Independent Oversight Inspection of Environment, Safety, and Health Programs at the

Pantex Plant

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Office of Environment, Safety and Health Evaluations
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Abbreviations Used in This Report

AHA	*Activity Hazard Analysis*
AIHA	*American Industrial Hygiene Association*
ATD	*Pantex Applied Technology Division*
B&W Pantex	*Babcock and Wilcox Technical Services Pantex, LLC*
CFR	*Code of Federal Regulations*
DOE	*U.S. Department of Energy*
ESF	*Essential System Functionality*
ES&H	*Environment, Safety, and Health*
HPFL	*High Pressure Fire Loop*
HRO	*High Reliability Organization*
IH	*Industrial Hygiene*
IH Lab	*Industrial Hygiene Laboratory*
ISM	*Integrated Safety Management*
JSHA	*Job Safety Hazard Analysis*
LCO	*Limiting Condition of Operation*
NEOP	*Nuclear Explosive Operating Procedure*
NNSA	*National Nuclear Security Administration*
OSHA	*Occupational Safety and Health Administration*
PPE	*Personal Protective Equipment*
PXSO	*NNSA Pantex Site Office*
SAC	*Specific Administrative Control*
SAR	*Safety Analysis Report*
SME	*Subject Matter Expert*
SSCs	*Structures, Systems, and Components*
TSR	*Technical Safety Requirement*
USQ	*Unreviewed Safety Question*

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1 Introduction

The U.S. Department of Energy (DOE) Office of Independent Oversight, within the Office of Health, Safety and Security, inspected environment, safety, and health (ES&H) programs at the DOE Pantex Plant during March through April 2009. The inspection was performed by the Office of Independent Oversight's Office of Environment, Safety and Health Evaluations.

At DOE Headquarters, the National Nuclear Security Administration (NNSA) has primary line management responsibility for the Pantex Plant. NNSA provides programmatic direction and funding for most nuclear weapons stockpile management, research and development, facility infrastructure activities, and ES&H program implementation at the Pantex Plant. At the site level, the NNSA Pantex Site Office (PXSO) has line management responsibility for the Pantex Plant. Under contract to DOE, the Pantex Plant is managed and operated by Babcock & Wilcox Technical Services Pantex, LLC (B&W Pantex).

The primary mission of the Pantex Plant is the assembly, disassembly, testing, and evaluation of nuclear weapons in support of the NNSA stockpile stewardship program. Pantex also performs research and development in conventional high explosives and serves as an interim storage site for plutonium pits removed from dismantled weapons.

Aerial view of Pantex Plant

Pantex Plant activities involve various hazards that need to be effectively controlled. These hazards include exposure to external radiation, radiological contamination, nuclear criticality, high explosives, beryllium, hazardous chemicals, and various physical hazards associated with facility operations (e.g., machine operations, high-voltage electrical equipment, pressurized systems, and noise). Significant quantities of radioactive materials and hazardous chemicals are present in various forms at the Pantex Plant.

The purpose of this Independent Oversight inspection was to assess the effectiveness of ES&H programs at the Pantex Plant under the direction of PXSO and NNSA. The Independent Oversight team evaluated a sample of activities that provide perspectives on the safety of current work activities at the Pantex Plant, including:

- Implementation of the core functions of integrated safety management (ISM) for selected work activities, including programmatic work activities of the Manufacturing Division and Applied Technology Division (ATD), maintenance activities, and construction project work (performed primarily by subcontractors). Independent Oversight focused primarily on the implementation of ISM at the facility and activity levels.

- Essential safety system functionality of several nuclear safety-class systems that are designed to prevent and mitigate accidents at the Pantex Plant, including the high pressure fire loop (HPFL) system and related support systems, fire suppression systems, blast valves, and facility crane assemblies.

- PXSO's and B&W Pantex's effectiveness in managing and implementing selected aspects of the ES&H program that the Office of Independent Oversight has identified as focus areas, including specific administrative controls (SACs), chemical management, hazardous waste management, and communication of workers' rights in accordance with the parameters of 10 CFR 851, *Worker Safety and Health Program*. Although these topics are not individually rated, the results of focus area reviews are integrated with or considered in the evaluation of other ISM elements.

- Selected aspects of PXSO and B&W Pantex feedback and continuous improvement systems. Specifically, the Independent Oversight team focused on PXSO oversight of Pantex Plant ES&H programs and B&W Pantex feedback and improvement processes as applied to the systems and processes reviewed by the Independent Oversight team on this inspection. The review of feedback and improvement systems also constitutes Independent Oversight's evaluation of the effectiveness of implementation of DOE Order 226.1A, *Implementation of DOE Oversight Policy*, which is a long-term Independent Oversight focus area.

Sections 2 and 3 discuss the key positive attributes and weaknesses, respectively, identified during this inspection. Section 4 presents a summary assessment of the effectiveness of the major ISM elements that were reviewed. Section 5 provides the Independent Oversight team's conclusions regarding the overall effectiveness of PXSO's and B&W Pantex's management of ES&H programs. Section 6 presents the ratings assigned during this inspection. Appendix A provides supplemental information, including team composition.

Appendix B presents the findings identified during this Independent Oversight inspection. The findings are also referenced in the applicable portions of Sections 3 and 4 of this report. In most cases, the findings listed in Appendix B were derived from multiple individual deficiencies that are described in the detailed results provided to DOE and contractor management in a separate document.

In accordance with DOE Order 470.2B, *Independent Oversight and Performance Assurance Program*, NNSA must develop a corrective action plan to address each of the findings identified in Appendix B, including the associated individual deficiencies, and provide appropriate causal analyses, corrective actions, and recurrence controls for each finding. The weaknesses set forth in Section 3 provide a management-level summary of the findings; these weaknesses do not need to be addressed separately in the corrective action plan because the findings encompass the scope of the weaknesses.

2 Positive Attributes

Positive attributes were identified in several ES&H programs, particularly in the effectiveness of controls for higher hazard nuclear and explosive activities.

PXSO and B&W Pantex are committed to achieving high reliability organization (HRO) principles. HRO involves efforts to avoid a system accident that would result in an organizational failure or the inability to meet mission requirements. PXSO and B&W Pantex intend to combine HRO principles with enhanced causal factor analyses to improve the effectiveness of corrective actions and reduce recurring deficiencies. Many PXSO and B&W Pantex personnel have completed HRO training. The Pantex Plant plans to establish an HRO foundation in 2009 and implement the program in 2010. Although still in development, the implementation of HRO principles and enhanced capabilities in causal factor analyses has the potential to result in improvements to PXSO oversight and B&W Pantex safety management.

B&W Pantex Manufacturing and Applied Technology Divisions rigorously implement many robust and effective administrative hazard controls where existing engineering controls are not sufficient to fully control the hazards. These controls include detailed operations procedures, postings, operator aids, technical safety requirements (TSRs), and SACs associated with the work of individual weapons programs. Technical procedures provide a foundation for work control and are technically accurate and complete**.** Technical procedures do not specifically list or describe all hazards related to worker safety; however, they provide the necessary information and direction to successfully perform the work. Technical procedures were also effective in providing task-specific administrative hazard controls at the procedure step where the control was needed.

The Pantex Industrial Hygiene Laboratory (IH Lab) provides a comprehensive and timely analysis of IH samples. The Pantex IH Lab obtained laboratory accreditation from the American Industrial Hygiene Association (AIHA) on February 1, 1992, and continues to maintain accreditation. Title 10 CFR 851 requires the use of an AIHA-accredited laboratory for the analyses of all IH samples collected. The IH Lab participates in the AIHA's proficiency testing program (consisting of metals, organics, and asbestos samples) on a quarterly basis, as required for continued lab accreditation maintenance, and has consistently received very high proficiency grades. The IH Lab also participates in the AIHA's beryllium-specific proficiency testing program and has demonstrated exemplary results since the inception of the program. Over the last three years (2006 – 2008), the IH Lab has processed an average of 7400 beryllium samples per year.

B&W Pantex provides effective support to and oversight of subcontracted construction projects. Subject matter experts (SMEs) from the ES&H Division participate in early planning by developing a preliminary hazard analysis for each project and ensuring that required controls are specified in contracts. After each contract is awarded, and before the start of work, safety specialists review the subcontractor's activity hazard

analysis (AHA) to ensure that tasks, hazards, and controls are adequately addressed. After work begins, the specialists visit each jobsite daily to provide safety oversight and support. The Projects Division has established a systematic process for ensuring that construction workers on each shift are prepared to work safely before the start of work: (1) prior to the start of work on each shift, work crews are briefed regarding the hazards that may be encountered and the related controls; and (2) project safety technical representatives, who are assigned line management responsibility for safety, visit jobsites at the start of each shift to confirm that subcontractors are prepared to work safely.

The B&W Pantex chemical inventory system is well integrated into the site's procurement system. B&W Pantex uses its software systems to establish a hold point when a chemical is being purchased for a building for the first time to ensure appropriate SMEs review the request. As part of the review process, the IH organization researches hazards and toxicology, the Waste Operations Division monitors for ozone depleting substances and pollution prevention opportunities, the Emergency Management Division reviews requests for hazardous materials of concern, the Nuclear Explosive Safety organization establishes maximum quantity limits for toxic inhalation hazards, and the Regulatory Compliance organization reviews requests involving paints and associated chemicals to ensure they do not exceed maximum allowable limits for volatile organic compounds. The Hazard Communication Program Office reviews the input from these organizations and approves or rejects the request. For approved requests, the Hazard Communication Program Office also updates the software system to reflect authorized quantity limits.

B&W Pantex effectively integrates hazardous waste management requirements into work activities. Operations are evaluated to determine the types and amount of waste that could be generated. Based on these evaluations, the Waste Operations Department provides pre-labeled containers for each specific waste stream. This longstanding practice for evaluating and controlling the waste stream is noteworthy because only these pre-labeled containers are accepted for disposal, thus providing a positive control on waste generation. These evaluations also allow consideration of pollution prevention opportunities. In addition, Nuclear Explosive Operating Procedures (NEOPs), used by the Manufacturing Division, incorporate specific instructions for managing wastes in accordance with site and regulatory requirements. Appropriately marked containers with the applicable waste stream codes are pre-positioned in the work area, resulting in effective management and disposition of wastes in accordance with regulatory requirements.

High explosives fabrication activities

PXSO and B&W Pantex are effectively using assessments and contract performance objectives to improve system engineering and configuration management processes, and TSR implementation. Since the 2005 Independent Oversight inspection, various improvements have been made in configuration management at the Pantex Plant in such areas as new engineering calculation and evaluations procedures, a new unreviewed safety question (USQ) procedure, and multiple other aspects of the configuration management program. In addition, B&W Pantex has enhanced its cognizant system engineer program and various assessment programs, such as implementation of verification reviews, management self-assessments, and material condition walkdowns. PXSO has enhanced their safety system oversight program and is performing effective reviews of the B&W Pantex cognizant system engineer program. In addition, PXSO is effectively

analyzing nuclear safety system performance and using the results to focus resources and drive improvement efforts. PXSO and B&W Pantex have also used contractor performance objectives to facilitate improvements. For example, PXSO has established contractual performance objectives that require the use of the contractor assurance system to formally assess the flowdown and implementation of TSR controls within the safety analysis report (SAR). Collectively, these efforts are resulting in improvements in nuclear safety and are providing PXSO and B&W Pantex with the information necessary to make informed decisions about risks and priorities. In many cases, PXSO and B&W Pantex have identified inconsistencies in TSR flowdown similar to those identified by Independent Oversight on this inspection, and plans were being developed or implemented to effect appropriate corrective actions.

B&W Pantex is using an array of processes as tools to foster and drive continuous improvement in contractor assurance system processes and implementation, and in overall safety management. These assurance and feedback mechanisms include internally developed independent review and feedback processes for management assessments, problem evaluation requests, reportable occurrence reports, and critiques of issue evaluation processes and activities. B&W Pantex also supports a behavior-based observation program that promotes safe operations through constructive feedback among workers. In addition, to more effectively manage many of the elements of contractor assurance systems, B&W Pantex is utilizing an issue and commitment communication and management tool (i.e., PER/ESTARS) that provides a robust mechanism for documenting and controlling the scope and content of evaluations and resolution of safety issues, including deficiencies and weaknesses identified during assessment activities, operational events, occupational injuries and illnesses, and lessons learned. The broad application of this tracking tool results in an increased level of management control, formality, and consistency in the investigation and resolution of safety issues and operating experience data. Site senior management has provided strong encouragement and support for these continuous improvement tools through communicated expectations and resource allocation.

3 Weaknesses

Although most aspects of ES&H are effective, there are weaknesses in Pantex Plant ES&H programs in a number of areas, including aspects of work controls, exposure assessments, nuclear safety system calculations and surveillance tests, and feedback and improvement.

Weaknesses in safety bases, design bases, and the translation of TSRs into conservative surveillance testing requirements impact the ability of the Pantex Plant to fully demonstrate that it has correctly evaluated and implemented the margins of safety as defined in the safety bases. Two types of weaknesses were particularly significant. First, a number of the calculations that support the safety bases and design bases are deficient. Although the new procedures instituted in System Engineering for performing and controlling engineering calculations and evaluations represent a positive step, B&W Pantex should ensure that the key elements of these procedures are reflected in procedural controls for safety-related calculations and analyses in other facets of the organization, including those supplied by vendors. In addition, some legacy calculations reviewed are deficient, some calculations that were previously identified as deficient were not corrected, and some recent calculations reviewed were technically deficient or not effectively performed in accordance with the new procedure. Second, some of the TSR surveillance tests and inspections that are performed for the systems reviewed do not fully demonstrate the systems' functional capabilities that are defined in the safety bases. In some cases, the validity of tests that demonstrate the margins of safety that are presented in the safety bases was questionable because of concerns with preconditioning the equipment such that the tests did not fully simulate accidents. In other cases, the acceptance criteria were non-conservative or not representative, the safety bases are not always correctly reflected in TSRs, and/or procedures were not sufficiently comprehensive and rigorous. While deficiencies are present in calculations and surveillance testing, no cases were identified in which system operability was likely to have been challenged. (See Findings #E-1 and #E-2.)

B&W Pantex has not fully addressed deficiencies in work planning and control processes at the Pantex Plant. The worker safety aspects of ISM and results of B&W Pantex hazard analyses processes within Manufacturing and Applied Technology Divisions are not sufficiently documented and/or effectively communicated to workers. Manufacturing and Applied Technology Divisions have not adequately met the B&W Pantex ISM Program Description requirement to develop and maintain division-specific ISM Plans that outline their approach to implementing the five core functions of ISM at the activity level, including the methods used to systematically analyze hazards associated with technical procedure development, and any needed documentation (job hazard analysis, etc.). Several B&W Pantex requirements documents call for all hazards to be identified in procedures; however, technical procedures generally do not identify specific worker safety and health activity-level hazards. While controls are identified and in many cases adequate, failure to identify and describe each activity-level hazard is contrary to ISM principles, limits the ability to verify the adequacy of listed controls, and limits the ability of supervisors and trainers to effectively communicate specific hazards during pre-job briefs and training evolutions. In addition, work planning

and control processes for some maintenance and construction activities were not always implemented with sufficient rigor to ensure that hazards and controls were communicated to workers and consistently implemented. Some of the deficiencies identified in this 2009 Independent Oversight inspection were similar to those identified in the 2005 Independent Oversight inspection. While some improvements have been made, the corrective actions were not always sufficiently comprehensive to address the full scope of the problem, and/or effectiveness reviews were not sufficient to ensure that the problems had been addressed. (See Findings #C-1, #C-3, and #C-4.)

The Pantex Plant non-radiological exposure assessment process has not been fully implemented. The Pantex Plant exposure assessment process consists of four sequential elements: (1) the performance of a hazard assessment for each of the primary Pantex areas or facilities with an evaluation of task hazards; (2) the conduct of qualitative and/or quantitative exposure assessments by line management or IH as defined in the hazard assessments; (3) the maintenance of the hazard assessments on a frequency based on risk; and (4) the inclusion of hazard assessment, exposure assessment, and laboratory data into a computer-based exposure assessment records-keeping database. Although Pantex has developed an exposure assessment process for non-radiological hazards since the 2005 Independent Oversight inspection, many needed exposure assessments have yet to be performed. For example, although hazard assessments have been performed for each of the buildings in which ATD activities occur, the current hazard assessments do not address all of the work activities within the buildings that may result in a worker exposure. Furthermore, across the Pantex site, hazard assessments have yet to be performed at other facilities, such as the Manufacturing Division facilities. Although over 200 plant-wide exposure assessments have been performed during the past few years and thousands of beryllium samples are analyzed each year, fewer than 10 percent of the needed exposure assessments identified by Pantex IH in the new exposure assessment program have been performed. The remaining exposure assessments have been scheduled based on a risk priority. However, for most of the work activities observed by the inspection team, either the work activity was not included or addressed in the hazard assessment for the building or an exposure assessment was not documented. The Pantex IH organization is in the early development stages of a computer database to manage the results from hazard assessments, exposure assessments, and laboratory data, but the database has yet to be prototyped, developed, or implemented. (See Finding #C-2.)

B&W Pantex and PXSO assurance and oversight systems are not always effective in identifying, correcting, and preventing the recurrence of deficiencies. Although B&W Pantex has established generally robust assurance system processes and supporting guidance, management tools, and quality reviews, the overall effectiveness of these systems is adversely impacted by some process weaknesses and numerous implementation deficiencies. B&W Pantex performs appropriate assessments of nuclear safety systems but few formal assessments of worker safety processes and/or assurance and management systems. Some B&W Pantex assessments lack sufficient rigor to effectively evaluate processes or performance. Many safety issues identified through assessment activities, operational events, occupational injuries, or problem evaluation requests are insufficiently evaluated for extent of condition and causes. Institutional and ISM weaknesses and deficiencies are often not fully considered during issue evaluations. As a result, corrective actions are not always sufficiently comprehensive, and recurrence controls are inadequate. PXSO has made improvements in a number of areas; however, deficiencies in the rigor and formality of some of its oversight processes continue to have a negative impact and have contributed to PXSO's failure to perform some required assessments and to consistently track and evaluate the effectiveness of corrective actions. Some of the findings from the 2005 Independent Oversight inspection were inadequately analyzed, and action plans were insufficient to prevent recurrence. Corrective action validation/effectiveness review activities by B&W Pantex and PXSO were inadequately rigorous to identify continuing deficiencies. Many pertinent external lessons learned are not being screened for applicability to the Pantex Plant and evaluated for needed actions. (See Findings #D-3, #D-4, and #D-5.)

4 Results

The following sections provide a summary assessment of the PXSO and B&W Pantex activities that the Independent Oversight team evaluated during this inspection.

4.1 Work Planning and Control

Manufacturing Division

Independent Oversight's review of weapons Manufacturing Division operations included field observation of work activities with ongoing weapons programs. Observed work activities included various assembly, disassembly, inspection, and dismantlement activities.

The scope of work for weapons programs is well defined from initial planning through the task-specific implementing procedures. NEOPs contain detailed instructions for performing assembly, disassembly, inspection, and dismantlement activities, and adequately define the scope of work for activity-level tasks.

Hazards associated with weapons program work are analyzed through a variety of mechanisms. At the task-specific level, a project team is convened to develop the necessary procedures to complete the applicable assembly, disassembly, inspection, or dismantlement process. These teams include production technicians for worker input and the relevant ES&H disciplines to evaluate activity-specific hazards. While nuclear explosives and radiological hazards are adequately addressed, the results of worker safety hazard analyses associated with this process are not formally documented or communicated to workers. These activity-level hazards are not identified in technical procedures or other documents. While controls are identified and in most cases adequate, failure to identify and describe each activity-level hazard is contrary to ISM principles and hinders efforts to verify the adequacy of

Forklift event at Pantex

listed controls. Without knowledge of the specific hazards, a worker's ability to recognize an imminent danger situation with that hazard could also be limited. This is a repeat concern that was not addressed in the corrective actions for the 2005 Independent Oversight inspection finding. (See Finding #C-1.)

The Manufacturing Division rigorously implements a variety of engineering and administrative controls to mitigate hazards posed by nuclear explosive manufacturing operations. Engineering controls are extensive and have been enhanced through the SS-21 program initiative. Administrative controls are effectively implemented where needed. The engineering and administrative controls are supplemented by the use of personal protective equipment (PPE), where necessary, to protect workers from activity-level hazards. NEOPs are technically accurate and complete, contain the necessary steps to perform the work, and are effective in providing task-specific industrial safety, hygiene, and radiological controls at the procedure step where the control is needed. The procedures also effectively implement other administrative controls, such as TSR requirements and SACs associated with individual weapons programs. While a few weaknesses in the application of radiological controls were evident, radiological control measures are conservatively implemented, and the potential for adverse radiological impacts is low.

With one exception, observed work was performed within specified controls with rigorous and effective procedure compliance and other conduct of operations principles. The exception involved an ongoing failure to report a discrepant condition; however, line management appropriately addressed the situation.

Overall, nuclear explosive hazards and radiological hazards are adequately addressed. However, the worker safety hazards specific to an activity are frequently not formally documented or communicated to workers. While controls are identified and in most cases adequate, failure to identify and describe each activity-level hazard is contrary to ISM principles and hinders efforts to verify the adequacy of listed controls. Without knowledge of the specific hazards, a worker's ability to recognize an imminent danger situation with that hazard could also be limited. Management attention is needed to ensure worker-safety-level hazards are effectively documented and communicated to the supervisors and workers.

Applied Technology Division

The Pantex ATD provides the personnel and facilities for the development, synthesis, manufacture, reclamation, and testing of high explosives. During this inspection, Independent Oversight observed selected work activities in various ATD departments.

In general, work scopes within ATD are well defined. At the facility level, a number of documents define the general scope of work activities conducted within the ATD buildings such that facility-level hazards and controls can be identified. At the activity level, work scopes are well defined in operating procedures, developmental instructions, and engineering instructions.

ATD personnel were knowledgeable of the hazards associated with their work activities. Facility-level hazards associated with the use, storage, synthesis, and manufacture of high explosives are identified and analyzed through the process hazards analysis and hazard control evaluation processes. A variety of mechanisms are in place for documenting activity-level hazards, such as procedures and job safety hazard analyses (JSHAs), but, in general, activity-level hazards are not adequately documented in work documents (i.e., operation procedures and developmental instructions). Progress is evident in the development of IH hazard assessments for each ATD building, although such hazard assessments currently do not address a number of tasks. While an exposure assessment program has been established and some progress has been made in performing exposure assessments, B&W Pantex has identified a large number of exposure assessments that still need to be performed, but limited progress has been shown in performing these

assessments to date. In some cases, hazards associated with specific work controls are not identified or sufficiently analyzed, resulting in controls that were missed. (See Findings #C-1 and #C-2.)

Effective engineering and administrative controls have been developed and implemented in the ATD laboratories and facilities. Controls for work activities are generally well documented in operating procedures and JSHAs. However, in some cases, controls were not always sufficiently documented in procedures, particularly when the hazard analysis was less than sufficient. (See Finding #C-1.

Work was performed in accordance with established controls, with some exceptions, and readiness to perform work is effectively verified using standup meetings, pre-job briefs, and pre-operational checks. Engineering and administrative controls were followed as required, and controls identified in work procedures were followed as written. Workers and line managers are not hesitant to stop work when hazards or controls are not understood. For example, Pantex workers stopped work during a parts-weighing operation because the potential for exposure to beryllium contamination was not sufficiently identified or analyzed.

Overall, ATD has made improvements in work planning and control in the past few years. Most hazards are adequately identified, analyzed, and controlled through the various processes used within ATD. However, some hazards were not sufficiently analyzed, and some controls were missed; continued management attention is needed to perform required exposure assessments and address process and performance weaknesses in hazards analysis and controls.

Maintenance

The Maintenance Division manages and conducts most of the maintenance activities at the Pantex Plant. ISM is incorporated into the maintenance planning process through the use of various work control documents (maintenance service requests, work orders, preliminary hazard analysis, AHAs and screens, job safety evaluation, work performance record, JSHA, and maintenance work instructions). Independent Oversight evaluated work performed by the Maintenance Division, including preventive and corrective maintenance and modifications, in facilities located throughout the site, manufacturing areas, maintenance shops, and several other buildings.

For the observed activities, most work definitions for B&W Pantex maintenance were adequate to determine the potential hazards present. However, in some cases, written work definitions in work orders did not provide sufficient detail to effectively analyze and control hazards such that reliance is placed on the supervisors' or workers' walkdowns and assessments of conditions.

Hazard analyses performed in connection with work control documents have improved since the 2005 Independent Oversight assessment of Pantex Plant maintenance activities. However, gaps in the processes have resulted in some hazards that were not identified or analyzed. (See Finding #C-3.)

In many cases, engineered and administrative controls have been used effectively to ensure worker safety. Most work control documents specified appropriate PPE. However, work control documents did not always provide controls with sufficient specificity to ensure that individuals are aware of the specific hazards and requisite controls that must be implemented prior to performing work for the specific activity. In some cases, the process relies on workers to determine which controls apply to each task, but the workers are not always sufficiently cognizant of the hazards to correctly apply the controls or to seek assistance from supervision or ES&H SMEs. (See Finding #C-3.)

A number of work evolutions observed by Independent Oversight were performed safely and in accordance with established controls. With some exceptions, general shop areas were maintained in a safe, orderly

manner. However, some controls were not properly implemented, and, in a few cases, workers did not implement or follow established controls. For example, workers did not always follow procedures for lockout/tagout hold points, did not properly implement electrical safety provisions, and did not stop work when hazards were encountered (elevated work) that were not addressed in the work control documents. In a few shops, eyewash stations were not properly located or had not been inspected, emergency exits were partially blocked, or emergency exit signs were not correctly placed. (See Finding #C-3.)

Isolation door at Pantex Plant

Overall, B&W Pantex has made some improvements in work planning and control for maintenance activities, and many hazards were effectively identified, analyzed, and controlled. However, gaps in the processes resulted in some missed hazards and controls, and some established controls were not properly implemented. In addition, the processes do not always identify hazards and controls with sufficient specificity and thus rely too heavily on individual workers to determine how to implement controls and when to seek ES&H assistance.

Construction Projects

Most construction work at the Pantex Plant is managed by the B&W Projects Division. A few projects are managed by the Corps of Engineers under contract with NNSA, and a roofing work project is managed by another DOE contractor. Most of the construction work managed by B&W Pantex is performed by construction subcontractors, but some is performed by B&W Pantex workers employed by the B&W Projects Division. The Independent Oversight team reviewed projects managed by B&W Pantex (one performed by B&W Pantex construction trades and six by B&W subcontractors) and B&W support (e.g., safety oversight, permits) to other construction projects at the Pantex Plant that are managed by other organizations under contract to DOE.

B&W Pantex has established and implemented adequate work control systems and procedures to address the definition of work scope for construction projects. Construction work observed during this inspection was adequately bounded by statements of work included in procurement requisitions, contracts, work control documents, and by engineering drawings and specifications. Step-by-step work instructions and AHAs defined the tasks to be performed within the identified scope of work in sufficient detail to provide a clear understanding of the work to be performed.

B&W Pantex has established adequate procedures and processes for identification and analysis of hazards associated with construction work performed by its subcontractors. With a few exceptions, hazards associated with subcontracted work were adequately identified, analyzed, and documented in AHAs. However, on one project performed by B&W Pantex workers, B&W Pantex had not fully assessed the potential for exposure to airborne silica associated with drywall work, and the drywall workers were not aware of this potential exposure hazard. (See Findings #C-2 and #C-4.)

B&W Pantex has improved the control of hazards associated with construction work through conservative requirements, ES&H involvement, daily safety meetings, and improved work control documents. A preliminary hazard analysis process has been established to better inform prospective bidders of required controls. Site-specific ES&H construction specifications contain appropriate safety requirements. However,

the specific ES&H requirements have not always been incorporated into AHAs or subcontractor safety and health plans, but oversight by B&W Pantex line managers and ES&H personnel has been sufficient to ensure adequate implementation of most requirements. (See Finding #C-4.)

Readiness to perform construction work safely is systematically confirmed before work is authorized to start, and, with few exceptions, the work observed during this inspection was performed safely. Workers understood that management expected them to work safely and exercised care in adhering to safety expectations and requirements.

Overall, workers were aware of most of the hazards in their workplace, and most work was performed within established controls. For subcontracted construction work, which represents most of the construction work at Pantex, most workplace hazards observed by Independent Oversight were adequately identified, analyzed, and controlled using an AHA process specifically developed for control of subcontracted construction work. However, for construction work performed by B&W Pantex employees, which represents a small portion of the construction work at the Pantex Plant, the hazards were not always sufficiently identified, analyzed, and controlled. Many controls are effectively communicated to workers through safety briefings, and B&W project management representatives and ES&H personnel perform extensive monitoring of safety at constructions sites, although some weaknesses in implementation of B&W Pantex processes for flowdown of controls to the working level persist.

4.2 Essential System Functionality of Nuclear Safety Systems

The nuclear safety inspection evaluated the effectiveness of B&W Pantex programs and processes for engineering and safety bases; configuration management; surveillance and testing (including TSRs and implementation of safety bases conditions of approval); maintenance and procurement; and system engineering and oversight (including Federal safety system oversight, contractor cognizant system engineering programs, and contractor and site office feedback and improvement processes as they are directly applied to the selected safety systems and contractor processes being inspected). As part of the nuclear safety inspection, Independent Oversight evaluated essential system functionality (ESF) on selected aspects of: the safety-class HPFL system, including interfacing and/or support systems (e.g., storage/supply tanks, diesel fire pumps, and their related support systems designated as safety class); the safety-class fire suppression systems, including wet-pipe sprinkler and deluge systems at selected Pantex facilities; blast valves, which are a safety-class cell confinement isolation design feature; and selected aspects of facility cranes. In addition, Independent Oversight conducted a review of the progress and actions taken to address ESF weaknesses identified in the 2005 Independent Oversight ES&H inspection at Pantex.

Engineering Design and Safety Basis

For the systems reviewed by Independent Oversight, most aspects of the engineering design are adequate. The HPFL, fire suppression systems, blast valves, and facility cranes are generally well designed with respect to their normal and accident operating functions and provide capacities in excess of the requirements (e.g., extra flow capacity) that provide substantial margins of safety. For example, the HPFL has a reliable configuration of diesel and electric fire pumps with redundant capability to provide the water flow required by the safety bases. The HPFL, however, is an older system with aging underground piping that is experiencing degradation because of corrosion. Although several important deficiencies were identified in the safety bases and design basis analysis, Independent Oversight did not identify any situations that indicated that the systems reviewed would not operate and perform their safety functions in normal and accident conditions.

Most aspects of the safety bases and design bases analyses are adequate. The accident analysis in the SAR adequately identifies accident scenarios, assumptions, functional requirements, and performance criteria for the systems. The information is sufficient to support the safety functions identified in the hazard and accident analyses and derivation of TSRs. The safety bases are well written and clear in most cases; however, some discrepancies were identified in the blast valve section of the SARs.

Although the safety bases appropriately define the systems' safety limits, the bases for the translation of these limits into the TSR surveillance testing acceptance criteria, in some cases, was inadequate, inconsistent, or non-existent. In addition, B&W Pantex has not been fully effective in ensuring that the design bases are fully and correctly analyzed and are sufficient to correctly and conservatively demonstrate that the HPFL, fire protection systems, blast valves, and cranes will perform within the parameters of the safety bases. As discussed in Section 3, Independent Oversight identified several important deficiencies in the design bases, including calculations that were not adequately performed, calculations that were not adequately revised and corrected, and configurations (e.g., system lineups) and components that were not fully and adequately analyzed. In some cases, B&W Pantex has adequate corrective actions planned or in development to address the safety bases and design bases deficiencies, and PXSO has been performing assessments that have identified similar issues and are driving improvements in the Pantex safety bases and design analysis. However, continued attention is needed in this area, with a particular focus on the quality of legacy calculations and on the adequacy of the design bases in demonstrating that the systems are designed and operated with conservative assessments of the margins of safety. (See Finding #E-1.)

As a result of these observations, B&W Pantex initiated actions during this Independent Oversight inspection to re-address the specific calculation concerns in question from both this inspection and the 2005 Independent Oversight inspection, and to adjust the scope of ongoing control owner management self-assessments to specifically review and upgrade all other safety-related calculations/analyses on a risk-prioritized basis.

Configuration Management

B&W Pantex has made progress in improving the implementation of configuration management since the 2005 Independent Oversight inspection and has adequately defined its configuration management program in program documents and various procedures for System Engineering. However, it was not clear whether these controls were fully extended to other facets of the organization (e.g., other Pantex engineering and vendor-performed engineering activities, such as calculations). Many aspects of the current configuration management program meet the requirements of DOE standards, and additional improvements are ongoing to further strengthen existing processes. B&W Pantex has also made significant improvements to the USQ program. Although some additional improvements in the USQ process are warranted, the USQ process documents reviewed by Independent Oversight generally met the applicable requirements. Furthermore, B&W Pantex has taken a number of positive steps to strengthen configuration control of the safety basis through the establishment of the control owners program and the independent verification review process. In addition, additional actions are under way to verify the completeness of existing TSRs and the flowdown of all TSRs, including SACs, at least once every five years. Even though shortcomings in several elements of the configuration management program (e.g., design drawings, design information summaries, design calculations) still exist and verification activities are not yet complete, the overall program has been improved and is generally performing adequately.

Surveillance and Testing

B&W Pantex performs TSR surveillance testing and inspections through their surveillance and in-service inspection program. B&W Pantex facility management adequately ensures that the tests, inspections, and preventive maintenances are performed on time. Many of the TSRs are adequate to ensure that safety structures, systems, and components (SSCs) and their support systems are maintained; that the facility is operated within safety limits; that limiting control settings and limiting conditions of operation (LCOs) are met; and that surveillance, testing, and inspections are performed to confirm operability and integrity of these SSCs. The Independent Oversight team's review of a sample of completed surveillances and test records and procedures indicates that many accurately reflected associated safety basis requirements, were technically valid and in conformance with commonly accepted practices, and were written in a manner that was clear to qualified users.

While no situations were identified that indicated that the systems will not perform their safety function, there are a number of weaknesses in the surveillance and testing processes, as discussed in Section 3, in such areas as preconditioning and acceptance criteria. Although current surveillance testing is in compliance with TSR bases, based on a review of the TSR requirements and their translation into surveillance testing requirements, some TSRs and their associated surveillance tests do not fully demonstrate the systems' functional capabilities as defined in the safety basis. One of the key underlying weaknesses is that B&W Pantex has derived TSRs and surveillance testing requirements for the HPFL and fire suppression systems to demonstrate conformance with National Fire Protection Association provisions rather than ensuring that testing fully demonstrates system functionality and performance in accordance with the accident analyses. (See Finding #E-2.)

B&W Pantex has recognized some of the shortcomings in the TSR surveillance testing area and has identified similar concerns regarding TSR flowdown inconsistencies, use of National Fire Protection Association provisions rather than the accident analysis to derive LCOs for system performance testing, and the need to re-evaluate current LCOs to reflect appropriate TSR testing requirements consistent with performance expectations in the SAR. Many of these actions were recently initiated, and their effectiveness could not be fully evaluated at the time of this inspection. However, additional attention is needed in clearly identifying the critical safety parameters for safety-related SSCs, rigorously analyzing and quantifying the associated safety limits, translating these into SAR statements, and flowing these down into the TSRs and corresponding surveillance tests procedures and their acceptance criteria.

Maintenance and Procurement

The B&W Pantex maintenance and procurement programs for the safety-class fire protection systems are generally mature and effectively implemented. The September 2008 update of the Pantex Plant Maintenance Implementation Plan meets the applicable requirements. The Pantex Plant computerized maintenance management system (Passport) provides many of the functions needed for an effective maintenance management program; however, the functionality of the Pantex implementation of Passport presents challenges to configuration management, preventive maintenance enhancement and optimization, retrieval of meaningful maintenance histories, performance trending, and life cycle control. B&W Pantex has established and implemented a robust program for meeting the requirements of managing the life cycle of real property, including nuclear facilities and equipment; however, a significant amount of maintenance has been deferred, including replacement of fire protection system underground piping that is experiencing aging and reliability problems. Finally, B&W Pantex has established robust processes for procurement of safety-class SSCs, commercial grade dedication, and preventing the introduction of suspect/counterfeit items, and the review of two fire protection system design change packages demonstrated effective implementation of the procurement program for safety-class components.

Systems Engineering and Assessments – B&W Pantex

The B&W Pantex system engineering program meets the requirements of the applicable DOE orders, is being implemented in a generally effective manner for the fire protection system functions reviewed by Independent Oversight, and evidences a significant effort and trend toward improving effectiveness. The fire suppression systems and HPFL system engineers provide appropriate support to operations and maintenance, and are appropriately involved in configuration management and ensuring system operability, reliability, and material condition are maintained at an appropriate level. B&W Pantex recognizes the need for further improvements in its system engineering program and is developing or implementing appropriate corrective action plans.

Safety System Oversight – PXSO

PXSO has made significant progress in establishing and implementing an effective safety system oversight program since the 2005 Independent Oversight inspection. The current program is effective and continues to mature. The PXSO systems engineering team is effectively monitoring the contractor's essential systems, safety bases, cognizant system engineering program, and configuration management programs, and is providing effective feedback to the contractor that is driving improvements in nuclear safety at Pantex. Noteworthy aspects of the PXSO safety system oversight program include formal quarterly reviews and analysis of operational awareness information (including information developed by PXSO and B&W Pantex) to identify trends in performance and potential focus areas, which are documented in formal quarterly reports to PXSO senior management. The PXSO assessments that were reviewed by Independent Oversight were conducted with sufficient rigor and identified actions for improvement in areas assessed, and usually included appropriate performance-based elements.

In the area of corrective action management, while some of the specific technical concerns identified in the 2005 report were resolved, some of the analysis and documentation (most importantly, calculations) of safety-critical aspects of safety-class SSCs were still found to be deficient, as evidenced by the previously discussed legacy calculation discrepancies not being corrected and similar specific new concerns identified in some recent calculations reviewed during this inspection. In these specific cases, PXSO effectiveness reviews were not sufficiently rigorous to provide adequate assurance that the overall performance issue was fully and effectively addressed. Continued emphasis on flowdown of SAR and TSR requirements is warranted, with a particular focus on the technical quality of underlying supporting calculations for the SARs.

4.3 Focus Areas

Specific Administrative Controls

SACs are administrative controls that provide preventive and/or mitigative functions for specific potential accident scenarios and that also have safety importance equivalent to engineered controls that would be classified as safety-class or safety-significant if engineered controls were available and selected. The Independent Oversight team reviewed the status and actions taken by NNSA Headquarters, PXSO, and B&W Pantex to implement SACs at nuclear facilities and reviewed selected SACs and a sample of surveillance procedures and results at the selected Pantex organizations.

Pantex has formulated and implemented a process for the development and implementation of safety bases that adequately addresses the guidance and requirements associated with SACs, as defined in the applicable DOE standards (i.e., DOE Standard 3009, Change Notice 3, and DOE Standard 1186-2004). Independent

Oversight selectively sampled a number of implementing procedures for several manufacturing activities and verified the proper implementation of a number of SACs and administrative controls for several ongoing manufacturing activities, including controlled owner oversight activities related to combustible loading control implementation, and concluded that the SACs that were reviewed were clearly written and effectively implemented. Control owners and/or their staff generally understood their roles, responsibilities, and authorities for their assigned controls; however, the team noted that for the particular safety basis controls that were the focus of this inspection, comprehension of the full depth and breadth of the assigned responsibilities of control owners and/or their staff was still evolving.

PXSO, in coordination with B&W Pantex, is effectively using the contract to focus management attention on ensuring that safety basis controls are effectively implemented and performance is continually improved. These efforts are positive and should result in improved identification of SACs, as well as more effective implementation. The effectiveness of these initiatives in assessing SACs needs to be monitored to ensure that the initiatives are effectively implemented and sufficient to ensure that SACs are effectively developed, communicated, and implemented.

Chemical Management

B&W Pantex covers all operations at the site under its hazard communication program. In addition, the B&W Pantex chemical hygiene program institutional requirements are applied to laboratory operations. The site has implemented an electronic material safety data sheet management system that is effective and easy to use. A centralized file of printed material safety data sheets is also maintained and available in the event of a network disruption. B&W Pantex has integrated chemical inventory controls into the procurement process, including an automatic hold point during procurement to ensure that newly procured chemicals are reviewed by appropriate SMEs.

The procurement controls are designed to prevent new purchases from resulting in quantities that exceed authorized thresholds. However, transport of chemicals between buildings, lack of inventorying of secondary containers, and the presence of legacy chemicals reduce the effectiveness of these controls and have resulted in some established site quantity limits being exceeded. In addition, some chemical storage containers were found to be unlabeled or had conflicting/missing hazard warning information on the label. Compressed gases and flammable liquids were inappropriately stored together in a few locations, and this situation was not prevented by the B&W Pantex storage criteria. Stock metals that may release hazardous substances during machining operations were improperly excluded from the hazard communication program under the Occupational Safety and Health Administration (OSHA) article exemption. B&W Pantex has pursued corrective actions for some of the deficiency examples identified during this inspection and, prior to the inspection, had initiated an effort to develop and deploy a new software system that has the potential to address issues identified in the current chemical inventory management system. Attention is needed to analyze the extent of condition in applying these corrective actions and to ensure that the software system under development adequately addresses the identified issues. (See Finding #F-1.)

Hazardous Waste Management

The Pantex Plant has a well-designed and effective program for managing hazardous wastes that ensures regulatory requirements are met. The Waste Operations Department provides effective support to line management, including performing facility/process evaluations to determine waste stream locations and makeup, issuing and controlling containers for disposal, providing comprehensive waste training to generators, developing well-written work instructions for managing waste areas, and providing appropriate resources and hazardous waste management expertise to line and field operations. Line organization work control

documents, such as procedures and subcontractor plans, effectively conveyed hazardous waste management requirements in most cases. Implementation of requirements was generally effective, particularly within the central waste management facilities.

While work instructions and work packages broadly defined hazardous waste management requirements, some work packages for routine work and some operating procedures did not address environmental hazards and therefore did not contain specific controls for managing hazardous wastes. Most work and hazardous waste management areas were being performed and/or managed in accordance with regulatory requirements during maintenance and support activities; however, site waste requirements that are used to ensure regulatory compliance were not always met, including a timeliness issue in holding waste in an accumulation area, inaccuracies in marking waste log sheets, and waste containers that were not staged so that labels were visible for use and/or inspection. (See Findings #C-3 and #C-4.)

Worker Rights and Responsibilities

Communication of workers' rights and responsibilities is an important element of 10 CFR 851, *Worker Safety and Health Program*. The Independent Oversight team evaluated the mechanisms used by contractors to communicate rights and responsibilities under 10 CFR 851 and the degree to which workers and first-line supervisors understand those rights and responsibilities.

As part of its worker safety and health program, B&W Pantex has developed several effective approaches to inform workers of their 10 CFR 851 rights and responsibilities. These mechanisms include classroom training, posting of the "It's the Law" poster, dissemination of information through the Pantex Plant intranet and the daily plant newsletter, all-hands meetings, and dissemination of badge-size cards that summarize basic worker rights and provide a hotline phone number that enables employees to ask questions and report concerns.

The Independent Oversight team interviewed numerous workers throughout the plant and found that virtually all employees had an adequate, basic knowledge of worker rights and responsibilities. All workers knew that they could stop work if they had concerns about safety, although some workers did not recognize that this right currently has a regulatory basis in 10 CFR 851. Safety representatives from the Metal Trades Counsel and the Plant Guards Union had a detailed understanding of worker rights and responsibilities as delineated in 10 CFR 851 and also indicated their beliefs that the knowledge and acceptance of the worker rights were more important than whether workers recognized that 10 CFR 851 provided a regulatory basis for those rights. These safety representatives indicated that worker rights had been well communicated but also indicated that periodic reinforcement of the information by supervisors/foremen was important.

4.4 Feedback and Improvement

NNSA Headquarters and PXSO Oversight

NNSA has made considerable recent progress in developing a documented framework for its oversight activities under its recently restructured organization. Although progress has been made on developing the framework documents for the restructured organization, the new processes are in the early stages of implementation. Continued NNSA management attention is needed to ensure that the deliverables are sufficiently rigorous, accomplished in accordance with formal process descriptions, accomplished on schedule, and result in effective oversight and continuous improvement of ES&H programs. In addition, the NNSA technical qualification program does not include a few positions that should be included, and NNSA has not yet approved and implemented an operational experience/lessons learned program. NNSA closed a previous

2007 Independent Oversight finding on the operating experience/lessons learned program but did not have an adequate basis for closure. (See Findings #D-1 and #D-2.)

Many aspects of PXSO oversight are effective or improving. The PXSO Federal occupational safety and health program, injury and illness investigation and reporting process, differing professional opinion process, Facility Representative program, operating experience/lessons learned process, and the contract performance evaluation process meet applicable requirements, are adequately implemented, and promote safety management. PXSO, in coordination with B&W Pantex, is committed to achieving HRO principles and enhanced causal factor analysis to improve the effectiveness of corrective actions and reduce recurring deficiencies. PXSO has effectively implemented a duty officer system that promotes effective communication of safety issues at Pantex. In addition, PXSO has completed and documented a large number of assessments and shadow assessments that identify substantive issues for corrective action. Assessments performed within the Assistant Manager for Nuclear Engineering organization that address nuclear safety systems have been rigorous and effective in identifying deficient conditions for corrective actions. The assessments are driving improvement in the Pantex ES&H programs. Although some additional improvements are warranted, the PXSO technical qualification program is functioning and all but a few of the PXSO technical staff are appropriately trained and qualified in accordance with applicable requirements.

However, PXSO continues to experience weaknesses in certain aspects of its oversight of ES&H programs at the Pantex Plant in the areas of assessments and issues/corrective action management. PXSO has recently self-identified that previously identified deficiencies in its issues management/corrective action processes had not been fully addressed and is developing additional corrective actions. In addition, PXSO does not have an adequate mechanism in place to plan and conduct PXSO assessments, shadow assessments, and self-assessments to ensure accomplishment (with approved scope, depth, and breadth) within defined periodicities. As a result, PXSO has missed several directive-required assessments. Further, while PXSO has performed some adequate verification reviews of corrective actions, some of the verification reviews have not been sufficient to ensure that corrective actions are rigorous and comprehensive and prevent recurrences. (See Finding #D-3.)

An aspect of NNSA and PXSO oversight that warrants continued management attention is the fragility of the HPFL and fire suppression system riser lead-in underground ductile iron piping. Engineering analysis confirms the ability to meet design fire protection water flow demand with an apparent conservative allowance for a concurrent potential pipe break. The site has made progress in addressing some of the HPFL system vulnerabilities through specific projects, such as selected replacement of parts of the HPFL system piping, and funding to address replacement of riser and lead-in piping from the HPFL system is scheduled for fiscal year 2010. The 2005 NNSA Headquarters Office of the Chief of Defense Nuclear Safety Biennial Nuclear Safety Review of Pantex also indicated that while the PXSO HPFL Vulnerability Assessment, dated August 16, 2005, sufficiently identified vulnerabilities of the HPFL system and provided recommendations to ensure its reliability, it was essential that the specific projects to address HPFL system vulnerabilities "remain a high priority until completed."

B&W Pantex Feedback and Improvement

B&W Pantex has established and is implementing the elements of a contractor assurance system as identified in DOE Order 226.1, *Implementation of DOE Oversight Policy*, in a system description; annual assurance system plans summarizing prior year activities and planned assessment activities; and ISM system policy, program description, and annual plan documents. Assurance processes have been strengthened, and implementation has improved in the past several years. Program, process, and physical condition safety deficiencies are being identified, evaluated, and resolved using a robust, documented issues management

process. Incidents, reportable events, and injuries and illnesses are being documented and investigated, and corrective/preventive actions are being identified and implemented. Internally and externally identified lessons learned are being identified and disseminated. B&W Pantex is using an array of processes as tools to foster and drive continuous improvement in contractor assurance system processes and implementation, including independent review and feedback processes for management assessments, issues management, and critiques and occurrence reports, as well as the application of human performance improvement and HRO techniques and concepts. As discussed below, the elements of an effective feedback and improvement program are in place at the Pantex Plant, but weaknesses in assurance system processes and implementation deficiencies are hindering the effectiveness of these programs.

B&W Pantex has established formal processes for identifying and conducting assessments, and is performing a variety of assessment activities to evaluate safety programs and performance and identify safety deficiencies to drive continuous improvement. These activities include independent assessments, management assessments, workplace surveillances, and a variety of safety-related inspection activities. The assessments of nuclear safety systems have improved since 2005 and were effective in identifying deficiencies that were similar to those identified by this Independent Oversight inspection. Although many inspections, assessments, and reviews are being performed, division self-assessments are not sufficiently tailored to evaluate division-specific activities, processes, risks, and management systems. Some self-assessment activities lack sufficient rigor in addressing the identified scope and purpose and in accurately documenting the results with supporting bases for conclusions. Assessment reports often inadequately categorize and identify process and performance issues. (See Finding #D-4.)

Many safety issues are being effectively managed using the generally robust PER/ESTARS documentation and management tool and the associated issues management procedures and guidance documents. However, implementation is insufficiently rigorous, especially for accurately and comprehensively identifying the extent of condition and causal factors. The bases for apparent causes and apparent causal analyses are not fully supported and documented. As a result, appropriate and comprehensive corrective actions and recurrence controls are not always established. Although management has embraced the application of industry-proven human performance improvement and HRO organization concepts and techniques for the operation of the Pantex Plant, the formal integration and application of these concepts and techniques into investigations and issues management processes and execution remains limited. (See Finding #D-5.)

Events are identified, reported, and investigated, and related issues are resolved in accordance with formal work instructions. Although most events are properly identified, investigated, and managed, as described above, the conduct of causal and extent-of–condition analyses is sometimes insufficiently rigorous. Worker statements and the information gathered during formal critiques of incidents and events are often insufficiently documented for use in subsequent investigation and analysis activities. (See Finding #D-5.)

OSHA-recordable occupational injuries/illnesses and first aid cases are documented, investigated, and reported using formal processes. The OSHA total recordable, restricted duty, and days away injury/illness rates at Pantex are much lower than the DOE complex averages. However, investigations of causes and extent of conditions and the resulting corrective actions are often insufficiently rigorous to identify and establish effective recurrence controls. (See Finding #D-5.)

B&W Pantex has established and implemented a generally adequate program for identifying, developing, disseminating, and applying operating experience data from both external and internal sources. However, some important sources of potential lessons learned are not being formally screened for applicability, and needed action. Effective metrics have not been established to monitor and measure the implementation and

effectiveness of the operating experience program. Additionally, the work instruction insufficiently addresses requirements and process steps in some areas.

B&W Pantex employees have various informal and formal means to communicate and obtain resolution of safety concerns and differing professional opinions. The requirements and processes for these programs are detailed in generally adequate formal work instructions. Many worker concerns regarding physical condition safety issues are effectively resolved in a timely manner through the "No More Surprises" program. Although the programs are in place, investigations and documentation for some employee cases were not sufficiently rigorous.

B&W Pantex feedback and improvement processes at the work-activity level include several mechanisms to solicit continuous feedback and improvement with respect to ongoing work, such as regular walkthroughs by managers and supervisors. For work performed by construction subcontractors, B&W Pantex ES&H and project personnel perform frequent inspections of safety at construction work sites. B&W Pantex has established and is implementing a robust management-supported and worker-implemented behavior-based safety observation program that is identifying and correcting unsafe behaviors and conditions on an individual basis and is effectively addressing broader safety issues as a result of analysis of collected observation data. Although generally adequate, in some cases the processes are not well documented (e.g., the behavior-based observation program lacks formal processes), and lessons learned have not always been applied to identify and correct deficiencies at the activity level. (See Finding #D-5.)

B&W Pantex has established and effectively uses other less formal mechanisms that provide two-way feedback between workers and management that promotes continuous improvement. The President's Safety Council, Joint Company and Union Safety Council, divisional and department safety meetings, Voluntary Protection Program Star Status preparations, and panels such as the Executive Issues Review Board provide ongoing platforms for interactions between workers and management and supervisors to communicate safety concerns, management expectations, and lessons learned.

Overall, B&W Pantex has established and is implementing the required elements of a contractor assurance system, assurance processes have been strengthened, and implementation has improved in the past several years. However, weaknesses in assurance system processes and implementation deficiencies are hindering the effectiveness of these programs in identifying and correcting deficient conditions and issues.

5 Conclusions

NNSA and PXSO have made progress in improving their oversight programs, and many aspects of PXSO oversight are effective. However, PXSO continues to experience weaknesses in certain aspects of its oversight of ES&H programs at the Pantex Plant in the areas of assessments and issues/corrective action management, which have contributed to some deficiencies not being adequately identified, tracked, and resolved in a timely manner.

Throughout this Independent Oversight inspection, B&W Pantex management, supervisors, and workers demonstrated their commitment to performing work safely, and management has shown an understanding of many of the areas where further improvement is needed. Much work at Pantex is rigorously performed to procedures that clearly identify the necessary hazard controls, and workers routinely and consistently follow these requirements. Most hazards at the Pantex Plant are effectively controlled through safety systems, engineered controls, administrative controls, and PPE. B&W Pantex has established and implemented several processes that support continuous improvement, such as independent reviews, management assessments, problem evaluation requests, and critiques, and is working to integrate HRO techniques and concepts into issue evaluation techniques. B&W Pantex has made progress in addressing many of the previous safety findings from the 2005 Independent Oversight inspection, including such areas as refining or developing new processes for exposure assessments, USQs, and nuclear safety calculations/analysis procedures in support of the safety bases.

B&W Pantex management attention will be required to improve some areas. In the Manufacturing and Applied Technology Divisions, worker-safety-level hazards are not fully analyzed and/or documented, although effective controls are well established for most activities. For some maintenance work and construction work performed by the B&W Pantex trades, hazards are not always adequately analyzed and/or controlled. In addition, much work remains to fully address the legacy weaknesses in exposure assessments and the safety bases and design analysis for nuclear safety systems. Although many safety issues are being effectively managed, some assessment processes are not sufficiently focused on worker safety issues, and management systems and some safety issues are not managed with sufficient rigor to accurately and comprehensively identify the extent of condition and casual factors. As a result, appropriate and comprehensive corrective actions and recurrence controls are not always established.

PXSO and Pantex have a good understanding of the remaining weaknesses, but increased focus on making the needed improvements in work control and feedback and improvement is warranted. Particularly important issues for management attention include: developing and implementing a strategic approach to addressing legacy calculation issues that support the safety bases, performing needed exposure assessments, and ensuring that plans for replacing aging HPFL and fire suppression system piping are completed.

6 Ratings

The ratings reflect the current status of the reviewed elements of PXSO and B&W Pantex ES&H programs.

Work Planning and Control – Core Functions #1-4				
ACTIVITY	**CORE FUNCTION RATINGS**			
	Core Function #1 – Define the Scope of Work	**Core Function #2 – Analyze the Hazards**	**Core Function #3 – Develop and Implement Controls**	**Core Function #4 – Perform Work Within Controls**
Manufacturing Division	Effective Performance	Effective Performance	Effective Performance	Effective Performance
Applied Technology Division	Effective Performance	Needs Improvement	Effective Performance	Effective Performance
Maintenance	Effective Performance	Needs Improvement	Needs Improvement	Needs Improvement
Construction Projects	Effective Performance	Effective Performance	Effective Performance	Effective Performance

Essential System Functionality	
Engineering Design and Safety Basis	Needs Improvement
Configuration Management	Effective Performance
Surveillance and Testing	Needs Improvement
Maintenance and Procurement	Effective Performance

Feedback and Continuous Improvement – Core Function #5[1]	
NNSA/PXSO Oversight	Needs Improvement
B&W Pantex Feedback and Improvement	Needs Improvement

Purpose and Definitions of Ratings

The Office of Enforcement and Independent Oversight uses a three-tier rating system that is intended to provide line management with a tool for determining where resources might be applied toward improving ES&H. The system is not intended to provide a relative rating between specific facilities or programs at different sites because of the many differences in missions, hazards, and facility life cycles, and the fact that these reviews use a sampling technique to evaluate management systems and programs. The rating system helps to communicate performance information quickly and simply. The three ratings and their definitions are:

- Effective Performance (Green): Assigned when the system being inspected provides reasonable assurance that the identified protection or program needs are met (overall performance is effective). The element being inspected is normally rated Effective Performance if all applicable standards are met and are effectively implemented. An element is also normally rated Effective Performance if, for all standards that are not met, other systems or compensatory measures exist that provide equivalent protection, or if the impact of failure to fully meet an applicable standard is minimal and does not significantly degrade the protection provided. Line managers are expected to effectively address any specific deficiencies identified.

- Needs Improvement (Yellow): Assigned when the system being inspected only partially meets identified protection or program needs or is not sufficiently mature and robust to provide assurance that the protection or program needs are fully met. The element being inspected is normally rated Needs Improvement if one or more of the applicable standards are not met and are only partially compensated for by other systems, and the resulting deficiencies degrade the effectiveness of the inspected system. Line managers are expected to provide sufficient attention to ensure that identified areas of weakness are effectively addressed through corrective actions and/or ongoing initiatives.

- Significant Weakness (Red): Assigned when the system being inspected does not provide adequate assurance that the identified program needs are met. The element being inspected is normally rated Significant Weakness if one or more of the applicable standards are not met, there are no compensating factors to reduce the impact on system effectiveness, and the resulting deficiencies seriously degrade the effectiveness of the inspected system. Line managers are expected to apply immediate attention, focus, and resources to the deficient program areas.

1 The ratings for NNSA/PXSO oversight and B&W Pantex feedback and improvement consider the Independent Oversight evaluation of the feedback and improvement elements as part of the review of ESF. Specifically, the rating for NNSA/PXSO oversight considers the effectiveness of the PXSO safety system oversight, and the rating for B&W Pantex feedback and improvement considers the review of B&W Pantex's system engineer programs and assessment processes applied to nuclear safety systems.

APPENDIX A
Supplemental Information

A.1 Dates of Review

Planning Visit	March 16-19, 2009
Onsite Inspection Visit	March 30-April 9, 2009
Report Validation and Closeout	April 28-30, 2009

A.2 Review Team Composition

A.2.1 Management

Glenn S. Podonsky, Chief Health, Safety and Security Officer
William Eckroade, Deputy Chief for Operations, Office of Health, Safety and Security
John Boulden, Acting Director, Office of Independent Oversight and Office of Enforcement
Thomas Staker, Director, Office of ES&H Evaluations
Steve Simonson, Director, Office of Emergency Management Oversight
William Miller, Deputy Director, Office of ES&H Evaluations

A.2.2 Quality Review Board

William Eckroade	John Boulden	Steve Simonson	Thomas Staker
Dean Hickman	Robert Nelson	William Sanders	Pete Turcic

A.2.3 Review Team

William Miller, Team Leader

Phil Aiken	Vic Crawford	Larry Denicola	Bob Freeman
Marvin Mielke	Jake Wechselberger	Bob Compton	Al Gibson
Ed Greenman	Joe Lischinsky	Jim Lockridge	Tim Martin
Joe Panchison	Don Prevatte	Ed Stafford	Mario Vigliani

A.2.4 Administrative Support

Laura Crampton
Tom Davis

APPENDIX B
Site-Specific Findings

FINDING STATEMENTS	
C-1	B&W Pantex Manufacturing Division and Applied Technology Division have not established sufficient integrated safety management mechanisms to ensure that industrial safety and industrial health hazards affecting worker safety are fully identified, analyzed, and documented and that task-related worker safety hazards can be effectively communicated to the workers, as required by DOE Policy 450.4, 10 CFR 851, and B&W Pantex institutional procedures.
C-2	B&W Pantex has not fully implemented an industrial hygiene exposure assessment program, including documented hazard assessments of work tasks for all operations, and qualitative and quantitative exposure assessments to meet the requirements of the *Pantex Worker Safety and Health Plan* and 10 CFR 851, *Worker Safety and Health Program*.
C-3	For some maintenance work activities and/or facilities, B&W Pantex has not adequately identified hazards or effectively implemented and/or followed appropriate hazard controls as needed to ensure compliance with 10 CFR 851, *Worker Safety and Health Program*; DOE Policy 450.4, *Safety Management System Policy*; and B&W Pantex institutional procedures and work instructions.
C-4	B&W Pantex line management and support organizations have not ensured that worker safety and environmental hazards associated with construction performed by B&W Pantex trades are fully identified, analyzed, documented, and controlled as required by DOE Policy 450.4, 10 CFR 851, and B&W Pantex institutional procedures.
D-1	NNSA weapons program engineers/scientists and weapons program managers who meet the requirements for inclusion in the technical qualification program are not included in the program as required by DOE Manual 426.1-1A, *Federal Technical Capability Manual*.
D-2	NNSA has not yet approved, issued, or implemented an operational experience/lesson learned program at DOE Headquarters, as required by DOE Order 210.2, *DOE Corporate Operating Experience Program.* (This is a repeat finding.)
D-3	PXSO has not established an effective baseline assessment program that includes an adequate mechanism to plan and conduct PXSO assessments, shadow assessments, and self-assessments that are performed with approved scope, depth, and breadth at defined periodicities, as required by DOE Order 226.1A, *Implementation of DOE Oversight Policy*, and PXSO implementing procedures (i.e., PXSO Policy 226-1 and PXSO Policy 226-2).
D-4	B&W Pantex has not fully implemented an effective management self-assessment program that rigorously evaluates processes, performance, and management systems for protecting worker safety and health as required by DOE Order 226.1A, *Implementation of Department of Energy Oversight Policy*.
D-5	B&W Pantex has not fully implemented an effective program that rigorously trends and evaluates the causes and extent of safety issues related to operational events/incidents, injuries, and assessment activities, and establishes and implements effective corrective actions and recurrence controls as required by DOE Order 226.1A, *Implementation of Department of Energy Oversight Policy*.

FINDING STATEMENTS	
E-1	B&W Pantex safety-related design basis calculations, including legacy and recently-generated calculations, do not always apply the level of rigor and attention to detail commensurate with "sound engineering/scientific principles" as required by 10 CFR 830, Subpart A, Criterion 6.
E-2	Some B&W Pantex technical safety requirement surveillance testing and inspections for the high pressure fire loop, fire suppression systems, and blast valves did not fully demonstrate the systems' functional capabilities, as defined in the Pantex Safety Analysis Reports.
F-1	B&W Pantex has not effectively captured some hazardous chemicals in the hazard communication chemical list; ensured that all secondary containers, except for immediate use, are appropriately labeled with the identity of the hazardous chemical and appropriate warnings; and ensured that chemicals are properly stored, as required by 10 CFR 851 (which invokes 29 CFR 1910.101 and 29 CFR 1910.1200).