHA	Occupational Safety and Health Administration
PER	Problem Evaluation Request
PM	Preventive Maintenance
PPE	Personal Protective Equipment
SDS	Safety Data Sheet
SME	Subject Matter Expert
SMP	Safety Management Program
USQD	Unreviewed Safety Question Determination
WCD	Work Control Documentation
WI	Work Instruction
WO	Work Order
WP&C	Work Planning and Control

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EXECUTIVE SUMMARY

The U.S. Department of Energy (DOE) Office of Worker Safety and Health Assessments, within the independent Office of Enterprise Assessments (EA), conducted an assessment of work planning and control (WP&C), explosives safety, and selected elements of feedback and improvement at the Pantex Plant. EA conducted this assessment February 12-15 and February 26 – March 1, 2018.

This assessment was conducted within the broader context of a series of targeted assessments of WP&C at sites across the DOE complex. EA also examined selected areas of the contractor assurance system as it applies to WP&C activities. The focus was on assessing implementation of the WP&C program by looking at a sample of ongoing work activities. The assessment is based on a sampling of data within the Maintenance, Manufacturing Production Tooling, and Explosives Technology departments with a focus on maintenance, craft shops, and explosives safety operations. Observed activities included maintenance field work; work in the Production Tooling machine shops, Inert Machining Shops, and Maintenance Shops; and the Explosives Technology Division.

The National Nuclear Security Administration (NNSA) Production Office (NPO) provides Federal line management oversight for both the Pantex Plant and the Y-12 National Security Complex Consolidated Nuclear Security, LLC (CNS) manages and operates both sites for DOE/NNSA under a single contract.

Pantex Plant Work Planning and Control

The CNS WP&C program is sufficiently implemented at the Pantex Plant for the safe and effective performance of work. Overall, most work activity hazards are identified and communicated to the workforce. Maintenance work packages are appropriate for the work observed, included identified hazards and controls, and included documentation of work authorization and work performance. Maintenance workers are skilled and qualified, exhibit a questioning attitude, and identify concerns before work is started. When used, activity-specific work control documents provide adequate work definition. Although work is well defined in some shops, others rely more heavily on skill of the craft. The maintenance and shop workforce is experienced and knowledgeable, and subject matter expertise is effectively engaged.

The maintenance organization has adopted an outage process called Turnaround Work where, for a two-week period, a facility is turned over to maintenance to perform planned corrective and preventive maintenance work. Additionally, preventive maintenance inside the Zone 12 material access area is performed during the swing shift, after the production daily work shift. These are positive practices that help deconflict work and minimize the impact on plant operations. Additionally, EA noted that craft shop workers developed two process innovations related to maintenance checklists for welding machines and an electronic work package system to streamline completion of WCDs and eliminate the storage of paper documents—contributing to overall effective WP&C.

EA observed one occasion of a breakdown in the conduct of operations program in the Explosives Technology Division. During the completion of the daily pre-operational checklist for one building within the Inert Machining Department, three engineering technicians in three separate bays/rooms did not follow the procedure verification requirements of the checklist. Each technician affirmed incorrectly that a step in the procedure had been verified as complete.

In addition, EA identified a few concerns in the implementation of the job safety hazards analysis process. Some hazards in observed work activities had not been identified and/or documented, and a few hazard controls were not effectively implemented. Also, CNS has not established thresholds for which work activity-level tasks in the craft shops require a qualification card process and workers are not consistently meeting training requirements.

Pantex Plant Explosives Safety

CNS has effectively developed and implemented the explosives safety program in support of the facilities engaged in developing, manufacturing, handling, storing, transporting, processing, and testing explosives and related assemblies. Numerous work instructions and other program documents appropriately implement this program. The Integrated Production Planning and Execution System (IPRO) as implemented by CNS is a best practice and is exceptionally effective in preventing the violation of facility explosives limits and ensuring that all concerned personnel are aware of the explosives quantities present in, and the limits of, their facilities.

Pantex Plant Feedback and Improvement

The work planning and control aspects of the CNS contractor assurance system include processes for identifying and reporting deficiencies, and developing and implementing effective corrective actions. CNS uses a risk-based process to develop assessment schedules and effectively resolves issues identified during assessments. CNS makes extensive use of challenging and meaningful metrics and has developed two web-based courses that train personnel on metrics development, usage, and maintenance. The maintenance organization has processes for soliciting feedback from workers and for sharing lessons learned related to the work being performed.

Summary

CNS has implemented a WP&C program that results in work packages appropriate for the work observed. Workers are skilled and knowledgeable, the observed work was conducted within established controls, and subject matter expertise was effectively engaged. CNS has effectively developed and implemented the explosives safety program. The CNS contractor assurance system contributes to the feedback and improvement aspects of work planning and control. Despite these overall positive results, concerns were identified with issues of procedure noncompliance, segments of the Pantex training and qualification process, and implementation of some hazard controls and the job safety hazards analysis process.

Office of Enterprise Assessments
Assessment of the Pantex Plant
Work Planning and Control Program

1.0 PURPOSE

The U.S. Department of Energy (DOE) Office of Worker Safety and Health Assessments, within the independent Office of Enterprise Assessments (EA), conducted an assessment of the work planning and control (WP&C) program at the Pantex Plant. EA performed this independent assessment in consideration of the former Deputy Secretary's response to the Defense Nuclear Facilities Safety Board (DNFSB) letter and technical report DNFSB/Tech-37, which included a commitment to enhance Federal oversight of activity-level WP&C. Additionally, the WP&C program assessment is within the broader context of EA's targeted assessments of programs at DOE sites that have high-consequence activities or whose performance may present significant risks in accordance with DOE Order 227.1A, *Independent Oversight Program*. EA conducted the onsite portions of this assessment February 12-15 and February 26 – March 1, 2018.

2.0 SCOPE

EA conducted this assessment in accordance with the *Plan for the Office of Enterprise Assessments Assessment of the Work Planning and Control Program at the Pantex Plant, February 2018*. This assessment evaluated the effectiveness of Consolidated Nuclear Security, LLC (CNS) implementation of the integrated safety management (ISM) core functions (define scope of work, identify and analyze hazards, identify and implement controls, perform work safely within controls, and feedback and improvement) with respect to WP&C implementation in operations that contain chemical, radiological, and explosive hazards at the Pantex Plant. In addition, EA evaluated the CNS contractor assurance system (CAS) and feedback and improvement processes. EA did not evaluate the effectiveness of the oversight provided by the National Nuclear Security Administration (NNSA) Production Office (NPO).

This assessment also evaluated the effectiveness of the flowdown of the DOE-approved explosives safety program (ESP) and associated requirements as expressed in approved explosives safety documentation, associated safety basis documentation, and operational procedures for activities with explosive materials. The assessment of the explosives safety processes and selected facilities was conducted in accordance with a review plan that focused on evaluation of CNS's establishment of explosives safety management programs, including organizational structure and administration, to ensure effective implementation and control of all explosive activities (10 CFR 851, Appendix A, 3.(b), *Explosives Safety)*. The review also evaluated CNS's implementation of, and compliance with, DOE-STD-1212-2012, *Explosives Safety*.

3.0 BACKGROUND

CNS manages and operates both the Pantex Plant and the Y-12 National Security Complex under a single contract on behalf of NNSA. Within NNSA, NPO provides Federal line oversight of CNS. The EA oversight program is designed to enhance DOE safety and security programs by providing DOE/NNSA and contractor managers, Congress, and other stakeholders with an independent evaluation of the adequacy of DOE/NNSA policy and requirements and the effectiveness of DOE/NNSA and contractor line management performance in safety, security, and other critical functions as directed by the Secretary

of Energy. The EA oversight program is described in and governed by DOE Order 227.1A *DOE Independent Oversight Program*. EA evaluates safety and emergency management policies and programs throughout DOE, with a particular emphasis on evaluating worker and public protection from high-consequence hazards that exist at many DOE sites. EA accomplishes its safety and emergency management oversight through two primary mechanisms: (1) a network of staff site leads who are assigned to monitor the activities at DOE sites with nuclear facilities or activities and coordinate EA assessment activities at those sites; and (2) a program of targeted assessments that evaluate selected functional or topical areas at multiple sites across the DOE complex. EA selects, prioritizes, and plans assessment activities based on such factors as risk to workers and the public, facility operational status, and performance history. This WP&C assessment is within the broader context of EA's targeted assessments of programs at DOE sites that have high-consequence activities such as Pantex's explosive and nuclear operations. This assessment also satisfies EA's commitment to perform targeted assessments with regard to the Deputy Secretary's response to DNFSB/Tech-37 that included, in part, a commitment to enhance Federal oversight of activity-level WP&C.

4.0 METHODOLOGY

EA implements the DOE Independent Oversight Program through a comprehensive set of internal protocols, operating practices, assessment guides, and process guides. Organizations and programs within DOE use varying terms to document specific assessment results. In this report, EA uses the terms "deficiencies, findings, and opportunities for improvement (OFIs)" as defined in DOE Order 227.1A. In accordance with DOE Order 227.1A, DOE line management and/or contractor organizations must develop and implement corrective action plans for the deficiencies identified as findings. Other important deficiencies not meeting the criteria for a finding are also highlighted in the report and summarized in Appendix C. These deficiencies should be addressed consistent with site-specific issues management procedures.

As identified in the EA assessment plan, this assessment considered requirements based on selected objectives and criteria from DOE Guide 226.1-2A, *Federal Line Management Oversight of Department of Energy Nuclear Facilities*, Appendix D, *Activity-Level Work Planning and Control Criterion Review and Approach Documents with Lines of Inquiry*. EA also selected objectives and criteria from sections of EA Criteria and Review Approach Document (CRAD) EA-32-03, *Industrial Hygiene Program Criteria and Review Approach Document*, and selected feedback and improvement criteria from DOE Guide 226.1-2A. The plan for this assessment employed the criteria from CRAD 32-01, *Explosives Safety*, to evaluate the ESP. In accordance with the assessment plan, the assessment focused on the performance and implementation of site ESP processes.

This assessment evaluated the effectiveness of the selected elements of the CNS WP&C program, the explosives safety program, and the integrating elements of the CNS feedback and improvement program with regard to the WP&C process at Pantex. The assessment is based on a sampling of data within the Pantex Maintenance, Manufacturing, and Explosives Technology departments. The maintenance section focuses on the Maintenance and Maintenance Work Planning Departments, and on field maintenance activities. Craft shops reviewed were within three CNS departments - the Maintenance Department, the Inert Machining Department, and the Production Tooling Department. EA examined key documents, such as work packages, procedures, manuals, analyses, policies, and training and qualification records. EA also interviewed key personnel responsible for developing and executing the associated programs; observed 22 work activities; and walked down significant portions of selected shops, focusing on the identification of hazards and use of controls. The members of the EA assessment team, the Quality Review Board, and EA management responsible for this assessment are listed in Appendix A. A detailed list of the documents reviewed, personnel interviewed, and observations made during this assessment,

relevant to the findings and conclusions of this report, is provided in Appendix B.

EA previously assessed ESP implementation at Pantex in November 2015, and this current assessment examined the completion and effectiveness of corrective actions for the previous assessment finding related to compensatory measures for inoperable blast door interlocks. The result of the corrective action assessment is included in Section 5.5 of this report.

5.0 RESULTS

5.1 Maintenance

The CNS Infrastructure Directorate manages the maintenance program through the Maintenance Work Control Department and the Maintenance Department. During this assessment, EA conducted work observations of four corrective maintenance jobs and two preventive maintenance (PM) jobs, as well as a walkdown of a corrective maintenance job by a work planner. Additionally, EA reviewed 10 corrective maintenance work orders (WOs), 1 maintenance WO to support subcontractor work, 7 PM WOs, training records for 13 maintenance employees, and 3 qualification cards for maintenance employees. The Maintenance Department is piloting a work control process for low risk work that relies upon skill of the workers. This process is called the Level III work control process. EA reviewed two Level III WOs during this assessment.

Work Planning and Control Programs and Processes

Objective:

The Organization has developed and approved WP&C processes to enable safe performance of work. (DOE Guide 226.1-2A, Appendix D, Objective WP&C1-1, Criteria #3 and 6)

The Organization has established a management and organizational framework for (1) initiating, analyzing, planning, and approving activity-level work and (2) authorizing, releasing, and safely performing activity-level work. (DOE Guide 226.1-2A, Appendix D, Objective WP&C1-4, Criterion #5)

The Infrastructure Directorate has approved policies, procedures, and processes that for the most part effectively define the maintenance WP&C program and appropriately emphasize the safe performance of work. Policy Directive DIR-0002, *Pantex Infrastructure and Enterprise Reliability and Maintainability Responsibilities and Authorities*, adequately describes the organizational framework and management responsibilities. MNL-352214, *Conduct of Maintenance and Utility Operations at Pantex*, provides the appropriate attributes and guidelines for conduct of maintenance in a methodical and safe manner. HNDBK-0006, *Infrastructure Work Control Planning Handbook*, contains useful information for planning a job. The Infrastructure Directorate has developed a suite of work instructions (WIs) that, in general, appropriately address the WP&C processes.

Approved WOs are used to accomplish maintenance work including corrective maintenance, maintenance support for subcontractor work, preventive maintenance, and modifications. Work packages for other than preventive maintenance work use template TMP-0010, Work Order Instructions. Preventive maintenance work order documents include technical procedures and preventive maintenance tasks (less rigorous than technical procedures). Each WO contains form PX-3170, which documents the work from beginning to end. Work planners perform the initial identification of hazards for activity-level work after conducting a walkdown of the job site, and they document hazards on form PX-5825, *Preliminary Hazards Analysis Checklist*. These documents are adequate to support safe work planning. The

Maintenance Department is piloting a Level III work control process for low risk work that relies upon skill of the workers.

CNS has replaced its integrated plan of the day process with individual work unit plan of the day meetings and an escalation process based on reporting tiers (Tier 1, Tier 2 and Tier 3). Per the CNS Escalation Guidebook, this process focuses daily communication on work scope and product delivery, allowing related issues to be resolved at the lowest appropriate level. Work scope and product delivery issues that cannot be resolved at the lowest level (Tier 1) are escalated to the next level of management attention, with the potential to escalate to Tier 5 (executive leadership team).

Work Planning and Control Implementation

Objective:

The scope of work is described in sufficient detail to allow the work planning process to identify hazards associated with the work and to develop necessary schedules, priorities, and work instructions. (DOE Guide 226.1-2A, Appendix D, Objective WP&C2-1, Criteria #2 and 3)

The scope of work for each of the reviewed corrective maintenance and contractor support WOs was sufficiently described in the TMP-0010 form or the WO cover sheet. The scope of work description in the Level III WOs was appropriate for the work being performed.

PM jobs are accomplished through technical procedures or PM tasks. The tasks that EA reviewed included PMs for lightning protection systems and blast doors, and the fire protection system annual inspection for one building and five-year inspection for another building. Technical procedures are established and implemented for the hoist PM monthly, annual, and three-year functional test, and for the fire protection system annual inspection for another building. The work scope is adequately described in all these documents except WO 0029942005 *Blast Door PM*, which did not include a description of the work scope in the PM task.

Workers performing the annual inspection of the fire protection system for one building noted that three fans were not included in the PM. The system is designed such that the fans turn off when the fire system is activated. In discussions with EA, the work planner who prepared this work package stated that he did not include the fans in the test at the direction of Facility Engineering because the panel was scheduled to be replaced, and the fans would be tested then. Since the fans were part of the system, and were operable, they should have been included in the test. The testing of fans during the observed evolution would have provided timely information on the operability of the interlock controlling the fans.

Objective:

All hazards that could adversely impact workers, the public, the environment, and the facility and its equipment are documented and analyzed for severity/significance. (DOE Guide 226.1-2A, Appendix D, Objective WP&C2-2, Criteria #2, 4, 5, 7, and 8)

Work planners perform the initial identification of hazards for activity-level work after conducting a walkdown of the job site, and they document hazards on form PX-5825, *Preliminary Hazards Analysis Checklist*. EA observed a work planner performing a walkdown of a job to replace a boiler for the heating, ventilation, and air conditioning system. The planner met with the engineer at the job site to discuss the work, appropriately used the PX-5825 checklist, and identified the potential for arc flash and shock hazards and the need for electrical, water, and gas line lockout/tagout. He also identified a potential issue with lockout of the gas system. There was no handwheel attached to the valve stem, so it

would have to be closed with a wrench, and since there was no place to hang a lock, it would have to be tagged only, requiring additional levels of approval. The planner was diligent in identifying hazards associated with the work.

The maintenance WP&C process appropriately provides for involvement of subject matter experts (SMEs) as requested by the work planner. TABLE-0068, *Safety Checklist*, identifies which hazards require SME review and signoff of the work package. These include industrial and radiation hazards, as well as hazards associated with work in explosive, nuclear material, or nuclear explosives areas. TABLE-0072, *Work Order Review and Approval Criteria*, provides the planner with further criteria for selecting functional areas for review of the work package.

The corrective maintenance WO template TM-0010 requires identifying hazards and controls and listing them in a table. The WO for boiler replacement, WO-0029949506, appropriately identified hazards for eye damage, cuts and pinches to fingers, slips, lifting heavy material, electrocution, hot work, and pedestrian traffic. The task instructions were listed by craft and included effective warnings appropriate to the craft activities, as well as the right to stop work as needed. Industrial Hygiene (IH) confirmed the absence of asbestos. The work package contained the required additional documents, such as PX-4347, *Scope Specific Lockout Procedure*, which addressed hazardous energy controls for electrical, gas and water and PX-5253, *Electrical Hazard/Risk Analysis*, for shock and arc flash hazards. Overall, the WO identified the appropriate hazards for the job being performed.

The work packages appropriately identified the hazards for the corrective maintenance work. Each corrective maintenance WO included a table of hazards and controls, notes, and warnings for related craft activities, and special instructions for asbestos, electrical hazards, and lockout/tagouts as appropriate. PM WOs include a technical procedure or task. Although the technical procedure for one of the observed PMs (crane/hoist) did not address hazards or controls, the attached form PX-3170, *Work Performance Record*, addressed some hazards and controls in the pre-job briefing section. NPO identified a finding (ISS-NPO-30 OPS-1.9.2017-713662) related to inadequate hazard identification and controls for preventive maintenance activities, and CNS developed and is executing a corrective action plan to address this finding. EA reviewed an additional five Task PMs and one Technical Procedure PM; all appropriately included a listing of hazards and controls in the precautions and limitations section.

Objective:

Controls are identified and implemented that effectively protect against identified hazards and approved activity-level work control documents can be performed as written. (DOE Guide 226.1-2A, Appendix D, Objective WP&C2-3, Criteria #2, 3, 4, 5, 6, 7, and 8)

For the observed maintenance activities and reviewed work packages, the selection of controls was appropriate for the identified hazards. Manual MNL-352176, *Hazardous Energy Control (Lockout/ tagout) Program Manual*, describes the requirement for written lockout procedures and associated criteria for exemption (e.g., single lockout device achieves a controlled zero-energy state). EA observed the appropriate application of single source lockout for the hoist repair corrective maintenance and inclusion of scope-specific lockout procedures in other work packages. Other controls in maintenance WOs appropriately included fall protection plans, lift plans, excavation/ penetration permits, hot work permits, electrical hazard/risk analysis, asbestos WIs, and specialized training.

Objective:

Work is conducted diligently in accordance with approved work instructions and within established controls. (DOE Guide 226.1-2A, Appendix D, Objective WP&C2-4, Criteria #2, 3, and 5)

The Infrastructure Directorate has several processes for ensuring that work is scheduled and integrated. For each of the craft shops, a weekly schedule of daily planned work (daily shop schedules) is developed that includes the crew members, a description of the work, and expected duration. As discussed in the program section, CNS has replaced its integrated plan of the day process with individual work unit plan of the day meetings and an escalation process based on reporting tiers (Tier 1, Tier 2 and Tier 3). The Maintenance organization holds a plan of the day meeting that includes the status of swing shift work, any work requiring escalation at the Tier 1 meeting, and planned work. Each craft conducts a standup meeting when work is assigned to the crews. EA observed two plan of the day meetings, three standup meetings, and a Tier 2 meeting and found them to be effective in communicating daily work activities. EA also observed a daily planner/supervisor meeting and an Integration with Facilities and Production meeting, which were useful in coordinating work activities.

To minimize impact to operations, maintenance has implemented an outage process called Turnaround Work. For a two-week period, a facility is turned over to maintenance to perform planned corrective and preventive maintenance work. Additionally, preventative maintenance inside the Zone 12 Material Access Area is performed during the swing shift, after the production daily work shift. These practices help deconflict work and minimize the impact to plant operations.

The CNS WP&C process includes a method for documenting the formal authorization of line management to proceed with work in their facility. WOs include form PX-3169, *Facility Structures, Systems, and Components Work Authorization Permit*. The cognizant CNS facility representative or facility manager signs the document, effectively turning over the facility to maintenance to conduct the work, and also signs when the work is completed. Each of the reviewed WOs included a signed form.

Approved WOs were used to accomplish all observed maintenance work. Each WO contains form PX-3170, which is used to document the work from beginning to end. It includes a pre-job review and the pre-job briefing contents, as well as attendee signatures, applicable SMEs signatures, documentation of completion of work, any deficiencies found, parts/materials installed, post-maintenance test results, measurement and testing equipment used, feedback, and the results of the post-job review. This method is effective in documenting Pantex WP&C activities.

The supervisors conducted pre-job briefings following the maintenance standup meetings. Supervisors appropriately addressed the work scope, the hazards and controls, and the wearing of PPE. The importance of stop-work authority was reinforced. Also, one supervisor stated that he walks down the jobsite every morning before work begins. The workers exhibited a healthy questioning attitude about the work packages, reviewed the procedures, and identified concerns before the start of work. For example, workers noted that the fans had been left out of the scope of the annual PM of a fire protection system, as discussed previously, and on a corrective maintenance job, a worker questioned whether the new equipment met the requirements for safe operation of electrical equipment in hazardous areas.

The maintenance managers, specialists, planners, supervisors, and crafts demonstrated appropriate knowledge, skills, and abilities. The maintenance managers have a significant amount of relevant experience. The work planning specialists and planners demonstrated proficiency with the maintenance management systems.

EA reviewed the training curriculum data for four positions ((SMI Mechanical, SMI Electrician, Carpenter, and Area Mechanic) and found the list of training to be comprehensive, however, some of the workers have not completed all required training in a timely manner. In particular, some of the crafts personnel had overdue training in a number of important safety courses (e.g., respirator usage, aerial lifts, asbestos worker) and courses relevant to their position (e.g., blast door troubleshoot and maintenance, scaffolding, wet/dry chemical fire suppression systems, forklift operator). Although the supervisors

discussed training requirements as part of the morning standup meeting, the number of longstanding (two years or more) overdue courses indicates a lack of attention to meeting CNS training requirements. Per discussion with the training representative, unqualified personnel can perform work under the direct supervision of someone who is qualified. However, supervisors do not assign unqualified employees to perform these specific duties independently until required training is accomplished. HNDBK-0006 includes as a hazard control the utilization of qualified craft personnel as a mitigating control for task-level hazards addressed in documented training and qualification of the craft skill. Also, MNL-352214 states that management ensures that personnel are trained in the maintenance fundamentals of their jobs, such that high-quality maintenance is accomplished safely and efficiently. CNS is aware that some workers' training is overdue, and the lapse of training is being addressed. **(Deficiency)**

The training organization confirmed that several of the crafts personnel – electricians, special mechanic inspectors (electrical and mechanical), fire service technicians, instrument technicians, electronic technicians, and garage mechanics – do not have qualification cards. Some of these crafts personnel work on safety systems; for example, special mechanic inspectors perform maintenance on the fire protection systems. The qualification process does not have established thresholds for which craft work requires a qualification card. Also, the workers are not consistently meeting training requirements. **(OFI-CNS-WPC-01)**

Maintenance Conclusion

The Infrastructure Directorate has adequately developed and implemented a WP&C process with approved policies, procedures, and processes that for the most part effectively define the WP&C program and appropriately emphasize the safe performance of work. HNDBK-0006 contains useful information for planning a job. The work scope definition was sufficiently detailed and accurate for most of the observed work. Hazards and controls were appropriately identified and included in the work packages. Work is coordinated and scheduled, and two CNS practices, Turnaround Work (maintenance outage) and swing shift work, help deconflict work and minimize impact to production operations. Approved WOs are appropriately used to accomplish maintenance work, and each job is effectively documented. Supervisors are appropriately involved in the work, and the workers exhibited a questioning attitude about the work packages. Maintenance employees demonstrated appropriate knowledge, skills, and abilities; however, the qualification process does not have established thresholds for when craft work requires a qualification card, and CNS is not consistently meeting worker training requirements.

5.2 Craft Shops

CNS operates a number of craft shops within three CNS divisions. Within the CNS Pantex Infrastructure Division, site wide infrastructure and maintenance activities are supported by six mechanical maintenance shops, two electrical shops, two shops for electronics and instrumentation, a vehicle maintenance shop, and a radio shop. During this assessment, EA conducted two work observations in the sheet metal and carpenter shops (mechanical maintenance shop area) and two in the vehicle maintenance shop. The Explosives Technology Division operates two craft shops within the Inert Machining Department. EA conducted four work observations in these two buildings. The Production Tooling Department within the Manufacturing Division operates two craft shops – a machine shop and a plastics shop – as well as a production tooling warehouse. EA conducted four work observations in the two Production Tooling craft shops.

Work Planning and Control Programs and Processes

Objectives:

The Organization has developed and approved WP&C processes to enable safe performance of work. (DOE Guide 226.1-2A, Appendix D, Objective WP&C1-1, Criteria #3 and 6)

The Organization has established a management and organizational framework for (1) initiating, analyzing, planning, and approving activity-level work and (2) authorizing, releasing, and safely performing activity-level work. (DOE Guide 226.1-2A, Appendix D, Objective WP&C1-4, Criterion #5)

Although there is some commonality of equipment, hazards, and hazard controls in the craft shops among the three divisions assessed, each division has distinct WP&C practices that are tailored to the specific operations that they support. CNS does not have an institutional WP&C process that provides WP&C direction for the various Divisions, but the requirements of CNS MNL-352254, *Integrated Safety Management (ISM) Program Incorporating Worker Safety and Health (WS&H) Program Requirements* apply to each division. In general, the overall requirements of CNS MNL-352254 have been adequately flowed down into each division's work planning and control process. Work performed in the Maintenance Department craft shops follows the same work processes as routine maintenance work (e.g., preventive and corrective maintenance work packages) conducted by maintenance technicians outside the craft shops, as described in Section 5.1 of this report. For example, the dumpster repair work observed within the sheet metal shop was performed under a maintenance work package, and the repairs to a Lenco armored BearCat vehicle within the vehicle maintenance shop were conducted under both preventive and corrective maintenance work packages. Craft shop work performed in either of the Production Tooling machine shops or the plastics shop consists of work performed by experienced and qualified machinists in accordance with input from a WO, engineering drawings, or in a few cases by procedures. Elements of the Production Tooling Department (Manufacturing Division) work process are addressed in the Production Tooling MNL-352164, *Special Tooling Operations Manual*. Craft shop work performed in the two Inert Machining shops within the Explosive Technologies Division is performed principally in accordance with engineering drawings and general instructions conveyed verbally or via electronic memos, and by trained and experienced engineering technicians.

The Inert Machining Department relies on experienced supervisors for direction of WP&C processes in lieu of a well-defined work control process, and performs most work as skill of the worker. While Pantex Procedure P6-2003, *Explosives Technology Division Operations Requirements*, provides applicable safety requirements for work in Explosive Technology Division facilities outside the material access area, such as the Inert Machining shops, training and qualification requirements for workers are not defined as described in the following paragraphs.

Among the three CNS divisions assessed, much of the work performed in craft shops is performed by skilled workers, based on their knowledge and experience and, without formal work documentation that identifies applicable hazards and hazard controls (i.e., work packages, work directions, instructions, or procedures). These "skill of the worker" tasks, as defined in Appendix A of DOE-HDBK-1211-2014, *DOE Handbook on Activity-Level Work Planning and Control Implementation*, require "a formal work process that is accompanied by high levels of accountability to ensure adequate performance." Although observed work activities are performed in each of the divisional shops as skill of the worker, CNS Pantex does not have a formal, well-defined "skill of the worker" WP&C process for work activities that can be performed by trained, qualified, and experienced workers with minimal WP&C documentation (e.g., only an engineering drawing or sketch). However, in January 2018, CNS Pantex initiated a skill of the worker pilot program fashioned after the Y-12 skill of the worker program. As a result, there is wide variability and no documentation among the craft shops with respect to: (1) the type of activities that can be

performed as skill of the worker; (2) the level of hazard identification and controls to be documented; and (3) worker qualifications required to perform such activities. For example, dumpster refurbishment work observed in the Maintenance sheet metal shop involved hazards and controls associated with welding and sheet metal shearing. The welding hazards and controls were well documented in a work package for this activity, but there was no work package documentation for the required sheet metal cutting work, which involved work with hoists and the operation of a shear press and was referred to by the workers as skill of the worker, although no such work definition exists at the Pantex Plant. In another example, in the Inert Machining shops, machinists who had not completed a formal CNS-documented training and qualification process were performing skill of the worker machining work, without a work control document that defined the work activity hazards and controls.

Development of a Skill of the Worker WP&C process is a recently initiated work in progress at the Pantex Plant; a pilot program for Level III (Skill of the Worker) Work Control processes was approved on January 24, 2018. However, the current pilot program has not been fully documented, only a few work activities have been piloted under this program, and the current program applies only to work activities conducted within the Maintenance Department. Section 6.3 of CNS MNL-352254 requires that for each task being performed, work control processes are to ensure that the scope of work is defined; that hazards, threats, and risks associated with the task are identified and analyzed; and that controls and measures are identified and implemented before the work is performed. Although, CNS currently lacks a fully developed work control process for skill of the worker tasks, CNS management is expediting formalization of a Level III (Skill-of-the-Craft) work control process for the Maintenance Department. **(OFI-CNS-WPC-02)**

Work Planning and Control Implementation

Objective:

The scope of work is described in sufficient detail to allow the work planning process to identify hazards associated with the work and to develop necessary schedules, priorities, and work instructions. (DOE Guide 226.1-2A, Appendix D, Objective WP&C2-1, Criteria #2 and 3)

The scope of activity-level work within the craft shops in the three divisions assessed varies significantly in the amount of detail provided in work control documentation (WCD). Within the Maintenance Department shops, descriptions of the scope of work are typically the same as for maintenance work performed outside the craft shops, consisting of work packages, procedures, and/or WOs and directions, as discussed in Section 5.1. With minor exception, WCD for the Maintenance Department craft shops adequately defines the scope of work involved (e.g., work packages associated with vehicle maintenance). However, some WCD does not include sufficient details regarding the work scope, hazards, and controls for skill of the worker activities as previously discussed (e.g., dumpster refurbishment). For work scope associated with work activities performed in the Production Tooling craft shops, most work tasks are adequately defined in PX-3170-T tooling work performance records. An exception is work performed in the heat treat area, which is performed by reference to procedures (typically procedures provided by the equipment manufacturer). For shop work activities performed in the Inert Machining shops, the scope of work provided in WCD is dependent on whether the work task involves high explosives (which is governed by procedures) or industrial machining, in which case the work scope may be defined through emails or engineering drawings transmitted by the Explosive Operations Division Engineering Group. Overall, for the observed shop work in the three divisions, the activity-level work scope was defined through a variety of mechanisms, but the observed work activities and scope were understood by both supervisors and craft shop personnel.

Objective:

All hazards that could adversely impact workers, the public, the environment, and the facility and its equipment are documented and analyzed for severity/significance. (DOE Guide 226.1-2A, Appendix D, Objective WP&C2-2, Criteria #2, 4, 5, 7, and 8)

In each of the shops, workers are potentially exposed to a variety of chemical, biological, and physical hazards. To assess these potential worker exposure hazards, the CNS Pantex IH department has developed and implemented a hazard and exposure assessment process that is documented in Section 3 of MNL-352231, the Pantex *Industrial Hygiene Program Manual*. The Pantex hazard assessment process provides a mechanism for industrial hygienists to perform both qualitative and quantitative (i.e., sampling or monitoring) assessments that are consistent with the requirements of 10 CFR 851.21, *Hazard Identification and Assessment*. For each shop observed by EA, IH had previously completed a documented hazard assessment that identified and analyzed the most significant worker exposure hazards. For example, the dominant chemical exposure hazard(s) associated with chemical cleaning and plating operations conducted in the heat treat area are appropriately identified, documented, and analyzed in one or more hazard/exposure assessments.

Hazard identification, analysis, and documentation in shops within each of the three Pantex divisions relies heavily on the job safety hazard analysis (JSHA) process, as described in Section 3.3 of MNL-352253, *Pantex Safety Program Manual*. In the Inert Machining and Production Tooling shops, for work that is not governed by procedures (which is most of the work performed in these shops), the JSHA is typically the only WP&C mechanism used for the identification and documentation of work activity-level hazards and controls. Within the craft shops, JSHAs are developed for most shop machines, and copies of the completed JSHAs are available electronically or in JSHA binders located in the shops. According to MNL-352253, JSHAs are not required if the work activity is addressed in other WP&C documentation with a hazard analysis (e.g., WIs, technical procedures, or work packages with an attached Hazard Evaluation/Hazard Controls Checklist). With three notable exceptions described below, that EA determined that JSHAs had been developed for each shop work activity/machine, and that JSHAs adequately identify and document the most significant applicable hazards associated with machine operations.

With respect to JSHAs used in craft shops, EA identified the following three concerns with implementation of the Pantex JSHA process:

- JSHAs were not developed for some craft shop machinery/equipment, and no other WP&C mechanism or WCD provided a documented identification of hazards and controls. For example, JSHAs have not been developed for surface grinders or conventional lathes in the Inert Machining shops, and such equipment is operated without other WP&C documentation that identifies the applicable hazards and controls. JSHAs were also not developed for a panel saw and sander/grinder in the carpenter shop although this concern has subsequently been addressed by CNS. Section 3.3.1 of MNL-352253 requires the development of a JSHA if there is a potential to cause severe or disabling injuries, and if another WCD (e.g., WI, hazard evaluation, and activity hazard analysis) does not address known and potential hazards and mitigating controls. **(Deficiency)**

- For the Mazak machine in the Inert Machining Department, multiple versions of the JSHA (some of which were undated), as well as multiple worker signoff sheets, were in the machine's JSHA file. As a result, workers and their supervision could not identify the most current version of the JSHA or determine which, if any, workers had reviewed the current JSHA. Section 3.3.6 of

MNL-352253 requires that the supervisor "assure the employee has reviewed the applicable [JSHA] before assigning them to an operation/task requiring a JSHA." **(Deficiency)**

- In two examples, JSHAs did not adequately identify one or more applicable hazards and controls. For example, the JSHAs associated with shop equipment that was supplied with local exhaust ventilation systems did not address the specific system, its operation, or the hazard it was intended to abate. In addition, none of the JSHAs associated with shop equipment using metalworking fluids (MWFs), including the various computer numerical control (CNC) machines or the 3-Axis Mill in the Inert Machining Department (JSHA # 1307-4), identified the potential hazards and/or controls associated with MWFs, oil mists, or machine lubricants (MWF is the name given to a range of oils and other liquids that are used to cool and lubricate metalwork during machining). According to National Institute for Occupational Safety and Health (NIOSH) Publication No. 98-102, *Criteria for a Recommended Standard: Occupational Exposure to Metalworking Fluids*, occupational exposures to MWFs may cause a variety of health effects, including such respiratory conditions as hypersensitivity pneumonitis, chronic bronchitis, impaired lung function, and asthma. Section 3.3.2 of MNL-352253 requires that JSHAs "identify known and potential hazards for each step and address mitigating controls." **(Deficiency)** NIOSH recommends that exposures to MWF aerosols be limited to 0.4 milligrams per cubic meter of air (thoracic particulate mass) or 0.5 milligrams per cubic meter (mg/m^3) of air (total particulate mass), as a time-weighted average concentration up to 10 hours per day during a 40-hour work week, which is an order of magnitude below the Occupational Safety and Health Administration (OSHA) permissible exposure limit for oil mists. **(OFI-CNS-WPC-03)**

Objective:

Controls are identified and implemented that effectively protect against identified hazards and approved activity-level work control documents can be performed as written. (DOE Guide 226.1-2A, Appendix D, Objective WP&C2-3, Criteria #2, 3, 4, 5, 6, 7, and 8)

Engineering, administrative, and PPE hazard controls were evident for shop work within each of the divisional shops. Hazard controls were identified in applicable WCDs, such as work packages in Maintenance shops and operating or technical procedures and vendor manuals in the Production Tooling and Inert Machining shops. Overall, for the shops observed, the JSHA is the dominant WCD for identifying hazard controls for shop equipment, and most hazard controls were adequately described in the JSHAs reviewed.

EA observed a number of positive hazard controls in the craft shops. Machine guarding, for example, was in place for the shop equipment observed, was appropriate for the hazards of the shop equipment, and was effectively implemented. In addition, the Inert Machining shop provided a tag on each piece of shop equipment that itemized the required machine guards. The shop equipment operators who EA interviewed were experienced and knowledgeable of the hazards and controls associated with their equipment. For example, the operator of the jig grinder in the Production Tooling Department had over 20 years of experience as a machinist using similar equipment, was knowledgeable of the hazards and controls listed in the equipment's JSHA, and had completed a formal training and qualification process as a toolmaker.

EA observed two positive WP&C process innovations developed by craft shop workers on their own initiative that shop management subsequently adopted for use. The welding engineer in the Maintenance sheet metal shop developed and implemented a series of checklists for performing periodic inspections and maintenance of shop welding machines to ensure that common welding hazards were addressed and that the applicable controls were in place and functioning. In the vehicle maintenance shop, two workers

developed and implemented an electronic work package system to streamline the use and completion of WCDs and eliminate the storage of paper documents.

As indicated previously in this section, most of the work observed in the craft shops was performed as skill of the worker, with minimal WCDs, and typically only a WO or engineering sketch or drawing and usually (but not always) a JSHA for the equipment being operated. For work performed as skill of the worker, the primary hazard control is often a well-qualified, trained, and experienced worker. As indicated in Appendix A of DOE-HDBK-1211-2014, an effective skill of the worker program "describes the basic discipline-specific competencies" that are "obtained through approved methods, such as accepted training, qualification, certification, education and experience." Lacking, however, is a definition of the minimum set of worker qualifications in the Pantex divisional shops for working on similar equipment with similar hazards and controls. For example, lathes are operated in craft shops within the Maintenance, Inert Machining, and Production Tooling Departments. In the Production Tooling Department, a formal "Operating Lathes Qualification" card must be completed and approved by supervision before the worker operates a lathe. However, within the Maintenance Department, worker qualifications for lathe use are not addressed in the qualification card for a maintenance mechanic (i.e., carpentry shop). Within the Inert Machining shops, there are no qualification cards for engineering technicians who operate a manual lathe, and there are no manual lathe JSHAs; manual lathe operator qualification in these shops is based on prior lathe operating experience (which may not have been gained at Pantex) and approval of the supervisor. Section 7.14 of CNS MNL-352254 states that "safe operations depend on trained and qualified employees who are knowledgeable of operations, facilities and equipment, and who possess the requisite skills required for competent job/task performance." However, as discussed in Section 5.1 of this report under Work Planning and Control Implementation, Pantex has not established thresholds for which work activity-level tasks in the craft shops require a formal qualification card process. Among the divisional craft shops, guidance is lacking with respect to defining the "requisite skills required for competent/job performance" when operating equipment with similar hazards and controls, such as when operating a lathe. **(Deficiency)**

Although most hazard controls observed within the shops were adequately defined in WCDs, EA observed two controls that were not effectively implemented:

1. The slot hood local ventilation system for caustic soda and acid tanks associated with the Presto Blackening System in the heat treatment room within the Production Tooling Machine Shop was not appropriately installed to reduce worker exposures to acid gases. The Presto Blackening System consists of a series of eight open bath tanks. Tanks 1, 4, 6, and 8 contained hazardous chemical solutions of caustic soda, phosphoric acid, Presto Black (diluted phosphoric acid), and mineral spirits, respectively, whereas the remaining tanks were non-hazardous water wash tanks. A slot hood ventilation system, consisting of three vertical hoods, had been installed to protect workers from inhaling hazardous chemicals. Although one of the hoods had been appropriately installed behind the caustic soda tank, one of the remaining two hoods was mounted behind a water tank with no exposure hazards, while the other slot hood was not in the proximity of the hazardous chemical tank, providing no effective ventilation for any of the tanks containing hazardous materials. The two tanks containing hazardous phosphoric acid and the tank containing mineral spirits (another potential exposure hazard) had no local ventilation for worker protection. Furthermore, the local exhaust mounted perpendicular to the caustic soda tank may have exacerbated workers' exposure to caustic acid gases by drawing acid vapors across the workers' breathing zone. Each of the slot hood ventilation systems had been flow tested annually and certified by IH, but the improper placement of several slot hoods was not recognized. The slot hoods had not been evaluated "individually considering the type of contaminant, the potential air concentrations of the contaminant, potential for employee exposure, etc." as required by Section 5.5.4 of MNL-352231. **(Deficiency)**

2. Potentially-contaminated beryllium parts were received and stored in the Production Tooling machine shop without the appropriate beryllium contamination label. During a tour of the Production Tooling machine shop, EA observed that three sets of double-bagged tools had been received and were awaiting repairs. The only markings on the tools were "Do Not Use" tags indicating their repair status; there were no markings on the tools, the bags containing the tools, or the entry doors to the storage area alerting workers to the presence of potentially beryllium-contaminated parts. However, the WO (Tooling Work Performance Record) did identify the parts as "beryllium contaminated tools." Section 4.3 of MNL-352224, *Pantex Beryllium Program Manual*, requires beryllium-contaminated items to be labeled indicating "Danger, contaminated with beryllium; Do not remove dust by blowing or shaking; Cancer and lung disease hazard." Such labels were not attached to these parts. **(Deficiency)**

Objective:

Work is conducted diligently in accordance with approved work instructions and within established controls. (DOE Guide 226.1-2A, Appendix D, Objective WP&C2-4, Criteria #2, 3, and 5)

Overall, for the observed work activities in the shops, work was performed within the controls identified in WCDs and JSHAs. Although work was generally performed within established controls, EA observed a problem in the implementation of conduct of operations during the completion of the daily pre-operational checklist for one building within the Inert Machining Department. Formally documented pre-operational checks are conducted daily to verify that safety surveillances have been completed on blast doors, fire detection alarms, and other items on the facility status board; confirm that building communication systems (e.g., public address system, pagers) were operable; and verify that procedures to be used or referenced are current and reflect the same information as the electronic document index (issue number and number of pages). On the day that EA observed the completion of the daily pre-operational checklist, the electronic document index used to verify procedure status was not operational in one building, and the status of procedures was not verified as required by Section 3 of the procedure. Additionally, in multiple bays/rooms, three separate engineering technicians indicated by their signature/initials that the step had been completed, with no indication of any deviation from the procedure. Step 5 of the Pre-Operational General Instructions states that if an item fails a pre-operational check, the person completing the checklist is to leave the corresponding block blank, and at the discretion of the facility manager the space can be marked with an "R#" in the remarks section with an explanation of why the step could not be performed. This step was not followed. Furthermore, Step 6 states that if "any step is not completed in accordance with the instructions or is deemed to be not applicable," the facility manager is to be notified. However, in this case the facility manager was not notified until after the supervisor had identified and verified the infraction with the workers, and no notes had been added to the checklist to explain the discrepancies. Later that morning, Explosive Technology Division management was notified of the event and a fact-finding and critique of the event was scheduled (IEN#2018-099). In addition, a Problem Evaluation Request (PER) was initiated (PER-2018-0100). In summary, the following four specific conduct of operations deficiencies were identified in this incident **(Finding F-CNS-WPC-1)**:

- Workers did not follow the requirements of the Pre-Operational Procedure Checklist (F6-5050) as documented. Section 16.3.3, Procedures Adherence, of MNL-00040, *Pantex Conduct of Operations Manual*, states that "All Pantex personnel, including onsite contractors and subcontractors, are required to strictly comply with all approved procedures relevant to work assignments and tasks being performed."
- Workers indicated by signature/initials that a step in the procedure had been verified as complete when the step had not been performed.

- Workers implemented their interpretation of Section 3 of the Pre-Operational Procedure Checklist to "verify the procedures to be used", which was not supported by shop management. Section 1.9 of the *Building 11-50 Specific Safety Requirements* procedure states, "verify the current issue of operating procedures before initiating any operation." Some machines in the bays are operated through operating procedures, while others are operated via skill of the worker and reliance on the JSHA and/or vendor manuals. On the day of the event, only machines that did not require operating procedures were utilized. However, shop management had previously instructed the engineering technicians that all operating procedures in each bay were to be verified on a daily basis, regardless of which specific machines might be in use or not, as had been performed in one building on the day of the incident. A similar event in another work location on December 18, 2017, occurred when workers did not verify the current procedure revision using the appropriate document control system, as required by local procedure. In this particular example, workers opted to use a list of procedure revision numbers posted on a computer cabinet, which may have circumvented the approved process (reported in PER-2017-0721).
- The aforementioned incident in one building was not an isolated event, since the same work had been performed in three separate bays/rooms by three independent engineering technicians, and on previous days, suggesting that this issue is systemic.

Craft Shops Conclusion

Overall, for the observed shop work in the three divisions, the activity-level work scope is defined through a variety of mechanisms, and the observed work activities and work scopes were understood by both supervisors and the craft shop personnel. The identification and analysis of activity-level hazards in the craft shops varies among the three divisions; however, many of the hazards are similar since all of the craft shops use a number of similar industrial shop machines (e.g., lathes, band saws, and CNC machines). In each of the observed shop work activities, the IH exposure assessment process effectively identified and analyzed potential worker exposure hazards. EA also identified a number of positive hazard controls in the craft shops, as well as two WP&C process innovations developed by shop workers.

Hazard identification, analysis, and documentation in shops within each of the three Pantex divisions rely heavily on JSHAs that are developed for each shop machine. Although most JSHAs reviewed by EA adequately identify and document the most significant applicable hazards associated with machine operations, EA identified four specific concerns with respect to the JSHA process. Similarly, although most hazard controls observed within the shops were adequately defined in WCDs, EA observed four examples of hazard controls that were not effectively implemented. For the observed work activities in the shops, most of the work was performed safely and within the controls identified in WCDs and JSHAs. However, in the one notable exception, EA observed a breakdown in the conduct of operations program during completion of the daily pre-operational checklist for one building within the Inert Machining Department.

Although there is some commonality of equipment, hazards, and hazard controls in the craft shops among the three divisions assessed, each division has distinct WP&C practices that are tailored to the specific operations they support. The Pantex Plant does not have an institutional WP&C process that provides WP&C direction for the various Pantex divisions. Among the three CNS divisions assessed, much of the work performed in craft shops is performed by skilled workers based on their knowledge and experience, without formal work documentation that identifies applicable hazards and hazard controls (i.e., work packages, work directions, instructions, or procedures). Although each of the divisional shops performed the observed work activities as skill of the worker, CNS does not have a formal, well-defined "skill of the worker" WP&C process for work activities that can be performed by trained, qualified, and experienced workers with only minimal WP&C documentation (e.g., an engineering drawing or sketch).

5.3 Explosives Safety

Overall Explosives Safety Program Effectiveness

Criteria:

The site contractor explosives safety program has been effectively implemented in support of the full scope of facilities engaged in developing, manufacturing, handling, storing, transporting, processing, or testing explosives, pyrotechnics, and propellants, or assemblies containing these materials, and to the safe management of such operations. (10 CFR 851, Appendix A, 3. (b), Explosives Safety; CRAD-32-01, Criterion ES.1-1)

An adequate number of explosives safety program personnel are assigned and available to support facility activities. (10 CFR 851, Appendix A, 3. (b), Explosives Safety; CRAD-32-01, Criterion ES.1-3)

EA conducted work observations in an assembly facility, an explosives pressing building, and an explosives machining building. EA conducted walkdowns in other manufacturing and explosives operating facilities, in explosives and explosives waste storage areas, in explosives shipping facilities, and at the firing site. The observations indicated that CNS has effectively implemented a comprehensive ESP. The explosives safety requirements are well documented and effectively implemented at all levels, and the documents reviewed contained the appropriate information. Workers and management were aware of their explosives safety responsibilities, the number of personnel allowed in each facility when explosives are present, and the explosives weight limitations for their work areas.

CNS has also established an Explosives Sensitivity Committee and has identified an Explosives Storage Review Coordinator who works with a group of explosives safety and storage SMEs and other disciplines as specific storage issues arise. Both groups meet as necessary to ensure that the related requirements of DOE-STD-1212-2012 are met.

Oversight of the ESP is provided by the CNS Nuclear Explosives Surety Department, and personnel support specific explosives operating facilities or areas. They observe explosives operations and provide explosives safety-related guidance to workers and supervision. The ESP personnel interviewed and encountered were all knowledgeable. The number of personnel authorized is appropriate for the mission, but two positions are currently vacant.

Implementation of Explosives and Personnel Limits and Quantity-Distance Criteria

Criteria:

Explosives and personnel limits and control have been established and are controlled. (10 CFR 851, Appendix A, 3. (b), Explosives Safety; CRAD-32-01, Criterion ES.1-5)

The site contractor has developed and implemented quantity-distance and level of protection criteria that provide specific levels of personnel and property protection from the effects of potential fires and explosions within and outside of DOE/NNSA installations. (10 CFR 851, Appendix A, 3. (b), Explosives Safety; CRAD-32-01, Criterion ES.1-8)

The personnel and explosives limits for all explosives facilities on the site are effectively provided by the Pantex Plant Explosives Safety Site Plan (ESSP). This plan displays all facilities on the plant, as well as the internal plant boundaries and roadways. The separation distances required for all explosives and non-explosives facilities are shown, along with the actual distances separating them. The quantity-distance maps in the plan provide the appropriate explosives safety arcs required for each explosives facility and display the distances required for the specific locations. The plan also appropriately includes the

distances required for intentional detonations for each firing site location.

The distances and personnel limits shown in the ESSP meet or exceed the explosives safety quantity-distance requirements of DOE-STD-1212-2012, which uses and references the quantity-distance tables and requirements in the Department of Defense (DoD) *Ammunition and Explosives Safety Standards* (DoDM 6055.09, Volumes 1-8). A waiver is in place for specific instances where personnel limits are not met for short time periods due to special activities.

At each explosives facility assessed, the maximum quantity of explosives and number of personnel allowed inside are appropriately posted at the entry. In addition, the Integrated Production Planning and Execution System (IPRO) provides a real-time listing of the net explosive weight in each explosives operating facility. This system is designed to monitor the quantities of explosives currently located in each facility and to evaluate proposed movements to ensure that explosives weight limits in these locations are not violated. The information from IPRO is available in the facilities to assist in their explosives and personnel loading safety compliance. The IPRO is exceptionally effective in preventing violation of facility explosives limits and in ensuring that all concerned are aware of the explosives quantities present in, and the limits of, their facilities. EA considers use of the IPRO a **Best Practice**. Discussions with management and technicians indicated a general acceptance and approval of IPRO.

Explosives Safety Exemptions and Waivers

Criterion:

Exemptions and waivers to DOE-STD-1212-2012 must be approved at the appropriate DOE/NNSA and contractor management level, as applicable. (10 CFR 851, Appendix A, 3. (b), Explosives Safety; CRAD-32- 01, Criterion ES.1-10)

The Pantex Plant has no exemptions currently on record. The Pantex Plant version of DOE-STD-1212-2012 (a verbatim, line-by-line copy of the DOE standard) differs only in the attachment of copies of the current waivers to the Pantex copy of the standard and the notation as to the requirements waived. Pantex Plant currently has six waivers of the explosives safety criteria, and each is properly written and approved.

Explosives Material Operations Compliance with Explosives Safety Requirements

Criteria:

The site contractor has implemented general operational safety guidelines to protect workers from exposures to potentially toxic materials, ensure clean workplaces, and to ensure that the hazards related to explosives operations are minimized. (10 CFR 851, Appendix A, 3. (b), Explosives Safety; CRAD-32-01, Criterion ES.1-11)

Remote explosives operations shall be performed in facilities where the construction of the operating bay or the control room affords sufficient protection to personnel to prevent serious injuries. (10 CFR 851, Appendix A, 3. (b), Explosives Safety; CRAD-32-01, Criterion ES.1-12)

The site contractor has implemented applicable requirements for explosives storage. (10 CFR 851, Appendix A, 3. (b) Explosive Safety; CRAD-32-01, Criterion ES.1-14)
In all of the operations observed and assessed, workers were appropriately using PPE prescribed as administrative controls (e.g., safety eyewear, safety shoes, gloves, coveralls) in CNS operating documents for workplace hazards. Applicable procedures noted the need for additional PPE when appropriate for

changes in operational conditions. When the procedures were read and verbalized as the steps were performed, workers noted the requirement for changes in PPE and took the necessary steps to comply.

Housekeeping in facilities, bays, connecting ramps, and outside areas was adequate, and in the explosives machining and pressing facilities, is effective and compliant. Means of egress from facilities is not impeded by improper equipment or material storage.

CNS has implemented an effective electrical safety program for explosives operating facilities. WI 02.01.07.01.06, *Implementing Electrical Requirements for Explosives Operations, Perform Facility Electrical Evaluations,* identifies the requirements for facility electrical systems (e.g., wiring, fixtures, electrical process support equipment, lightning arrestors, and surge suppressors) as identified in the Pantex Plant version of DOE-STD-1212-2012. EA did not identify any violations of this portion of the standard in operating facilities during the assessment. However, one new facility that was in startup mode did have electrical deficiencies that were identified by CNS and being corrected.

All facility door interlocks were operational in the facilities visited. The interlocks were documented as checked for correct operation as part of the facility startup process. The technicians conducting remote processes were observed continuously viewing the operations via remote cameras; allowed exceptions to this requirement are noted in an approved waiver.

Explosives storage in the facilities assessed was appropriate. Explosives were properly stored, overall effective and explosives weight compliant. Explosives were properly stored, and personnel limits were not violated. Containers were properly labeled and safely stacked. Where operationally possible, explosives were separated to limit the potential for propagation in the event of a detonation. However, the small explosives pellet pressing operation in location allows temporary storage of the pressed pellets in small plastic bags that are placed in a metal container in the pressing location. The placement of these pellets could result in a sympathetic detonation of some or all of the pellets in the container should an explosives incident occur in the container. (See **OFI-CNS-ES-01**.)

In the explosives storage magazines assessed by EA, stored materials were properly arranged, and all required markings were present on the containers. While reviewing the inventories, EA noted that workers were maintaining the posted limits on personnel and explosives as work was performed. The personnel and explosives limits all matched the limits noted in the ESSP. All required safety items were present, and the earth cover on the magazines was in good condition.

EA noted that a location used for staging explosives prior to movement has some significant deterioration in the concrete floor, including broken portions of the floor and one hole more than six inches in diameter caused by a piece of the floor surface breaking apart. The broken piece was present, and the hole and the loose piece presented a tripping/slipping hazard in the bay. In addition, the pallet jacks used to move containerized explosives into, inside, and out of the bay could catch a wheel in the hole, endangering the load integrity of the explosives being moved.

EA reviewed the processes for removing waste explosives and explosive-contaminated wastes. The processes were conducted in accordance with DOE-STD-1212-2012 and WI 02.01.07.01.07, *Implementing Requirements for the Decontamination, Collection and Treatment of Explosives Waste*. Storage of these wastes in magazines was in compliance with WI 02.01.07.01.09, *Implementing the Requirements for the Handling, Transportation and Storage of Explosives*, and DOE-STD 1212-2012. In addition, the spill kit required by the waste storage permit was present in the magazines visited.

EA interviewed the range safety officers for the range where 40-millimeter grenade firing weapons are employed. Currently, Pantex only allows the use of training/practice cartridges that contain inert

projectiles on this range to mitigate the need to address unexploded ordnance on site. Additionally, CNS has completed actions to remove any previously fired projectiles containing energetic materials from the range, significantly reducing the potential for unexploded ordnance to be present.

Explosives Safety Training and Qualifications

Criterion:

The site contractor has established a training and qualification program with established qualification requirements to ensure that personnel have been properly trained before they are assigned to explosives operations. (10 CFR 851, Appendix A, 3. (b), Explosives Safety; CRAD-32-01, Criterion ES.1-7)

The CNS training and qualification program for explosives operations is thorough. All new employees are given basic explosives safety training. CNS uses internally-developed Process Document 02.03.02.03, *Process for CNS Pantex Training and Qualification Program*, as the basis for determining the additional explosives-related training specific to their assigned position. This document provides effective line management, training management, and training organization processes for analyzing, designing, developing, implementing, and evaluating training. It also provides guidance and references to various related WIs. Explosives safety personnel and line management review the training requirements for all individuals who work in explosives-related positions, and each position's required explosives training is reviewed annually. All CNS employees training and qualifications are tracked on the Pantex Plant Learning Management System.

Implementation of Emergency Controls

Criterion:

For emergency control purposes, firefighting hazard identification symbols (as specified in DoD 6055.09-M or National Fire Protection Association 704) shall be displayed consistently on buildings and work areas throughout an entire facility to warn of potential hazards from explosives and to provide information for emergency situations. (10 CFR 851, Appendix A, 3. (b), Explosive Safety; CRAD-32-01, Criterion ES.1-9)

To warn of potential explosives-related hazards, the Pantex Plant uses the DoD firefighting hazard identification symbols on all facilities where explosives are or may be located. While these symbols were present as required, some were significantly faded and could be difficult for emergency responders to read.

Contractor Explosives Safety Assessment Program

Criterion:

The site contractor has established an assessment program to confirm the adequacy of the explosives safety program in support of facility activities. (10 CFR 851, Appendix A, 3. (b), Explosive Safety; CRAD- 32-01, Criterion ES.1-2)

Overall, CNS has established and implemented an effective assessment program for the ESP in accordance with the CAS. As required by the Pantex CAS, CNS evaluated the hazards associated with explosives activities, and a risk ranking value was calculated and assigned to the safety management program (SMP) controlling the explosives hazards (i.e., the ESP). The risk ranking allows CNS to relate the ESP to all other SMPs across the site and use it to prioritize assessment activities for the fiscal year.

The ESP ranked high among the other SMPs across the Pantex Plant, and CNS routinely conducts assessments of ESP implementation. The following summaries illustrate the comprehensiveness of these assessments:

- Report A-15- 03, *Explosives Operations Independent Assessment January 27, 2015 - March 13, 2015.* This assessment of Insensitive High Explosives (IHE) machining operations found that this machining produces quality parts safely and in compliance with explosives safety, conduct of operations, and machine guarding requirements. However, the CNS independent assessment team identified three findings, two weaknesses, and two observations. The findings and weaknesses are annotated in the PER database (PER-2015-0124, -0125, -0126, -0127).

- NES-15-01, *CNS Explosives Packaging Operations Management Self-Assessment November 2014 - January 2015.* The self-assessment team walked down the facilities, reviewed procedures and records, observed operations, and interviewed facility personnel. Based on an evaluation of the developed criteria and explosives packaging operations in those buildings, the self-assessment team determined that the operations complied with the evaluated packaging requirements and related requirements of DOE-STD-1212-2012. The self-assessment team identified no findings or weaknesses, but identified two observations related to requirements flowdown and one observation related to an advisory requirement for procedure content. The self-assessment team concluded that the explosives packaging operations carried out in the packaging bays of these buildings maintain acceptable compliance with DOE-STD-1212-2012.

Explosives Safety Conclusion

CNS has implemented a comprehensive ESP. In most cases, CNS has established and effectively implemented controls for reducing the risk associated with explosives operations. The flowdown of explosives safety requirements is well documented and implemented. In particular, development and implementation of the IPRO system, which provides real-time weights of explosives in various operating locations to prevent exceeding explosives weight limits, is a Best Practice.

Furthermore, the explosives and personnel limits and controls have been established and rigorously implemented. Explosives systems engineers, scientists, facility management, and explosives operating personnel are well trained through a comprehensive training and qualification program, and workers are conscientious and knowledgeable of explosives operations and processes. Overall, the level of worker explosives safety and conduct of operations in these facilities were acceptable.

Although overall ESP implementation is adequate, EA identified a few areas of concern. The storage of bagged explosive pellets in a container that allows potential close contact of the pellets presents the possibility of a sympathetic detonation should one of the pellets in the container detonate for some reason. Additionally, explosives operations are being conducted in a location with a damaged floor in. Also, the firefighting hazard identification symbols on some explosives facilities were significantly faded and could be difficult for emergency responders to read.

5.4 Feedback and Improvement

Criterion:

The contractor assurance system includes provisions for management and independent assessment of all elements of the WP&C processes, and of specific activity implementation of the process dependent on complexity and hazards of the activity by line and functional area. (48 CFR 970.5223-1(c) (5); 10 CFR

830.122 (a), (c) (4), (I), and (j) (1); DOE Order 226.1, Att. 1 and 2.b (2) and (5); DOE Order 422.1, Att. 2, 2.a. (3) b and c; and DOE Order 433.1B, Att. 2, 2.b and 2.p)
The contractor has developed processes to identify, categorize, prioritize, track, trend, correct, and close deficiencies associated with the WP&C program. These processes include the requirement to perform corrective action effectiveness reviews. (10 CFR 830.122(c); DOE Order 226.1, Att. 1, 2.b. (3); DOE Order 422.1, Att. 2, 2.a. (3) a and d; and DOE Order 433.1B, Att. 2, 2.b, 2.o, and 2.p)

The CNS CAS is implemented by procedure E-SD-2006, *CNS Contractor Assurance System Program Description*. This document describes the performance of assessments, event reporting, issues management, performance metrics, and performance trending among other CAS-related topics. EA reviewed the fiscal year (FY) 2018 Assessment Planning Process Presentation and the FY 2018 Assessment Planning Tool (an Excel workbook). The process includes an evaluation of risk probability and contractually required assessments. The FY 2018 schedule contains assessment of various ISM elements, such as work scope, hazard identification, hazard control, and performing work within defined controls.

EA reviewed a sample of assessments (self-assessments, management assessments, and independent assessments) and PERs generated by those assessments. For the most part, assessments were comprehensive, and the resulting corrective actions were adequate for the identified issues. EA reviewed *Independent Assessment of the Stop/Pause Work Process (A-14-13), 9-30-2014* and *Planning, Scheduling, and Coordination of Maintenance Activities* effectiveness assessments on the Stop/Pause Work process and the Planning, Scheduling, and Coordination of Maintenance Activities (PX-INFR-17-08) and noted that those assessments identified issues that drive the improvement of WP&C. EA also reviewed a sample of extent-of-condition reviews (outlined in CNS Policy-0024) and effectiveness reviews and found them to be adequate.

EA reviewed a management self-assessment for the local ventilation system at the carpenter's shop, which identified less-than-adequate airflow for all of the equipment reviewed; however, it did not identify the significance of the less-than-adequate airflow and did not include any formal actions. These results are inconsistent with procedure E-Proc-3004, *Enterprise Assessments Process*, which states that issues are to be evaluated for corrective action.

EA attended an Issues Management Review Board meeting. The Issues Management Review Board is defined in E-PROC-0006, *CNS Issues Management Process*. The board appropriately consisted of representatives from several disciplines: engineering, authorization basis, contractor assurance, and quality assurance. All board members appropriately participated in determining the significance level of issues identified in assessments, surveillances, or occurrence reports.

Criteria:

WP&C processes are routinely evaluated by the organization's contractor assurance system (CAS) and feedback and improvement processes, and lessons learned are adequately captured and incorporated into the planning and performance of ongoing and future work activities. (DOE Guide 226.1-2A, Appendix D, Objective WP&C2-5, Criterion #1-4, feedback and lessons learned)

WI 02.06.04.02.04, *Execute Maintenance Work and Provide Feedback*, requires workers to document applicable feedback on Form PX-3170. The maintenance programs administrator uses the feedback and improvement database to generate a monthly Feedback and Improvement Comments Review/Response Report, which is used to track response to the feedback. EA found that this report adequately captures the appropriate information. Supervisors are responsible for communicating resolution to the workers. Workers also have opportunities to provide feedback during pre-job and post-job briefings. EA reviewed

eight PX-3170 forms that documented feedback on the work performance. Additionally, the Maintenance organization has developed an anonymous feedback survey on the Level III work process that is being piloted in their organization.

HNDBK-0006, *Infrastructure Work Control Planning Handbook*, requires work planners to include lessons learned with each work package. All reviewed WOs contained at least a reference to a relevant lesson learned; however, anyone wishing to review the lesson learned would have to retrieve it from the lessons-learned database. One planner facilitated the use of the lessons-learned process by including in his work packages a printout of the relevant lesson learned and strategically placing it before the PX-3170 form that all the workers are required to sign. This practice increases the likelihood that workers will review, use, and benefit from the lessons learned.

Criteria:

The contractor has established WP&C programmatic performance objectives and expectations (i.e., measures or metrics) in order to evaluate the program's effectiveness and promote continued improvement. (48 CFR 970.5223-1(e); DOE Order 226.1, Att. 1, 2.b. (6); DOE Order 422.1, Att. 2, 2.a. (3) e, f, and g; and DOE Order 433.1B, Att. 2, 2.o)

The CNS metrics program is implemented by E-SD-006, *CNS Performance Metrics Program*, and provides for the establishment and maintenance of metrics to correct negative performance trends. Metrics are developed from web-based training workshops (Workshops 1&2) that provide information on the usage of the SMART (specific, measurable, attainable, realistic, timely) criteria for metric development. In reviewing the ISM performance objectives and measures for FY 2015 and FY 2016, EA observed challenging metrics, such as achieving injury/illness rates below industry and the NNSA averages, explosive safety observation rate of 10 observations per month, 16 industrial hazard assessments per quarter, 300 ISM-related safety inspections per month, and a JHSA review rate of 90%. These measures and objectives were met for FY 2016. CNS has developed training materials to facilitate the development of useful metrics, and the associated training has contributed to the efficient use of metrics at the Pantex Plant.

EA reviewed the CNS organizational health metrics, which include metrics on authorization basis, business health metrics, the CAS, critical skills, and operational health. The CAS metrics goals were not always met, so they are appropriately challenging. Most of the CAS metrics were trending positively. However, the conduct-of-operations metric for January 2018 was given a green rating trending downward, even though the data showed that errors were exceeding the average severity and thus should have resulted in a lower rating.

The Maintenance organization uses metrics to track the backlog of overdue maintenance WOs. Although the backlog has decreased over the past year, there still remains a significant number (over 14,000) of both corrective and preventive maintenance overdue WOs.

The following examples of overdue maintenance involve deteriorating infrastructure that could lead to injury:

- The steps leading into the pit (non-skid strip) of one building are deteriorating, resulting in a trip hazard; a WO was previously submitted and has remained active in the system for over a year.
- The covered walkway between one building and the exterior bathroom: structural issues used to be marked with cones, which were removed; a WO was previously submitted and has remained active in the system for over a year.

- At the staging area in one building: floor is pitted, and concrete is loose; WO in the system for over a year.

Additionally, the PM work instruction, WI 02.06.04.02.07, requires the PM specialist to obtain unreviewed safety question determination (USQD) approval when changing the PM schedule status. Per discussion with a PM specialist, over 100 revised PM work packages are overdue as a result of a backlog in the (USQD) review process. This was confirmed by the USQD manager, who indicated that actions were being taken to reduce the USQD backlog including the training of additional staff and focused effort on completing USQDs.

Feedback and Improvement Conclusion

CNS Pantex has effectively developed and implemented procedures, processes, and metrics that contribute to the improvement of WP&C processes. These processes include the scheduling and performance of assessments that identify issues, the categorization of identified issues, and the resolution of those issues. Feedback is solicited from workers and lessons learned are incorporated into work packages. While metrics are effective in tracking the maintenance backlog, and the backlog is decreasing, overdue maintenance items that are the responsibility of several organizations are not being completed in a timely manner.

5.5 Previous Finding

The finding from the EA review of the Pantex ESP (report dated November 2015) concerning compensatory measures for inoperable blast door interlocks has been effectively addressed. Finding-CNS-01 stated that "Contrary to the requirements of DOE-STD-1212-2012, *Explosives Safety*, personnel are stationed directly outside a bay in the ramp area as a compensatory measure to control entry to nuclear explosives operating bays when the blast door interlocks are inoperable." Stationing personnel outside a bay in the ramp area violated the non-occupied area requirements and could have exposed those personnel to unacceptable high explosive hazards because they lack the required explosive safety Class II levels of protection.

The relevant CNS procedure ([U] *Safety Requirements for Nuclear and Explosive-Only Facilities*, F7-5001, Issue BJ, April 19, 2016) now lists the affected buildings and provides a detailed procedure for the actions to be taken and the procedures to be followed in the event of an interlock failure in the noted facilities. This procedure is in effect, and it effectively addresses the previous finding.

6.0 FINDINGS

Findings are deficiencies that warrant a high level of attention from management. If left uncorrected, findings could adversely affect the DOE mission, the environment, the safety or health of workers and the public, or national security. DOE line management and/or contractor organizations must develop and implement corrective action plans for EA appraisal findings. Cognizant DOE managers must use site- and program-specific issues management processes and systems developed in accordance with DOE Order 227.1A to manage these corrective action plans and track them to completion. In addition to the findings, deficiencies that did not meet the criteria for a finding are listed in Appendix C, with the expectation from DOE Order 227.1A for site managers to apply their local issues management processes for resolution.
The identified finding pertains to CNS.

F-CNS-WPC-1: During the completion of the daily pre-operational checklist for one building within the Inert Machining Department, workers did not adhere to the procedure compliance requirements of the *Pantex Conduct of Operations Manual* (MNL-00040), the Explosive Technology Division *Operating Procedure* (P6-2003) or Section 1.9 of the *Building 11-50 Specific Safety Requirements* procedure. These issues were systemic rather than isolated events, since they were evident on different days, at different locations, and involving different personnel. Specifically:

- Workers did not follow the requirements of the Pre-Operational Procedure Checklist (F6-5050) as written.

- Workers indicated by signature/initials that a step in the procedure had been verified as complete when the step had not been performed.

- Workers implemented an interpretation of Section 3 of the Pre-Operational Procedure Checklist to "verify the procedures to be used" that was not supported by shop management.

7.0 OPPORTUNITIES FOR IMPROVEMENT

EA identified some OFIs to assist cognizant managers in improving programs and operations. While OFIs may identify potential solutions to findings and deficiencies identified in appraisal reports, they may also address other conditions observed during the appraisal process. EA offers these OFIs only as recommendations for line management consideration; they do not require formal resolution by management through a corrective action process and are not intended to be prescriptive or mandatory. Rather, they are suggestions that may assist site management in implementing best practices or provide potential solutions to issues identified during the assessment.

All identified OFIs pertain to CNS.

OFI-CNS-WPC-01: Consider developing written guidance to establish thresholds for which craft work requires a formal qualification card process. A qualification card demonstrates additional assurance that the worker understands the training through required reading, demonstration of proficiency, oral or written tests, and confirmation signature by a supervisor or section head.

OFI-CNS-WPC-02: Consider augmenting the current approach to the skill of the worker program under development for the Pantex Plant Maintenance Department to include the approaches that Lawrence Livermore Nuclear Laboratory is developing for its *Competent Worker Program*, including the use of pre-authorized tasks, competent workers, and enhanced job-hazards-analysis-based work control documents. The Lawrence Livermore National Laboratory procedures on these topics describe the program, and skill of the worker guidance is also provided in DOE-HDBK-1211-2014, *DOE Handbook on Activity Level Work Planning and Control Implementation*, Appendix A.

OFI-CNS-WPC-03: Consider incorporating the NIOSH guidance on MWFs into the IH exposure assessment and sampling program for shop workers who use equipment lubricated by MWFs (e.g., mills, lathes, CNC machines). NIOSH Publication No. 98-102. *Criteria for a Recommended Standard: Occupational Exposure to Metalworking Fluids*, provides guidance for working with MWFs.

OFI-CNS-ES-01: Consider designing and placing non-propagating trays in the pressed pellet container used to eliminate the potential for propagation if one of the pellets detonates.

Appendix A
Supplemental Information

Dates of Assessment

Onsite Assessment: February 12-15 and February 26 – March 1, 2018

Office of Enterprise Assessments (EA) Management

William A. Eckroade, Acting Director, Office of Enterprise Assessments
Thomas R. Staker, Director, Office of Environment, Safety and Health Assessments
William E. Miller, Deputy Director, Office of Environment, Safety and Health Assessments
C.E. (Gene) Carpenter, Jr., Director, Office of Nuclear Safety and Environmental Assessments
Kevin G. Kilp, Director, Office of Worker Safety and Health Assessments
Gerald M. McAteer, Director, Office of Emergency Management Assessments

Quality Review Board

Steven C. Simonson
Kevin L. Dressman
Thomas R. Staker
William E. Miller
Michael A. Kilpatrick
Kevin L. Nowak

EA Site Lead for Pantex

Jimmy S. Dyke

EA Assessors

James B. Coaxum, Jr. – Lead
Thomas F. Hall, Jr.
Charles C. Kreager
James R. Lockridge
Terry B. Olberding

Appendix B
Key Documents Reviewed, Interviews, and Observations

Documents Reviewed

14460 Surveillance Procedure Adequacy Survey (P6-1746)
14607 ISM Management Observation (planning and scheduling of the safety aspects of environmental well sampling)
14997 ISM Management Observation (Work/Process)
15047 ISM Management Observation Maintenance
15149 ISM Management Observation (Work/Process)
15188 Management Observation Procedure Adequacy Survey
15541 surveillance Procedure Adequacy Survey (PX-4008)
15614 ISM Management Observation Local Exhaust Ventilation Survey
15890 ISM Management Observation Noise Monitoring
15949 Surveillance Procedure Adequacy Survey
Building 11-20 Specific Safety Requirements, F6-5020
Building 11-50 Specific Safety Requirements, F6-5050
CNS Escalation Guidebook, R0
CNS Policy-0024
Curriculum Data AMMO (Area Mechanic)
Curriculum Data SMEO (SMI Electrician)
Curriculum Data SMFO (SMI Mechanical)
Curriculum Item Status (training records)
DESKAID-0967, *Pantex Skill of the Worker Description*, R0
DIR-0002, Policy Directive, *Pantex Infrastructure and Enterprise Reliability and Maintainability Responsibilities and Authorities*
E-PROC-0006, *CNS Issues Management Process*
E-PROC-3004, *Enterprise Assessments Process*
ES-17-02, *Explosives Safety Management Assessment*, September 28, 2017
E-SD-006, *CNS Performance Metrics Program*
E-SD-2006, *CNS Contractor Assurance System Program Description*
ESH-ECD-17-11, Revision #1 Asbestos Notification Regulatory Requirements
ESH-SIH-17-06, *IH Program Local Exhaust Ventilation Exhaust*, 07/27/17ES-17-01 *Explosives Safety Management Assessment*, March 30, 2017
ESH-WOD-16-02 Waste Operations – Evaluation of Metrics
Explosives Technology Division Operating Procedure, P6-2003
F7-5001, *Safety Requirements for Nuclear and Explosive-Only Facilities*, Issue BJ, 04/19/2016
Feedback and Improvement Comments Review/Response Report, 11/17
FPC-Building 11-50 Pre-Operational Checklists
FY 2018 Assessment Planning Process Presentation
FY 2018 Assessment Planning Tool
FY-16 Independent Assessment Schedule
FY-17 Independent Assessment Schedule
FY-18 Independent Assessment Schedule
FY-18 Management Assessment-Organizational Assessment Schedule
Guidance for Effective Pre-Job Briefings; DESKAID-0431
HNDBK-0006, *Infrastructure Work Control Planning Handbook*
IA-16-004 Rev. 0 (Formerly A-15-09) Independent Assessment OSHA Reporting Process
IA-16-005, Revision 0 Implementation of Quality Requirements for Procedures/Instructions, Document Control, and Records (Formerly Nuclear Facility QA Program)

IA-17-013-R, Revision 0 10 CFR 835- Entry Control and Posting Labeling Program
IA-17-025-R, Rev.0 Nuclear Facility QA Program
I-ER-17-002, Rev 1 and PX-INFR-17-05, Rev 1 Management Assessment Post Maintenance Testing (PMT)
Independent Assessment of the Stop/Pause Work Process (A-14-13), 9-30-2014
Independent Surveillance Number: IS-17-014, Revision 0 Extent of Condition (EOC) Reviews
Industrial Hygiene Qualitative/Quantitative Exposure Assessments
CNS MNL-352254 *Integrated Safety Management (ISM) Program Incorporating Worker Safety and Health (WS&H) Program Requirements* IS-16-066 Independent Surveillance Preventative Maintenance Procedures
IS-17-007, Revision 0 Independent Surveillance Fire Protection Maintenance
IS-17-013, Revision 0, Independent Surveillance, Pantex Confined Space Entry Program
IS-18-006, Revision 0 Independent Surveillance ISO/IEC 17025 Quality Assurance Program Requirements
Job Safety Hazard Analyses (Maintenance, Inert Machining, Production Tooling)
MA-CA-17-002, Revision 0 Management Assessment Quality of Corrective Actions
MA-CA-17-003 (ASM-2017-0002 000 00), Revision #1 Management Assessment Contractor Assurance System (CAS) Effectiveness Review
MA-DRM/TP-FY17-Q03-01, Revision 0, Technical Procedures Independent Review, Validation, and Training Review and Approval Documentation
Maintenance Work Instructions
MNL 240176 DOE-STD-1212-2012, *Explosives Safety, Pantex/Lawrence Livermore National Laboratories Version,* Issue 12-12, June 2012
MNL-352164, *Special Tooling Operations Manual*
MNL-352176, *Hazardous Energy Control* (*Lockout/Tagout) Program Manual*
MNL-352214, *Conduct of Maintenance and Utility Operations at Pantex*
MNL-352231, Industrial Hygiene Manual
NES-15-01, *Explosives Safety Management Assessment,* June 30, 2015
OP P6-2022 (U) *2-Ton General Automation Pneumatic Press Operation* Issue J
OP P7-0120 (U) *Isostatic Universal Hemisphere Main Charge Pressing* Issue T
OP P7-0707-1 (U) *Syntron Vibrator Procedures* Issue P
OS-EAAR-16-003, Revision 0 Organizational Surveillance FY 2016 Quarter 3 Management Assessment Report Performance
Pantex Beryllium Program Manual, MNL-352224
Pantex Conduct of Operations Manual, MNL-00040
Pantex Escalation Guidebook
Pantex Problem Evaluation Requests
Pantex Safety Program Manual, MNL-352253
PD 02.01.07.01, *Process for the Pantex Explosives Safety Program,* Issue 5
PD 02.01.07.03, *Process for Explosives Storage Safety,* Issue 3
PD 02.03.02.03, *Process for CNS Pantex Training and Qualification Program,* Issue 4
PER-2017-0715
PER-2017-0716
PER-2017-0717
PER-2017-0718
PER-2017-0719
PER-2017-0720
PER-2017-0721
PER-2017-0722
PROJ-16-01 Lockout Tagout. Rev 5 Projects Management Role in LOTO Process
PX-3169, *Facility Structures, Systems, and Components Work Authorization Permit*

PX-3170, *Work Performance Record*
PX-4347, *Scope Specific Lockout Procedure*
PX-5253, *Electrical Hazard/Risk Analysis*
PX-5825, *Preliminary Hazard Analysis Checklist for Maintenance Activities*
Px-Infr-16-02, Rev.1 Job/Activity Hazards Analysis
PX-INFR-17-07 Lockout/Tagout-Hazardous Energy Control
PX-INFR-17-08 Planning, Scheduling, and Coordination of Maintenance Activities
PX-Infra-16-04 Management Assessment Hazardous Energy Control- Lockout/Tagout
PxOps-OS-FY18-1 Organizational Surveillance Waste Management – Removal of Sanitary Waste from Zone 12 MAA
Qualification Cards
SB-ES-941277, *CNS Pantex Explosives Safety Site Plan Final*, Revision 8, January 9, 2016
TABLE-0068, *Safety Checklist*
TABLE-0072, *Work Order Review and Approval Criteria*
TMP-0010, *Work Order Instructions*
TRNG-16-04 Lockout Tagout Training Program-Maintenance
WI 02.01.07.01.01, *Defining the Elements of the Pantex Explosives Safety Program*, Issue 2
WI 02.01.07.01.02, *Administration of the Pantex Explosives Safety Program*, Issue 2
WI 02.01.07.01.03, *Verify Compliance with the Pantex Explosives Safety Program*, Issue 4
WI 02.01.07.01.05, *Implementing General Requirements for Explosives Operations*, Issue 1
WI 02.01.07.01.06, *Implementing Electrical Requirements for Explosives Operations*, Issue 2
WI 02.01.07.01.07, *Implementing Requirements for the Decontamination, Collection and Treatment of Explosives Waste*, Issue 2
WI 02.01.07.01.08, *Implementing Requirements for the Processing and Testing of Explosives*, Issue 1
WI 02.01.07.01.09, *Implementing of the Requirements for the Handling, Transportation and Storage of Explosives*, Issue 2
WI 02.01.07.01.10, *Implementing the Requirements for Explosives Facility Limits and Facility Siting*, Issue 3
WI 02.01.07.01.11, *Implementing the Requirements for the Development and Hazard Classification of New Explosives*, Issue 1
WI 02.01.07.03.01, *Assignment of Hazard Classification - Division and Storage Compatibility Group for Bulk Explosives*, Issue 3
WI 02.01.07.03.02, *Assign Hazard Class - Division and Storage Compatibility Group for Consolidated Explosives*, Issue 5
WI 02.01.07.03.03, *Establish Storage Review Requirements for Explosives*, Issue 3
WI 02.01.07.03.04, *Combine Explosives Storage Compatibility Groups in Storage-Staging Areas*, Issue 3
WI 02.01.07.03.05, *Perform Explosives Storage Review*, Issue 3
WI 02.01.07.03.06, *Inventory Requirements for Explosives Staging and Storage*, Issue 13
WI-02.06.04.01.01, *Manage the Maintenance Program*,
WI-02.06.04.02.01, *Creating, Submitting and Approving Work Requests*
WI-02.06.04.02.02, *Manage the Maintenance Backlog and Schedule Work*
WI-02.06.04.02.03, *Planning and Approving Maintenance Work Orders*
WI-02.06.04.02.04, *Execute Maintenance Work and Provide Feedback*
WI-02.06.04.02.07, *Establish Preventive Maintenance for Facility and Infrastructure Structures, Systems, Components, and Equipment*
WO 0029904703, Corrective Maintenance for Light Fixture
WO 0029928612, Repairs to Non MAA Doors
WO 0029929273, Repairs to Non MAA Doors
WO 0029932903, Lightning Protection PM
WO 0029938541, Relamp Troubleshoot and Repair
WO 0029940751, Lightning Protection PM

WO 0029941011, 12-61 Fire Protection System Annual Preventive Maintenance
WO 0029941326, Blast Door PM
WO 0029941450, Fire System PM
WO 0029942005, Blast Door PM
WO 0029943304, Level III Work Order to repair hydraulic leak on fork lift
WO 0029943663, Repairs to Non MAA Doors
WO 0029944285, Hoist PM
WO 0029948315, Electric Power System – contractor support
WO 0029948804, Hydr Blast Door CM
WO 0029948984, Electric Power System CM
WO 0029949384, Hoist CM
WO 0029949506, 12-118 Replace Boiler
WO 0029951519, Level III Work Order for Freeze Protection

Interviews

- Pantex Maintenance Senior Manager
- Pantex Maintenance Work Management Senior Manager
- Industrial Hygiene Manager
- Industrial Safety Manager
- Shop Supervisors
- Work Planners
- Machinists
- Engineering Technicians
- Quality Specialist
- PM Work Planners (2)
- Corrective Maintenance Work Planners (2)
- Training Manager
- Work Control Specialists (2)
- Reliability Integration Manager/Feedback and Improvement
- Industrial Hygienist
- Industrial Safety/JSHA Specialist
- CNS Facility Representative/Facility Managers
- Unreviewed Safety Question Determination Manager
- Explosives Sensitivity Committee Chairman
- Firing Site Manager
- Senior Explosives Safety Engineer
- Explosives Storage Review Coordinator
- Zone 4 Manager
- Division Training Managers (2)
- Production Section Managers (3)
- Weapons Training Manager
- Explosives Waste Manager
- Senior Waste Compliance Manager
- Security Senior Manager
- Armorer Internal Staff Member
- Facility/Operations Managers
- ES&H Senior Specialist
- Pantex Acting Feedback and Improvement Manager

- Issues Management Manager
- Issues Management Specialists
- Causal Analysis Specialists
- Fire Protection Engineer
- Independent Assessment Program Site Lead
- Independent Assessment Program Manager

Observations

- WO 0029904703 Corrective Maintenance for Light Fixture
- WO 0029938541 Relamp Troubleshoot and Repair
- WO 0029941011 12-61 Fire Protection System Annual Preventive Maintenance
- WO 0029929273 Repair Doors
- WO 0029949384 Hoist Repair
- WO 0029944285 Hoist Preventive Maintenance
- Work Planner job walkdown
- Maintenance Tier 1 and Tier 2 meetings
- Maintenance Standup meetings
- Maintenance Pre-job Briefings
- Carpenter Shop Equipment
- Daily planner/supervisor meeting
- Integration with Facilities and Production meeting
- Maintenance Shops (Sheet Metal, Vehicle Maintenance Shops, Carpenter Shops)
- Inert Machining Shops (Building 11-50 & 11-20)
- Production Tooling Shops (Buildings 12-68 & 12-16)
- Buildings 12-121, 12-63, 11-61, 11-55, 11-42, 11-50
- Firing Sites (FSs):
    - FS 4: Underground Testing
    - FS 16: Machining Testing
    - FS 21: Test Firing & Skid Testing
    - FS 22: Large Charge Hydrodynamic Testing
    - FS 24: Indoor Test Fire & FS 11A Buildup and Service Magazine
- Issues Management Review Board Meeting

Appendix C
Deficiencies

Deficiencies that did not meet the criteria for a finding are listed below, with the expectation from DOE Order 227.1A for site managers to apply their local issues management processes for resolution.

Training and Qualification

The training and qualification process for maintenance workers has not resulted in the timely completion of required training or the establishment of thresholds for which work activity-level tasks in the craft shops require a formal qualification card. In addition, the training and qualification process for shop craft workers is not well-defined or consistent among the divisional craft shops observed. As a result, there is no mechanism for ensuring that all maintenance and shop craft workers "possess the requisite skills required for competent job/task performance" as required by Section 7.14 of CNS MNL-352254.

Craft Shops

- JSHAs have not been effectively implemented for craft shops with respect to confirming that JSHAs are developed for all applicable shop equipment (e.g., grinders and lathes); ensuring that workers read and understand the current version of the JSHA before operations/tasks requiring a JSHA; and verifying that JSHAs address all applicable hazards and controls (e.g., local exhaust ventilation systems), as required by Section 3.3 of the *Pantex Safety Program Manual*.

- The slot hood local ventilation system for caustic and acid tanks associated with the Presto Blackening System in the heat treat area of the Production Tooling Machine Shop is not effective in reducing worker exposures to acid gases, contrary to the requirements of Section 5.5.4 of the *Pantex Industrial Hygiene Program Manual*.

- Potentially contaminated beryllium tools were received and stored in the Production Tooling machine shop without labels identifying the parts as beryllium-contaminated tools, contrary to the requirements of Section 4.3 of the *Pantex Beryllium Program Manual*.