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

Hanford Site Waste Treatment and Immobilization Plant

February 2009

Office of Environment, Safety and Health Evaluations
Office of Independent Oversight
Office of Health, Safety and Security
Office of the Secretary of Energy

HSS
Office of Health, Safety and Security

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Abbreviations Used in This Report

AISC	*American Institute of Steel Construction*
ANSI	*Formerly American National Standards Institute, now ANSI International*
ASME	*American Society of Mechanical Engineers*
BNI	*Bechtel National, Incorporated*
CAIRS	*Computerized Accident/Incident Reporting System*
CFR	*Code of Federal Regulations*
DOE	*U.S. Department of Energy*
EM	*DOE Office of Environmental Management*
ES&H	*Environment, Safety, and Health*
FTCP	*Federal Technical Capabilities Program*
HSS	*DOE Office of Health, Safety and Security*
HVAC	*Heating, Ventilation, and Air Conditioning*
ISM	*Integrated Safety Management*
ITS	*Important-to-Safety*
JHA	*Job Hazards Analysis*
NQA	*Nuclear Quality Assurance*
ORP	*Office of River Protection*
PT	*Pretreatment*
QA	*Quality Assurance*
QL	*Quality Level*
SSC	*Structures, Systems, and Components*
STARRT	*Safety Task Analysis Risk Reduction Talk*
WTP	*Waste Treatment and Immobilization Plant*

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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 (HSS), inspected environment, safety, and health (ES&H) programs at the DOE Hanford Site Waste Treatment and Immobilization Plant (WTP) during October through November 2008. HSS reports directly to the Office of the Secretary of Energy, and the ES&H inspection was performed by Independent Oversight's Office of Environment, Safety and Health Evaluations.

At DOE Headquarters, the DOE Office of Environmental Management (EM) has primary line management responsibility for the WTP project. As such, EM has overall Headquarters responsibility for programmatic direction, funding of activities, and ES&H at the site. At the site level, line management responsibility for the WTP falls under the Manager of the Office of River Protection (ORP). Within ORP, the Office of the Assistant Manager for the WTP project is responsible for WTP activities with the support of the ORP Office of the Assistant Manager for Environmental Safety and Quality and the ORP Office of the Assistant Manager for Engineering and Nuclear Safety. The quality assurance (QA) team lead, within the Environmental Safety and Quality organization, and the Director of the WTP Construction Oversight and Assurance Division of the WTP project have significant responsibilities for oversight of the WTP and also report directly to the ORP Manager. Site construction and maintenance activities at WTP are managed by Bechtel National, Incorporated (BNI) under contract to DOE.

The WTP is currently in the design and construction phase and has no operating facilities or nuclear materials. WTP is an essential aspect of the overall EM and ORP approach to the cleanup of high-level tank waste at the Hanford Site. When complete, WTP will use vitrification technology to immobilize chemical and radioactive waste in a sturdy form of glass to isolate it from the environment. The WTP will be an industrial complex of facilities for separating and vitrifying millions of gallons of radioactive and chemical waste stored at the Hanford Site. The five major components of the WTP will be the Pretreatment (PT) facility for separating the waste, the High Level Waste and Low Activity Waste facilities where the waste will be immobilized in glass, the Analytical Laboratory for testing the quality of the glass, and the Balance of Facilities which will comprise over 20 various support facilities.

Aerial view of the WTP primary facilities

Current WTP activities involve various potential hazards that need to be effectively controlled, primarily various industrial hazards associated with construction and maintenance operations (e.g., hoisting and rigging heavy loads, electrical equipment, hazardous chemicals, and noise). When complete, WTP will process large quantities of radioactive materials and

will consist of two category 2 nuclear facilities, two category 3 nuclear facilities, and several non-nuclear, balance-of-plant facilities.

The purpose of this Independent Oversight inspection was to assess the effectiveness of ES&H programs at WTP, as implemented by BNI under the direction of ORP and EM. Independent Oversight evaluated a sample of activities at WTP that provide perspectives on the safety of current construction and maintenance activities and supporting activities at WTP, including:

- Implementation of the core functions of integrated safety management (ISM) for selected construction and maintenance activities at the WTP project, focusing on work planning and control systems at the activity level.

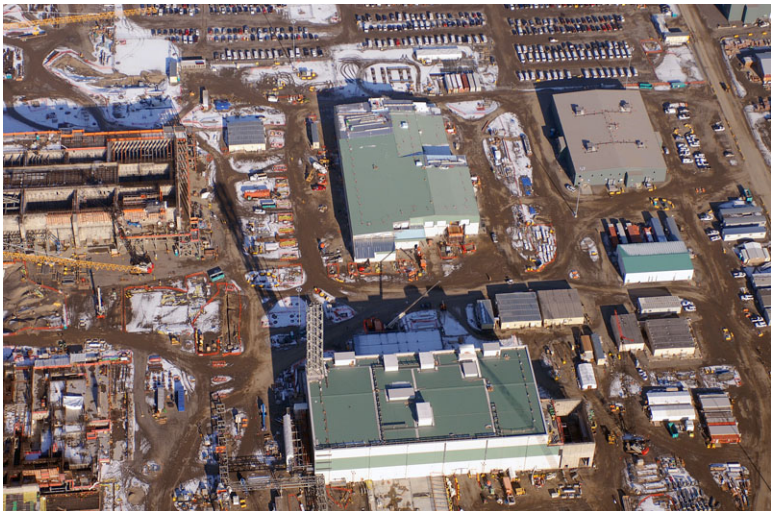
- A sample of activities at WTP that provide perspectives on the effectiveness of current processes for ensuring that nuclear safety structures, systems, and components (SSCs) are designed and installed in a manner that meets applicable requirements for facility design, construction, and QA, and will be able to perform their functions when the facility becomes operational. Specifically, the Independent Oversight team focused on a few selected safety SSCs: the important-to-safety (ITS) reinforced concrete and steel structures and the ITS ventilation and service air systems for the WTP PT facility, which is currently in the design and construction phase.

- ORP's and BNI's effectiveness in managing and implementing selected aspects of the ES&H program that Independent Oversight has identified as focus areas, including injury and illness reporting 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 DOE (EM and ORP) and BNI feedback and continuous improvement systems. Specifically, Independent Oversight evaluated EM and ORP institutional programs and ORP's oversight of nuclear safety design and construction. Independent Oversight also evaluated BNI's feedback and improvement processes as applied to the systems and processes reviewed by Independent Oversight on this inspection, specifically the selected nuclear safety systems, and to the activity-level work planning and control for construction activities. The review of feedback and improvement systems also constitutes the Independent Oversight 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.

WTP personnel are aware of previous deficiencies in certain aspects of QA and procurement with regard to black cell vessels and piping (i.e., inaccessible or difficult to reach after the facility is operational because of high radiation levels). These deficiencies have been the subject of an enforcement action by the HSS Office of Enforcement and are currently the subject of an ongoing enforcement investigation. Because these deficiencies are being evaluated by another HSS organization, Independent Oversight focused on systems other than black cell piping. Further, BNI has developed and is implementing a number of important corrective actions, such as improvements in procurement processes, QA, and assessments (e.g., the broad-based review), in response to deficiencies identified by the Office of Enforcement and other internal and external (e.g., Defense Nuclear Facilities Safety Board and DOE Office of Enforcement) reviews of nuclear safety processes at WTP. On this inspection, Independent Oversight examined the effectiveness of these revised processes as applied to the systems selected for review.

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 Independent Oversight's conclusions regarding the overall effectiveness of ORP's and BNI's management of ES&H programs, and Section 6 presents the ratings assigned during this inspection. Appendix A provides supplemental information, including team composition.



Aerial view of the WTP facilities

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 the DOE and contractor management in a separate document.

In accordance with DOE Order 470.2B, *Independent Oversight and Performance Assurance Program*, EM 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 in Section 3 provide a management-level summary of the findings; these weaknesses do not need to be addressed separately in the EM 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 certain aspects of nuclear safety.

Several good work practices were evident in the WTP construction areas. Although the overall work control process is not sufficiently defined and rigorous, some individual elements are effectively implemented. Barricades were established around work areas, and housekeeping in most construction work areas was good. Hard hats, safety glasses, safety vests, and gloves were consistently worn, and, for observed tasks, work activities were performed in accordance with requirements for excavation and fall protection. Fall protection equipment, cranes/hoisting equipment, power tools, and ladders were inspected regularly, were within their inspection intervals, and were in good condition. Scaffolding was used extensively at WTP, and scaffolds observed were well constructed and met all applicable scaffold erection and inspection requirements. Safety assurance representatives were actively engaged in safety oversight. Construction craft and supervision routinely attend daily bend and stretch activities where safety topics, lessons learned, and the day's activities are discussed. Processes used daily by BNI to ensure readiness to perform work are comprehensive, well attended, and include plan-of-the-day schedules, morning meetings, crew briefings, and pre-job briefs. One aspect of the BNI plan-of-the-day meeting is noteworthy. Specifically, BNI issues a daily plant layout drawing that identifies the location of work activities; the drawings are logically arranged and denote the tasks and physical locations where each craft, including subcontractors, will be working during that day and indicate locations of hot work areas, barricades, cranes, and lifts, etc.

BNI has established a comprehensive set of project plans and procedures that implements the nuclear safety requirements of the WTP Configuration Management Plan. The plan appropriately addresses key elements of configuration management, including configuration identification, design change control, design process, design verification and independent review, and tracking and document control. The plan is based on International Standards Organization guidelines and was recently strengthened to ensure full conformance to ANSI International standard ANSI EIA-649, *National Consensus Standard for Configuration Management*, and DOE Order 413.3, *Program and Project Management for the Acquisition of Capital Assets*, and the operational configuration management requirements of Nuclear Quality Assurance (NQA)-1 2000, *Requirements for Quality Assurance Programs for Nuclear Facilities*, in accordance with the BNI QA Manual and DOE Order 413.3. WTP has established adequate mechanisms that define the methods the Engineering organization uses to maintain and implement the requirements of the plan. Updates and improvements in the Configuration Management Plan and processes were evident, in particular in addressing the shifting focus of the WTP project from design and construction to commissioning.

BNI has established robust and comprehensive commercial grade dedication processes for the procurement of ITS items and services. The process is applied to suppliers/vendors that do not implement an American Society of Mechanical Engineers (ASME) NQA-1 compliant QA program. Commercial grade

dedication procurement documents that were reviewed by Independent Oversight for major Q List C5 ventilation system components appropriately identified the critical characteristics for design and acceptance, and established appropriate requirements for verification activities to ensure that the supplied component would have those characteristics.

Structural steel at the High Level Waste facility

High-quality construction was evident in concrete placements for the nuclear safety structures observed by the Independent Oversight team. Most BNI craft workers and quality control inspectors have significant prior nuclear construction experience and understand their responsibilities and the expectations for strict compliance with drawings and specifications. Mutual respect and good communications were evident between the craft workers and inspectors. For the work reviewed by Independent Oversight, the materials used for the manufacture of concrete and the concrete produced by the onsite concrete batch plants met or exceeded specifications; adequate controls were applied to ensure concrete reinforcing steel (rebar) and embedments, such as anchor bolts and embedded plates, were installed in accordance with design drawing and specifications; and in-process pre-placement testing of the concrete was adequate and was properly verified by BNI quality control inspectors.

Although much work remains, BNI and ORP are devoting significant effort to improving their feedback and improvement systems. BNI has taken numerous corrective actions and initiatives in recent months to improve feedback and improvement for its nuclear safety programs in such areas as management and independent assessments, lessons learned, trend analysis, and performance indicators. BNI management has placed managers and subject matter experts with appropriate nuclear and technical experience and qualifications in positions to effect substantial change in feedback and improvement programs. Recently, established entities, such as the Engineering Corrective Action Review Board and the Performance Improvement Review Board, are engaging managers in the development and "hands on" monitoring of the management of safety and quality issues and mentoring of responsible staff members in issue analysis and action plan development. BNI, with participation from ORP, is implementing a major effort, called the broad-based review, to identify and correct deficiencies in the flowdown of requirements to the system design.

Similarly, ORP has undertaken significant initiatives to enhance its oversight of nuclear safety design and construction at WTP. ORP is performing more frequent assessments of BNI construction and engineering design programs, and the assessments are more rigorous and are identifying some deficient conditions. The recent ORP ISM re-verification review of BNI is an example of a thorough assessment that identified several significant weaknesses in BNI's work planning and control processes, which were validated by this Independent Oversight inspection, and that demonstrated the enhancements ORP has made to its assessment capabilities. ORP has also strengthened its capabilities through the addition of new staff and realigned its organization to provide increasing emphasis on safety, quality, and integrated oversight.

3 Weaknesses

Although some aspects of ES&H are effective, there are weaknesses in WTP ES&H programs in a number of areas, most significantly in the implementation of site work control and in a few areas of nuclear safety.

The BNI hazard analysis process does not sufficiently ensure that hazards associated with activity-level construction work are systematically identified, analyzed, and controlled, and management and supervision have not strictly enforced compliance with established processes related to activity-level hazard analysis and controls. The procedures for identification and analyses of construction work hazards at WTP have been modified several times during the past few years, which has contributed to insufficient understanding of the intended process among supervision and workers. Although several BNI procedures describe mechanisms for conducting hazard analyses for construction work activities, collectively, these BNI hazard analysis processes have not been adequate in systematically identifying and analyzing hazards for all construction work activities as required by 10 CFR 851 and DOE Policy 450.4. Established controls have not always been sufficiently implemented in accordance with institutional requirements in a number of areas, including job hazard analyses (JHAs), Safety Task Analysis Risk Reduction Talk (STARRT) application, hazardous work packages, hot work permits, and electrical and chemical procedures. In addition, requirements that were clearly stated in JHAs, work instructions, and permits were not always followed or enforced. The complexity and lack of cohesiveness of BNI hazard analysis processes has also led to worker frustration and work-arounds in some cases. The issues with hazard analysis and controls have been previously documented in several prior work control assessments including the 2008 ORP ISM re-verification. BNI feedback and improvement processes have not been timely in identifying and correcting identified deficiencies in the work planning and control processes. (See Findings #C-1 and #C-2.)

Two technical weaknesses in engineering design and safety bases, which have generic implications for the WTP facility, were identified. The first weakness concerns the vulnerabilities to the design basis ashfall event that could impact the ITS service air system, as well as other ITS systems, such as diesel generators and the control room heating, ventilation, and air conditioning (HVAC) chillers. These vulnerabilities exist as a result of a number of technical/design process weaknesses in characterizing the ashfall event parameters, establishing equipment environmental qualification requirements, and developing practicable event response strategies and equipment designs to ensure that facility ITS SSCs can reliably perform their safety functions for this event. The second weakness is that the current BNI single failure analysis of safety class SSCs was not effective in demonstrating compliance with the requirements established through the preliminary documented safety analysis and the safety requirements document. The WTP Project's ISM process, which is intended to detect such technical weaknesses in safety equipment, may have eventually detected the above-described weaknesses; however, the engineering processes and ISM reviews are not being accomplished in a timely manner that ensures technical issues have been sufficiently evaluated during the design phase, resulting

in the potential for a need for significant redesign of certain systems. Following the Independent Oversight inspection, WTP had knowledgeable individuals review the application of the single failure criterion to certain components of the safety class SSCs. These recent actions are a good first step in providing a technical basis for demonstrating conformance to the single failure criterion, but the new information needs to be evaluated and incorporated into formal safety bases documents and subject to the formal quality review, quality assurance, and DOE approval processes. (See Finding #F-1.)

Worker welds a piece of steel beam in the Low Activity Waste facility hot cell area

Several deficiencies were identified in the storage, control, and use of structural steel bolts issued for construction. BNI procedural requirements for storage of temporary bolts were not always met. Temporary bolts were not marked to prevent co-mingling with permanent bolts, and some Quality Level (QL) bolts, nuts, and washers were stored in conditions that did not meet requirements for protection against environmental factors (e.g., bolts with visible rust were available for use). Proper bolt storage is important because the use of bolts that are dirty, rusty, or otherwise altered may not provide proper tension when tightened. Quality control inspectors do not always observe joint assembly and thus cannot effectively inspect the cleanliness of joint contact surfaces as required by BNI procedures. (See Finding #F-2.)

BNI's processes and performance for the identification and management of nuclear safety and quality issues lack sufficient rigor in documenting, analyzing, and establishing effective recurrence controls. Although improvements are underway in many aspects of feedback and improvement, BNI independent assessments lack sufficient focus on evaluating the quality of the implementation of processes, and the basis for assessment conclusions are not always adequately documented. On condition reports, initial statements are often insufficient to describe the adverse conditions. Procedures for nonconforming materials do not require or promote the determination and documentation of causes or extent of condition. Deficiency report procedures do not require documentation of the basis for cause code determinations. The basis for specified apparent causes and cause code selections for corrective action reports are not always adequately documented or are incomplete or inappropriate. Action plans do not always address or adequately provide recurrence controls for all identified causal factors. (See Finding #F-3.)

ORP oversight processes have not consistently driven improvements in WTP performance. Currently, some ORP oversight processes that are undergoing revision are not yet functioning effectively. Weaknesses in issues/corrective action management have contributed to instances where ORP has identified deficient conditions but has not been effective in ensuring that they were adequately addressed by the contractor in a timely manner. ORP has not performed adequate assessments of important ISM programs, such as the contractor assurance system and oversight of contractor injury & illness reporting. Further, ORP oversight of nuclear safety design was not effective in ensuring that BNI adequately addressed the ashfall event and single point failures in a timely manner. ORP has recently identified similar systemic deficiencies in work planning and controls at WTP, but did not ensure that BNI took timely corrective actions and compensatory measures.

4 Results

The following sections provide a summary assessment of the ORP and BNI activities that Independent Oversight evaluated during this inspection.

4.1 Work Planning and Control

The Independent Oversight review of the ISM core functions focused on ES&H programs and work planning and control systems as applied to construction work activities at WTP. Work activities and work planning were reviewed, including construction activities at each of the four main facilities being erected at WTP as well as maintenance operations associated with the construction of these facilities.

Construction work scopes are defined through various mechanisms including bulk installation list work packages, engineering drawings, work instructions, and verbal direction. Day-to-day construction tasks are further defined and communicated to the craft by supervision and entered daily on the STARRT cards. These mechanisms are generally adequate to define construction work scopes. However, in some cases, written work definitions provided on the STARRT cards were not sufficient to ensure all hazards and controls were identified, communicated to workers, and understood. (See Finding #C-1.)

Several BNI procedures describe mechanisms for conducting hazard analyses for construction work activities. Some aspects of these mechanisms have been effective, such as elements of the Industrial Hygiene Exposure Assessment Strategy. However, in a number of cases, these processes have not been effective in systematically identifying and analyzing hazards for all construction work activities as required by 10 CFR 851 and DOE Policy 450.4. While STARRT cards are used by supervisors and all workers and serve as good reminders for supervisors and workers to review the hazards and controls associated with their work, application of the STARRT card process requires more rigor to ensure that requirements for additional analysis (beyond the initial analysis by supervisors and workers) are sufficiently defined. Hazards analyses for work instructions are not always accurate or linked to governing JHAs, and some work instructions were missing key hazards and requisite controls to be implemented. Some hazards present during observed work activities were not sufficiently analyzed to ensure that appropriate controls have been established and implemented. Identification and analyses of construction work hazards at WTP relied heavily on supervisor and worker experience and training, but BNI's process for determining when additional analysis beyond skill of the craft is necessary was not adequately documented. Furthermore, the complexity of the BNI hazard analysis processes led to worker frustration and work-arounds in some cases. These weaknesses reflected insufficient understanding of and/or compliance with established hazard control processes. Similar weaknesses have been identified by previous assessments, but the development of effective corrective actions has not been timely. The weaknesses in the hazard analysis processes at WTP resulted in situations in which risks to workers had not

been sufficiently identified and analyzed to ensure that workers can safely perform the work, as required by 10 CFR 851 and the *WTP Safety and Health Program*. However, since the onsite phase of the Independent Oversight inspection, BNI has designed and is implementing an aggressive set of compensatory measures that provide for increased management and subject matter expert involvement in hazard analysis and that reduce the risks to workers. (See Finding #C-1.)

BNI uses a variety of engineering and administrative controls, coupled with personal protective equipment, to mitigate hazards for construction work activities. Some controls, such as noise protection boundaries, scaffolds, and training, are well established and extensive. BNI workers are generally knowledgeable of and, in most cases, comply with the standard industrial controls (safety glasses, safety shoes, hard hats, work gloves, and fall protection). Many aspects of observed work were performed in accordance with established controls.

However, there were weaknesses in the development and/or implementation of a variety of safety controls in accordance with institutional requirements in JHAs, STARRT cards, hazardous work packages, hot work permits, and electrical safety procedures. In a few cases, institutional requirements for specifying hazard controls were lacking. For the work activities where requirements and controls had been properly established, there were several examples in which BNI and/or subcontractors did not properly adhere to and/or apply the defined safety controls. In some cases, workers are not following WTP procedures; BNI is conducting causal analysis to determine the causes and to identify suitable corrective actions and recurrence controls. These weaknesses reflect inadequacies in the safety culture expectations and inadequate enforcement of ES&H requirements at WTP. Similar weaknesses have been identified by previous assessments but have not been adequately addressed. (See Finding #C-2.)

Overall, some elements of ES&H programs at WTP are effective for many hazards and construction work. However, there are systemic weaknesses in work control processes and their application, and workers and supervisors did not always rigorously and strictly adhere to controls and/or correct the deficiencies. The systemic weaknesses in the work planning and control process were identified on a recent ORP ISM re-verification review and confirmed by this Independent Oversight inspection.[1] BNI's data shows improvements in injury and illness rates at WTP in the past two years such that BNI injury and illness rates are now at or near DOE averages for comparable work. However, WTP continues to experience reportable events and near misses (e.g., recent reportable events involving violations of lockout/tagout and hazardous energy control requirements, and events that could have caused injuries to workers). The BNI Corrective Action Plan apparent causal analysis for the Integrated Safety Management System Re-Verification (dated November 26, 2008) also supports a need for the development of new work control processes. Since the onsite phase of the Independent Oversight inspection, BNI has applied increased management attention, focus, and resources to address the work control and hazard analysis processes at WTP. BNI actions include developing corrective actions to address the deficiencies identified by the ORP re-verification review and the Independent Oversight inspection, and developing and implementing compensatory measures that will remain in place until the corrective actions are implemented and verified to be effective.

[1] At the time of the Independent Oversight inspection, BNI was working on the causal analyses of the ORP issues identified in the ORP Integrated Safety Management System Re-Verification Report. As a result of the ORP issues, BNI implemented some additional controls after the re-verification review and was working on other controls. However, the majority of work activities reviewed by the Independent Oversight team were not significantly affected by the additional controls. Therefore, for most types of work activities, Independent Oversight reviewed the same work control processes as ORP, and the Independent Oversight review confirms the deficiencies identified by ORP.

4.2 Nuclear Safety

Independent Oversight's nuclear safety team focused primarily on the WTP PT facility's ITS reinforced concrete and structural steel and the ITS C5 ventilation and service air systems, which are being designed and constructed. In reviewing these systems, Independent Oversight evaluated the following areas: engineering design and safety basis, configuration management, procurement and material management (including storage and preservation maintenance), and construction quality. Independent Oversight also examined selected aspects of BNI feedback and improvement processes and ORP's oversight of WTP design and construction as applied to nuclear safety (see Section 4.4).

Engineering Design and Safety Basis. A full complement of engineering procedures has been developed that, for the most part, adequately ensures the required control and quality of engineering activities and products, including changes. The C5 ventilation system is appropriately designed to fully perform its design basis safety functions. However, two specific hardware design concerns and two facility-wide generic concerns were identified in the ITS service air system. The specific design concerns relate to the air accumulator safety relief valve capacity and air receiver sizing calculation. The two generic design weaknesses that impact the ITS service air system are: (1) the system's vulnerability, in its present design stage, to the design basis ashfall event; and (2) the vulnerability to single failure as a result of the single failure criteria not having been applied for ITS SSCs in accordance with the applicable requirements. The vulnerability to the ashfall event also applies to other ITS systems, such as the diesel generators and the control room HVAC chillers, and single failure vulnerabilities potentially extend to other safety class SSCs. WTP actions following the Independent Oversight inspection (i.e., reviews of the application of the single failure criterion for certain components) are appropriate first steps in providing a technical basis for demonstrating conformance with the single failure criterion. Any such new information needs to be evaluated and incorporated into formal safety bases documents and subject to the formal quality review, quality assurance, and DOE approval processes. (See Finding #F-1.)

Configuration Management. WTP has established a comprehensive set of project plans and procedures that implement the requirements of the WTP configuration management program. The Design Criteria Database is an effective mechanism to identify and capture design criteria and constraints from source documents in order to facilitate appropriate selection and design of SSCs and the development of relevant design documents. WTP is making progress in updating and improving the quality and level of detail of system description documents. With few exceptions, selected drawings and datasheets reviewed for the PT facility ITS structures and the C5 ventilation system were technically accurate and up to date. Selected safety evaluations of changes were performed in accordance with applicable procedures. While the prescribed numerical criteria to judge the safety significance of a design change requiring an authorization basis amendment request for DOE approval are inappropriate, ORP and BNI are addressing this weakness. Reviewed authorization basis amendment requests were appropriately incorporated into the Design Criteria Database and flowed down to applicable design documents for implementation. WTP has established adequate processes to ensure project personnel are adequately trained and qualified in configuration management principles and requirements. WTP has established several mechanisms for use in monitoring and evaluating the effectiveness of certain aspects of configuration management tools, processes, and procedures, and management assessments performed by the configuration management group were effective in driving program improvements.

Procurement and Material Management. The BNI procurement and material management procedures and practices for QL and Commercial Material materials and services reviewed by Independent Oversight appropriately implement applicable requirements. Many procurement procedures were recently revised as

a result of corrective actions for internal and external assessments and investigations. The current processes for procurement of QL components are comprehensive and detailed. Interviewed program managers and senior staff are experienced and knowledgeable, and notable effort is being expended in engineering and safety requirement change control and in coordination between BNI organizations. The procurement documents reviewed were consistent with associated design documents and the requirements of procurement procedures. BNI has established robust and comprehensive commercial grade dedication processes for the procurement of QL materials and services from suppliers/vendors that do not implement an ASME NQA-1 compliant QA program. The BNI suspect and counterfeit item prevention program meets the requirements of DOE Order 414.1C and is appropriately defined in their QA Manual and comprehensively detailed in their "Control of Suspect/Counterfeit Items" procedure. Receipt inspection activities for QL items are performed effectively and in accordance with the requirements of the WTP QA Manual. In most cases, storage of QL items is effectively performed in accordance with the requirements of the WTP QA Manual, and maintenance activities to ensure preservation of installed and in-storage QL items are being effectively developed, scheduled, and performed.

Construction Quality. Appropriate controls have been established to ensure the quality of construction, and the level of quality achieved to date has been adequate. Appropriate industry standards have been adopted, and applicable construction requirements have been incorporated into BNI procedures and processes. Satisfactory completion of concrete and structural steel work is verified by craft management, field engineers, and quality control personnel in accordance with established processes. Concrete and steel structures inspected by the Independent Oversight team were installed in accordance with design drawings. However, Independent Oversight identified several instances of non-compliance with applicable BNI procedures and industry standards with respect to the storage, control, and use of steel bolts used for structural steel erection. Craft work and quality control inspections (with the exception of issues related to bolts) were properly performed. Construction records required by procedures were properly maintained and were adequate to demonstrate compliance with design requirements. (See Finding #F-2.)

4.3 Focus Areas

Worker Rights. Communication of workers' rights and responsibilities is an important aspect of 10 CFR 851, *Worker Safety and Health Program*. Independent Oversight evaluated the mechanism(s) used by contractors to communicate employee rights and responsibilities under 10 CFR 851 and the degree to which workers and first line supervisors understand those rights and responsibilities.

BNI's *WTP Worker Safety and Health Program* and associated lower-tier documents, for the most part, adequately set expectations and management responsibilities for the establishment and communication of worker rights and responsibilities and associated training requirements. The Hanford General Employee Training and supplemental training on worker rights adequately cover 10 CFR 851 worker rights and responsibilities. The WTP foremen and workers who were interviewed understood their basic rights (e.g., to stop work for a safety concern). However, some additional improvements in communication of worker rights are warranted. Although workers were aware of their rights, many were not aware that their rights have a basis in a Federal regulation (i.e., 10 CFR 851). Also, while the DOE "IT'S THE LAW" poster was displayed on a few official bulletin boards, it was not displayed in other areas routinely used by workers (e.g., lunch rooms, break areas).

Injury and Illness Reporting. ORP has implemented suitable procedures to identify and report work-related injuries and illnesses incurred by Federal employees. Controls are in place to ensure occupational injuries and illnesses experienced by ORP employees are evaluated and reported.

BNI has established procedures for recording and reporting occupational injuries and illnesses to employees and subcontractors. Most of these procedures allow for the timely classification and reporting of occupational injuries and illnesses as required by DOE Manual 232.1-1A. BNI's local computer system, Safety Data System, is used to collect information on injury cases and other reporting requirements, including information for most data fields reported to DOE through the DOE-wide Computerized Accident/Incident Reporting System (CAIRS). All 2007 cases classified by BNI and reported to CAIRS were included on the Log of Work-Related Injuries and Illnesses (Occupational Safety and Health Administration Form 300) for the time period.

However, there are weaknesses in the BNI processes and performance of injury and illness investigation and reporting. The procedure is not fully effective in ensuring that 29 CFR 1904 requirements are followed properly because some of the requirements that are restated in the BNI procedure are not identical to the rule (e.g., definitions of days away from work and days of job restriction or transfer). Several of the case files reviewed did not include adequate documentation to support classification decisions. BNI was not effective in ensuring that all recordable occupational injuries and illnesses were reported to DOE. Independent Oversight reviewed documentation for 11 percent (108) of the 669 cases reviewed by BNI during the first ten months of 2008. Of these 108 cases, 35 of the case files were in the process of being reorganized and thus did not include complete documentation; the other 73 cases were complete and would be expected to include complete documentation in support of classification decisions. However, potential classification errors were identified in 23 of the 73 fully documented cases. Of these 23 cases, 15 errors were resolved when supplemental information was provided or BNI agreed with the discrepancy identified by the Independent Oversight team. BNI plans to further investigate two additional cases that were classified as non-occupational and has tentatively agreed to record these two cases. Eight percent (6 cases) of the 73 cases were not classified in accordance with the intent of the requirements in 29 CFR 1904. Some work-related cases were incorrectly classified as non-occupational (both recordable and non-recordable cases).

4.4 Feedback and Improvement

DOE Oversight. The review of DOE oversight included a review of EM and ORP institutional processes and focused review of ORP oversight of design and construction of nuclear safety systems and structures.

EM has made significant progress in establishing a technical qualification program that meets most of the requirements of DOE Manual 426.1-1A, *Federal Technical Capabilities Program (FTCP) Manual*. While additional work is needed in such areas as individual development plans and status reporting, EM has a good understanding of the status and needed efforts. Within EM, the Office of Operations Oversight has made progress in developing procedures for oversight and self-assessments. Office of Operations Oversight teams have conducted assessments at various EM sites, and EM Headquarters maintains good operational awareness of field activities through mature and effective processes (e.g., daily review of occurrence reporting, and EM monthly safety summary reports).

Independent Oversight's review of ORP feedback and improvement processes considered the current efforts to significantly increase staffing levels and re-establish a set of documented procedures to govern ORP management processes. The current management team has performed various self-assessments to identify the extent of weaknesses in their oversight processes. In addition, ORP and BNI have been engaged in contract negotiations for about one year, resulting in a situation where ORP does not have some important contract management tools for driving contractor performance improvements (e.g., Contract Management Plan and Performance Evaluation Plan).

Some aspects of the current ORP feedback and improvement processes are adequately defined and implemented. The Facility Representative program is functioning adequately and provides valuable data about the status of WTP nuclear safety and industrial safety programs for senior management consideration. ORP has established and implemented appropriate processes for construction, and site inspectors have appropriate technical experience and national certifications in several inspection areas. The ORP operational awareness process is maturing and is providing data for trending purposes and to support the monthly interface meetings with site contractors. Most aspects of the ORP Federal Employee Occupational Safety and Health program and employee concerns program are adequate.

While ORP has made several improvements and additional improvements are ongoing, some of the current programs contain weaknesses that reduce ORP's effectiveness in driving improvements in contractor performance. While assessments have improved in the past year, some assessment planning, reporting, and closure processes are not implemented in accordance with ORP procedures. Some important areas (e.g., contractor assurance system, and contractor injury and illness reporting) have not been assessed with sufficient rigor. In some cases, deficiencies identified by ORP were not addressed by BNI because the deficiencies were not correctly categorized and thus did not result in findings that prompt BNI to develop corrective actions. ORP has previously identified that the ORP issues/corrective action management process does not meet some DOE requirements and that there are weaknesses in such areas as causal analysis, effectiveness reviews, and the application of non-cited findings. The efforts to rapidly add new staff present challenges to the technical qualification program that warrant continued ORP management attention, and the current program does not ensure that ORP personnel are qualified for their position or have a defined path to achieve the requisite qualifications. Although the technical qualification program warrants management attention, ORP efforts to hire many well-qualified professional staff members have significantly improved the quality of its staff and the capability to perform DOE line management oversight activities. Also, ORP is developing, but has not fully implemented, an operational experience/lessons learned program. (See Findings #D-1 and #D-2.)

Independent Oversight reviewed two separate aspects of ORP oversight of nuclear safety: construction and design. The ORP construction oversight program is adequately defined and effectively performed. Activities are adequately described in recently developed work instructions. Surveillances and operational awareness were technically adequate and identified numerous findings and observations, and assessments of construction that were reviewed were also adequately planned and performed and are improving in overall quality.

Based on a limited sample, ORP oversight of design has improved but has not been sufficiently effective in some areas. ORP identified safety equipment design concerns related to the design basis ashfall event with notification to the contractor as far back as 2001. This issue has been subsequently tracked by ORP as assessment follow-up items and conditions of acceptance, demonstrating that ORP has maintained awareness of this concern. However, ORP's review of the ashfall concerns and BNI corrective actions did not ensure that the design basis for the event was adequately developed and translated into appropriate strategies and equipment design requirements in a coordinated and integrated manner. Also, ORP's oversight of BNI's application of single failure criteria in the designs of safety SSCs has not been sufficiently effective to ensure that BNI meets applicable requirements.

Over the past year, ORP has implemented initiatives to enhance its oversight and has realigned its organizational structure to provide increased emphasis on safety, quality, and full integration of oversight. More numerous and improved assessments of BNI construction and engineering programs are being performed. While the processes and performance of ORP's oversight of engineering and nuclear safety reviewed by Independent Oversight are improving , ORP faces continuing challenges in providing effective oversight due to the large numbers of new staff members who must be trained and must gain WTP site-specific oversight experience.

BNI Feedback and Improvement. The Independent Oversight review of BNI feedback and improvement evaluated two selected elements: (1) activity-level feedback systems as applied to construction activities, and (2) application of selected feedback and improvement processes to nuclear safety systems, with a focus on the nuclear safety systems that were reviewed by Independent Oversight.

Several mechanisms at the work activity level exist to solicit continuous feedback and improvement with respect to ongoing work. However, these processes are in some cases not effectively implemented. The Independent Oversight team observed several instances where feedback and improvement mechanisms were not effectively implemented in areas of STARRT Cards, Work Closure Feedback forms, safety walkdowns, and the project issues evaluating reporting process. (See Finding #C-2.)

For nuclear safety systems, BNI has established and implemented effective processes for assessment, issues management, and lessons learned for nuclear safety and quality. Although there were weaknesses and deficiencies in the processes and performance for these feedback and improvement elements, management has recognized most of these shortcomings and has initiated or taken actions to address them, including hiring additional subject matter experts and strengthening processes. Assessments are not sufficiently focused on performance and need to better support conclusions, and the management of safety and quality issues is not rigorously documented and analyzed to ensure that controls to prevent recurrence are effective. Application information and metrics are not sufficiently provided to demonstrate the effectiveness of the lessons learned program. However, senior management and Engineering and QA organization managers are actively engaged in monitoring and improving safety and quality processes and performance. (See Finding #F-3.)

Equipment installation activities

5 Conclusions

In the area of worker safety, the BNI work control process has a number of process and implementation deficiencies relative to the requirements of 10 CFR 851, the DOE ISM policy, and the site-specific *WTP Worker Safety and Health Program*. The results of this review confirm the conclusions of a recent ORP assessment that indicated the BNI work control process was not effectively designed and implemented. After the onsite phase of the Independent Oversight inspection, BNI developed and/or refined corrective actions for the weaknesses identified by ORP and the similar weaknesses identified by Independent Oversight. In addition, BNI developed a set of compensatory measures. For example, BNI recently initiated a work pause with craft supervision to ensure that provisions of the construction work planning and control process are understood and followed, and established a cross-sectional review team of subject matter experts to review the adequacy of hazard analyses performed for current work activities. These compensatory measures are included in the formal corrective action plan submitted by BNI and approved by ORP and will remain in place until the corrective action plan is completed and implemented. Senior BNI management, including area superintendents, lead field engineers, and lead safety assurance specialists, is engaged in both the compensatory measures and the final corrective actions addressing the Integrated Safety Management System Re-Verification. BNI management needs to ensure that the recent attention, focus, and resources to address and correct the work control and hazard analysis process at WTP are sustained, and ORP and EM need to ensure that such efforts are timely and are regularly reviewed for effectiveness.

Overhead piping installations

BNI has made significant improvements in nuclear safety processes, in part, to address systemic weaknesses identified by internal and external assessments and investigations (e.g., black cell piping procurement issues). For the systems and locations reviewed by Independent Oversight, the BNI efforts have resulted in significant improvements in several important areas, such as configuration management, procurement, and construction quality. However, during this inspection, Independent Oversight identified two generic engineering weaknesses (vulnerabilities to the design basis ashfall event and inadequate application of single failure criteria in safety class systems), as well as continued weaknesses in issues/corrective action management. For the ashfall event, the Independent Oversight team concluded that extensive conceptual redesign may be required for certain WTP systems. Continued EM/ORP and BNI attention and sustained improvement are needed to ensure that weaknesses, and their impacts to project performance and schedules, are evaluated and addressed for the systems that were reviewed by Independent Oversight, and other systems are systematically evaluated for similar weaknesses in a timely manner.

Installed rebar and decking awaiting concrete on the Low Activity Waste facility export bay roof

Structural steel installed on High Level Waste facility

Although considerable work remains, EM, ORP, and BNI have made improvements in their feedback and improvement programs in the past year. BNI has made improvements in many nuclear safety feedback and improvement processes but continues to have deficiencies in issues/corrective action management, and evaluating and improving work planning and control systems at the activity level. Some EM and ORP oversight program elements are functioning adequately, but there are weaknesses in important programs, such as issues/corrective action management and oversight of contractor injury and illness reporting, that reduce the overall effectiveness of EM and ORP in driving needed improvements in contractor performance in a number of important areas, such as work planning and control, injury and illness reporting, and the contractor assurance system. In most areas, EM and ORP have performed self-assessments and have a good understanding of the remaining weaknesses and, in some cases, have specific plans to address them.

6 Ratings

The ratings reflect the current status of the reviewed elements of ORP and WTP ES&H programs.

Work Planning and Control – Core Functions #1--4	
Core Function #1 – Define the Scope of Work	Needs Improvement
Core Function #2 – Analyze the Hazards	Needs Improvement
Core Function #3 – Develop and Implement Controls	Needs Improvement
Core Function #4 – Perform Work Within Controls	Needs Improvement
Nuclear Safety[2]	
Configuration Management	Effective Performance
Procurement and Materials Management	Effective Performance
Construction Quality	Effective Performance
Feedback and Continuous Improvement - Core Function #5	
DOE Oversight	Needs Improvement
BNI Feedback and Improvement	Needs Improvement

Purpose and Definitions of Ratings

The Office of 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. It 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:

2 The Independent Oversight review of nuclear safety also examined the Engineering Design and Safety Basis subtopic. However, engineering design and safety basis documents, including the preliminary documented safety analysis, are currently preliminary documents and are continually being updated/revised as design/construction continues. Therefore, at this point in design/construction, the assignment of a rating to the Engineering Design and Safety Basis subtopic would be premature.

- 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.

APPENDIX A
Supplemental Information

A.1 Dates of Review

Planning Visit	October 6-9, 2008
Onsite Inspection Visit	October 20-30, 2008
Report Validation and Closeout	November 18-20, 2008

A.2 Review Team Composition

A.2.1 Management

Glenn S. Podonsky, Chief Health, Safety and Security Officer
Michael A. Kilpatrick, Deputy Chief for Operations, Office of Health, Safety and Security
William Eckroade, Director, Office of Independent Oversight
Thomas Staker, Director, Office of Environment, Safety and Health Evaluations
William Miller, Deputy Director, Office of Environment, Safety and Health Evaluations

A.2.2 Quality Review Board

Michael Kilpatrick	William Eckroade	Thomas Staker	William Miller
Dean Hickman	Robert Nelson	William Sanders	

A.2.3 Review Team

William Miller, Team Leader
Shiv Seth, Nuclear Safety Team Leader

Phil Aiken	Vic Crawford	Bob Freeman	Janet Macon
Bob Compton	Tony D'Angelo	Al Gibson	Ed Greenman
Joe Lenahan	Joe Lischinsky	Jim Lockridge	Tim Martin
Don Prevatte	Ed Stafford	Mario Vigliani	

A.2.4 Administrative Support

Laura Crampton
Tom Davis

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APPENDIX B
Site-Specific Findings

Table B-1. Site-Specific Findings Requiring Corrective Action

FINDING STATEMENTS	
C-1	The BNI hazard analysis process does not sufficiently ensure that hazards associated with activity-level construction work are systematically identified, analyzed, and controlled, as needed to ensure compliance with 10 CFR 851, *Worker Safety and Health Program*, DOE Policy 450.4, *Safety Management System Policy*, and the *WTP Safety and Health Program*.
C-2	BNI management and supervision have not adequately enforced established institutional safety requirements and processes in the areas of hazards analysis and control, including job hazard analysis/Safety Task Analysis Risk Reduction Talk card application, rigor and formality of operations, and procedure compliance, as required by 10 CFR 851, *Worker Safety and Health Program*, DOE Policy 450.4, *Safety Management System Policy*, and the *WTP Safety and Health Program*.
D-1	Some ORP safety processes, including issues/corrective action management, and DOE oversight of BNI injury and illness investigation and reporting do not currently meet some aspects of applicable directive requirements of DOE Order 226.1A, *Implementation of DOE Oversight Policy*, DOE Order 414.1C, *Quality Assurance*, and DOE Manual 231.1-1A, *ES&H Reporting Manual*.
D-2	The ORP technical qualification program does not meet some requirements of DOE Manual 426.1-1A, *Federal Technical Capabilities Manual*, in the areas of planning, training records, tracking of qualifications, and ensuring that individuals are trained and qualified in accordance with requirements.
F-1	The current BNI single failure analysis of safety class structures, systems, and components was not effective in demonstrating compliance to the requirements of ANSI Standard ANSI/ANS-58.9-1981 and IEEE Standard 379-1994, which are explicitly required by the preliminary documented safety analysis and the safety requirements document.
F-2	BNI has not controlled storage or use of structural steel bolts with sufficient rigor to ensure compliance with BNI procedures or industry standards: (a) a few temporary bolts were not marked as required by Procedure 24590-WTP-GPP-CON-7109; (b) some permanent bolts were not stored and maintained in accordance with requirements of Procedure 24590-WTP-3PS-SS02-T0001 or Standard AISC 348; and (c) cleanliness of bolted joint contact surfaces was not adequately inspected by quality control inspectors as required by Procedure 24590-WTP-GPP-CON-3206.
F-3	BNI is not adequately identifying, analyzing, and resolving some adverse conditions to effectively identify causes and implement recurrence controls as required by DOE Order 414.1C, *Quality Assurance*, and DOE Order 226.1A, *Implementation of Department of Energy Oversight Policy*, and the BNI Quality Assurance Manual does not incorporate all causes and extent-of-condition determination requirements from these orders.

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