Inspection of
Environment, Safety,
and Health Management
at the

Y-12 National Security Complex

April 2003

Office of Independent Oversight and Performance Assurance
Office of the Secretary of Energy

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Abbreviations Used in This Report

AHA	Activity Hazards Analysis
AIHA	American Industrial Hygiene Association
AJHA	Automated Job Hazards Analysis
ALARA	As Low As Reasonably Achievable
ANSI	American National Standards Institute
BWXT	BWXT Y-12, LLC
CAAS	Criticality Accident Alarm System
CAPS	Corrective Action Planning System
CFR	Code of Federal Regulations
CO	Carbon Monoxide
CY	Calendar Year
DNFSB	Defense Nuclear Facilities Safety Board
DOE	U.S. Department of Energy
EMS	Environmental Management System
ES&H	Environment, Safety, and Health
FCN	Field Change Notice
FIS	Facilities, Infrastructure, and Services Division
FIWG	Feedback and Improvement Working Group
FRAM	Functions, Responsibilities, and Authorities Manual
FY	Fiscal Year
HAC	Hazards Analysis Checklist

(Continued on inside back cover)

OVERSIGHT

Abbreviations Used in This Report (continued)

IMPRB	Issues Management Prioritization and Risk Board
ISM	Integrated Safety Management
ISMS	Integrated Safety Management System
ISO	International Organization for Standardization
JHA	Job Hazards Analysis
JHI	Job Hazard Identification
LLC	Limited Liability Company
LLW	Low-Level Waste
LMPO	Line Management PAAA Officer
MAR	Monthly Assessment Report
MJR	Maintenance Job Request
MSDS	Material Safety Data Sheet
NFPA	National Fire Protection Association
NNSA	National Nuclear Security Administration
OA	Office of Independent Oversight and Performance Assurance
ORPS	Occurrence Reporting and Processing System
OSHA	Occupational Safety and Health Administration
OR	Oak Ridge Operations Office
PAAA	Price-Anderson Amendments Act
PAM	Performance Assessment Matrix
PCBs	Polychlorinated Biphenyls
PEP	Performance Evaluation Plan
ppm	Parts per Million
psig	Pounds per Square Inch Gauge
RCRA	Resource Conservation and Recovery Act
RCT	Radiological Control Technician
RWP	Radiological Work Permit
SAR	Safety Analysis Report
SME	Subject Matter Expert
SMO	Special Materials Organization
SOC	Skill of the Craft
S/RID	Standards/Requirements Identification Document
STA	Safety Task Assignment
STR	Subcontractor Technical Representative
SWP	Standing Work Package
TSR	Technical Safety Requirement
USQ	Unreviewed Safety Question
USQD	Unreviewed Safety Question Determination
YSO	Y-12 Site Office
Y-12	Y-12 National Security Complex

1.0 Introduction

The Secretary of Energy's Office of Independent Oversight and Performance Assurance (OA) conducted an inspection of environment, safety, and health (ES&H) at the U.S. Department of Energy (DOE) Y-12 National Security Complex (Y-12) in March-April 2003. The inspection was performed by OA's Office of Environment, Safety and Health Evaluations.

Aerial View of the Y-12 Site

The National Nuclear Security Administration (NNSA) Office of the Deputy Administrator for Defense Programs is the lead program secretarial office for Y-12. As such, it has overall Headquarters responsibility for program direction, funding of activities, and ES&H at the site. At the site level, the Y-12 Site Office (YSO) Manager has line management responsibility for Y-12 operations and safety. The Oak Ridge Operations Office (OR) provides support to YSO in several areas (e.g., legal, human resources, employee concerns program, and training) in accordance with a formal support agreement. YSO may also obtain technical ES&H expertise from OR or the NNSA service center. Y-12 is managed and operated by BWXT Y-12, LLC (BWXT).

The primary mission of Y-12 is to support the DOE nuclear weapons stockpile maintenance program. Y-12 also supports DOE and other Federal agencies in various aspects of testing and development, nonproliferation, and technology transfer. The Y-12 site is located in Oak Ridge, Tennessee.

Y-12 stockpile maintenance activities include assembly and disassembly of nuclear weapon components, quality evaluations and surveillance of nuclear weapons components, secure storage of special nuclear material, and various other nuclear weapons-related activities. Other Y-12 activities include facility operations and maintenance, waste management, and environmental restoration. These activities include various potential hazards that need to be effectively controlled, including exposure to radiation, radiological contamination, hazardous chemicals, and various physical hazards associated with facility operations (e.g., machine operations, high-voltage electrical equipment, pressurized systems, and noise). Radiological and chemical hazards are present in various forms at Y-12.

Throughout the evaluation of ES&H programs, OA reviewed the role of NNSA organizations in providing direction to contractors and conducting line management oversight of contractor activities. OA is placing more emphasis on the review of contractor self-assessments and NNSA line management oversight in ensuring effective ES&H programs. In reviewing NNSA line management oversight, OA focused on the effectiveness of YSO in overseeing the Y-12 contractor, including such management functions as setting expectations, providing implementation guidance, monitoring and assessing contractor performance, and monitoring/evaluating contractor self-assessments. Similarly, OA focuses on the effectiveness of contractor self-assessment programs. DOE directives require contractors to establish self-assessment programs that review all aspects of ES&H performance.

The purpose of this inspection was to assess the effectiveness of selected aspects of ES&H management at Y-12 as implemented by BWXT

under the direction of YSO. The inspection evaluated four related aspects of the integrated safety management (ISM) program:

- YSO and BWXT implementation of selected ISM guiding principles, including roles and responsibilities (ISM Guiding Principle #2) and identification of standards and requirements (ISM Guiding Principle #5). As part of this review, OA reviewed YSO and BWXT progress in managing the implementation of 10 CFR 830, Subpart B, which requires upgrades in safety basis documentation for nuclear facilities. OA also examined selected aspects of YSO staff training and qualifications as they relate to their ES&H responsibilities, and the qualifications and training of BWXT personnel involved in development of safety basis documentation.

- YSO and BWXT feedback and continuous improvement systems.

- Y-12 implementation of the core functions of safety management for various work activities associated with Buildings 9204-2E, 9204-2, and 9215, and for selected maintenance, waste management, and construction activities.

- Essential system functionality for selected safety-related systems, including fire suppression systems and criticality accident alarm systems in Building 9204-2E.

The OA inspection team used a selective sampling approach to determine the effectiveness of YSO and BWXT in implementing DOE requirements. The approach involved examining selected institutional programs that support the ISM program, such as YSO and BWXT implementation of selected ES&H responsibilities. To determine the effectiveness of the institutional programs, the OA team examined implementation of requirements at selected Y-12 organizations and facilities. Specifically, the OA inspection encompassed selected programs and work activities performed within Building 9204-2E, Building 9204-2, and Building 9215. Specific activities reviewed in these buildings include disassembly and assembly of nuclear weapons components; evaluation of nuclear weapon components; processing and manufacturing of uranium parts; lithium production and manufacturing; construction, maintenance, operation, and testing of safety-related systems; and facility-specific waste management activities. Selected sitewide waste management activities were also reviewed.

Section 2 of this volume provides an overall discussion of the results of the review of the Y-12 ES&H programs, including positive attributes and program weaknesses. Section 3 provides OA's conclusions regarding the overall effectiveness of YSO and BWXT management of the ES&H programs. Section 4 presents the ratings assigned during this review. Appendix A provides supplemental information, including team composition. Appendix B identifies the specific findings that require corrective action and follow-up. Appendix C presents the results of the review of selected guiding principles of ISM. Appendix D presents the results of the review of the YSO and BWXT feedback and continuous improvement processes. The results of the review of the application of the core functions of ISM for the selected Y-12 activities are discussed in Appendix E. Appendix F presents the results of the review of essential systems.

2.0 Results

2.1 Positive Attributes

As discussed throughout this report, most aspects of the Y-12 ISM program are effective. With a few exceptions, the work control systems are effective in identifying, analyzing, and controlling hazards, and most work observed by OA was performed with a high regard for safety. As discussed below, several aspects of YSO and BWXT programs are particularly effective.

YSO management has established effective processes for monitoring YSO organizational performance. YSO has also established two notably effective reporting processes that YSO senior management uses to keep informed of the ES&H status at Y-12, YSO organizational performance, and progress toward established goals and objectives. First, the monthly assessment report (MAR) process is an effective management tool for categorizing results from YSO oversight activities and communicating them to the contractor. The MAR has been effective in promoting line management ownership, detailed technical knowledge of the issues/performance concerns, and consistency in categorization of assessment results. Second, YSO has established effective mechanisms—a strategic plan quarterly performance indicator report and an internal performance indicator process—to ensure proper flowdown of mission requirements and functions, provide a basis for accountability, and keep senior management informed of the status and areas needing attention. The internal tracking and monthly reporting addresses a number of areas (e.g., completion/acceptance of occurrence reporting and processing system corrective action plans, validation activities for corrective actions, and completion of oversight activities of the contractor) and provides valuable feedback to the YSO Manager on implementation of key Federal functions.

YSO has established effective processes for line management oversight of ES&H at Y-12, including additional training and qualification requirements. The YSO line management oversight processes—including the Facility Representative program, assessments, and other operational awareness activities—are effectively implemented. These processes are effective largely because YSO senior management sets clear expectations, ensures that YSO personnel understand their responsibilities, and supports a strong technical qualification program. Senior management has established additional recurring technical qualification program requirements to ensure that staff maintain proficiency in their assigned job functions. Specifically, YSO requires 80 hours of additional continuing professional training and specifies requirements for conducting individual assessments, spending field time in the major production facilities, and participating in major technical activities and/or on projects.

BWXT has effectively established and implemented worker involvement as a Y-12 ISM guiding principle. The integrated safety management system (ISMS) program description designates worker involvement as imperative to their success and requires worker involvement to be an intrinsic part of Y-12 programs and procedures. Y-12 uses many processes to promote and support worker involvement in addressing safety and health concerns, near misses, recommendations, and opportunities for improvement (e.g., Zero Accident Councils and the "I Care-We Care" program). BWXT managers recognize that the processes and elements of ISMS are enhanced by worker involvement and such involvement is key to their success. Further, workers are routinely and appropriately involved in Y-12 safety, compliance, and production activities. BWXT management has also supported the development and limited implementation of a behavior-based safety program, which is positively impacting safety, and is planning to allocate additional resources for full implementation.

The Y-12 technical procedure development modification process provides a comprehensive system to ensure technically accurate procedures with appropriate ES&H controls. The Y-12 process effectively addresses technical procedure development, review, approval,

use, and modification. The procedure review process requires a job hazards analysis for all new revisions and significant changes. The process also requires peer reviews and ES&H discipline reviews, and includes a comprehensive validation of the procedure. The conduct of operations manual chapter on procedure adherence establishes a program for strict adherence to procedures and lays out comprehensive management expectations regarding use of procedures.

The BWXT Construction Special Safety Team is an effective mechanism for identifying and correcting safety housekeeping and work performance deficiencies identified in the field. The construction safety team consists of three to five individuals from different trades (e.g., carpenters and pipe fitters) who are assigned to the team on a full-time basis for a 3-month period. The team performs inspections that focus on workplace conditions and behavior-based observations of construction work activities. Deficiencies are entered into a computer-based corrective action tracking system, are tracked and trended, and are presented periodically at construction safety meetings. The Construction Special Safety Team has been effective in focusing on higher risk construction activities and has contributed to a decreasing recordable injury and illness rate.

YSO and BWXT are aggressively pursuing implementation of an environmental management system (EMS), have significantly reduced legacy low-level radioactive waste, and are effectively managing newly generated waste streams. As initial steps in implementing an EMS, BWXT has developed an implementation plan using ISO 14001 provisions and established a pilot program at a small facility. In conjunction with YSO, BWXT also has committed to fully implementing EMS one year earlier than the time frame specified by the new DOE environmental protection order. Additionally, BWXT has reduced the number of legacy low-level radioactive waste containers from 3,128 to 964. Y-12 continues to effectively manage newly generated wastes through a well-established pollution prevention program, comprehensive waste management procedures, and deployment of environmental officers/waste management coordinators to line organizations.

Y-12 has implemented comprehensive and rigorous bioassay monitoring and internal dose investigation systems. Many Y-12 uranium production facilities were not originally designed with containment features that eliminate the potential for intakes of radioactive materials. Therefore, Y-12 has implemented a very robust bioassay monitoring program

Storage Racks for Uranium Items

that is capable of detecting, monitoring, and controlling intakes. Derived investigation levels for bioassay results are set low enough to provide reasonable assurance that significant intakes can be identified early enough to implement corrective actions, such as work restrictions. All bioassay results that exceed pre-defined trigger levels are evaluated by internal dosimetrists, and detailed records are maintained.

The Y-12 beryllium program is well documented, extensive, and includes several noteworthy attributes. The Y-12 beryllium program has implemented program elements (such as beryllium buffer areas and a lower-level limit for beryllium surface contamination) that are more rigorous than the minimum requirements of the Beryllium Rule (10 CFR 850). Y-12 coordinates the "round-robin" beryllium laboratory analysis campaign for the entire DOE complex and was recently selected by the American Industrial Hygiene Association to administer the beryllium proficiency analytical program. The aspects of the beryllium program reviewed on this inspection (beryllium characterization and beryllium sampling for two construction projects) were extensive, thorough, and well documented.

The criticality accident alarm system (CAAS) is designed and has been well maintained to provide a robust, redundant, and diverse means of detecting an accidental criticality. CAAS is designed to meet the most current industry standard and includes design features (i.e., redundant detector stations) that are beyond the requirements of the applicable design standard. Furthermore, portable

CAAS units and portable radiation detection instruments are available to support such special conditions as power outages. These components have been extensively field-tested and bench-tested to demonstrate that they could reliably perform their safety functions. BWXT has established good testing and maintenance programs to ensure continued reliability. The responsible engineers and technicians demonstrated a thorough knowledge of the system and have been proactive in identifying improvements in system design and maintenance.

Criticality Accident Alarm System Equipment

2.2 Program Weaknesses

Weaknesses were identified in some aspects of ISM management systems and work control processes.

BWXT construction engineering processes and implementation of design engineering processes have not ensured that temporary construction modifications to structures, systems, and components within nuclear facilities are properly evaluated, documented, and approved with respect to the facility safety basis before execution of the modification. Because work activities are defined in a number of work documents, construction workers face challenges in adequately identifying, documenting, and communicating work scope or changes in work scope once the project has commenced. A specific concern is that temporary construction modifications performed in Y-12 nuclear facilities may not be adequately identified in construction work scope documents to ensure that such temporary modifications are properly evaluated prior to the execution of the modification. A section of a return air system duct and central vacuum system line in Building 9212 was removed temporarily during a construction project to enable access for heavy construction equipment. This change in work scope was not identified in construction work documents. BWXT construction did not formally request or obtain formal approval from design engineering prior to proceeding with the temporary modification. Additionally, this work was not properly evaluated by BWXT design engineering prior to execution of the modification. In response to this concern, BWXT reviewed the removal of the duct and vacuum system line and determined that the facility safety basis had not been adversely impacted. As result of this event, BWXT issued a lessons learned and an occurrence report, and the Building 9212 Operations Manager and construction management initiated a temporary construction stand-down.

Aerial View of Building 9212

Work control processes for maintenance activities have not ensured that all skill-of-the-craft work packages have adequate work instructions and include hazard identification and hazard controls specific to the work activities and that skill-of-the-craft work packages are not used for more complex work activities. Although maintenance procedures are comprehensive in most respects, they do not fully address preparation of maintenance job requests that are performed as skill-of-the-craft work. Instruction to planners on how to prepare maintenance job request work packages and provisions for planning or maintenance supervisory

review are insufficient. As a rsult, there were deficiencies and inconsistencies in skill-of-the-craft work packages. As examples, leather gloves were improperly listed as a control for electrical shock; the exact locations of the work were not always specified; pre-job briefings were not always provided; controls were not always specified; and job hazards were not always listed. Maintenance procedures do not fully address classification of work based on the collective difficulty and increased risk due to such factors as interfaces among multiple trades, required engineering support, necessity to pre-stage parts, coordination with operations, and job complexity. Some complex jobs were classified as skill-of-the-craft, resulting in deficient work packages being released to the field without proper planning, engineering supprt, drawings, and work instruction for the craft. For example, a complex modification (involving disassembly of parts of a chemical system, a piping modification, pipe support design, quality assurance inspections, and an unreviewed safety question) was performed as skill-of-the-craft work with minimal instructions to the craft personnel.

Hazard controls identified in some BWXT construction hazard control documents (e.g., hazards analysis checklists, or HACs, and safety permits) are not kept current with changing workplace conditions. Although there were a number of positive attributes with respect to the identification and implementation of hazard controls, the HAC for some construction projects was not updated in a timely manner when new hazards were identified or new controls were established. For example, high levels of carbon monoxide (CO) were identified during a construction project and controls were established, such as continuous industrial hygiene monitoring of CO levels. A revision to the HAC was initiated to address the CO hazard and incorporate the new hazard controls. However, the revision to the HAC was not issued and posted at the job site until approximately six weeks after the CO hazard and initial controls had been identified and implemented. As a result, work resulting in CO emissions was performed for several weeks using an outdated HAC that did not identify the CO hazard or the hazard controls being implemented to mitigate the hazard. BWXT construction has not established clear requirements for when a HAC must be revised, a methodology to achieve timely revisions to HACs, or a policy as to when work must be stopped until the HAC is updated. The automated job hazards analysis (AJHA) process and procedure also lack guidance on reviewing AJHAs when new hazard controls are identified after work has commenced. In addition, some safety permits do not accurately reflect current workplace controls or locations. For example, a hot work permit posted in the work area stated that welding would be performed on the first floor. Welding activities, however, were being performed in the stairway, and the same permit was to be used for welding in the pit area, as well as the first floor.

BWXT has not adequately maintained configuration control of safety-significant fire protection features to ensure that they will function as defined in the Building 9204-2E safety analysis, and they have not performed some testing required by the National Fire Protection Association (NFPA). BWXT has not provided adequate guidance on implementing the Y-12 configuration management program requirements to evaluate and document the need to reconstitute the design as changes are made to existing facilities. As a result, during a recent design change to the Building 9204-2E fire protection system, BWXT did not effectively implement its configuration control procedure, which resulted in an unvalidated drawing being used as a design input without sufficient evaluation. A number of other concerns with the configuration control of the fire protection system were identified. For example, fire doors and the fire dampers in the only safety-significant fire barrier in Building 9204-2E have not been demonstrated to be operable through regular testing. BWXT has initiated some corrective actions and is currently analyzing the impact of these concerns on the operability of safety systems throughout the Y-12 site. Although the fire protection system surveillance, testing, and inspection procedures

Aerial View of the 9204 Complex

included most NFPA Code requirements, a few deviations have not been adequately evaluated by BWXT or approved by NNSA. For example, drain flow testing of normally open section isolation valves in the Building 9204-2E sprinkler system is not performed after they have been closed for maintenance.

Certain aspects of BWXT feedback and improvement programs, including categorization and processing of some safety issues, implementation of line management self-assessments, and employee concerns program procedures and documentation of resolutions, are not fully effective in ensuring that deficiencies are consistently and accurately documented, evaluated, and tracked to closure. Although the BWXT feedback and improvement program has many positive aspects, some aspects of issues management (categorization and processing of some findings) have process and implementation weaknesses that result in some issues not being consistently evaluated and corrected. Institutional procedure and management expectations do not drive use of the process for addressing findings that meet threshold criteria from less formal sources such as ES&H safety walkthroughs. The OA team also identified examples where deficiencies identified in line management assessments were incorrectly categorized and therefore the causes were not subjected to the appropriate level of review and the corrective actions were not sufficiently rigorous. Weaknesses were identified in the documentation and screening of secondary sources for Price-Anderson Amendments Act reporting criteria. BWXT has self-identified weaknesses in its line management self-assessment process in several areas and is currently taking corrective actions. In addition, employee concerns are adequately addressed but the evaluation resolutions are not always adequately documented and the procedures are not sufficiently clear and accurate.

3.0 Conclusions

With few exceptions, YSO has established appropriate processes for implementation of its ES&H functions, and BWXT has established an effective ISMS. ES&H roles and responsibilities for YSO and BWXT management and staff are well defined, clearly communicated, understood, and effectively implemented for the most part. Processes for identifying applicable requirements and flowing them down to contractors and subcontractors are effective. In most instances, these requirements are translated into clear procedures for the workers. Structured processes were in place for planning, controlling, and authorizing program, maintenance, construction, and waste management activities. Most work observed was conducted safely in accordance with requirements. Workers interviewed indicated that they felt empowered to stop work if safety concerns arose. Most aspects of YSO and BWXT feedback and improvement processes are effective. Many assessments and inspections are performed, corrective actions are taken to address assessment findings, and lessons learned are developed and communicated to workers. YSO processes for evaluating contractor performance, including the performance assessment matrix and the performance evaluation plan, are effectively implemented.

Some aspects of YSO and BWXT ES&H program implementation are particularly effective, are more rigorous than the minimum requirements, and/or demonstrate a high degree of management commitment to safety. YSO has established and implemented effective mechanisms to ensure proper alignment and flowdown of mission functions through its strategic plan and associated performance indicator report. The YSO managers' commitment to staff training has resulted in a strong YSO technical qualification training program. BWXT management has shown strong support for employee involvement through a substantial number of programs and processes, including the Construction Special Safety Team and the behavior-based safety program. The BWXT procedure development process for program work is rigorous and produces detailed and accurate procedures for control of hazards in nuclear operations. The beryllium program and bioassay and internal dose investigation program are comprehensive and rigorous. In addition, YSO and BWXT leadership have several ongoing and planned initiatives that should lead to further improvement in ES&H. A new process for identifying hazards and controls for work activities was in the initial stages of implementation. The process should result in more comprehensive and consistent identification of controls for associated hazards.

However, some specific elements within an overall effective ISM program either were not effectively implemented or need to be enhanced. Weaknesses in a few aspects of work planning processes resulted in a few hazards that were missed. While maintenance work hazards are effectively controlled through procedures for large and complex maintenance tasks and routine maintenance, job packages for some skill-of-the-craft work did not provide adequate work instructions or tailor the hazards and controls to the work. Construction work activities observed were performed safely, but work control processes did not ensure that temporary construction modifications to structures, systems, and components within nuclear facilities were properly evaluated with respect to the facility safety basis prior to the execution of the modification. In addition, safety controls were in place but some BWXT construction hazard control documents were not kept current with changing workplace conditions. There were a few instances where Y-12 personnel did not follow procedures verbatim or fully implement all applicable requirements. Improvements in some aspects of radiological controls and documentation of unreviewed safety question determinations would enhance the current systems. Finally, most YSO and BWXT feedback and improvement processes are effective, but the categorization and processing of certain safety issues, implementation of line management self-assessments, and employee concerns procedures and documentation need to be enhanced to provide additional assurance that deficiencies are identified,

tracked, resolved, and documented. While these weaknesses need to be addressed, the identified weaknesses did not result in significant risks to workers or facility safety. Further, YSO and/or BWXT promptly took or initiated corrective actions for several of the identified weaknesses.

The essential safety systems reviewed on this OA inspection—the fire protection system and CAAS in Building 9204-2E—are in good material condition and are well designed to perform their safety functions. Technical specification requirements are appropriate, and procedures for responding to alarms/system activations are detailed and current. Personnel responsible for testing and maintaining the system are experienced and well trained. Testing and maintenance programs ensure continued operability of the systems, and the maintenance backlog is low. Although adequate in most respects, configuration control of fire protection systems at Y-12 requires additional management attention. Y-12 does not have a complete set of fully validated and controlled drawings of the fire protection systems and have made some design changes based on unvalidated information. Although BWXT has established a process for making design changes that addresses the use of unvalidated, legacy documents, improvements are needed in implementation guidance. In addition, fire doors and the fire dampers in Building 9204-2E have not been demonstrated to be operable, and a damaged wall has not been repaired in one Building 9204-2E staircase, which serves as an escape route. YSO and BWXT are developing corrective actions that will address Building 9204-2E and other Y-12 facilities.

YSO and BWXT are effectively managing the implementation of 10 CFR 830, Subpart B. Although the safety basis documents for Y-12 nuclear facilities were established only several years ago, it has been necessary to upgrade these documents to meet the requirements of 10 CFR 830, Subpart B. Upgrades for 12 of 13 facilities are on schedule to be submitted by the April 10, 2003, deadline, and NNSA has approved a delay for the last submittal. No significant deficiencies were identified in the portions of the upgraded documents reviewed by OA.

Overall, YSO and BWXT have established a generally effective ISM program. YSO and BWXT management have demonstrated their commitment to continuous improvement and have effective tools and process enhancements to address known weaknesses. Similar management commitment and line oversight and process enhancement initiatives need to be applied to the weaknesses identified in this report, with particular attention on configuration management for safety systems, work control processes, and corrective action management. In some cases, YSO and BWXT have already initiated corrective actions.

4.0 Ratings

The ratings reflect the current status of the reviewed elements of the Y-12 ISM program:

Safety Management System Ratings

Guiding Principle #2 – Clear Roles and Responsibilities ..... EFFECTIVE PERFORMANCE
Guiding Principle #5 – Identification of Standards and Requirements .... EFFECTIVE PERFORMANCE

Feedback and Improvement

Core Function #5 – Feedback and Continuous Improvement ..... EFFECTIVE PERFORMANCE

Implementation of Core Functions for Selected Work Activities

Core Function #1 – Define the Scope of Work ..... EFFECTIVE PERFORMANCE
Core Function #2 – Analyze the Hazards ..... EFFECTIVE PERFORMANCE
Core Function #3 – Develop and Implement Hazard Controls ..... EFFECTIVE PERFORMANCE
Core Function #4 – Perform Work Within Controls ..... EFFECTIVE PERFORMANCE

Essential System Functionality

Design/Configuration Management ..... NEEDS IMPROVEMENT
Surveillance and Testing ..... EFFECTIVE PERFORMANCE
Maintenance ..... EFFECTIVE PERFORMANCE
Operations ..... EFFECTIVE PERFORMANCE

APPENDIX A
SUPPLEMENTAL INFORMATION

A.1 Dates of Review

Scoping Visit	December 3-6, 2002
Onsite Inspection Visit	March 17-27, 2003
Report Validation and Closeout	April 8-10, 2003

A.2 Review Team Composition

A.2.1 Management

Glenn S. Podonsky, Director, Office of Independent Oversight and Performance Assurance
Michael A. Kilpatrick, Deputy Director, Office of Independent Oversight and Performance Assurance
Patricia Worthington, Director, Office of Environment, Safety and Health Evaluations
Thomas Staker, Deputy Director, Office of Environment, Safety and Health Evaluations

A.2.2 Quality Review Board

Michael Kilpatrick
Dean Hickman
Patricia Worthington
Robert Nelson

A.2.3 Review Team

Thomas Staker, Deputy Director, Office of Environment, Safety and Health Evaluations (Team Leader)

Safety Management Systems and Feedback and Improvement Systems
Robert Freeman (Topic Lead)
Al Gibson
Tim Martin
Bob Compton

Essential Systems
James O'Brien (Topic Lead)
Ivon Fergus
Don Prevatte
Michael Shlyamberg

Core Function Implementation Team
Bill Miller (Topic Lead)
Vic Crawford
Mark Good
Jim Lockridge
Edward Stafford
Mario Vigliani

A.2.4 Administrative Support

Mary Anne Sirk
Tom Davis

APPENDIX B
SITE-SPECIFIC FINDINGS

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

FINDING STATEMENTS	REFER TO PAGE
1. Many program and performance deficiencies that are identified by means other than external and internal independent assessments and reportable events are not being consistently and accurately documented, evaluated, and tracked to closure.	28
2. Employee concerns program procedures are not sufficiently defined, and the documentation, evaluation, and disposition of concerns are not adequate to demonstrate that all employee concerns are being appropriately resolved.	30
3. BWXT construction engineering processes and implementation of design engineering processes have not ensured that temporary construction modifications to structures, systems, and components within nuclear facilities are properly evaluated, documented, and approved with respect to the facility safety basis before execution of the modification.	35
4. Work control processes for maintenance activities have not ensured that all skill-of-the-craft work packages have adequate work instructions and include hazard identification and hazard controls specific to the work activities and that skill-of-the-craft work packages are not used for more complex work activities.	42
5. Hazard controls identified in some BWXT construction hazard control documents (e.g., hazards analysis checklists and safety permits) are not kept current with changing workplace conditions.	43
6. BWXT has not adequately maintained configuration control of safety-significant fire protection features to ensure that they will function as defined in the Building 9204-2E safety analysis.	54
7. BWXT has not performed all inspections, tests, and maintenance required by National Fire Protection Association (NFPA) 25 on the Building 9204-2E fire protection system.	55

APPENDIX C
GUIDING PRINCIPLES OF SAFETY MANAGEMENT IMPLEMENTATION

C.1 INTRODUCTION

The U.S. Department of Energy (DOE) Office of Independent Oversight and Performance Assurance (OA) evaluation of safety management systems focused on selected guiding principles of integrated safety management (ISM) as applied at the Y-12 National Security Complex (Y-12). OA examined Guiding Principle #2 (Clear Roles and Responsibilities) and Guiding Principle #5 (Identification of Standards and Requirements). These guiding principles were selected based on a review of Y-12's past performance and the status of the ISM program.

OA also selectively followed up on the status of ongoing actions in several areas of interest to the Defense Nuclear Facilities Safety Board (DNFSB), including implementation of 10 CFR 830 and system engineering as part of DNFSB Recommendation 2000-2, *Configuration Management, Vital Safety Systems*. OA also examined selected aspects of Y-12 Site Office (YSO) staff training and qualifications as they relate to YSO ES&H responsibilities, and the qualifications and training of BWXT Y-12, LLC (BWXT) personnel involved in development of safety basis documentation.

National Nuclear Security Administration (NNSA), YSO, BWXT, and subcontractor personnel were interviewed to determine their understanding of the ISM program and their responsibilities, as well as the status of ongoing initiatives and corrective actions. The OA team reviewed various documents and records, including the Y-12 ISM system description; associated procedures; Functions, Responsibilities, and Authorities Manuals (FRAMs); environment, safety, and health (ES&H) manuals; contract provisions related to safety; subcontract provisions; selected aspects of staffing, training, and qualifications of technical personnel; and various Y-12 plans and initiatives. In evaluating the guiding principles, the results of the OA review of the core functions and essential systems were considered.

C.2 RESULTS

C.2.1. Clear Roles and Responsibilities

Guiding Principle #2: Clear and unambiguous lines of authority and responsibility for ensuring safety shall be established and maintained at all organizational levels within the Department and its contractors.

NNSA/YSO

As part of its reengineering process, NNSA has established a number of policies that will significantly change the roles and responsibilities of NNSA site offices (including YSO), such as Policy Letter NAP-4, "Corporate Performance Evaluation Process for Management and Operating Contractors." The NNSA Administrator has issued a January 2003 memorandum that describes the broad roles and responsibilities of the site offices and service center within the new organizational structure and clarifies responsibilities for "critical functional areas," such as start-up and restart of nuclear and non-nuclear facilities and ISM.

Within NNSA, YSO is clearly assigned line management responsibility for safety at Y-12. YSO management clearly understands and accepts this responsibility. Based on observations of weekly meetings, a review of the management systems description commitments report, self-assessments, and YSO "command media" (e.g., YSO FRAM, management systems documents, and procedures), YSO management has been effective in continually maintaining and improving its management systems and processes.

Senior managers have been proactive in ensuring that YSO effectively implements its expanded set of ES&H responsibilities. YSO has established mechanisms to continually update and maintain its command media. Senior managers meet weekly to

review the status of the command media and they take actions to ensure that NNSA expectations are met. For example, YSO conducted a self-assessment of its command media against the NNSA January 2003 memorandum.

YSO has established effective mechanisms to ensure proper alignment and flowdown of mission requirements and functions. YSO has established its own strategic plan, which contains goals and objectives that link to the NNSA and Y-12 strategic plans. YSO managers and staff performance plans are consistent with YSO FRAM and management system description documents and are effectively linked to the YSO strategic plan. In addition, YSO has developed a noteworthy approach for measuring progress toward strategic plan goals and objectives, which includes a quarterly performance indicator report.

Line management ES&H roles, responsibilities, and authorities are well documented and understood. Roles, responsibilities, and authorities are well defined in the YSO FRAM and management system description documents. These documents are being appropriately maintained and updated on a periodic basis. With few exceptions, YSO has developed sufficient procedures to implement assigned responsibilities. YSO has identified several areas needing additional formalization within its command media, including the performance assessment matrix (PAM) process, annual review and approval of the contractor integrated safety management system (ISMS) program, integration of the Technical Division systems engineering functions, and processes used by the Weapons Quality Assurance Group. Actions to address these areas have been identified and are being tracked.

The YSO staff are required to maintain their level of knowledge with YSO procedures and policy documents, in accordance with established continuing training and requalification program requirements. Discussions with YSO program managers, project managers, subject matter experts, safety basis engineers, and Facility Representatives confirm that assigned functions within the command media are clearly assigned and understood.

YSO is effectively ensuring that responsibilities and accountability for line oversight of contractor activities are clearly assigned and communicated within its organization and to the contractor. YSO has issued formal direction for program managers and project engineer coverage of Y-12 capital projects, line oversight of facility and system start-ups, and Facility Representative oversight of Y-12 site buildings. In addition, YSO has appointed a Program Division Manager with a broad ES&H background to ensure proper identification of ES&H support requirements for line programs and projects and to perform certain ES&H functions, such as approval of facility and equipment start-up and restarts. These actions have significantly improved line management ownership for safety for NNSA mission activities associated with assigned projects and programs. Further, the consolidation of project engineers and program managers in the Program Division has improved the interfaces for key projects. Internal program review meetings are held biweekly to discuss the status of programs and projects, key issues, and concerns. These meetings facilitate awareness and identification of technical and operations support division needs among the YSO staff.

YSO is making good progress in establishing and integrating the systems engineering and safety basis engineering functions into its operations. YSO has addressed all of their technical skills gaps for vital safety system coverage. System engineer assignments for reviewing vital safety systems have been formalized and communicated to the staff and contractor. System engineers are providing valuable matrix support for design and construction project reviews, facility and system start-ups requiring DOE operational readiness reviews and level II readiness assessments, and safety basis reviews of contractor submittals in coordination with the safety basis engineer group. For example, system and safety basis engineers involved in the enriched uranium operations wet chemistry start-up, identified a number of configuration control and unreviewed safety question determination (USQD) implementation problems requiring contractor action.

YSO has established technical position-specific standards for all subject matter experts, including systems and safety basis engineers, that are unique to the technical competency requirements at the site and facility level. All subject matter experts are participating in a technical qualification program and are on track to meet initial training and qualification commitments. YSO personnel who have ES&H responsibilities are well qualified and experienced for their positions. For example, most systems engineers have engineering degrees in nuclear and chemical engineering fields, have an average of 25 years experience, have served on DOE operational readiness reviews and readiness assessments, and have participated in vital safety system joint assessments with the contractor as part of implementation of DNFSB Recommendation 2000-2. Similarly, safety basis engineers are technically well qualified and have significant experience in

conducting safety analysis type activities from other DOE sites.

The YSO Manager has set high expectations for maintaining the technical competency of his staff. For example, YSO has established Technical Qualification Program continuing training program requirements to maintain staff proficiency in their assigned job functions. These requirements mandate 80 hours of additional continuing professional training and include provisions for conducting individual assessments, spending field time in the major production facilities, and participating on major technical activities and/or projects. The YSO Manager's commitment to staff training has resulted in a strong technical qualification program.

The YSO performance evaluation plan (PEP) for the BWXT contract meets the intent of NNSA Policy Letter NAP-4. The PEP contains adequate performance objectives, measures and targets. The PEP is appropriately cross-referenced and linked to the NNSA strategic plan and the YSO PAM process.

The BWXT contract PEP contains an appropriate set of performance objectives and measures that address ES&H and ISMS performance. It covers such key safety performance elements as issues management, critical skills, ISMS implementation, and performance assurance (e.g., self-assessments). The technical and ES&H area covers technical functional areas and is linked to the standards/requirements identification document (S/RIDs). The PEP places appropriate attention on the evaluation and improvement of performance of the contractors' self-assessment processes. Performance-based incentives are focused on mission accomplishment and such key safety areas as 10 CFR 830 implementation, maintenance, facility condition assessment surveys, and implementation of the fire protection comprehensive corrective action plan. The effective integration and linkage of the contract PEP, S/RIDs, and PAM process, combined with an effective oversight and assessment program (discussed in Appendix D), provide a strong foundation to monitor and hold the contractor accountable for safety performance, in accordance with contract requirements.

BWXT

BWXT roles and responsibilities for organizations and line and support managers are clearly and comprehensively defined in multiple documents, such as the ISM system description, the Conduct of Operations Manual, and various facility and program procedures. ISM is applicable to all work performed by BWXT and its subcontractors. Senior BWXT managers are assigned appropriate ISM responsibilities and take an active role in ISM. For example, the General Manager has overall accountability for the effectiveness of the ISMS program and the Executive Steering Group, chaired by the Deputy General Manager for Operations; provides policy and strategic direction; ensures that the work scope and budget process incorporates ISMS principles; and oversees and guides implementation of the ISMS across BWXT. The roles and responsibilities of the manufacturing, maintenance, and ES&H support organizations are clearly defined and effectively incorporate ISM. For instance, the Director of Manufacturing is accountable for establishing safety as the first priority and integrating it into every activity while supporting production schedules. Specific ES&H-related responsibilities of BWXT managers at all levels are clearly defined and communicated. Managers are supported in implementing their safety responsibilities by various safety committees/councils and operational safety boards, which also have clearly defined charters and responsibilities.

OA team interviews and observed performance of manufacturing, maintenance, and ES&H program managers and staff demonstrated that they understood their ISM responsibilities and were generally effective in implementing their responsibilities. For instance, the enriched uranium operations manager has effectively established within his organization the relative importance of safety, compliance, and production, and the expectation that production will only be authorized when both safety and compliance requirements and concerns are satisfied. The Manager, Assembly Operations, the Manager, Enriched Uranium Operations, and respective operations/facility managers, shift managers, and shift technical advisors who were interviewed and/or observed by OA each demonstrated attention to safety in their respective activities. For example, the Building 9204-2E shift manager was observed routinely soliciting and assuring response to staff and tenant safety concerns; promoting discussion of the plan-of-the-day meeting safety topic; touring the facility and directing resolution of several identified hazards; and appropriately reviewing and approving activities after confirming they could be performed safely and within the authorization bases. Further, in one instance observed, supervisors in enriched uranium operations and assembly operations appropriately responded to employee reports of pain by taking the affected employees to medical authorities for diagnosis and treatment to avoid complications or further injury.

Tenant managers and supervisors also demonstrated they understood their responsibility for assuring that their activities were conducted safely within their respective facility and activity safety basis, that new tenant activities were subject to USQDs that had to be approved by the operations/facility manager before the new activity was authorized to start, and that they were required to coordinate and keep the facility shift manager informed of the status of their activities. Each meeting observed by OA included a presentation and discussion of a planned safety topic. Facility, tenant, and support management and staff were also observed demonstrating appropriate attention to safety during shift turnovers, plan-of-the-day meetings, a weekly all hands meeting, a weekly maintenance planning meeting, an operational safety board meeting, a quarterly all hands safety meeting, and several manager tours of their respective facilities. Further, all managers and supervisors who were interviewed expressed the conviction that the open and candid communications that existed between the staff and management were absolutely necessary to ensuring that safety concerns were identified and appropriately addressed in a timely manner. The effective implementation of BWXT line management responsibilities is an important factor in the improvement in ISM in the past few years and the effective implementation of the ISM core functions in the facilities reviewed (see Appendix E).

Appropriate focus on safety roles and responsibilities was also evident during OA observation of three management assessments that were conducted by an enriched uranium operations manager, an enriched uranium operations shift technical advisor, and an assembly operations shift technical advisor, respectively. The operations manager toured two production areas, reviewed logs, inspected equipment for safety hazards, observed production activities, identified one safety-significant deficiency (associated with the placement of a catch basin), identified a number of record entries that did not meet expectations, carefully avoided creating a distraction to craftsmen actively engaged in production activities, discussed the results and necessary corrective actions with the production shift manager, and demonstrated an appropriate respect for using the line organization to counsel staff performance. The enriched uranium operations shift technical advisor assessed the status and staff understanding of a new hearing protection program; identified one individual who did not understand how to apply "stay time" requirements without hearing protection; identified several pieces of hearing protection equipment that were not on the approved list; identified two opportunities for program improvement; and briefed the production shift manager on the results. The assembly operations shift technical advisor confirmed activity procedure adherence; identified several safety deficiencies and opportunities for improvement; and solicited comments and concerns from the observed machine operators and radiological control technician. In all three assessments observed, line management demonstrated their understanding of their safety responsibilities in their review activities, and the assessments were professionally conducted, appropriately documented, and provide valuable insights for future corrective action plans. As discussed in Appendix D, BWXT has taken a number of actions to improve implementation of management assessments, which has contributed to the effective performance in the three management assessments observed by OA.

Managers and supervisors are also accountable for performance of their ES&H roles and responsibilities. Performance against individual performance plans is assessed at least annually as part of the performance development process. Each assessment includes a review of safety performance and is the basis for merit pay increases. Performance improvement plans are developed to address performance weaknesses and deficiencies. Managers and staff are also eligible for additional financial incentives or recognition for achieving specific goals and performance improvements or for significant achievements.

The roles and responsibilities for authorizing work activities related to maintenance are comprehensively defined in many BWXT documents including the Conduct of Operations Manual and various procedures (e.g., "Maintenance Job Planning and Execution"). The authority to authorize activities within a facility is reserved to the operations/facility manager or as delegated to the shift manager. OA observation of enriched uranium operations and assembly operations manager and shift manager activities confirmed that assigned roles and responsibilities for authorizing work activities were being effectively implemented.

Worker Involvement. Worker involvement has been established as the eighth BWXT ISMS Guiding Principle at Y-12. The ISMS program description designates worker involvement as imperative to successful implementation of ISMS and requires this concept to be an intrinsic part of BWXT programs and procedures. As a result, worker participation has been made a formal requirement and fundamental aspect of site programs, processes, and activities that implement

safety, compliance, and production responsibilities. Employees routinely participate in procedure development and validation, incident investigations, operational safety boards, and many safety councils. Employees are encouraged and were observed to raise concerns during crew briefings, all hands meetings, and face-to-face discussions with managers and supervisors. Interviewed managers clearly understood the role, responsibility, and authority of employees to stop work when faced with an unsafe condition, and relied upon that expectation as another defense in depth to established processes for assuring safety. Further, many processes exist to promote and support worker involvement in addressing safety and health concerns, recommendations, opportunities for improvement, and surfacing of near misses. Examples include the Joint Labor/Management Safety Committee, Rolling Safety Focus Teams, Zero Accident Councils, the Employee Concerns Response Program, and the "I Care-We Care" program, which is another BWXT employee concerns program that focuses on safety. OA team interviews confirmed that managers recognize that the processes and elements of ISM are enhanced by worker involvement and that such involvement is key to their individual and organization's success. Further, OA team observations confirmed that worker involvement in Y-12 safety, compliance, and production activities is routinely encouraged and received.

Summary of Guiding Principle #2

YSO has established effective mechanisms to ensure proper flowdown of mission requirements and functions to its staff. The YSO strategic plan and associated performance indicator report is an effective process for monitoring ES&H performance. Line management ES&H roles, responsibilities, authorities, and accountability are well documented and understood. With few exceptions, YSO has developed sufficient procedures to implement assigned responsibilities and is making good progress in integrating the systems engineer and safety basis functions into its operations. Personnel with ES&H responsibilities are well qualified and experienced for their positions. The YSO Manager's commitment to staff training has resulted in a strong technical qualification program. YSO has also established a PEP that contains an appropriate set of ES&H performance objectives and measures and appropriately emphasizes the contractors' self-assessment processes.

BWXT roles and responsibilities are clearly and comprehensively defined and are generally understood and effectively implemented. Further, observed and interviewed facility tenants demonstrated they understood their ES&H roles and responsibilities and the requirement to receive approval for and coordinate their activities with their facility landlord. Processes are in place to provide incentives and to hold managers accountable for effective performance of their responsibilities. Roles and responsibilities for authorizing work are clearly defined and effectively implemented with few exceptions. Employee involvement is strongly supported and is an essential element of Y-12 programs and processes.

C.2.2 Identification of Standards and Requirements

Guiding Principle #5: Before work is performed, the associated hazards shall be evaluated and an agreed-upon set of safety standards shall be established that, if properly implemented, will provide adequate assurance that the public, the workers and the environment are protected from adverse consequences.

NNSA/YSO

NNSA has established a policy for a requirements management program. The policy, which was established October 2002 by Policy Letter NAP-5, *Policy Letter for Standards Management*, provides an appropriate set of principles for standards management and clearly assigns responsibility for implementation. However, NNSA has not specified implementation milestones or completion dates.

ES&H requirements applicable to Y-12 activities have been maintained in a S/RID since the early 1990s. Compliance with this document is required by the NNSA/BWXT contract. The S/RIDs method for establishing requirements is consistent with the NNSA policy. YSO has been actively involved in ensuring the effectiveness of the S/RIDs process. In May 2001, YSO identified deficiencies in the Y-12 S/RID and directed BWXT to perform a comprehensive review and revision to include adding necessary requirements and deleting requirements that did not add value. BWXT completed this review and revision in the fall of 2001.

YSO has effectively implemented most aspects of NNSA Policy NAP-5 and has assumed ownership of the requirements management process. Responsibility and authority for establishing appropriate ES&H requirements are formally assigned to staff members

through the FRAM, formal procedures, and delegations. Subject matter experts are involved in standards selection, and responsibilities for program management have been formally delegated to a contracting officer representative. YSO has arranged for administrative support from the Oak Ridge Operations Office and has documented this arrangement in a service agreement. However, YSO has not yet established a formal process for managing requirements applicable to the Federal staff as will be required for full implementation of NNSA Policy NAP-5. OA will follow up with NNSA Headquarters on the need for further guidance regarding expectations for implementation and schedule commitments for policies issued by NNSA.

YSO is effectively managing the implementation of 10 CFR 830, Subpart B. Although the safety basis documents for Y-12 nuclear facilities were established only several years ago, it has been necessary to upgrade these documents to meet the requirements of this new regulation. YSO established an authorization basis team to manage this upgrade effort and BWXT developed in implementation plan, as required by 10 CFR 830. The YSO authorization basis team established procedures and plans for the review and approval of safety basis documents and is using these procedures and plans effectively to ensure compliance with Subpart B. The YSO team has provided feedback on the quality of BWXT submittals through review comments and has provided guidance through weekly meetings with BWXT counterparts. Formal qualification requirements have been established and met for YSO staff members reviewing safety basis documents. YSO has assigned a sufficient number of qualified personnel to complete timely reviews of BWXT safety basis submittals and expects to complete review and approval of most documents this fall. This expectation appears to be realistic based upon the current rate of progress and level of effort.

YSO has directed BWXT to implement the recently issued DOE Order 450.1, *Environmental Protection Program*, which includes a provision for developing a comprehensive environmental management system (EMS). BWXT is reviewing this order to determine the need for additional programs and activities to meet new or modified requirements. The order will be incorporated into the DOE/BWXT contract and the Y-12 S/RIDs when the review and gap analysis are complete. YSO and BWXT have agreed to implement the new order one year earlier than the time frame specified by the new DOE order.

BWXT

The ES&H requirements established in the NNSA/BWXT contract are adequate for the scope of work reviewed at the site. Processes and procedures are adequate for keeping the contract current with new and revised ES&H requirements. Responsibilities are clearly assigned and procedures are established to assure that applicable requirements are included in the NNSA/BWXT contract and that the contract is revised to reflect changes in requirements. The OA team confirmed that selected applicable directives were included in the current Y-12 S/RID and that changes to DOE directives had been incorporated in a timely manner. No deficiencies in safety performance were attributed to deficiencies in the Y-12 S/RID.

BWXT has adequately incorporated requirements from the Y-12 S/RID into appropriate company-level and lower-tier procedures. The Y-12 S/RID is maintained in a database that is readily accessible to site personnel. The database includes references to source requirements and to company-level procedures. The company-level procedures, which are accessible via the Y-12 internal network, include references to specific S/RID requirements. Lower-tier procedures are used, when necessary, to convey requirements from company-level procedures to the BWXT workforce. Responsibilities have been assigned and procedures have been developed for maintaining and updating the S/RID and implementing documents.

Flowdown of ES&H requirements to subcontractors is adequate in most instances and is being enhanced. BWXT recognizes their responsibility for ensuring compliance with contractual ES&H requirements at Y-12 regardless of whether the work is performed by BWXT employees or subcontractors. Appropriate mechanisms for ensuring flowdown of ES&H requirements to subcontractors have been established that include appropriate involvement of ES&H subject matter experts. BWXT recognizes that the current processes are highly dependent upon the expertise of subject matter experts, and self-identified and corrected some problems in this area. BWXT is developing a more systematic process, including the use of checklists, to ensure the effective flowdown of requirements to subcontractors. Subcontracts reviewed by the OA team contained appropriate ES&H requirements.

BWXT has taken an aggressive approach to implementing an EMS. They have been working on an EMS implementation plan using the ISO 14001

provisions as a baseline since 2001, when a DOE notice on environmental actions was issued, and the implementation plan is now addressing the DOE Order 450.1 provisions. A sitewide EMS team has been established and has taken actions to identify and risk-rank environmental aspects. In addition to committing to implement EMS one year earlier than the new DOE order requires, BWXT has implemented a pilot program to apply EMS to facilities at a small offsite BWXT operation (Union Valley Analytical Laboratory). Lessons learned from this pilot program are being used to improve sitewide guidance and processes.

BWXT has performed self-assessments in the area of requirements management. Personnel indicated that annual assessments of the requirements management system have been performed by the Performance Assurance organization, although only the most recent assessment (December 2002) was documented. The documented assessment provides an adequate review of compliance with process requirements.

Subpart B of 10 CFR 830, issued January 2001, requires contractors to establish and maintain safety bases for Hazard Category 1, 2, or 3 DOE nuclear facilities. In the context of this regulation, safety basis means the documented safety analysis (e.g., safety analysis report or basis for interim operations) and hazard controls (e.g., operational safety requirements or technical safety requirements) that provide reasonable assurance that a facility can be operated safely.

BWXT has issued adequate procedures for establishing the safety basis for its Category 2 and 3 nuclear facilities. Requirements from 10 CFR 830, Subpart B, and guidance from associated DOE guides have been adequately implemented through a comprehensive set of safety basis procedures. Procedures for identifying and evaluating hazards, as well as procedures for accident analysis and document development, are consistent with DOE regulations and guides and provide a systematic approach for establishing the safety basis for Y-12 Category 2 and 3 nuclear facilities.

Sufficient resources have been allocated to support submittal of most safety basis documents to NNSA for approval by the April 10, 2003, deadline. Safety basis documentation is required for 13 nuclear facilities at Y-12; 8 are classified as Category 2, and 5 are classified as Category 3. At the time of this inspection, BWXT had submitted safety basis documents for nine nuclear facilities to YSO, and expects to submit safety basis documents for three others by the April 10, 2003, milestone. Because of competing priorities, the submittal for the Building 9212 complex has not been completed and is scheduled for September 2004. NNSA has approved an exemption to 10 CFR 830 permitting the delayed submittal of the Building 9212 complex package. YSO has approved submittals for three facilities and indicated that the quality of the BWXT submittals was generally adequate. As part of its review of fire protection systems, OA reviewed fire protection aspects of the Building 9204-2E safety analysis report, and no significant deficiencies were identified.

The training and qualifications of individuals preparing safety basis documents were generally adequate, although BWXT has not established formal requirements in this area. The OA team reviewed training and qualifications of selected members of the facility safety engineering organization who were assigned to prepare documented safety analyses. No formal qualification or training requirements had been established for these individuals. Records of qualifications indicated that the individuals had appropriate education and experience for assigned tasks. All staff members had received some BWXT safety basis training but the training that was provided varied among the individuals. Most had attended workshops on hazards analysis and accident analysis. Individuals preparing USQDs are required to successfully complete a two-day unreviewed safety question (USQ) workshop and exam and to be current on biannual requalification training. Individuals are also required to have training on the safety bases associated with the USQDs and screenings that they prepare.

The USQ process for controlling changes to the Y-12 safety basis is generally adequate. The Y-12 process meets the requirements of 10 CFR 830.203 and is consistent with the guidance in DOE Guide 424.1-1, *Implementation Guide for Use in Addressing Unreviewed Safety Question Requirements*.

Most aspects of the USQ procedures and training reviewed were adequate. In addition, the USQ screening process was adequately implemented for the screenings associated with Building 9204-2E that were reviewed by OA. Implementation of this process was recently reviewed by NNSA as part of an operational readiness review of enriched uranium operations in the Building 9212 complex. This NNSA review identified a USQ screening that failed to identify an occupational hazard introduced by a procedure change. At the time of the OA inspection, additional training had been provided to address this finding in the Building 9212 complex and the extent of the condition was being reviewed to determine the need for broader corrective

actions. The OA team reviewed several USQ screenings for changes to procedures applicable to activities in Building 9204-2E, all of which reached the proper conclusion regarding the need for a USQD.

Several deficiencies were identified in the quality of USQDs. The OA team reviewed several recent USQDs to determine whether USQs were properly identified. Although the conclusion of each determination was correct, the documented justification was not always sufficient to support the conclusion as required by the BWXT USQD procedure. Other deficiencies in the quality of USQDs included incomplete descriptions of proposed changes and incorrect conclusions regarding the need for changes in the documented safety analysis.

Deficiencies in USQD quality have been evident for some time at Y-12. An independent assessment by the BWXT Quality Assurance organization in December 2001 determined that USQD documentation was not adequate to describe proposed activities or to support stated conclusions. A February 2003 BWXT evaluation of the recent operational readiness review of enriched uranium operations identified the need to more fully document the basis of conclusions in USQDs. While most aspects of the USQ procedures and training programs are adequate, further enhancements are needed to improve the quality of USQDs. For example, procedures contain broad requirements that are consistent with DOE requirements and guides, but do not include sufficient detailed guidance and direction on expected USQD content. BWXT understands the need to improve the USQD procedure and has scheduled a procedure revision. BWXT USQ training is generally adequate, and lessons learned are discussed during monthly meetings with USQD managers. However, more effective periodic retraining on the nuances and lessons learned associated with USQD preparation is needed to provide feedback to preparers to further improve the quality of documented USQDs. Responsibilities for preparation and review of USQDs are clearly assigned, but the BWXT performance appraisal process is not being effectively used to ensure that individuals are accountable for the quality of USQDs.

Summary of Guiding Principle #5

NNSA is effectively managing requirements at Y-12. YSO has assumed ownership of the Y-12 requirements management program, and most elements of the recently issued NNSA policy on standards management have been implemented. YSO and BWXT have worked together to establish an appropriate set of ES&H requirements in the NNSA/BWXT contract and have established procedures for maintaining these requirements current with respect to new and revised ES&H requirements. Flowdown of ES&H requirements into BWXT procedures and subcontracts has been adequate. YSO is also effectively managing the upgrade of Y-12 safety bases to achieve compliance with 10 CFR 830, Subpart B. However, some deficiencies were identified in the quality of USQDs prepared by BWXT that require continued management attention.

C.3 CONCLUSIONS

YSO and BWXT have established and communicated clear roles and responsibilities and effective processes for establishing requirements and incorporating them into work instructions. OA's interviews and observations indicate that YSO and BWXT responsibilities and processes are effectively implemented with few exceptions. Although improvements are needed in a few areas (e.g., quality of USQD documentation), YSO and BWXT have a good understanding of the residual weaknesses and they have identified actions to address most of them. Further, both YSO and BWXT have made a strong commitment to upgrading the safety bases for Category 2 and 3 nuclear facilities.

The major improvements in ES&H over the past five years and generally effective implementation of ISM are largely attributable to the efforts of the YSO Manager, YSO staff, and the new site contractor, BWXT. The YSO Manager has set high expectations for his staff and the Y-12 contractor. YSO and BWXT are developing an effective working relationship in which YSO is striking an appropriate balance between its role as a "demanding customer" that provides direction and holds BWXT accountable for results, and its role as a line organization with responsibility for safety that is actively involved in managing safety at Y-12. The YSO Manager and other YSO senior managers have also devoted significant attention and resources to ensuring that the YSO staff understand their responsibilities and have the resources and training to carry them out (e.g., strong support for technical qualification and recurring training). YSO and BWXT line managers were actively involved in ES&H matters and were well aware of technical details of operations and ES&H programs in the Y-12 facilities. Senior BWXT managers are actively involved in ISM and

demonstrated their understanding of their ES&H line management responsibilities during the OA inspection. BWXT management commitment to worker involvement is strong at Y-12, as evidenced by the establishment of worker involvement as an ISM guiding principle and the existence of many processes to promote worker involvement in safety. A commitment to continuous improvement was evident at all levels of YSO and BWXT management.

C.4 RATINGS

The ratings of the guiding principles reflect the status of the reviewed elements of the Y-12 ISM program.

Guiding Principle #2 – Clear Roles and Responsibilities: EFFECTIVE PERFORMANCE

Guiding Principle #5 – Identification of Standards and Requirements: EFFECTIVE PERFORMANCE

C.5 OPPORTUNITIES FOR IMPROVEMENT

This OA inspection identified the following opportunities for improvement. These potential enhancements are not intended to be prescriptive or mandatory. Rather, they are intended to be reviewed and evaluated by the responsible line management, and accepted, rejected, or modified as appropriate, in accordance with site-specific program objectives and priorities.

NNSA/YSO

1. **Strengthen and sustain ongoing management efforts to formalize YSO management systems and processes.** Specific actions to consider include:

   - Complete efforts to formalize YSO processes for the PAM, annual ISMS review and approval, quality assurance functions performed by the YSO Weapons Quality Assurance Group, and formalization and integration of the YSO Technical Division systems engineering functions in YSO command media.

   - Develop a process for flowdown of ES&H requirements applicable to Federal workers as stated in NNSA Policy NAP-5.

   - Ensure that corrective actions, including those identified from YSO self-assessments, are captured in the appropriate YSO system. Continue efforts to develop management systems that better integrate all YSO actions/ issues to facilitate YSO efforts to prioritize resources.

BWXT

1. **Strengthen procedural guidance and training to improve the quality of USQDs.** Specific actions to consider include:

   - Establish training and qualification requirements for members of the facility safety engineering organization. Include training on preparation of documented safety analyses, USQDs, and screenings.

   - Revise the procedure for performing USQDs to provide more specific guidance and direction on the content of USQD documentation.

   - Provide periodic training on the preparation and review of USQDs, including training on lessons learned and expectations regarding specific information to be included in USQD documentation.

   - Senior management should convey expectations for improvement in the quality of USQDs to line organizations and hold line managers accountable for improved performance.

   - Continue ongoing efforts to revise the USQD procedure to provide clear expectations for USQD content, to incorporate lessons learned, and to clarify definitions of essential USQD concepts.

APPENDIX D
FEEDBACK AND CONTINUOUS IMPROVEMENT (CORE FUNCTION #5)

D.1 INTRODUCTION

The U.S. Department of Energy (DOE) Office of Independent Oversight and Performance Assurance (OA) evaluation of feedback and improvement at the Y-12 National Security Complex (Y-12) included an examination of the programs and performance of the Y-12 Site Office (YSO) and BWXT Y-12, LLC, the Y-12 contractor. The OA team examined the YSO line management oversight of integrated safety management (ISM) processes and the implementation of selected line management oversight functions, including the Facility Representative program and environment, safety, and health (ES&H) assessments. OA also selectively followed up on the status of ongoing YSO actions in several areas of interest to the Defense Nuclear Facilities Safety Board (DNFSB). The OA team reviewed Y-12 institutional feedback and improvement processes, including assessments and inspections, corrective action/issues management, lessons learned, and employee concerns. Selected Y-12 activity-specific feedback and improvement processes, such as post-job reviews and application of lessons learned, were also reviewed to determine how effectively institutional programs are implemented.

D.2 RESULTS

D.2.1 YSO Line Management Oversight

YSO has established an effective program for line oversight of contractor performance. YSO reviews the contractors' standards/requirements identification documents (S/RIDS) and performance evaluation plan annually to determine a baseline set of assessments that will provide for sufficient coverage of ES&H functional areas to evaluate contractor performance. Assessments are tracked on a monthly basis through its internal performance indicator process to ensure that assessments are completed on schedule. In 2002, YSO committed to conduct 791 assessment activities according to its assessment schedule, and performed more (903) assessment activities than required by its baseline schedule.

YSO management has emphasized the need for managers and staff to monitor contractor performance through "field time" (i.e., time spent in the Y-12 facilities observing work activities or performing other operational awareness activities). Field time goals have been established for all YSO managers and staff. Field time is tracked and reported on a monthly basis to the YSO Manager, and in most cases, staff meet or exceed monthly field time goals. In addition, YSO has established requirements for all managers to regularly conduct and document management walkthrough assessments. The management walkthroughs are being performed in accordance with the established schedules and are effective in identifying deficiencies for contractor corrective action.

YSO assessment activities, including the Facility Representative program and ES&H subject matter expert assessments, are providing effective safety oversight of contractor operations. These assessments cover a broad range of contractor activities, including follow-up to BWXT lessons-learned communications, contract performance-based incentive verification reviews, observations of maintenance work and outages, safety basis implementation, performance assurance program implementation, and follow-up of effectiveness of corrective actions. YSO has an adequate number of experienced and knowledgeable Facility Representatives. Monthly Facility Representative assessments (including facility walkthroughs, observations of operations, and corrective action verifications) are being adequately performed, documented, and communicated to BWXT. YSO management at all levels recognize the value of the Facility Representative program and expressed their full support for the program. Subject matter experts within the Operations and Technical Support Division conducted a variety of assessments during fiscal year (FY) 2002 in various areas (e.g., quality assurance, occupational safety and health, facility maintenance, environmental protection, criticality safety, fire protection, vital safety system reviews, and cross-cutting areas, such as training and qualification,

management and independent assessments, and corrective action implementation). Subject matter experts conducted joint assessments and walkthroughs with BWXT in several areas, such as integrated safety management system (ISMS) implementation, construction safety, radiological protection, and vital safety systems reviews. BWXT and YSO have developed a good working relationship, and the assessment activities were thorough in the areas reviewed.

YSO operational awareness activities and assessments have identified deficiencies in BWXT ISM implementation and have resulted in corrective actions and improved ES&H performance. For example, a recent Facility Representative quarterly assessment of safety basis implementation identified a number of conduct of operations deficiencies in BWXT's performance of technical safety requirement (TSR) surveillances, which are being corrected. Subject matter expert assessment findings are appropriately focused on performance and identify substantive findings requiring contractor corrective action. For example, the Weapons Quality Assurance Group (within the YSO Operations and Technical Support Division) has conducted a number of facility quality assurance assessments of the BWXT management assessment process and the control of measuring and test equipment, which identified performance weaknesses and resulted in BWXT corrective actions in these areas.

YSO is taking steps to further improve line oversight coverage of contractor activities and to support the transition to the National Nuclear Security Administration (NNSA) 'self-governance' model. For example, YSO recently implemented a teaming approach to provide a coordinated method of oversight for various construction and decontamination and decommissioning activities. In addition, YSO is working to formalize the performance assessment matrix (PAM), which includes monthly updates (a more frequent update than most other NNSA organizations), and to schedule quarterly evaluations of contractor management and independent assessment processes. Further, assessment schedules are being coordinated with BWXT to minimize duplication of effort and to ensure that YSO has the opportunity to observe and evaluate BWXT assessments.

YSO has established the essential elements of an effective self-assessment program for its activities. The self-assessment process is adequately defined in a procedure, which identifies specific areas to be evaluated once every three years. Schedule compliance is monitored and tracked by the performance indicator program, and findings and corrective actions are tracked and monitored. YSO implementation of its self-assessment program is improving based on a review of the scope and findings from recent self-assessments. For example, recent self-assessments focus more on the effectiveness of management processes and have identified opportunities for improvement, such as the need to formalize requirements for documenting lessons learned. The current annual assessment schedule reflects an appropriate emphasis on important YSO functions that had not previously been subject to self-assessments, such as emergency readiness, start-up/restart reviews, the Price-Anderson Amendments Act program, and systems engineering.

YSO has established a number of performance indicators to effectively monitor its organizational performance. The internal tracking and monthly reporting of a number of areas (e.g., completion/acceptance of occurrence reporting and processing system, or ORPS, corrective action plans, validation activities for corrective actions, and completion of oversight activities of the contractor) provides valuable feedback to the YSO Manager on implementation of key Federal functions and helps to establish resource needs and priorities. It also serves as a mechanism to evaluate the performance of YSO managers and staff and hold them accountable for meeting expectations.

The monthly assessment report (MAR) process is an effective management tool for categorizing results from YSO line oversight activities and communicating them to the contractor. The MAR process is well documented in procedures, and actions are tracked to closure in the deficiency tracking system. As part of development and finalization of the MAR report to the contractor, the YSO Deputy Manager and all division managers meet to discuss deficiencies and weaknesses from assessment activities. This step promotes line management ownership, detailed technical knowledge of the issues/performance concerns, and consistency in categorization of assessment results. In the meetings observed by OA, YSO management at all levels displayed a good working knowledge of the issues and were actively involved in the discussions of priorities and expected corrective actions.

YSO has a number of appropriate processes to monitor and communicate trends in contractor performance. The PAM process is maturing and gaining acceptance as a tool for evaluating contractor performance against the contractual provisions of the performance evaluation plan (PEP). YSO uses this process to communicate ratings and/or trends (positive

and negative) to contractor senior management and to solicit suggestions for additional actions/performance goals to focus needed improvements. Weekly meetings with the contractor are held to discuss events and injuries, and YSO holds monthly meetings to discuss performance indicators and recommendations for actions and improvements. Based on OA's observations of these meetings, YSO and BWXT have established a good working relationship and the meetings were effective in explaining positive and negative trends and identifying constructive improvements in the performance indicators and ES&H processes.

YSO Actions for Issues of Interest to the DNFSB. As another method for evaluating YSO's performance, OA selected a number of issues of interest to the DNFSB, including maintenance of safety-related equipment, use of improperly heat-treated aluminum, use of engineering controls for criticality safety, and implementation of systems engineering functions in DOE operations. For each of these issues, OA reviewed the status of the issue and the YSO actions to ensure timely and effective resolution. As discussed below, OA did not identify any major concerns with the YSO actions to address these issues; however, in one case, NNSA Headquarters actions to address one concern were not timely.

During the OA inspection, YSO was in the process of conducting a maintenance team inspection of safety system class grade 1 and 2 equipment. The assessment plan scope and criteria adequately addressed important elements of system maintenance to evaluate system operability and reliability. The assessment team had sufficient technical expertise and included several Facility Representatives and a safety basis engineer. Furthermore, as discussed in Appendix F, the Building 9204-2E fire protection system and criticality accident alarm system (CAAS) appear to be in good physical condition, and corrective and preventive maintenance programs are appropriate to ensure their operation.

Actions were taken during November 2002 by YSO and BWXT to determine the use of improperly heat-treated aluminum by a certain aluminum vendor. However, the DNFSB determined that the initial actions by DOE/NNSA were not sufficiently comprehensive based on their review of field element actions to date. Subsequently, the DOE Headquarters Office of Environmental Management developed and provided to their field elements additional lines of inquiry to more comprehensively address this issue. However, similar actions have not yet been taken by NNSA Headquarters to resolve this issue in a timely manner. At the time of the OA inspection, NNSA Headquarters was in the process of issuing a letter to NNSA site office managers directing site offices and their contractors to reevaluate their previous actions and to address the lines of inquiry suggested in a memorandum issued by the Assistant Secretary for Environment, Safety and Health. YSO has communicated to BWXT the need for additional investigation of the use of aluminum parts or raw material that may have been supplied or tested by the aluminum vendor.

BWXT and YSO are working to improve the use of engineering controls for criticality safety, with a primary focus on reduction and simplification of material containers used for current operations and improved application of criticality engineering controls to new projects, such as the enriched uranium operations modernization project. Container and material handling issues are identified as a NNSA/YSO priority in the February 2003 PAM report, and reduction and simplification of administrative controls were identified as an area for improvement for the contractor in the PAM and PEP.

As discussed in Appendix C, YSO is making good progress in establishing and integrating the systems engineering functions into its site operations. The YSO system engineering function has been staffed with well-qualified personnel; assignments for reviewing vital safety systems coverage have been formalized; and expectations for day-to-day awareness of configuration of assigned systems have been defined and established.

D.2.2 BWXT Feedback and Improvement Systems

BWXT has established and implemented a variety of programs to provide feedback on the adequacy of ES&H processes and performance and to foster continuous improvement. Independent and management self-assessment programs as well as line and support surveillance and oversight inspections are conducted to evaluate performance. Other feedback mechanisms, including ORPS, management reviews, radiological awareness reports, lessons learned, behavior-based safety programs, and employee concerns processes, provide additional institutional feedback vehicles for improving ES&H performance. Formal processes are in place to manage safety issues identified during these evaluations.

These feedback and improvement processes are maturing, having undergone many changes in the last two years since BWXT assumed responsibility as the management and operating contractor. BWXT has established and implemented various organizational and

process initiatives to increase the effectiveness of feedback and improvement at Y-12 and to address identified weaknesses. While generally effective and maturing in most respects, weaknesses in management assessment and issues management processes and performance remain to be addressed.

Assessments. BWXT has established a robust program for independent and management assessments. Numerous independent and management self-assessments and inspection/surveillance activities are conducted by BWXT. These assessments and inspections are effective in identifying and documenting facility condition and safety process and performance deficiencies.

The Performance Assurance organization conducts numerous, thorough, and comprehensive independent assessments that focus on crosscutting both ES&H program topics and facility- or project-specific performance. Assessment topics are selected using an appropriate analysis of external drivers, internal requirements, and evaluations of past performance, trends, and input from line and support organization management. Annual schedules are developed and maintained and the assessments are formally planned and performed to predetermined acceptance criteria. This process and roles, responsibilities, and authorities are delineated in an institutional procedure. Findings from internal independent assessments are reviewed against a S/RID for classification. In addition, a comprehensive corporate ISM assessment is performed annually.

Another institutional procedure delineates the requirements and management expectations for each line and support organization at Y-12 to schedule, plan, and conduct management assessments of processes and performance. Annual schedules are developed and placed on the BWXT internal website, with the status maintained as assessments are performed, canceled, or postponed. These schedules generally reflect an appropriate number of self-assessments of a variety of processes and activities within line and support organizations, and most scheduled assessments are being performed as scheduled. During the past year, the Facilities, Infrastructure, and Services Division (FIS) Director has led an in-depth team evaluation of each of his subordinate organizations, providing management with a more direct picture of performance and a clear communication of management expectations. In addition, ES&H performs routine surveillances and safety walkthroughs of plant facilities and work areas, and line organizations perform informal inspections, walkthroughs, and surveillances. ES&H supervisors and managers also conduct formal weekly senior supervisory watch observations of work activities. The construction organization in FIS has established a special safety team that provides an effective mechanism for identifying and correcting safety housekeeping and work performance deficiencies. This cross-discipline team is comprised of three to five craft persons, who are assigned full time on a three-month rotational basis. The team is coordinated by a former construction craft superintendent with significant construction safety experience and training. Construction superintendents also perform similar safety surveillance weekly. Observations are documented and deficiencies are entered into a computer-based corrective action tracking system; the documented deficiencies are tracked and trended by a team coordinator and presented at weekly construction safety meetings.

The framework for an effective management assessment program is in place, and many assessment activities are performed at Y-12. However, YSO and BWXT have identified weaknesses in this program. In September 2002, YSO issued a finding against the BWXT management assessment program, which is being tracked. In addition, BWXT has identified and reported through the PAAA noncompliance tracking system a programmatic concern with management assessments. YSO and BWXT recognize that the disparity between the number and substance of issues identified internally in contrast to those identified by independent and external reviews is an indicator that line management assessments are not yet as rigorous and self-critical as they need to be to serve as an effective complement to the currently effective independent internal assessments performed by various BWXT organizations and assessments performed by external organizations.

YSO and BWXT have made improvements in the management assessments a priority and have initiated several mechanisms to drive improvement. YSO has established improvement in management assessments as one of several specific performance objectives and measures in the FY 2003 performance evaluation plan. BWXT has developed a comprehensive four-day feedback and improvement workshop involving team planning and execution of an actual management assessment and analysis and resolution of findings, which is attended by many FIS and Manufacturing supervisors and managers. Anecdotal evidence indicates these workshops are resulting in improved management assessment performance. Last spring, compliance managers were appointed in both FIS and

Manufacturing to assist line management in coordinating and improving management assessment and issues management performance and to serve on the Issues Management Prioritization and Risk Board (IMPRB). Compliance managers are serving as an effective liaison with support groups and other line organizations and are improving the quality and consistency of management assessments. The special materials organization (SMO) in Manufacturing has recently instituted monthly management assessment staff meetings to review assessment needs, coordinate schedules, and review assessment findings. OA's observation of three management assessments indicates that the BWXT managers were conscientious in performing their responsibilities and the assessments were effective in identifying needed improvements.

Although improvements in the quality and depth of management assessments requires continued management attention, OA's review indicates the ongoing actions are appropriate and significant progress is being made.

Issues and Corrective Action Management. BWXT has established a formal graded approach for managing the documentation, evaluation, and resolution of most assessment findings, ORPS reportable events, and PAAA noncompliance corrective actions. A robust database called the corrective action planning system (CAPS) supports tracking and trending corrective actions. Assessment findings, defined as noncompliance with a requirement, are graded as level A, B, or C using a significance checklist. The institutional issues manager, in consultation with the IMPRB, grades findings from external and internal independent assessments. This multiorganizational review board provides effective and consistent evaluation and classification of these findings. The graded level dictates the rigor applied to evaluation, documentation of corrective actions, and monitoring of actions and closure. Level A findings, the most significant, require a formal root cause analysis. There have been no issues classified as Level A since the inception of the CAPS significance checklist in March 2002. The results of informal root cause analysis required for Level B findings are extensively documented in the CAPS database, with linkage of corrective/preventive actions to the underlying causes.

With some exceptions, corrective actions were considered by the OA team to be appropriate and adequately addressed causal factors. Generic implications are required to be determined for Level A and B findings and addressed in the corrective actions. No causal analysis is required for Level C findings, and corrective actions are typically documented by a disposition statement rather than a formal action plan. Findings from management assessments are graded by the line organization owning the assessment. Level C findings need not be entered into CAPS if they are addressed within five days of reporting or before the IMPRB review for external and independent assessment findings. Line management is responsible for being able to demonstrate that Level C findings have been appropriately resolved. Findings from external assessments, such as YSO monthly reports and reportable events, are categorized by default as Level B issues. Organizations can, and many do, use CAPS to track other issues and management commitments.

An effective safety issue review forum, called the Feedback and Improvement Working Group (FIWG), meets regularly to evaluate matters related to assessment and issues management and to coordinate development of a quarterly performance and trending report of feedback and improvement data. The formally chartered FIWG includes ES&H, Performance Assurance, and Quality Assurance representatives and is supported by non-voting Compliance Managers from line organizations. The FIWG has identified approximately 20 crosscutting or special issues for senior management attention and additional action from its reviews of feedback and improvement data since late 2001. These issues have been forwarded to the General Manager, Deputy General Manager, and the Executive Steering Group for direction. The extensive quarterly feedback and improvement reports consist of summary evaluations and individual detailed feeder reports from line directorates. Key directorates have also established formal internal FIWGs to perform similar reviews and coordinate the development of quarterly feeder trending reports.

As part of its PAAA program, BWXT has established a process for screening nuclear and radiological safety issues from such primary sources as reportable events, external and internal independent assessments, and Level B findings from management assessments. Many individuals in line and support organizations have been trained and designated as line management PAAA officers (LMPOs) with the responsibility to screen deficiencies identified in their organizations against PAAA reporting criteria. In calendar year (CY) 2002, over 750 issues were screened, and 24 noncompliance tracking system reports were issued at Y-12. Issues from sources

designated as "secondary," such as documented surveillance activities and fire hazards assessments, are screened collectively by LMPOs on a quarterly basis.

Notwithstanding the generally effective management of issues input to CAPS, there are weaknesses in some aspects of issues management, especially the categorization and processing of management assessment and non-assessment findings. As a result of process and implementation weaknesses, some issues are not being consistently evaluated and corrected. Specific areas of weakness are discussed in the following paragraphs.

Although CAPS provides a powerful mechanism to support trending, its use for capturing many issues is voluntary and results in inconsistent data collection. The exclusion of many Level C findings from CAPS (based on completion of actions within specified time frames) excludes many issues from trending and distorts the picture of overall performance. The significant issues identified by the FIWG and presented to senior management are not subjected to the institutional classification process. While some organizations (e.g., FIS) employ formal internal tracking systems, FIS and Manufacturing do not have formal instructions or processes for managing non-CAPS issues.

The institutional procedure and management expectations do not drive use of the process for addressing findings that meet threshold criteria from less formal sources, such as ES&H safety walkthroughs, ES&H Senior Supervisory Watch observations, and line surveillance or inspection activities not considered a formal assessment. No formal reporting vehicle, such as a deficiency report, exists to document deficiencies, evaluations, and resolutions. For example, deficiencies in job hazards analysis and job hazard identification identified during ES&H safety surveillances, owned by line organizations, have not been formally addressed and tracked to closure.

Deficiencies in the handling of a February 2003 event in the SMO group of Manufacturing reflects the results of a non-conservative selection of the method for documenting an operational event and the lack of a generic deficiency reporting mechanism. The Conduct of Operations Manual requires that a formal critique be held for events that are reportable to DOE or that are classified as a deficiency (the equivalent of a current Level B finding), and that a management review be conducted for non-reportable events that could impact safety or reliability. However, the SMO group conducted and documented the review of an event that involved multiple violations of requirements in design control, configuration management, and operations by both SMO and Engineering and Technology as a "post-job analysis." A post-job analysis is identified as a technique allowed for analysis of operations to improve safety and performance, but is not intended for event analysis. The event involved several non-compliances with requirements that would meet the criteria of Level B findings, with potential safety and programmatic implications. The post-job analysis process, which is described in the guidance rather than in the requirements section of the Conduct of Operations Manual, does not require a causal analysis or formal documentation of the evaluation or corrective actions. No documented causal analysis was performed, and recommended actions in the post-job analysis report did not address the design control or configuration management issues. The report included a summary lessons-learned paragraph of recommendations (e.g., procedures must be followed verbatim) but did not identify any discrete corrective actions. BWXT management indicated that corrective actions were taken for the operational issues, but had only been documented as "recommendations" in draft minutes of a post-event meeting. A formal lessons learned, in draft during the OA inspection, was subsequently issued; it discussed direct and root causes of the configuration control issue and included an action to develop and present effective training on configuration control and modifications for project and operations personnel in a description of the resolution (not an action plan). However, the lessons learned did not address the SMO operational error of working outside of the procedure when the design errors were discovered in either the causal discussion or the description of resolution. No issues were classified or entered into CAPS or a formal line management tracking system. Neither the "recommended" actions on the post-job analysis nor the description of resolution on the lessons learned had assigned organizations or owners. The post-job analysis report had no indication of documented supervisory review and approval (as none is required by the Conduct of Operations Manual).

The OA team also identified examples where noncompliance with requirements identified in line management assessments were either incorrectly identified as observations or were classified as Level C findings when the issues met the criteria for Level B. For example, findings from an October 2002 construction management assessment identified issues involving multiple performance weaknesses in lockout/tagout (e.g., a worker using another worker's lockout

equipment) and performing work without development of a job hazards analysis, job hazard identification, or hazards assessment checklist, and they were both non-conservatively classified as Level C. In other cases, findings from management assessments have not been classified or input to CAPS in a timely manner. Twenty-one findings from a Director's assessment of maintenance and manufacturing conducted in November 2002 had not yet been screened as required by the institutional issues management procedure.

Line organizations have not defined their processes for addressing non-CAPS issues as required by the institutional issues management procedure. Documentation of actions and tracking of the resolution of non-CAPS issues by line organizations is mostly informal and typically only includes notes on a copy of the source document. Corrective actions resulting from a recent enriched uranium operations management review (a critique process employed for incidents that typically are less than ORPS reportable) had not been input to CAPS or documented as completed.

Weaknesses were identified in the documentation and screening of secondary sources for PAAA reporting criteria. The institutional procedure does not clearly address the use of multiple LMPOs (26 in Manufacturing and 18 in FIS) or the minimum documentation requirements for screening secondary sources. Line organizations do not have implementing procedures or clearly defined processes (although some informal descriptions of methodology and sources exist). Further, line organizations do not have logs or consolidated databases or records for demonstrating complete screening of secondary sources or central files for completed screening forms. Although institutional procedures require the PAAA manager to review line LMPO logs and perform independent or management assessments of the program's effectiveness, this review has not been performed since the new secondary source screening process was instituted in early CY 2002 and is not on current assessment schedules.

Because of the weaknesses described above, BWXT institutional procedures and informal directorate processes do not ensure that some issues (i.e., less significant issues and issues identified by mechanisms other than assessments) are reliably captured, classified, processed, resolved, and analyzed for extent of condition and recurrence controls. These weaknesses also reduce the ability to perform effective trending and screening of PAAA secondary sources.

Finding #1: Many program and performance deficiencies that are identified by means other than external and internal independent assessments and reportable events are not being consistently and accurately documented, evaluated, and tracked to closure.

Lessons Learned. Externally generated lessons learned are being screened for applicability to Y-12, lessons learned reports are being generated from internal events, and both external and internal lessons learned are being disseminated to workers. Selected lessons learned are being placed in required reading files and discussed at safety meetings and crew briefings. An internal website provides an extensive and accessible collection of archived lessons learned. To assist users in the identification of potentially applicable lessons, the website provides a search function that allows sorts by date, classification level, activity, functional area, hazard, and keywords. The website also provides a list of contacts and links to external lessons-learned sources. An institutional lessons-learned coordinator in the Performance Assurance organization serves as the program owner and screener for external lessons learned. Personnel in line organizations have been designated local coordinators and points of contact for generating and sharing lessons learned. Approximately 200 lessons learned were forwarded for further dissemination by the lessons learned program manager in the last two years.

Notwithstanding the communication of many lessons learned at Y-12, the effectiveness of the program could be strengthened with a more rigorous process for ensuring and documenting that lessons learned are reviewed for applicability and are appropriately disseminated by line organizations. Feedback on applicability reviews and directed actions are via electronic mail to the program manager, and tracking responses and demonstrating effective performance is difficult. Although an electronic feedback form is available and referenced in the institutional procedure, it is not consistently used by recipients or used to evaluate program implementation. Further, the institutional procedure does not address use of subject matter experts for evaluation of applicability or needed actions.

Behavior-Based Safety Program. Limited-scope behavior-based safety programs have been in operation in the construction and maintenance

organizations. This program provides a vehicle for increasing worker awareness of safety behavior on a personal basis through training of observers and the immediate feedback provided by one-on-one observations in the workplace. BWXT senior management supports this program, recognizing the benefits of dedicating personnel time needed to attend training, conduct observations, analyze data, and administer the program. The behavior-based safety program is currently implemented for some activities (e.g., painters and pipe fitters). Senior BWXT management has recognized the benefits of this program in improving worker safety practices and is allocating resources for sitewide implementation.

Employee Concerns Programs. BWXT employees are encouraged to voice any safety concerns to their immediate supervisors for resolution. If concerned workers choose not to work through their supervisors or desire confidentiality or anonymity, several other vehicles are available for reporting concerns. An institutional procedure defines a formal employee concerns response and appeals process. Another institutional procedure describes a program for documenting and resolving safety and health concerns, called "I Care-We Care." Forms for reporting concerns through this program are available in boxes located at numerous bulletin boards and other locations at Y-12. The various mechanisms available for reporting safety concerns, including the General Accounting Office and DOE Inspector General, are also communicated to workers during initial employee ethics training and initial general employee training and biennial retraining. An employee concerns website and the ethics training material direct employees to a menu-driven hotline telephone number, as well as specific direct contact numbers for a variety of areas of concern, including health and safety, chemical and biological, radiological, occupational health, and industrial hygiene.

The "I Care-We Care" program is administered by the ES&H organization, with evaluations performed by members of a committee of subject matter experts and line personnel. Almost 200 "I Care-We Care" concerns were reported in CY 2002. Based on a sample of data and completed concern resolution reports, these concerns are adequately evaluated and resolved in a timely manner with feedback to the concerned individual.

Although these processes are providing for resolution of many employee concerns, there are a number of weaknesses in the processes and procedures for implementing these programs. The formal employee concerns response procedure does not accurately describe the program or processes employed at BWXT for managing employee concerns. This procedure does not reflect how the hotline telephone system works, the process the employee concerns office in Human Resources uses to transfer concerns to other site organizations for resolution, the required evaluation process, documentation requirements, or the roles, responsibilities, and authorities for the organizations handling employee concerns. General employee training is outdated and does not reference the hotline number or process. Organizations to which concern calls are routed or to which concerns are forwarded by the employee concerns office, such as industrial hygiene and radiation protection, do not have internal instructions for documenting the resolution of concerns. There is no process for developing a master compilation or recording of employee concerns for the Y-12 site.

In addition, weaknesses in documentation of the resolution of employee concerns reduce the usefulness of these programs as a management tool for demonstrating that employee concerns have been addressed. OA's review of a sampling of intimidation/harassment concerns addressed by the employee concerns office in Human Resources indicates that documentation was incomplete (e.g., evaluation and closure were inadequately detailed and the employee concerns form cited in the institutional procedure was not completed). Evidence files for several "I Care-We Care" concerns did not provide adequate documentation reflecting a clear description of the issue, the evaluation process, or the rationale for the final resolution of the concerns. For example, the documented analyses and resolutions in the evidence file for a concern related to a possible beryllium exposure situation were incomplete and inaccurate. The evidence file created the incorrect perception that employees may have been exposed to beryllium for some time or to levels exceeding allowables. After being alerted to this situation, BWXT was able to collect information that showed the potential for exposure was low and that actual actions taken to resolve the issue were commensurate with the risk. However, the relevant information was not in the evidence file and was not readily available.

The OA team identified no instances where safety concerns raised through the "I Care-We Care" or the employee concerns response program were not addressed. However, the procedural weaknesses reduce the assurance that employee concerns will be properly processed and resolved. In addition, expectations for documentation are not clearly

defined, and some documentation files do not provide sufficient assurance that worker's concerns are properly addressed.

Finding #2: Employee concerns program procedures are not sufficiently defined, and the documentation, evaluation, and disposition of concerns are not adequate to demonstrate that all employee concerns are being appropriately resolved.

Activity-Level Feedback and Improvement Elements. In addition to various assessments that focus on ES&H at the activity level, Y-12 has a number of effective processes for reviewing work at the activity level. Safety meetings, shift turnovers, plan-of-the-day meetings, and the Zero Accident Council provide forums for workers to provide feedback to management.

In addition, the behavior-based safety program and the construction safety surveillance program are effective in providing direct one-on-one feedback on safety performance. The Construction Special Safety Team consists of three to five individuals from different trades (e.g., carpenters and pipe fitters) who are assigned to the team on a full-time basis for a 3-month period. The team performs inspections that focus on workplace conditions and behavior-based observations of construction work activities. Deficiencies are entered into a computer-based corrective action tracking system, are tracked and trended, and are presented periodically at construction safety meetings. The Construction Special Safety Team has been effective in focusing on higher risk construction activities and has contributed to a decreasing recordable injury and illness rate. These two programs are effective in providing feedback to workers to improve their implementation of safety practices. They are also effective forums for workers to provide feedback on safety-related issues and to suggest improvements in ISM processes.

While several effective activity-level processes are in place, some other existing mechanisms are not well documented or are underutilized. The Y-12 ISM program specifies the use of post-job reviews, which are used to obtain feedback from workers to improve processes and performance. Post-campaign reviews have been conducted for recently completed lithium metal production, gashouse, and deuterium gas facility campaigns in SMO, but corrective actions have not been systematically and formally documented. In addition, maintenance work package forms contain a comments section, but it is rarely used to identify safety, support, or work control administrative concerns. Neither the form nor the procedure clearly solicit or encourage feedback from workers. Further, reviews of samples of maintenance work packages, which are required by BWXT procedures, are performed but have not been demonstrated to provide feedback that results in significant improvements to work control processes or documents.

D.3 CONCLUSIONS

YSO has established an effective assessment program for line oversight of contractor performance. Its assessment and issues management programs are sufficient to evaluate contractor performance and are being effectively implemented. YSO has also established the essential elements of an effective self-assessment program for its own activities. Some aspects of feedback and improvement programs are particularly effective, such as its use of performance indicators to self-assess and monitor performance of its internal operations and mechanisms to communicate information to the contractor (e.g., the MAR). YSO has identified areas for further improvement in implementation of its line management oversight responsibilities and has a number of ongoing initiatives.

BWXT has established and implemented generally effective feedback and improvement processes, in various stages of maturation, that are providing feedback and improvement in safety performance at Y-12. Formal programs have been established for conducting independent and management assessments, documenting deficiencies and tracking corrective actions, addressing employee concerns, and identifying and communicating lessons learned. BWXT management is effectively compiling and evaluating safety-related indicators to focus attention and drive performance improvements. To improve performance in the areas of assessment and issues management, BWXT has established specialized staff positions, review committees and management panels, and separate programs that have been effective in accelerating the maturation of these processes. Some aspects of BWXT activity-level feedback processes, including the Construction Special Safety Team and behavior-based safety program, are having a positive impact on safety practices and performance.

While BWXT has an effective tracking system for many issues (those classified as more significant and those identified by most formal assessments), other safety issues (less significant issues and issues identified by less formal assessment mechanisms) are not always

being reliably captured and resolved. Process and performance weaknesses in the classification, disposition, PAAA screening, and resolution tracking of these other safety issues reduce BWXT's ability to perform accurate trending of safety issues. In addition, the formality and rigor being applied to processing of employee concerns is insufficient to provide assurance that issues are being consistently and appropriately evaluated and resolved. Further, some potentially useful activity-level feedback mechanisms are underutilized.

BWXT management has developed and implemented a variety of effective tools and process enhancements to address known weaknesses in feedback and improvement programs at Y-12. Similar management commitment and oversight and process enhancement initiatives applied to the weaknesses described in this report will result in more effective feedback and continuous improvement performance.

D.4 RATING

Core Function #5 – Feedback and Continuous Improvement: EFFECTIVE PERFORMANCE

D.5 OPPORTUNITIES FOR IMPROVEMENT

This OA inspection identified the following opportunities for improvement. These potential enhancements are not intended to be prescriptive or mandatory. Rather, they are intended to be reviewed and evaluated by the responsible line management, and accepted, rejected, or modified as appropriate, in accordance with site-specific program objectives and priorities.

YSO

1. **Continue ongoing management efforts to improve YSO assessment and self-assessment processes.** Specific actions to consider include:

   - Increase the emphasis on evaluating contractor performance assurance processes by expanding the scope of functional area assessments to include an examination of the contractor's self-assessment in the area reviewed, consistent with the PEP.

   - Increase the emphasis on evaluating work activities (e.g., YSO Operations Division assessment type OP-5). Consider structuring the individual assessment report results around the five core functions of ISMS to provide additional performance data for consideration to the ISM implementation element within the comprehensive incentive PEP evaluation.

   - Further improve the YSO self-assessment program by aligning suggested assessment areas to the management systems identified in the YSO management system description.

BWXT

1. **Strengthen issues management processes and performance.** Specific actions to consider include:

   - Establish clear management expectations and documentation vehicles, such as a deficiency report, to ensure that all safety deficiencies are documented, evaluated, and resolved based on the substance of the issue, regardless of the source.

   - Revise Chapter 6 of the Conduct of Operations Manual to require the screening of issues subject to management reviews in accordance with the institutional issues management procedure and the use of CAPS for tracking issues and corrective actions as required; clarify the term deficiency as it relates to critiques.

   - Establish formal instructions within line and support organizations to define the roles responsibilities, authorities, and internal processes and requirements for implementing such institutional programs as management assessments, issues management, and PAAA screening.

   - Establish more formal line and support organization tracking systems for corrective actions for non-CAPS issues.

   - Establish performance objectives and more rigorous trending and feedback for action plan and closure verifications conducted by line organizations and Performance Assurance.

- Institute a method for independent directorate-level review and approval of issue classifications by line organizations to ensure timely, accurate, and consistent grading of issues.

- Update the institutional PAAA procedure to address multiple LMPOs and provide clearer expectations for records/documentation for secondary PAAA screenings.

- Revise the institutional issues management procedure to address the Corrective Action Review Board process for issues classified as Level A by the IMPRB.

- Revise the maintenance job planning and execution procedure and maintenance job request form to provide guidance and expectations to encourage definitive post-job feedback from workers and first line supervisors. Consider expanding the maintenance job request comment field to elicit response to specific topics, such as the adequacy of planning, documentation, and support.

2. **Strengthen the rigor and formality for documenting and tracking subject matter expert and line organization feedback on applicability reviews and actions taken for lessons learned.**

3. **Strengthen the rigor and formality for resolving employee concerns.** Specific actions to consider include:

    - Revise the institutional employee concerns program to accurately describe the structure and processes for assuring that employee concerns are thoroughly and effectively evaluated and resolved.

    - Ensure that sufficient documentation is generated to accurately log concerns and their disposition.

    - Institute additional controls to ensure that the evaluation and resolution of "I Care-We Care" program concerns are thoroughly and accurately documented.

APPENDIX E
CORE FUNCTION IMPLEMENTATION (CORE FUNCTIONS 1-4)

E.1 INTRODUCTION

The U.S. Department of Energy (DOE) Office of Independent Oversight and Performance Assurance (OA) evaluated implementation of the first four core functions of integrated safety management (ISM) at Y-12. The evaluation focused on safety performance during conduct of program work, construction, maintenance, and waste management activities by BWXT Y-12, LLC (BWXT). The evaluation of Y-12 Site Office (YSO) effectiveness in providing direction to and line management oversight of BWXT is discussed in Appendices C and D.

For program work, OA reviewed the application of the core functions at three Y-12 facilities: Buildings 9204-2E, 9204-2, and 9215. Program activities reviewed at Building 9204-2 included cold press production operations and lithium hydride handling and packaging. At Building 9204-2E, reviewed activities included nuclear weapon component assembly, disassembly, inspection, and testing. At Building 9215, various operations associated with enriched uranium machining and material handling were reviewed.

For maintenance work, OA focused primarily on observation of manufacturing and infrastructure maintenance activities at Buildings 9204-2, 9204-2E, and 9215, review of work documents, and selected facility walkdowns related to maintenance work. The Y-12 maintenance organization is part of the Facilities, Infrastructure, and Services (FIS) Division. OA observed such work activities as crane and pump preventive maintenances, electrical and computer upgrades, a heat exchanger replacement, sight-glass modifications, a pump replacement, hydraulic pump work, and numerous lockout/tagouts associated with the observed work.

For construction work, OA selected four construction projects performed by BWXT employees (direct hire projects) and two construction projects performed by subcontractors. These projects included both nuclear and non-nuclear facilities at Y-12. BWXT construction projects included the installation of a new abrasive saw in Building 9212; the installation of a 3500-ton press in Building 9998; a construction project to remove and replace bond strand piping in the vicinity of the Y-12 Steam Plant (Building 9401-3); and a glovebox preparatory demolition project in Building 9204-2E. Subcontracted projects observed were removal of overhead piping supports associated with the demolition of Building 9205, and installation of continuous emission monitoring systems at the Y-12 Steam Plant.

In the waste management area, OA reviewed facility-specific waste management activities at Buildings 9204-2, 9204-2E, and 9215, at one construction site, and at the central BWXT waste management facility. Selected sitewide waste management activities were also reviewed, including aspects of pollution prevention activities and waste management activities at the Y-12 waste management facilities that store and/or process waste materials for disposition.

For all work observed (program, construction, maintenance, and waste management), the implementation of institutional, facility-level, and activity-level work control processes was examined. Environment, safety, and health (ES&H) programs, procedures, and policies, such as stop-work policies, were evaluated, and hazards analysis and control systems were examined. This approach enabled OA to evaluate the implementation of work control processes governing a broad spectrum of work in the areas of program work, maintenance, construction, and waste management.

E.2 RESULTS

E.2.1 Core Function #1 – Define the Scope of Work

Missions are translated into work, expectations are set, tasks are identified and prioritized, and resources are allocated.

Program. The scope of program (production) work in Buildings 9204-2, 9204-2E, and 9215 is clearly defined from the facility-level safety basis documents through the task-specific implementing procedures. The scopes of production work processes are initially described in

the facility description sections of the safety basis documents. Technical procedures more specifically describe the scope of work for discrete work activities. When new activities or revisions to existing processes are needed, the job hazards analysis (JHA) and radiological work permit (RWP) request forms provide a detailed scope of work and become the basis for subsequent hazard identification/analysis and identification/implementation of controls. This process results in new or revised technical procedures and permits containing the appropriate task-specific scopes of work. Schedules and production requirements are adequately defined in appropriate project schedules that break down production needs on a monthly basis. The facilities work from these documents to produce the required products.

BWXT is in the process of implementing a new computer-based automated job hazards analysis (AJHA) system, with full implementation scheduled for March 31, 2003. Several examples of AJHAs produced under the new system were reviewed during the OA inspection. Although the new process has many positive attributes, the AJHA procedure provides minimal guidance concerning the level of detail to which work activities should be described, and in some cases, the detail presented in approved AJHA scopes of work is not sufficient to adequately identify and analyze the hazards. Consequently, hazards are occasionally not identified during the AJHA process. For example, some AJHAs in Building 9204-2E restate the AJHA title with little additional information on the actual scope of the activity.

Maintenance. The scope of work for most jobs is adequately defined and documented in work documents used in the field by craft personnel. Larger jobs are defined in change proposals, modification packages, and formal planned work packages that are used to implement major changes. The scopes of work for most routine preventive and corrective maintenance jobs are adequately defined in maintenance job requests (MJRs) and associated documentation. Maintenance job planning and execution procedures generally provide adequate requirements and guidance for defining the scope of work. MJRs prepared for the various jobs observed appropriately specified craft disciplines, task priority, hazard grading, and system/component classification.

Formal procedures are in place to provide prioritization guidance for maintenance activities based on the importance of the equipment and hazards of the work. Review of numerous work packages indicated maintenance priorities were appropriately assigned. Additionally, the procedures address provisions for emergency and urgent work that may be necessary to protect workers, the environment, and the public.

A few work activities performed as skill-of-the-craft (SOC) work did not have sufficient work breakdown or work planning to fully define all elements of the job. A fully defined scope of work and associated work breakdown allows identifying hazards such that appropriate controls can be integrated into work packages. For example, inadequate work definition and instructions for lifting an 1100-pound heat exchanger resulted in craft personnel improvising to complete the work by cutting and modifying a structural support for the heat exchanger, resulting in an unplanned facility modification (discussed in Section E.2.3). For a sight-glass modification task, instructions and drawing details for installation of a pipe support were also inadequate.

Construction. Planning and scheduling of work activities for both BWXT direct hire and subcontractor construction work is well coordinated, organized, and communicated as evidenced in a variety of weekly construction planning and scheduling meetings. For example, the weekly meeting of subcontractor technical representatives (STRs) is interactive and effective at dealing with resource, equipment, technical, and ES&H issues associated with BWXT construction subcontractors. Several BWXT direct hire construction planning meetings are also held each week, such as the construction staff meeting, construction manpower meeting, and the construction direct hire planning meeting. During these meetings, current and planned work activities are reviewed, material and labor resources are planned, and construction line managers are effectively engaged in resolving recent concerns raised during field activities.

The sequential steps involved in work planning for both direct hire and subcontracted construction projects are detailed in BWXT construction procedures, such as the "Construction Work Planning" procedure. In addition, subcontracted work is generally well defined in project safety and health plans, activity hazards analyses (AHAs), and Division 1 specifications (which are the ES&H requirements prepared by BWXT and are applicable to the subcontractor). For example, the subcontract work scope for infrastructure reduction of Building 9205 is well defined in the ES&H plan, a series of AHAs, and Division 1 specifications. For direct hire construction work, most work scopes are adequately defined collectively though project execution

plans, hazards analysis checklists (HACs), site characterization and worker requirement reports, Division 1 specifications, and facility drawings and specifications.

Most construction projects involve a variety of sequentially performed activities (e.g., foundation, structural, and electrical), multiple craft personnel, and project durations that may extend over a number of months or years. Because work activities are defined in a number of work documents, construction work faces challenges in adequately identifying, documenting, and communicating work scope or changes in work scope once the project has commenced.

A specific concern is that temporary construction modifications performed in Y-12 nuclear facilities may not be adequately identified in construction work scope documents to ensure that such temporary modifications are properly evaluated prior to the execution of the modification. For example, a section of a return air system duct and a central vacuum system line in Building 9212 (A-Wing) were removed temporarily during the abrasive saw construction project to enable access for heavy construction equipment. This change in work scope was not identified in construction work documents (e.g., HACs or site characterization and worker requirement reports). Although the removal of these structures was outside the scope of the construction work package, the work documents were not revised to incorporate these temporary changes to the facility. BWXT construction did not formally request or obtain formal approval from design engineering prior to proceeding with the temporary modification. Additionally, this work was not properly evaluated by BWXT design engineering prior to execution of the modification. Field change notices (FCNs) were not initiated by construction engineering, and a temporary modification to these systems was performed without the modification being properly documented, reviewed, and approved. In response to this concern, BWXT reviewed the removal of the duct and vacuum system line and determined that the facility safety basis had not been adversely impacted. As a result of this event, BWXT issued a "Blue Alert" (a type of lessons learned) on March 21, and an occurrence report was initiated on March 25. The Building 9212 Operations Manager placed a temporary hold on the construction project, and construction management initiated a temporary Y-12 construction stand-down on March 24.

Finding #3: BWXT construction engineering processes and implementation of design engineering processes have not ensured that temporary construction modifications to structures, systems, and components within nuclear facilities are properly evaluated, documented, and approved with respect to the facility safety basis before execution of the modification.

In two other cases, the construction work scope was not sufficiently defined such that workplace hazards or hazard controls could be adequately defined and/or implemented. In one example, the work scope for a construction project to remove a press in Building 9204-2E did not indicate that the press and its components could be made available to the public though excess equipment sales upon completion of the project. There was no mention that the equipment was also in a legacy beryllium buffer area. Although not specifically required, industrial hygiene did conduct the appropriate beryllium surveys. In another example, for the abrasive saw construction project, the use of heavy diesel- and gasoline-powered equipment was not clearly defined in the HAC (or other work documents). The failure to include the use of diesel- and gasoline-powered equipment in the work scope for this construction project contributed to the carbon monoxide hazard not being identified as a hazard in the HACs as described in Core Function #2.

Waste Management. BWXT has clearly defined the scope of work for handling discarded waste from Y-12 operations. Working within the framework of external regulations for hazardous, mixed, and sanitary waste and DOE Order 435.1, *Radioactive Waste Management*, for low-level and mixed radioactive waste, BWXT has effectively defined waste handling requirements in a suite of waste management procedures. These procedures describe organizational responsibilities and requirements for storage in operating facilities and for meeting established waste profiles that allow transfer to the contractor that manages the Oak Ridge Waste Management Program for DOE.

At the facility level, the primary mechanism used to define waste management functions is the JHA, AJHA, and HAC processes when applied to the waste aspects of operations and projects. For the facilities

and projects reviewed, the scope of work was properly defined to permit effective waste management analysis through these processes. The potential for operations or projects to generate waste has been adequately defined so that the need for an analysis of storage and disposition options can be determined.

Although waste management functions are generally effectively defined, BWXT has not formalized processes to ensure that maintenance work in an operating facility will be coordinated with the primary (Operations) environmental officer/waste coordinator for that facility. In most cases, an informal approach achieves the objectives and provides a means for maintenance workers to effectively dispose of most waste streams from these facilities using the support of the facility's (operations) waste management coordinator and that facility's approved waste stream profile. However, in some cases, the informal processes did not provide full assurance that radioactive waste streams would be disposed of in the most effective manner. One facility's waste management coordinator was not always aware when a maintenance job would generate waste that requires his support for disposal. At another operations facility, management will not accept low-level waste (LLW) generated by maintenance activities. Because maintenance does not have an approved LLW waste profile for the Nevada Test Site, a more expensive disposal option must be used.

Summary. The scope of work for activities reviewed in the areas of program work, maintenance, construction, and waste management was well defined with some exceptions. For production work, the scope of work generally is clearly defined from the safety basis documents through the task-specific implementing procedures. Schedules and production requirements are adequately defined in appropriate project schedules. For waste management, the scope of work defined in JHAs is adequate to permit effective waste management analysis. For maintenance work, the scope of work for most jobs is adequately defined and documented in modification packages, formal planned work packages, and/or MJRs, depending on the type of work. However, some maintenance work activities performed as SOC work do not contain sufficient work definition and instructions. For construction, the scope of work for both direct hire and subcontracted construction projects is well defined. However, one project in a nuclear facility performed a temporary modification outside the original scope of work without the modification being properly documented, reviewed and approved.

BWXT is in the process of implementing a new computer-based AJHA system, which facilitates a systematic and rigorous approach to work planning. In some cases, the detail provided in approved scopes of work developed with this new process is not sufficient to fully identify and analyze the hazards, indicating a need for additional refinement.

In most cases, Y-12 processes (e.g., subcontract ES&H specifications, project execution plans, MJRs, and HACs) are adequate to ensure that mission requirements are translated into manageable activities and tasks. With a few exceptions, these processes were effectively implemented. YSO and BWXT have a good understanding of the current deficiencies in otherwise effective processes and are developing plans to address them.

E.2.2 Core Function #2 – Analyze the Hazards

Hazards associated with the work are identified, analyzed, and categorized.

Program. At the facility level, BWXT uses safety analysis reports and other safety basis documents to provide the facility-level hazards analyses for production activities. In most cases, activity-level hazards analyses for production work are performed and documented using the JHA/AJHA process. Most of the production work processes have been performed for many years, and the existing JHAs are generally adequate to cover the major processes. Initially, the hazards analyses for activity-level processes were part of the procedure development process. As part of ISM implementation in recent years, the site implemented a requirement to perform JHAs for all technical procedures, and the facilities reviewed have been performing JHAs for specific procedures as part of the implementation effort. For example, Building 9204-2 has completed JHAs for most technical procedures, and Building 9204-2E has completed JHAs for just over half of their technical procedures.

The new AJHA system provides a comprehensive hazard question set and corresponding controls as well as requirements for further actions needed to complete the hazard and control identification process. This system results in a more user friendly and comprehensive hazards analysis, provides for involvement of the appropriate ES&H professionals, and fosters identification of more consistent controls in the final JHA. The question set continues to evolve based on inputs from an established users group.

However, some question subsets could be further enhanced, such as those addressing environmental concerns (see the Waste Management section). For the most part, the AJHA administrative procedure requirements establish the appropriate mechanism to ensure that the JHA comprehensively analyzes activity-level hazards and identifies appropriate controls.

Although the JHA/AJHA processes provide an acceptable system for activity hazards analysis, the level of rigor associated with completion of JHAs/AJHAs was not sufficient in a few cases, resulting in some hazards and corresponding controls being missed. For example, a JHA addressing electrochemical etching in Building 9215 did not identify electrical and chemical hazards present in the work activity. In Building 9204-2E, a small quantity of cleaning solvent used in an assembly procedure was not identified by the JHA. In Building 9215, the JHA associated with chip packing did not address the hazards associated with the use of coolant, and the JHA for machining did not identify chemical hazards of the cleaning solutions. For the most part, the missed hazards were less significant or involved small quantities of materials. The small number of isolated instances of missed hazards indicates a need for more rigor, but does not indicate a systemic problem with the JHA/AJHA process.

The new AJHA program has the potential to lessen the occurrence of these types of mistakes. However, procedures that rely upon previously developed JHAs may not undergo a new AJHA for several years, depending on the specific procedure review cycle. Further, BWXT is not performing real-time plant-wide reviews of completed AJHAs for completeness and consistency during the initial implementation. Although a management review of the process is scheduled six months following full implementation, some of the early AJHAs reviewed are continuing to have the same deficiencies as older JHAs, particularly in the area of identifying chemical hazards. Additionally, AJHA teams have left the predefined generic AJHA controls in several of the approved AJHAs without developing specific controls for unique hazards. For example, the AJHA program will automatically include a generic control to review the appropriate material safety data sheet (MSDS) for an activity involving a reactive chemical, but cannot automatically identify the specific chemical hazards involved. The AJHA team must enter custom entries of the chemical hazards and, following the appropriate analysis of the hazards, custom entries of the controls. In several recent AJHAs involving chemical hazards, neither the specific chemical hazards nor controls tailored to the specific activity have been listed in the approved AJHA.

Maintenance. Formal sitewide procedures are in place and being appropriately used for hazard identification, work planning, and job hazards analysis. The hazard identification and planning procedure has comprehensive hazard identification checklists that, when properly performed, identify the hazards, reference procedures, and required reviews by safety disciplines (e.g., industrial safety, industrial hygiene, radiological controls, and environmental), and determine permits for specific maintenance jobs. The JHA procedure requires a more detailed JHA dependent on identified hazards of the job. Maintenance organizations are in the process of implementing the new AJHA process. Overall, the job hazard identification (JHI) and JHA procedures (and the AJHA system) provide a solid framework for the identification and analysis of hazards associated with the maintenance tasks and facilities where they are performed.

For maintenance activities, the typical hazards for routine preventive and corrective maintenance activities are enveloped by several standing work packages (SWPs). The SWPs, developed by multi-disciplinary teams, are based on craft trade and work activities (e.g., electrical work, pipe fitters, outside machinists, and crane and hoist work), and appropriately identify most work activity hazards. The SWPs also identify suggested controls for typical craft jobs performed under the various trades and work activities. These SWP controls adequately address the hazards for most maintenance work. Work performed under SWPs is performed as SOC work. Maintenance tasks, not bounded by the SWPs, receive an additional hazard screening to determine whether the jobs are SOC or require additional hazards analysis and a planned job package.

Although procedures were adequate to guide the identification of hazards, the OA team identified several weaknesses in hazard information on SOC MJRs. Specific hazard information for individual jobs was not well integrated into the work documents used by the craft in the field, and there were deficiencies in hazard information on many SOC MJRs. Hazard information was not consistently entered, and varied with the assigned planner. On several work requests, no hazard information was entered.

Construction. In most cases, workplace hazards are identified and sufficiently documented in HACs for direct hire construction work and in AHAs for subcontracted construction work. The AJHA process

is now being implemented on new direct hire construction projects, but had not been implemented on direct hire construction projects evaluated by the OA team. The AJHA process is also being used by BWXT as a hazard identification tool in support of subcontracted work to identify hazards associated with the work location, although subcontractors will continue to rely on work activity hazards analysis processes, such as the AHAs, that are integral to a subcontractor's safety and health policies and procedures.

For both direct hire and subcontracted construction work, safety and health professionals are well integrated into the planning, development, and execution of construction work activities, and in assisting line management in the identification and analysis of hazards. BWXT safety engineers are routinely evaluating workplace safety conditions at construction job sites and providing assistance to BWXT construction supervisors, STRs, and subcontractor staff in the identification of workplace hazards and correction of safety deficiencies. Safety engineers, for example, provided considerable technical expertise in the development of critical lift plans for the dismantlement of a press in Building 9204-2E. Industrial hygiene noise area monitoring and sampling for airborne contaminants has generally been extensive and well documented. Extensive noise monitoring and monitoring for airborne contaminants (e.g., asbestos, carbon monoxide, and silica) was conducted at the Building 9212 abrasive saw construction project. For the Building 9204-2E press removal project, legacy beryllium surface sampling had been conducted in 1998, and beryllium surface sampling for legacy contamination was performed in support of each stage of the press removal.

In most cases, BWXT subcontractors have attempted to associate hazards with specific work phases by developing a series of AHAs that correspond to specific work tasks or phases (e.g., project mobilization and preparation of a concrete pad). As a result, for construction work being performed by subcontractors, hazards can be linked to specific work phases and communicated to workers through mandated daily pre-job briefings.

However, hazards for some BWXT direct hire construction projects have not been sufficiently tailored and linked to specific work activities or construction phases as evidenced in HACs. For example, the BWXT direct hire construction projects for the 3500-ton press, abrasive saw, and bond strand removal projects are longer duration construction projects with multiple and distinct work phases. Each phase of the construction project introduces some hazards that are unique to that phase. However, for each of these projects, the collective hazards for the entire project are often documented in a single HAC, resulting in some hazards not being linked to specific construction phases or work activities. Furthermore, some direct hire construction projects do not have a consistent and formal mechanism to communicate current hazards and hazard controls identified in the HAC to workers, such as a formal daily pre-job briefing. Although construction supervisors are required to ensure that a safety task assignment (STA) is completed with each worker before proceeding to a new task, the expectations for the conduct and content of an STA are not well documented in the "Execution of Direct Hire Work" construction procedure, and the role of the HAC when conducting an STA is unclear.

Although most construction hazards for subcontracted and direct hire construction work were identified in the planning stages of the construction project and were documented in the HAC, the OA team observed one significant exception. For the abrasive saw construction project, the carbon monoxide (CO) hazard resulting from the indoor operation of industrial gasoline- and diesel-powered equipment (Bobcat, backhoe, and a gasoline-powered concrete saw) was not identified in the project HAC and could have resulted in overexposures of workers to CO. During the initial operation of the concrete saw, industrial hygiene monitoring for CO was conducted. Recorded CO levels at operator work stations peaked at 50 parts per million (ppm) and the job was stopped by industrial hygiene. (The Occupational Safety and Health Administration [OSHA] permissible exposure limit is 25 ppm.) Monitoring of CO had been initiated at the request of the construction superintendent, based on the superintendent's prior experience in working with similar equipment. The work planning process, however, had not identified the CO hazard, and CO monitoring requirements were not documented in the HAC or in the construction work package.

Waste Management. At the institutional level, BWXT has an effective program for analyzing Y-12 operations to determine pollution prevention/waste minimization opportunities. This program is supported by a comprehensive Y-12 pollution prevention program plan and a Y-12 pollution prevention and sustainability policy, which emphasize technical feasibility and economically practicable sustainability principles and practices. Line organizations have implemented this program to analyze operations and determine opportunities for reducing waste.

At the facility level, driven by tight restrictions for handling discarded waste, BWXT has effectively implemented requirements to analyze operations and programs into the JHA, AJHA, and HAC waste hazard question sets and checklists in order to determine whether waste will be generated. This approach has resulted in most facility- and activity-level work-induced waste hazards being analyzed to identify wastes that may be generated so that appropriate controls can be considered.

Within facilities, effective actions have been taken to reduce the generation of hazardous waste by switching to non-hazardous cutting oils/solvents/ cleaners and finding an offsite user for a hazardous chemical from site operations. For construction activities, the HAC process has requirements for considering pollution prevention/waste minimization through reuse of construction debris. BWXT organizations have about 40 ongoing pollution prevention projects and have received several awards for reducing/ eliminating waste.

Summary. The new AJHA system provides a comprehensive hazard question set and corresponding controls as well as requirements for further actions needed to complete the hazard and control identification process. Some question sets could be further enhanced, and further effort is needed to ensure generic controls are tailored to the unique hazards for an activity.

For most types of work, the hazards are adequately identified. In most cases the activity-level hazards analyses for program activities were adequately performed and documented using the JHA/AJHA process. There were a small number of cases where some hazards and corresponding controls were missed. The JHA process for maintenance is being adequately implemented in accordance with maintenance procedures. SWPs are properly defining and analyzing the hazards for routine preventive and corrective maintenance activities. For construction, in most cases workplace hazards are identified and sufficiently documented in HACs for direct hire construction work and in AHAs for subcontracted construction work. Safety and health professionals are well integrated into the planning, development, and execution of construction work activities and in assist line management in the identification and analysis of hazards. Hazards for some BWXT direct hire construction projects have not been sufficiently tailored and linked to specific work activities or construction phases. The collective hazards for the entire project are often documented in a single HAC, resulting in some hazards not being linked to specific construction phases or work activities. For waste management, which is driven by tight restrictions for handling discarded waste, BWXT has effectively implemented requirements into the JHA, AJHA, and HAC waste hazard question sets and checklists to analyze operations and programs in order to determine whether waste will be generated.

The processes for identifying and analyzing hazards are generally well established and documented for program work, maintenance, construction, and waste management. With a few exceptions, these processes were effectively implemented and the hazards were adequately identified and analyzed.

E.2.3 Core Function #3 – Develop and Implement Hazard Controls

Safety standards and requirements are identified and agreed upon, controls to prevent/ mitigate hazards are identified, the safety envelope is established, and controls are implemented.

Program. Engineering controls are used for many of the hazards associated with production work at Y-12. For example, buildings are designed to prevent contaminants from being released to the environment, and the use of hoods and other large ventilation booths is prevalent. In some cases, engineering controls were not incorporated into the design or cannot practically be retrofitted into the systems and facilities, some of which are over 50 years old. Where engineering controls are not in place, BWXT effectively implements appropriate administrative controls in most cases. Commonly used administrative controls include postings, radiological work permits (RWPs), and personal protective equipment; however, the most prevalent administrative control for production work is the use of procedures.

The Y-12 technical procedure development, review, approval, use, and modification process provides a comprehensive system to ensure that technically accurate procedures with appropriate ES&H controls are provided to and appropriately used by workers. The procedure review process requires a JHA for all new revisions and when the intent of the procedure changes, as well as peer reviews, ES&H discipline reviews, and comprehensive validation. The Conduct of Operations Manual chapter on procedure adherence (Chapter 16) establishes a program for strict adherence to procedures and lays out comprehensive management expectations regarding use of procedures. Consequently, the procedures used in production operations are well written, technically accurate, and

contain the appropriate information and level of detail to perform the tasks safely.

BWXT is also effective in monitoring radiation dose and maintaining the highest doses to personnel within conservative administrative control limits. At the facilities reviewed, the potential for intakes of radioactive material and resulting internal dose represents the primary radiological hazard. The Y-12 bioassay monitoring and internal dose investigation systems were comprehensive, rigorously implemented, and effective. Because the original design of many Y-12 uranium production facilities did not include localized containment features, the potential for intakes of radioactive materials to workers cannot be eliminated without significant and costly reengineering. However, Y-12 has implemented a comprehensive bioassay monitoring program that is capable of detecting, monitoring, and controlling intakes of radioactive material that may occur. Bioassay requirements and scheduling dates are integrated and tracked through the Y-12 electronic bar coded RWP process. Derived investigation levels are predefined and used to screen individual bioassay results that require further evaluation and additional special monitoring. These levels are set low enough to provide reasonable assurance that intakes of significance with respect to administrative control levels can be identified early enough to implement such corrective actions as work restrictions. All elevated bioassay results that exceed the derived investigation levels are provided a unique case number and assigned to a professional internal dosimetrist for further internal dose evaluation. Records related to intake cases from Building 9215 indicated a high level of professionalism and attention to detail in internal dose investigations. The process provided rigorous individual case follow-up, including generation of complete records related to actions taken on the case. The types of information provided in the internal dosimetry records included workplace and RWP investigation results; analyses of presumed exposure scenarios; descriptions of internal dosimetry assumptions and models used to calculate the dose of record; and any follow-up actions taken, all of which are maintained in the permanent file for future reference.

Although most procedural and permit controls are effective, some program and activity-level deficiencies exist in the new AJHA and procedure development processes and certain aspects of radiological controls. These deficiencies are discussed in the following paragraphs.

For production work, the JHA process does not provide a clear mechanism to ensure that all controls identified in JHAs are implemented. The administrative procedure controlling the AJHA process does not address implementation of program controls other than having the operations or facility manager ensure that the appropriate controls are in place prior to authorizing the work. The Y-12 Writer's Guide for Technical Procedures provides a step to ensure that JHA controls are placed in procedures; however, no mechanism exists to ensure that such non-procedure controls as engineering controls, training, postings, and other administrative controls are implemented. Consequently, some controls are not verified to be in place. Also, some program procedures in the Dimensional Metrology Department at Building 9215 do not identify controls at the appropriate action steps within the procedure, as required by the writer's guide. In these cases, the controls are identified in a JHA included as an attachment to the procedure; however, the procedure does not integrate the JHA controls into the appropriate steps within the body of the procedure.

For radiological program work, the RWP process is generally effective as a control to prevent contamination events and limit dose. However, the RWP process can be improved in a number of areas. For example, radiological survey information was incomplete for some RWPs in Buildings 9215 and 9204-2E. While survey maps of area conditions are available for review, they do not include survey information associated with the highest radiological conditions that may be encountered during the work, such as on contaminated parts or machines. Also, job-specific air sampling was not identified on an RWP in Building 9204-2E where grinding work was being performed in a non-airborne radioactivity area. In this case, informal methods were used to convey the need for job-specific air sampling to the radiological control technician (RCT), but workers signing in on the RWP would not know that an operating air sampler should be present in their work area.

The OA team also identified a need for more rigor in implementing radiological management requirements (radiological field operations procedures) and identifying radiological threshold conditions. The field operations procedures for air sampling and RWPs specify specific requirements and trigger levels associated with radiological work. A comparison of these trigger levels with Y-12 air monitoring and bioassay data for Building 9215 shows that there are instances where the radiological conditions have been exceeded for work

and/or workers covered by the RWPs used for machining and material handling. However, as required by procedure, these two RWPs have not been subject to formal as-low-as-reasonably-achievable (ALARA) review or documented radiological engineering evaluations in response to elevated air sample results, do not require any form of respiratory protection, and do not provide justification for the lack of continuous air monitors in the work area. While strict adherence to the procedural requirements was not demonstrated, there has been a significant amount of work done by Enriched Uranium Operations radiological control support personnel to evaluate these types of conditions and past intakes that have occurred in Building 9215, including a large-scale statistical study of air monitoring and bioassay data. Information from these efforts has also been used to modify operations and controls over the years and provide training to workers on proper work practices. However, as required by procedures, this information has not been used in support of systematic and formal ALARA reviews for the RWPs being used, which has affected the ability to justify decision-making and demonstrate whether current controls for the work are optimized.

Maintenance. The maintenance program is governed by several up-to-date detailed program procedures, such as the "Maintenance Management Program," "Preventive Maintenance Program," "Work Plan Preparation," and "Maintenance Job Planning and Execution" procedures. The procedures are used in conjunction with sitewide ES&H procedures and requirements and provide a sound framework for implementing the maintenance program. Maintenance standards/requirements identification documents (S/RIDs) capture upper-tier requirements, which are imbedded in maintenance procedures, and include a cross-reference to facilitate making changes to procedures when upper-tier requirements change. Y-12 is in the process of implementing DOE Order 433.1, *Maintenance Management Program for DOE Nuclear Facilities*. BWXT is currently addressing YSO comments on BWXT's nuclear facilities implementation plan.

For much of the work observed, engineered and administrative safety controls were properly defined. However, there were a few isolated examples of where maintenance work controls did not fully address some potential industrial-type worker safety hazards. During a crane preventive maintenance, a worker servicing the crane did not maintain exclusive control of a locking device. This practice was permissible according to a 1997 Y-12 safety department letter but did not meet OSHA lockout/tagout requirements. When alerted to this practice, BWXT took immediate and appropriate action to discontinue the non-compliant practice. In another instance, the bridge crane horn in Building 9204-2E had been disconnected for several years with no compensatory measures. BWXT took immediate action to take the crane out of service. In a third instance, facility operations had not authorized any routine preventive maintenance on the high-pressure hydraulic pumps in Building 9215, raising concerns about safety and reliability and the age/condition of a high-pressure rubber hydraulic hose on one of the pumps. Three high-pressure hydraulic accumulators in the system did not have American Society of Mechanical Engineers pressure vessel code-required relief valves. The facility had written a non-compliance report, but the due date could have left the discrepancy in place for up to a year. BWXT indicated that a pressure safety task force had previously been established to address a sitewide issue about missing pressure relief valves. For the Building 9215 hydraulic pump relief valves, engineering finalized the design and drawing information during this OA inspection, and work requests are being initiated to install relief valves.

In most areas, the maintenance procedures are comprehensive. However, maintenance procedures do not fully address preparation of SOC MJR packages and the processes for integrating hazard identification and hazard control information from the SWPs into those packages. Instructions to planners on how to prepare MJR work packages are lacking, and there is no signature review by planning or maintenance supervisors certifying that they have reviewed the package and that it is adequate for the work. As a result, there were numerous deficiencies and inconsistencies in SOC work packages reviewed in the field. Examples of deficient MJRs included leather gloves improperly listed as a control for electrical shock; exact locations of the work not always specified; lack of a pre-job briefing; missing JHI/controls sections on some MJRs; no listing for job hazards and insufficient information about controls; and operations had not briefed the work crew for one job. Maintenance procedures do not fully address classification of work based on the collective difficulty and increased risk due to such factors as interfaces among multiple trades, required engineering support, necessity to pre-stage parts, coordination with operations, and job complexity.

Some jobs that were more complex jobs were classified as SOC, resulting in deficient work packages being released to the field without proper planning, engineering support, drawings, and work instructions

for the craft. A modification was performed as SOC that involved disassembly of parts of a chemical system, a piping modification (drilling and welding), pipe support design, Quality Assurance inspections, and an unreviewed safety question. MJR instructions to the craft were minimal. In another job, a heat exchanger was replaced requiring modification of the heat exchanger supports, rigging the 1100-pound old unit out and a new unit in near restrictions and system piping, and performing an equivalency evaluation. Instructions provided to the craft were insufficient, resulting in craft cutting a support outside the allowable scope of the MJR. Three SOC MJRs were written for the job instead of one well-planned job package. The current Y-12 processes were not sufficient to recognize that the collective job warranted the more stringent analysis and controls associated with a planned job package.

Finding #4: Work control processes for maintenance activities have not ensured that all skill-of-the-craft work packages have adequate work instructions and include hazard identification and hazard controls specific to the work activities and that skill-of-the-craft work packages are not used for more complex work activities.

Construction. In most cases, hazard controls for both direct hire and subcontracted construction projects are identified and well documented. For subcontracted construction work, hazard controls are identified in Division 1 specifications, AHAs, and safety and health plans. For direct hire construction projects, hazard controls are identified in ES&H procedures and in a variety of construction work documents, such as HACs, Division 1 specifications, safety permits, and site characterization and worker requirement reports. Of particular note is the BWXT Construction Safety Handbook for BWXT Y-12 construction workers that serves as a useful and portable resource to help BWXT construction workers understand and comply with OSHA and DOE safety and health requirements. Each construction worker is provided with a copy of the pocket-size handbook, and based on observations by the OA team, BWXT construction workers use the handbook in the field. The handbook is also an integral part of the BWXT Construction Special Safety Team activities, and is used during the conduct of construction site inspections.

The Y-12 beryllium program is well documented, extensive, and includes several noteworthy attributes. The Y-12 beryllium program has implemented program elements (such as beryllium buffer areas and a lower-level limit for beryllium surface contamination) that exceed the requirements of the DOE Beryllium Rule (10 CFR 850). Y-12 coordinates the "round-robin" beryllium laboratory analysis campaign for the entire DOE complex. Y-12 was recently selected by the American Industrial Hygiene Association (AIHA) to administer the beryllium proficiency analytical program. For this review, the adequacy of beryllium characterization and beryllium sampling was assessed for two construction projects (3500-ton press, and the infrastructure reduction project for Building 9205). In both cases, the initial beryllium characterization was extensive and thorough, and workplace sampling (when required) was well documented and adequate to support the conclusions.

Safety postings at direct hire and subcontractor work sites are accurate and are maintained in accordance with changing workplace conditions. For example, noise postings and requirements for double hearing protection at the abrasive saw construction site were rigorously maintained and changed as noise conditions changed. Construction boundaries, safety signage, and AHAs were prominently displayed at the subcontractor work sites.

Worker training records indicated that for the specific construction jobs evaluated, the appropriate safety training was identified and workers were current with training requirements. Training records were accessible to line managers, and line managers were knowledgeable of the training requirements for their workers and the status of their training.

Although there were a number of positive attributes with respect to the identification and implementation of hazard controls, the HAC for some construction projects was not updated in a timely manner when new hazards were identified or new controls were established. For example, as described in Core Function #2, high levels of CO were identified during the abrasive saw construction project in mid-February 2003. Controls to mitigate the CO hazard were established, such as limitations on which equipment could operate concurrently, continuous industrial hygiene monitoring of CO levels, and requirements for local ventilation exhaust when operating the gasoline-powered concrete saw. A revision to the HAC was initiated to address the CO hazard and incorporate the new hazard controls. However, the revision to the HAC was not issued until late March, approximately six weeks after the CO hazard and initial controls had been identified and implemented. As a result, work resulting in CO emissions was performed for several weeks using an outdated HAC that did not identify the

CO hazard or the hazard controls being implemented to mitigate the hazard. The STA process relies upon the HAC as a vehicle to communicate hazards to workers through STA briefings. BWXT construction has not established clear requirements for when a HAC must be revised, a methodology to achieve timely revisions to HACs, or a policy as to when work must be stopped until the HAC is updated. The same issues apply to the new AJHA process, which will replace the HAC process. At present, there is no mechanism to readily update the field copy of the HAC or AJHA to ensure that these documents reflect the most current hazards and controls. In contrast, BWXT subcontracted work controls are better tailored to work activities through a series of AHAs, each addressing a specific stage of the project (e.g., mobilization or concrete forming). Subcontractors are also instructed that if a hazard or control is missed on the AHA, they must stop work until the AHA is revised and approved.

The OA team observed that some safety permits do not accurately reflect current workplace controls or locations. For example, the confined space permit for the 3500-ton press construction project required both local ventilation exhaust and respirators when welding. Welders, however, were not wearing respirators. BWXT industrial hygiene clarified this discrepancy by indicating that the respirators were only required for those welding tasks that would be performed in the equipment pit at a later time. This explanation, however, was not communicated on the permit, and the permit was later revised. In another example from the same construction project, a hot work permit posted in the work area stated that welding would be performed on the first floor; welding activities, however, were being performed in the stairway, and the same permit was to be used for welding in the pit area as well as on the first floor.

Finding #5: Hazard controls identified in some BWXT construction hazard control documents (e.g., hazards analysis checklists and safety permits) are not kept current with changing workplace conditions.

In a few cases, hazard controls were not sufficiently detailed in HACs or safety permits. For example, for the 3500-ton press construction project, welding clothing (including the requirement for flame retardant clothing) was not adequately specified in the permits (hot work or confined space permits), the HAC, or the Construction Safety Handbook. BWXT had plans to address the BWXT policy on protective clothing required when welding in an upcoming weekly construction safety meeting. In another example, the concrete dust hazard for the Building 9205 demolition project had not been sufficiently analyzed, and the subcontractor's policy on the use of dust masks was unclear. Work documents did not establish a clear basis for when dust masks would be required or whether such masks were an adequate control for the hazard. The subcontractor's safety and health plan did not address the use of dust masks.

Waste Management. BWXT has developed effective procedures for waste management at Y-12. These procedures are detailed and provide guidance to waste generators on the proper management and disposal of hazardous, mixed, and radioactive wastes as well as polychlorinated biphenyls (PCBs) and asbestos. To ensure compliance, the procedures often establish more stringent controls than required by external and DOE requirements.

For the most part, BWXT trash collection processes have adequate controls to preclude the introduction of hazardous and/or radioactive waste into the sanitary waste streams. For example, BWXT recently evaluated trash collection processes and issued additional guidance related to containers and a corrective plan that identifies improvements (e.g., an AJHA on trash collection). Dumpsters have been labeled to help control the introduction of unacceptable waste; however, deterioration has made many of the labels illegible. BWXT initiated a project to refurbish the site's approximately 300 dumpsters. About 160 were refurbished and relabeled, and about 30 were taken out of service. The remaining approximately 110 dumpsters were not refurbished as a result of funding limitations.

In addition, the Maintenance Department is piloting a process entitled clean sweep for managing waste/material from non-radiological areas. This process results in the efficient removal and proper disposition of waste or recyclable/reusable items from maintenance activities, which in the past would remain in operating facilities as accumulating clutter.

BWXT has implemented an effective program that provides matrixed environmental officers in line organizations to support environmental compliance and waste management activities. The environmental officers support the line operations in interfacing with support organizations, obtaining permits, disposing of waste, addressing sitewide issues, and monitoring compliance. In addition, monthly meetings provide an opportunity for these environmental officers to meet with BWXT subject matter experts to discuss

crosscutting items, learn about new environmental programs, and resolve issues impacting the site.

The BWXT construction organization is in the process of formalizing its interfaces with facility environmental officers. For current construction projects, the construction organization's environmental officer informally coordinates with the environmental officer for the facility where the project will occur. This coordination is required because waste management and disposal is usually performed by the host facility. The construction organization is revising its guidance to formalize this interface.

The construction organization currently uses several effective documents for addressing the environmental aspects of their projects. For example, the Building 9212 abrasive saw project provides detailed guidance on waste management and pollution prevention, a HAC that provides an extensive set of environmental questions and associated guidance for a variety of areas ranging from erosion control areas to spill contingency, and a site characterization and worker requirement report that contains guidance and references to procedures and support personnel for managing the environmental aspects of the project. However, the general requirements index of the Division 1 ES&H specifications for the abrasive saw project did not include the specific detail needed to ensure proper waste disposal. For example, the guidance for Resource Conservation and Recovery Act (RCRA) waste is unclear and incomplete, and includes references to state requirements that do not establish site-specific requirements.

The new AJHA process does not provide sufficient details to ensure identification of controls necessary to properly manage PCBs, radioactive waste, and RCRA hazardous and mixed waste. The AJHA process allows inclusion of detailed controls/requirements for identified hazards; however, the waste management controls are not well defined. For example, for most waste types, the identified generic controls from the software set are superficial (i.e., containerize, label, storage, and inspect). In addition, the labeling requirement did not reference the "Waste Container Labeling" procedure, and the AJHA references the less-than-90-day accumulation area RCRA procedure rather than the more encompassing general waste management procedure. Further, when waste hazards are identified in the AJHA, there is no control/requirement identified to contact the environmental officer/waste management coordinator.

In operating facilities, detailed procedures that govern how activities will be performed do not clearly link the process that generates waste to an available means of disposition, in accordance with sitewide waste management procedures. The selection of waste disposal is based on the facility operator's expertise rather than on formal guidance.

In shop and machine work areas, containers that receive special waste streams are marked. However, containers being used to collect trash for disposal in the landfill are located in the same area, and some are not labeled to show they are only for sanitary/industrial waste. Therefore, although trash containers are not required to be labeled, special waste streams in these locations could be inadvertently disposed in these trash containers.

Efficient waste management planning could be hindered by an accumulation of residual radioactive material that is being stored in operation areas, some of which are accounted for in the Y-12 nuclear material control and accountability system (which is used for security purposes). This radioactive material, generated in past operations, is not being stored and managed in accordance with the requirements of DOE Order 435.1 because the materials have not formally been declared as waste. For example, there were several rusty drums labeled as radioactive and carried within the nuclear material control and accountability system in Building 9215, which date back to the early 1990s, that had not been declared waste. Based on processes that had been in effect in the 1990s and information tracked within accountability, it is unlikely the drums contained either RCRA or PCB constituents; however, Y-12 does not have a detailed knowledge of the contents. Therefore, these drums, when declared waste and removed for disposal, will require sampling and analysis to obtain information required for disposition. Also, because of the poor condition of the drums, the contents must either be repacked in new drums, or the old drums must be overpacked.

Summary. In most cases, appropriate controls are established and implemented for recognized hazards. Controls applied to program work and waste management were effective and well designed to control hazards associated with nuclear materials. For program work, the Y-12 technical procedure development, review, approval, use, and modification process provides a comprehensive system to ensure that technically accurate procedures with appropriate ES&H controls are provided to and appropriately used by workers. The procedures used in production operations are well written, technically accurate, and contain the appropriate information and level of detail to perform the tasks safely. Because of the potential

for internal exposures, Y-12 has implemented a comprehensive bioassay monitoring program that is fully capable of detecting, monitoring, and controlling intakes of radioactive material. A few aspects of radiation protection programs warrant further enhancement, including RWP survey information, specification of RWP radiological controls for specific jobs, and performing and documenting ALARA reviews. BWXT has implemented several controls for waste management, including effective procedures, processes to preclude the introduction of hazardous and/or radioactive waste into trash collection, deployment of environmental officers in line organizations, and use of effective documents for addressing the environmental aspects of construction projects.

Controls for maintenance and construction were adequate to ensure worker safety in most cases, with some isolated gaps in otherwise effective systems. For maintenance, with the exception of SOC work, the development of hazard controls is well defined in detailed procedures. SOC work packages in general do not always ensure that hazards and controls specific to the work activities are defined. In most cases, hazard controls for both direct hire and subcontracted construction projects are identified and well documented. Safety postings at direct hire and subcontractor work sites are accurate and are maintained in accordance with changing workplace conditions. However, for construction, HACs are not updated in a timely manner when new hazards are identified or when hazard controls are implemented. Some construction safety permits are too broad, attempt to envelope too many work tasks, and introduce confusion with respect to defining and implementing the appropriate controls. YSO and BWXT have a good understanding of the current deficiencies and are developing plans to address them.

E.2.4 Core Function #4 – Perform Work Within Controls

Readiness is confirmed and work is performed safely.

Program. Readiness to perform production work in facilities is effectively verified on a daily basis through plan-of-the-day schedules, plan-of-the-day meetings, shift manager meetings, crew briefings, and pre-job briefings. For example, the Building 9204-2 production supervisor effectively conducted a crew briefing that included discussion and work assignments for the planned production work. The meeting also began with stretching exercises followed by a brief discussion of a safety topic. A crew briefing in Building 9215 provided review of safety topics and effectively defined job assignments for the day. A pre-job briefing for machining work in Building 9204-2E was thorough and included a review of the hazards and controls for the work.

Production operations observed were generally performed safely and in accordance with established controls. Workers performed operations in accordance with technical procedures and administrative criticality requirements. For example, an operator in Building 9204-2 performed abnormal condition actions in accordance with the procedure when a ventilation exhaust system differential pressure was found out of specification during the pre-start checks. The operator took the appropriate actions as required by procedure to shut down the exhaust system and notify the supervisor. The supervisor took action to have the filters cleaned, and the operator then restarted the system and resumed the operation with the system in specification. In Building 9215, skilled machinists performed M-Wing machining operations consistent with the requirements of the technical procedure. In some cases, such as disassembly operations in Building 9204-2E, the procedure reader/worker system was effectively implemented even when not required. In all cases, workers were fully aware of their stop work authority and indicated that they would not hesitate to use it if a potentially dangerous situation arose.

Housekeeping in most areas was adequate. However, a significant quantity of stored excess material was evident in Buildings 9204-2 and 9204-2E. The accumulated material has potential to interfere with operations and maintenance but has not been evaluated for disposition. In addition, the OA team identified a few deficiencies, such as a 55-gallon drum near circuit breaker control handles and material stored in front of a local breaker panel in Building 9204-2 (these items were immediately corrected), and deficient labeling (dual labels) on hydraulic accumulator isolation valves in Building 9215 (O-Wing).

Most work observed by the OA team was performed safely and in accordance with established controls. However, there were a few instances of failure to follow established requirements or optimal contamination control practices in Buildings 9215 and 9204-2E. In Building 9204-2E oven bays, one worker was standing in an oven while the other worker used a bridge crane to lower the heavy component into the oven. Because of the size of the oven and the component, the worker in the oven was very close to

being under the plane of the load and would likely have been injured if the load had fallen. Following facility notification of this observation, the workers were counseled, and the operations manager initiated required reading for building workers for crane lifting operations. Other isolated examples of failure to follow established controls were observed. As part of assembly work in Building 9204-2E, workers breached a posted contamination area boundary to move contaminated parts out of the contamination area to a benchtop radioactive material area. The RWP being used was valid for radioactive material area work only and was not appropriate for contamination area work. Following discovery of this deficiency, a new RWP was issued to control the work. During machine and part inspections in Building 9204-2E, the work area was not posted "Benchtop Radioactive Materials Area" as required by the RWP. In Building 9215, a machinist was improperly signed in on the machining RWP without having received the required pre-job briefing. Workers in Building 9215 were occasionally observed exercising practices that were less than optimal, such as handling or contact with highly contaminated parts or machines followed by handling of less contaminated items, such as chip cans.

Maintenance. Y-12 maintenance craft observed were experienced and knowledgeable of the facilities and equipment. Most craft have extensive experience at the plant. To the extent possible, planners and manufacturing maintenance personnel are assigned to facilities so that craft become more knowledgeable of the specific facilities. This practice is especially prevalent at nuclear facilities. The supervisors and workers observed demonstrated a safety conscious approach in their work activities. With some exceptions (discussed below), maintenance work observed was performed safely and in accordance with procedures and work packages.

Readiness to perform work was appropriately verified. Maintenance work observed was properly approved, was listed on schedules and plans of the day (or authorized as emerging work), and was properly authorized in writing by facility operations personnel just prior to work. Facility operations personnel briefed maintenance craft on facility hazards associated with their work and certified the briefing on the MJRs. Pre-job briefings were performed based on a graded approach.

Although a majority of the work was safely performed, there were some isolated deficiencies identified in the performance of some jobs observed by OA. Some repairs to a high-pressure hydraulic pump in Building 9215 were not performed properly (tubing and compression nuts were coated with pipe sealant and reused rather than using new tubing and compression nuts).

During preventive maintenance in Building 9204-2E, the oil level for one of several vacuum pumps was not verified properly until prompted by an OA team member. The oil was below the level of the sight glass but was assumed to be above the level of the sight glass until the worker was prompted to drain oil to verify the level. The sight glasses for some of the pumps were difficult to read and appeared to need cleaning.

A work activity to replace vacuum seals on a Building 9204-2E electron beam welder was being performed in a radiological buffer area in an area not normally accessed by personnel (under the welder platform), adjacent to and under posted contamination areas. Work planners and the shift supervisor did not realize that the work might require additional radiological surveys, and RWP request. The shift manager had authorized the work and initialed that the crew was briefed on the facility hazards. Additionally, workers were not wearing bump hats for work under the platform in a confined area with overhead hazards. The job was stopped to counsel the crew and to allow the Radiological Control organization to evaluate the work area. In addition, the AJHA question set was revised to require the initiation of an RWP request form for any work in a radiological buffer area that may disturb surfaces, so that Radiological Control can properly evaluate the area.

Because of the identified deficiencies, maintenance management conducted lessons-learned sessions for about one hundred maintenance, manufacturing maintenance, and planning section personnel. The lessons-learned sessions addressed most of the deficiencies identified with maintenance activities.

Construction. BWXT direct hire construction work processes and procedures incorporate a number of activities to ensure readiness prior to commencement of work. For example, most construction projects convene a kickoff meeting involving all construction departments. Requirements in the HAC or AJHA are discussed with each craft supervisor to ensure that responsibilities and safety requirements are understood. Craft training requirements and completion status are reviewed. Safety permits, which were identified in the project planning stages, are reviewed with craft supervisors prior to work commencement. For subcontracted construction work, similar requirements are imposed prior to the execution of work. In addition, subcontractors are required to submit safety and health

plans and AHAs for review and approval by BWXT STRs and safety engineers prior to performing work.

In general, BWXT construction work performed by both direct hire and subcontracted craft has been performed safely. Since BWXT assumed the responsibility for onsite construction in October 2001, recordable injury and illness rates have been well below the rates for construction in the United States and are comparable to the DOE complex average for similar construction work. Safety trends are improving. The BWXT construction workforce felt empowered to stop work if safety concerns were identified.

During the OA team evaluation, some construction activities were paused or stopped by BWXT upon the identification of deficiencies in construction work practices or work packages. For example, an electrical contractor supporting a BWXT subcontractor in the installation of continuous emission monitoring systems at the Y-12 Steam Plant failed to follow the requirements in the subcontractor's Division 1 specifications and the subcontractor's site safety and health plan regarding the inventorying, review, use, and availability of chemical MSDSs. Two chemicals were identified in the electrical contractor's gang box that had not been reviewed by BWXT industrial hygiene prior to transporting the chemicals on site. Furthermore, the MSDSs for these chemicals were not available at the job site, and the hazard controls (e.g., eyewash stations) identified in the MSDSs had not been adequately evaluated by the subcontractor or incorporated into the subcontractor's AHA. The work activity was paused by BWXT until these deficiencies were resolved.

In another example, direct hire construction work associated with the abrasive saw construction project was stopped by BWXT construction management pending the analysis of the impact of the removal of duct and piping sections without an adequate review by design engineering (see Core Function #1). Work resumed following the completion of the analysis, the issuance of a Blue Alert, and a Y-12 construction stand-down to ensure communication of event to the affected construction staff.

Waste Management. BWXT effectively operates a central less-than-90-day accumulation area that serves most operations at Y-12. This area also provides central storage for LLW, mixed waste, Toxic Substances Control Act waste, and non-regulated waste being staged for transfer to the Oak Ridge Operations Office environmental waste management contractor. Containers are properly labeled and are tracked in a database to ensure that RCRA waste is disposed of within 90 days. Containers holding liquids were appropriately placed inside bermed areas. The aging facility is being adequately maintained to ensure structural integrity; however some wooden pallets being used to hold containers of LLW were in poor condition. Personnel indicated that they were aware that such pallets should not be used for stacking drums, but there are no specific restrictions that prevent the stacking of degraded pallets.

Operating facilities are managing hazardous, mixed, and currently generated radioactive waste in accordance with site, DOE, and regulatory requirements. Operating facilities generate small amounts of hazardous waste because actions have been taken to reduce waste generation (e.g., switching from using hazardous cutting/machining oils to environmentally safe fluids). DOE Order 435.1 requirements have been implemented for all radioactive waste that has been generated since the order was implemented at Y-12. Required inspections of accumulation areas are being performed, pollution prevention opportunities have been implemented, and containers were properly managed and labeled.

Y-12 has reduced legacy low-level radioactive waste amounts from 3,128 to 964 containers over the last two years in response to a performance-based incentive. As part of DOE Order 435.1 implementation, existing waste was defined as legacy waste and requirements from the Order were applied to newly generated waste. YSO included a performance-based incentive in the performance plan to promote reduction in the amount of legacy radioactive wastes. Although there is no FY 2003 waste management performance-based incentive, BWXT has requested additional funding for disposal of a large portion of the remaining legacy waste.

Summary. Most work observed was safely performed within established controls. Workers understood the site hazards and the importance of procedural compliance. Workers indicated that they felt empowered to stop work if safety concerns arose. BWXT has established a strong focus on workplace safety as evidenced in a better than average safety record for the construction workforce. The waste management activities are performed effectively, and Y-12 is making progress in reducing legacy wastes.

However, some isolated instances of less-than-adequate work practices were observed (e.g., program workers did not effectively implement established controls, personnel standing very close to being under the plane of a suspended load, and workers disturbing potentially contaminated surfaces without requesting an RWP). Although some weaknesses are evident,

Y-12 work activities were performed with a high regard for safety in most cases. YSO and BWXT have taken prompt corrective actions for the identified deficient work practices.

E.3 CONCLUSIONS

Most aspects of work at Y-12 were performed consistent with the core functions of ISM. Most engineering controls and administrative controls were well designed and effectively implemented. Some aspects of Y-12's implementation of the core functions of ISM were notably effective, such as procedure development, beryllium controls, safety training, construction workplace safety inspections, many aspects of environmental protection, and bioassay monitoring. In addition, workers demonstrated a safety conscious attitude toward work, were actively involved in ISM, and fully understood their right to stop work to address safety concerns.

Further enhancements are warranted in a number of areas, such as certain aspects of hazards analysis and control processes, use of temporary modifications during construction work, procedure adherence, controls for SOC work, identification of individual chemical hazards, and various maintenance work practices (e.g., lockout/tagout). However, YSO and BWXT have a good understanding of the identified weaknesses and have initiated several appropriate corrective actions.

E.4 RATINGS

The ratings of the first four core functions reflect the status of the reviewed elements of ISM program elements at Y-12.

Core Function #1 – Define the Scope of Work: EFFECTIVE PERFORMANCE

Core Function #2 – Analyze the Hazards: EFFECTIVE PERFORMANCE

Core Function #3 – Develop and Implement Hazard Controls: EFFECTIVE PERFORMANCE

Core Function #4 – Perform Work Within Controls: EFFECTIVE PERFORMANCE

E.5 OPPORTUNITIES FOR IMPROVEMENT

This OA inspection identified the following opportunities for improvement. These potential enhancements are not intended to be prescriptive or mandatory. Rather, they are intended to be reviewed and evaluated by the responsible line management, and accepted, rejected, or modified as appropriate, in accordance with site-specific program objectives and priorities.

BWXT

1. **Increase emphasis on ensuring compliance with radiation protection field operating procedures and strengthening the technical basis for established radiological controls for program work with the potential for unplanned intakes.** Specific actions to consider include:

   - Consider the feasibility and value of subdividing broad program RWPs for machining and material handling into smaller RWPs with narrower and more manageable spans of control (i.e., machine and/or task specific).

   - Evaluate trigger levels in RWP, air sampling, and ALARA procedures against available dose and air sampling data for machining and material handling. Determine root causes for failing to follow specific requirements and correct deficiencies. Ensure that exposure-based trigger levels include both derived air concentration-hour levels (as measured from air sampling) and equivalent dose levels (as measured from bioassay).

   - Implement a more systematic approach to radiological feedback and improvement initiatives (such as studies) and ensure that the results of such activities are fully documented and incorporated into formal ALARA reviews that provide the basis for established controls.

- To further reduce doses from unplanned intakes in Building 9215, evaluate the merits of requiring some form of respiratory protection for workers, particularly those such as material handlers who do not operate rotating equipment.

2. **Increase attention to tailoring RWPs to specific radiological hazards, including more detailed information on radiological conditions and linkage to all required job-specific radiological controls.** Specific actions to consider include:

   - Ensure that routine radiological surveys are designed such that information on specific radiological conditions that could be encountered is documented, including machine- or part-specific contamination levels.

   - Limit the use of phrases such as "Be familiar with Radiological Conditions" in RWP radiological information sections. Instead, attach specific survey information wherever possible and/or increase the use of such techniques as posting of radiological survey maps and data at entrances to controlled areas and near individual workstations.

   - Ensure that required radiological controls that a worker could witness and verify in the field, such as air sampling, are listed as requirements on the RWP.

3. **Enhance the AJHA process during initial implementation to provide more consistent, comprehensive hazard reviews and to clarify linkages between hazards and implemented controls.** Specific actions to consider include:

   - Clarify line management processes to ensure that controls identified by the AJHA process are implemented. Consider incorporating a requirement to link all identified controls in the AJHA to the implementing mechanism.

   - Revise the AJHA management procedure or provide mentors to ensure that generic hazards and generic controls generated by the initial AJHA question set are utilized to generate custom controls that are tailored to the unique hazards associated with the activity.

   - Revise the AJHA management procedure to provide more distinct management expectations regarding scope of work descriptions in AJHAs.

   - Provide management expectations and a defined process to follow when new hazards are discovered during performance of an activity.

   - Consider utilizing the AJHA users group to perform cross-organizational reviews to increase consistency and provide feedback on differing controls for similar hazards.

   - Continue to refine the AJHA question set by revising and clarifying generic controls in the areas of waste and environmental management.

4. **Enhance waste activities management to ensure continued compliance with regulatory, DOE, and Y-12 requirements.** Specific actions to consider include:

   - Formalize processes to ensure that maintenance work in a non-maintenance facility will be coordinated with the primary (Operations) environmental officer/waste coordinator for that facility.

   - Take full advantage of the new AJHA process to ensure implementation of rigorous and detailed controls necessary to properly manage PCB, radioactive, and RCRA hazardous and mixed waste.

   - Revise the Division 1 General Requirements, Section 1550, *Waste Management*, to provide site-specific requirements based on Y-12 waste management procedures.

   - Revise operational procedures for processes that result in the generation of waste to either include waste management requirements or provide linkage to the waste management procedures. Consider revising the writer's

guide to require inclusion of waste management requirements in technical procedures.

- Ensure that sanitary dumpsters and other trash containers are appropriately labeled to help ensure that only sanitary waste going to the onsite landfill is put in these containers.

- Enhance waste management planning by declaring accumulated residual radioactive material as waste where possible, thereby assuring management in accordance with requirements of DOE Order 435.1.

- Continue reducing the number of legacy low-level radioactive containers and establish formal controls for use of wooden pallets at the less-than-90-day yard to reduce environmental and safety risks.

5. **Ensure that temporary modifications of structures, systems, or components performed during construction projects are properly reviewed, documented, and approved prior to execution of the modification.** Specific actions to consider include:

   - Require formal communications between the construction and engineering organizations and facility operations (i.e., change notices) when contemplating changes to a facility, even if the changes are only temporary.

   - Revise construction work control procedures, as necessary, to provide guidance on revising work documents (e.g., AJHAs) and initiating the temporary facility modification process when performing temporary modifications.

   - Provide training on the configuration control process to members of the construction staff who may be involved in the initiation of temporary modifications within nuclear facilities (e.g., construction engineering and construction superintendents). Include training on the interface between unreviewed safety question determinations and configuration control process.

6. **Establish a process for tailoring construction hazards and hazard controls to specific work activities or construction phases.** Specific actions to consider include:

   - Develop work scopes for each sequential phase of a construction project (site characterization, foundation construction, construction, facilities interface, etc.) such that hazards and controls can be readily identified.

   - Prepare individual AJHAs for each of the sequential work scopes.

   - Improve and document the mechanisms for communicating hazards and hazard controls to workers (pre-job briefings and/or STAs).

7. **Develop a method for keeping hazards analysis documents and safety permits current with changing conditions at construction sites.** Specific actions to consider include:

   - Revise BWXT construction procedures, as applicable, to enable a "pen and ink" change process to both HACs and AJHAs.

   - Establish and document criteria in construction procedures for stopping work when construction work documents no longer reflect an accurate work scope, new hazards, or new or revised hazard controls.

   - When new hazards and/or controls are identified on construction projects, define how workers are to be trained and how the training is to be documented.

   - Ensure that safety permits are unambiguous with respect to the work being performed, such that at any point in the work activity, the work location and hazard controls (e.g., personal protective equipment) are clearly defined.

8. **Provide additional mechanisms to assist and periodically evaluate the safety performance of BWXT subcontractors.** Specific actions to consider include:

   - Expand the scope of the BWXT Construction Special Safety Team to also review subcontractor work sites and work activities.

Include a subcontractor as a rotating safety team member.

- Develop guidance for inspecting BWXT subcontractors, using requirements from the Division 1 specifications.

- Ensure that BWXT subcontractors communicate safety and health requirements to lower-tier subcontractors.

- Routinely inspect equipment and materials that are brought on site by subcontractors and lower-tier subcontractors for compliance to the requirements documented in the subcontractor's contract.

9. **Enhance processes for performing SOC work.** Specific actions to consider include:

   - Improve procedural guidance for the development, review, and approval of SOC MJRs.

     – Ensure that dominant hazards and controls are identified and documented on MJRs used in the field by the craft.

     – Provide for work planner and maintenance supervision review and approval by signatures of all work requests prior to releasing them to the craft for work.

     – Improve the definition of thresholds for complex and multitrade work that require planned job packages.

   - Consider implementing a "mini" JHA performed by the craft for all SOC jobs. This uses the craft's experience and knowledge about the job and the environment to act as an additional barrier for safe work.

   - Improve maintenance management and supervisory proactive oversight of routine day-to-day work activities and work documents to identify and correct performance and work package deficiencies.

APPENDIX F
ESSENTIAL SYSTEM FUNCTIONALITY

F.1 INTRODUCTION

The purpose of an essential system functionality review is to evaluate the functionality and operability of a facility's systems and subsystems essential to safe operation by performing a technically focused evaluation of selected systems. The review criteria are similar to the criteria for Defense Nuclear Facilities Safety Board Recommendation 2000-2 implementation plan reviews; however, U.S. Department of Energy (DOE) Office of Independent Oversight and Performance Assurance (OA) reviews also include an evaluation of selected portions of system design and operations.

The OA team selected the fire protection system and the criticality accident alarm system (CAAS) within Building 9204-2E at the Y-12 National Security Complex (Y-12) for review. The fire protection system provides the means to detect a fire; alert facility personnel and facilitate safe building evacuation; initiate fire response; and mitigate and prevent the spread of a fire until the fire department arrives. The CAAS provides the means to detect an accidental criticality condition; alert personnel potentially impacted by radiation from the accident; and initiate emergency response. The OA team's review of these systems focused on elements of system design/configuration control, surveillance and testing, maintenance, and operations important to ensuring that the systems can perform their safety functions.

F.2 RESULTS

F.2.1 Design/Configuration Control

Design. The fire protection system and CAAS were originally designed in accordance with the industrial standards applicable at the time of the systems' installation — the National Fire Protection Association (NFPA) codes and American National Standards Institute (ANSI) standards respectively, circa 1967. Since that time, the safety function and operability requirements of the fire protection system and CAAS have been further defined and adopted in a safety analysis report (SAR) and technical safety requirements (TSRs).

The current SAR analyzes an appropriate spectrum of potential accidents to identify the safety grades of the fire protection system and CAAS. Portions of both systems have been designated as safety significant because of their roles in mitigating the impact of accidents on worker safety and in providing defense in depth. The SAR provides a good description of the systems' design and operation using information from the recently completed fire hazards analysis and the CAAS system manual. In addition, the SAR references appropriate NFPA and ANSI standards as the bases for the design of these systems. The Y-12 Site Office (YSO) review of the initial version of the Building 9204-2E SAR (2000), documented in a safety evaluation report, was detailed and provided good feedback to the contractor that resulted in a number of improvements to the safety basis.

The fire protection system consists of sprinkler systems, fire barriers, and alarms that monitor system configuration (e.g., valve position and system operation). Since its original design, some design changes have been made to improve its reliability and capability. For example, the fire cycle dry pipe sprinkler system was modified to a wet pipe system because of problems with keeping the fire cycle system operable and changes in facility operations that made a wet pipe system appropriate. Furthermore, the fire alarm system was modified to enhance response capabilities (i.e., provide more information to responders regarding the alarm location). Another recent improvement was the removal of a wooden platform to reduce combustible loading.

The CAAS consists of radiation detectors, alarm circuitry, and annunciators (emergency notification system speakers and clarion horns). The current CAAS design exceeds ANSI Standard 8.3 in that it includes redundant detector stations (each consisting of two detectors) that provide overlapping coverage in areas where a criticality accident could occur. This design feature provides increased reliability and operational flexibility. Furthermore, portable CAAS stations (of similar design to the fixed stations) and portable radiation detection instruments , which are small, hand-carried devices, are used to support special conditions, such as power outages. The CAAS stations, as well as the portable radiation detection instruments, have

been extensively field and bench tested to demonstrate that they can perform required safety functions. BWXT (and the predecessor Y-12 contractor organization) have taken appropriate actions to improve the CAAS and address some design vulnerabilities. For example, the CAAS was modified so that detector failure would not initiate a CAAS evacuation alarm because this condition had caused two inadvertent CAAS alarms (resulting in expedient, potentially hazardous, and disruptive facility evacuations). Because component failure or trouble alarms are continuously monitored by central control room personnel, this design change was appropriate.

As part of its review of the CAAS design, OA evaluated Y-12's use of administrative controls for ensuring criticality safety, with particular attention on administrative controls relevant to the CAAS detector coverage area. DOE Order 420.1A requires that a CAAS must be provided for areas where more than specified quantities of fissile material could be stored and the probability of a criticality accident occurring is greater than one in a million per year. With one exception, CAAS coverage is in place for all areas in Building 9204-2E where significant quantities of fissile material can be stored or used. Y-12's rationale for not having CAAS coverage in the one area is that administrative controls have reduced the likelihood of a criticality accident to less than one in a million. However, the basis for this determination is not well documented. BWXT Y-12, LLC (BWXT), the Y-12 contractor responsible for managing and operating the site, has indicated that it will be reconstituting the basis for its determination, including taking credit for engineered features and other relevant facts.

YSO has developed a performance measure that provides specific commitments and milestones relevant to reducing administrative controls. BWXT's highest priority is to reduce the number of fissile material container types and simplify the administrative limits for each. While this action does not in itself replace any administrative controls for criticality safety with engineered controls, it significantly reduces the number of administrative controls and is a good first step in transitioning from administrative to engineered controls in many cases. BWXT has also proposed various ways to reduce reliance upon administrative controls by replacing them with engineered controls. Typically, one or two such proposals are funded each year. BWXT is also pursuing other initiatives, such as a proposal to develop computer-assisted administrative controls to measurably strengthen administrative controls site wide. Although some progress has been made in strengthening administrative controls, progress has been slow in reducing the reliance on administrative controls through the transition to engineering controls. YSO and BWXT personnel expressed reluctance to significantly upgrade aging facilities, indicating that the focus should be on designing engineering controls into new facilities.

Configuration Control. Although the original fire protection system and CAAS were appropriately designed to standards in existence at the time they were built and have been improved, there are concerns about the adequacy of some documentation of the actual as-built condition of the systems. For example, BWXT has not verified that all current piping and instrumentation and physical drawings have been appropriately maintained to accurately reflect the current conditions. In addition, although BWXT has recently defined a set of technical basis documents to be controlled for some safety systems (e.g., the Building 9204-2E fire protection system), they have not been defined for all safety systems (e.g., CAAS). BWXT self-identified these concerns and has plans in place to address most of them. However, BWXT did not include validation of physical drawings (which are important for some aspects of design control) in its plans.

The BWXT configuration control program descriptions provide generally appropriate guidance for addressing reconstitution of the design basis (e.g., to as-built conditions) to support configuration control when performing new design modifications. Specifically, the BWXT configuration management program allows the BWXT responsible engineer (i.e., "Design Authority Representative") in coordination with the facility operations manager to determine when recovery or reconstitution of the design basis requirements is appropriate. However, specific guidance for making and documenting this determination is not provided, and the program requirements were not effectively implemented during a recent design change to the Building 9204-2E fire protection system. In this design change, a drawing of undetermined accuracy was used as a design input, and the acceptability of the risk associated with use of this drawing was not formally evaluated. Specifically, design engineers relied on a drawing, which had not been maintained in a rigorous configuration control system, to determine if the addition of sprinkler heads to an existing branch exceeded the number of heads permitted by the NFPA code. The unreviewed safety question determination (USQD) for the modification did not address the use of this unvalidated drawing. Additionally, the facility operations manager was not involved in the reconstitution decision. It appears likely that other modifications to the Building

9204-2E fire protection system (and potentially other safety systems at Y-12) were also based on unvalidated drawings that were not addressed in USQDs, and thus could have resulted in these systems being outside the safety envelop as defined in safety bases. YSO was knowledgeable of BWXT's implementation of this element of its configuration control process but did not recognize the potential for putting a system out of the safety envelope described in the SAR. BWXT is currently analyzing the impact this concern may have on the operability of safety systems throughout the Y-12 site. BWXT personnel indicated that they have evaluated all modifications to safety-significant fire protection systems since establishment of safety basis documents for these systems, and no modifications impacting system operability were identified. Formal documentation of this evaluation and YSO review has not yet taken place.

Three additional concerns with the configuration control of the fire protection system were identified, including:

- Fire doors and fire dampers in the only safety-significant fire barrier in Building 9204-2E have not been demonstrated to be operable. The implementation plan for the recently developed SAR did not identify specific testing requirements, and none were performed even though the Y 12 Fire Protection Program Manual includes requirements for testing the doors and dampers.

- A modification package for the installation of the ceiling tiles in an office area in Building 9204-2E did not fully consider the impact of the drop ceiling (located below some sprinklers) on the fire protection system and did not identify the fire hazards analysis as an affected document.

- BWXT did not appropriately analyze the impact of a damaged wall in one of the Building 9204-2E staircases on the ability of the staircase to serve as a fire escape in accordance with NFPA and Occupational Safety and Health Administration requirements. The damaged wall, which has a large through-wall crack along a corner, has been in this condition for at least five years. After an initial attempt to repair it, BWXT accepted this condition based upon the judgment of the authority having jurisdiction, without an appropriate documented justification.

Finding #6: BWXT has not adequately maintained configuration control of safety-significant fire protection features to ensure that they will function as defined in the Building 9204-2E safety analysis.

In response to this issue, BWXT has initiated an occurrence report notification for the inoperable fire barrier and implemented a number of compensatory actions, including fire watch and additional transient combustible control. Furthermore, BWXT is now in the process of implementing a temporary modification to address the damaged wall in the staircase and has developed plans for a permanent solution.

OA's review of configuration control of CAAS did not identify any design modifications where potential inadequacies of the as-built configuration may have resulted in the CAAS not being able to function as described in the SAR. In addition, because post-modification testing of CAAS includes a full operability check, including exposing detectors to a radiation source and checking annunciator audibility levels throughout the facility, any operability impact should be identified during this test. Furthermore, OA's review of a sample of USQDs indicates that CAAS design and procedure changes have been appropriately analyzed.

Summary. BWXT has developed a SAR that appropriately delineates the fire protection system and CAAS safety functions. The fire protection system components reviewed were designed in accordance with accepted industry standards, and some design upgrades have been made to enhance their reliability and performance. The CAAS is well designed and provides robust, redundant, and diverse means to detect an accidental criticality. However, BWXT has not appropriately implemented all aspects of its configuration management program, in particular as it applies to evaluating and documenting decisions on reconstitution of the design documentation during system modifications to address design uncertainties. In addition, in several instances BWXT has not maintained adequate configuration control of the fire protection system in Building 9204-2E to ensure that it can perform its safety functions. BWXT has taken a number of immediate and compensatory corrective actions to ensure the fire protection system functionality, including review of past modifications, establishment of fire watches, and establishment of additional limits on combustibles.

F.2.2 Surveillance and Testing

Surveillance and testing of fire protection systems and alarms is governed by TSRs specific to Building 9204-2E (for safety-significant systems) and NFPA requirements (for both safety-significant and non-safety systems). The fire protection system TSRs include periodic verification of adequate supply pressure, valve alignment, and flow path. In addition to TSR surveillance and tests, NFPA-required surveillances and tests are performed on a periodic basis in accordance with BWXT procedures, including inspections of hardware (e.g., sprinklers, gauges, flow switches, fire department connections, valves, pipes, fittings, and hangers) and surveillances and tests of hardware (e.g., control valves, supervisory signal devices, backflow preventers, interlocks, alarm devices, and antifreeze features). Surveillance and testing of CAAS is also governed by the TSRs and the ANSI standard for CAAS. The TSR surveillances include monthly detector operability checks and an annual complete functional check of the CAAS, including an audibility check. The TSRs for fire protection and CAAS in conjunction with the NFPA and ANSI surveillances are an appropriate set of tests to ensure system operability.

With few exceptions, fire department and CAAS surveillance, testing, and inspection procedures are effective, rigorous, and comprehensive. They are typically complete, clear, and concise, and have appropriate levels of detail and well-designed data sheets. The fire department and CAAS management all encourage technician involvement in procedure improvements. CAAS surveillance and test procedures have been extensively reviewed and revised in the aftermath of a series of false alarms. Even though the false alarms were mostly related to design or equipment failure , Y-12 chose to perform a comprehensive review, including testing and surveillance, to ensure that all possible contributors to false alarms were considered.

Although the fire protection system surveillance, testing, and inspection procedures included most of NFPA Code requirements, some deviations exist. For example, a number of surveillance frequencies have been relaxed based on industry experience, special conditions within Y-12, operating experience, and other technical justifications. Most of these deviations have been adequately evaluated and approved by the National Nuclear Security Administration (NNSA)/YSO. However, a few deviations have not been adequately evaluated by BWXT or approved by NNSA. The most significant unanalyzed deviation involves flow testing of normally open system or section isolation valves after they have been closed for maintenance. NFPA requires verifying that such valves are open via a drain flow test. BWXT has not been performing this test for sectional valves in the Building 9204-2E sprinkler systems. Other deviations that have not been fully analyzed and properly approved include:

- NFPA-required stocks of spare sprinklers are not being maintained.
- The NFPA requirement for a monthly verification of the condition of pressure gauges is not addressed in BWXT surveillance procedures (the procedures do, however, require monthly pressure gauge readings, at which time any major material condition concerns would likely be identified).
- The NFPA requirement for verification that automatic drain valves for fire department connections are operating properly is not reflected in Building 9204-2E fire protection system surveillance procedures.

Finding #7: BWXT has not performed all inspections, tests, and maintenance required by National Fire Protection Association (NFPA) 25 on the Building 9204-2E fire protection system.

Another weakness is that BWXT has not taken timely action to modify its surveillance procedures to reflect a correction factor to the supply pressure acceptance criteria, which is needed to address uncertainties in pressure gauge readings. In October 2002, BWXT identified a sitewide concern that a 9-psig uncertainty in installed sprinkler system pressure gauges had not been factored into the TSR acceptance criteria. In response, BWXT issued a standing order requiring facility operators to apply a 9-pounds per square inch (psig) correction factor to monthly surveillance pressure readings for determining system operability. However, BWXT did not formally incorporate this correction into the surveillance procedures. Instead, they relied on facility operation personnel to consider this correction during their approval of the completion of the procedure. Recently, facility operation personnel did not appropriately consider this correction factor in its review of a completed surveillance procedure. As a result, the system was incorrectly deemed operable when, in fact, the pressure (considering the correction factor) was below the TSR limits.

A review of the last two years of surveillance data for the fire protection system and the CAAS did not identify any instances where surveillances were not performed. The plant shift superintendent's office has an effective database system for tracking the CAAS surveillance testing history, facilitating effective predictive maintenance. The lack of a similar database for fire protection systems has not impacted BWXT's ability to meet the TSRs but does impact the ability to track system performance. BWXT is taking actions to implement a database system (FIRECOM) to support performance monitoring.

Technicians performing the fire protection and CAAS surveillances are knowledgeable about the installed equipment and, with one exception, demonstrated the capability to perform the surveillances with the intended rigor. The exception was a Category II semiannual inspection and test of a dry pipe sprinkler system in Building 9998 (OA observed two fire protection surveillances at buildings other than 9204-2E because no Building 9204-2E surveillance was scheduled during this evaluation). The OA team identified the following concerns with the Building 9998 semiannual inspection on a non-limiting-condition-for-operation, Safety Grade 3 (important-to-safety) system:

- A required water release approval from Environmental Management was not obtained.
- Several applicable steps were skipped, and others were not executed completely.
- Technicians did not immediately stop work, as required by the Conduct of Operations Manual, when a procedure step could not be performed (due to inadequate procedural direction for testing a low air pressure alarm).
- The surveillance procedure directions were not used in performing the system restoration. In addition, the independent verifier did not have a clear understanding of what was required to verify the system restoration or in the use of the procedure's restoration checkoff sheet.

In addition, in initial discussions with fire department personnel (including one responsible for supporting proper fire department operations at Y-12) regarding these concerns, they indicated that technicians did not need to utilize the Category II procedure to restore the system as it was within the skill of the craft. This is contrary to the procedure's intent and the Y-12 Conduct of Operation Manual (Category II procedures at Y-12 must be followed verbatim) and indicates that additional attention is needed to ensure that Y-12 expectations for procedural adherence are fully understood and accepted throughout the workforce.

Summary. The surveillance, testing, and inspection programs, practices, and procedures for the Building 9204-2E fire protection system and CAAS are generally comprehensive and complete. Across the board, significant program improvements have been made in recent years, and a strong culture of self-identification of weaknesses and proactive responses to concerns has been established. In most aspects, the systems' capabilities to perform their design functions are effective as evidenced by surveillance, testing, and inspection historical documentation. However, some NFPA Code non-compliances exist, resulting in incomplete verification that fire protection systems will perform as designed. In addition, there is evidence that a procedure-based culture for important-to-safety systems is not fully infused into the fire protection organization.

F.2.3 Maintenance

Based on OA walkdowns, the fire protection system and CAAS are in good material and physical condition. The current fire protection maintenance backlog is very low, which is partly due to BWXT's concerted efforts at backlog reduction over the last several years. In addition, NFPA-required maintenance activities for fire protection components, such as lubrication, cleaning, and replacement of age-affected and damaged components, are addressed in procedures and are being performed at the required frequencies, which have been approved by YSO. BWXT has a 10-year comprehensive commitment to correct longstanding sitewide fire protection problems.

The CAAS maintenance backlog is also low, and BWXT has an effective system for monitoring component reliability. The responsible system engineer is very knowledgeable of CAAS system design, configuration, and operation and coordinates well with maintenance department personnel (dedicated to the CAAS) to address problems that could impact reliability. For example, the change out frequency of DC (direct current) power units was recently decreased from 8 years to 6 years based upon failure data. Furthermore, BWXT has implemented several initiatives to support maintenance of CAAS. For example, BWXT has

developed an effective CAAS simulator to test system components, break-in spare components, train technicians, and practice CAAS maintenance. BWXT has also installed a remote CAAS system monitor (a duplicate of that in the plant shift superintendent's office) in the CAAS shop area to allow technicians to diagnose CAAS operational problems in real time. Finally, based on input from CAAS technicians, the detector calibration test stand was modified to minimize radiation exposure to workers.

Some concerns were identified with the planning of maintenance jobs on fire protection systems. For example, during one maintenance job on a safety-significant system, facility operations did not ensure that fire patrols were established within the TSR-required time, resulting in a TSR violation. In addition, during this maintenance job, the flow switch that was replaced was not the appropriate switch and leaked badly after being installed. The cause of this error was partly attributable to insufficient planning and partly attributable to weaknesses in the configuration control equipment data sheet process used to identify vendors and part models acceptable for use in safety-significant systems.

Another example of insufficient planning involved a fire protection system outage in Building 9204-2E to perform modifications and replacement of defective equipment. This job was postponed, in part, because of a number of problems with the outage package and also because responsible organizations had not adequately reviewed the package before the Operational Safety Board meeting that occurred the day before work was to start. Problems with the work package included:

- Incomplete linkages between the "lead" package for isolating, draining, refilling, and returning systems to service and the maintenance and construction work packages

- Work instructions containing individual steps that required multiple valve manipulations and only included single signoff blanks, which is contrary to the Conduct of Operations Manual

- Redundancy and duplication of instructions and documentation of actions

- An improperly completed hazard identification planning form (e.g., the form was signed off as approved by three individuals, with none of the 14 questions on the form answered and not all pertinent functional areas, such as criticality safety, identified for review of the form)

- Inadequate post-maintenance testing, which did not address testing of a check valve that was to be installed. Forward and reverse flow testing should have been specified.

Summary. The Building 9204-2E fire protection system and CAAS are generally in good physical condition, with appropriate corrective and preventive maintenance being performed to assure their continued capabilities. The maintenance backlog has been reduced and is being maintained at a low level. However, OA identified a few shortcomings in maintenance planning that caused delays in completing maintenance activities, including incomplete work packages and insufficient safety review of the packages.

F.2.4 Operations

The fire protection system and CAAS are standby systems that automatically operate during accident conditions. BWXT has established a set of procedures for responding to fire protection system and CAAS trouble and actuation alarms. The procedures, for the most part, are well organized, detailed, and provide appropriate actions for response personnel. In addition, personnel responsible for implementing the procedures demonstrated that they were knowledgeable of their responsibilities and could appropriately implement the procedures.

The fire dispatch alarm response procedure appropriately incorporates a process for differentiating between recurring trouble alarms and actual trouble alarms and provides guides for evaluating the alarms and dispatching appropriate resources. The fire department alarm room dispatchers (a continuously manned position) demonstrated good knowledge of alarm room equipment operations, including use of the Fire Watch system to identify the specific fire protection system and building area where an alarm occurred. Dispatchers' initial training includes performance elements to ensure they are adequately prepared to perform the dispatcher duty. In addition, the Y-12 fire protection department has established plans, procedures, and checklists to support response to fires in Building 9204-2E. For example, Y-12 has developed a fire pre-plan for Building 9204-2E that provides an

appropriate level of detail supporting fire response, including information on hazards and fire protection systems to support response efforts. BWXT has a program established for periodically updating the fire pre-plans, and fire department personnel participate in facility walkdowns to support the updates. Although the Building 9204-2E fire pre-plan had not undergone a formal review and revision since 2000, Y-12 has established a formal process for keeping the plan updated via pen and ink changes. BWXT has also developed a procedure to safely guide firefighting in fissile material areas, and fire department personnel receive training on the procedure. The fire department battalion chiefs interviewed were familiar with the tools and procedures available to support their response and indicated that they would be utilized to fight a fire in Building 9204-2E.

The CAAS alarm response procedure is generally well structured and provides an appropriate level of detail. It includes separate sections for automatic actions, immediate actions, and follow-up actions. Furthermore, it includes instructions for considering limiting conditions of operations that may be impacted by component failures. The Y-12 control center assistant and plant shift superintendent, who continuously man the control center, receive training on response to CAAS trouble and actuation alarms, and personnel serving in these positions demonstrated good understanding of their response actions for CAAS trouble and actuation alarm.

Although the fire protection and CAAS alarm response procedures are generally effective and operators are well trained and capable of implementing them, a few concerns were identified. For example, fire department personnel indicated that their response to criticality alarms calls for evacuating the fire hall with response vehicles could result in their traveling past a building where a criticality could occur. However, the building response procedure instructs personnel to respond to their normal accountability station, and there is no procedure that discusses relocation of the response vehicles. For the CAAS response, two concerns were identified. First, the alarm response procedure does not clearly differentiate between trouble alarms and actual CAAS activations to facilitate quick access to sections pertaining to response to actual criticality events. This situation contributed to an assistant having difficulty finding the correct section during an interview. Second, the procedure does not provide clear linkage to other response procedures, such as the event classification procedure and an emergency operation procedure specific to criticality response. One plant shift superintendent interviewed did not identify all of the procedures that would be used during a CAAS event.

Summary. BWXT has established a generally good program (procedures, training, and qualification) to prepare personnel to respond to inadvertent alarms and actual operations of the standby CAAS and fire protection system. The responsible personnel interviewed demonstrated that they are capable of performing these duties. Some specific concerns with alarm response procedures and personnel knowledge of expected response to alarm conditions were identified that could slow response or potentially lead to inappropriate actions.

F.3 CONCLUSIONS

The two essential systems evaluated (fire protection and CAAS in Building 9204-2E) are well designed to perform their safety functions. Furthermore, an appropriate set of TSRs has been identified to verify continued operability of the systems, and BWXT has developed a good set of procedures to support system surveillance and testing. With one observed exception, these appear to be executed in the required manner, and surveillances are being performed at the frequency specified in the TSR. The systems are being adequately maintained as demonstrated by their generally good material condition and the low backlog of maintenance items. Recent efforts to reduce that backlog are noteworthy, as well as the 10-year comprehensive commitment to correct longstanding fire protection problems site wide. BWXT has also developed a good set of procedures to guide response to trouble alarms and actual activations of these systems. Responsible personnel have been trained on these procedures and generally demonstrate good understanding of their roles, responsibilities, and response actions.

However, BWXT has not provided adequate configuration control of the fire protection system and has not ensured that all fire protection modifications and configuration changes are appropriately analyzed. Furthermore, some NFPA-required surveillances have not been performed. Finally, weaknesses were identified in procedure compliance during fire protection surveillance and tests, in fire protection maintenance planning, and in some alarm response plans and procedures. BWXT has implemented a number of

near-term actions to address the most significant of these concerns and has begun to address longer-term solutions.

F.4 RATINGS

Design/Configuration Management: NEEDS IMPROVEMENT

Surveillance and Testing: EFFECTIVE PERFORMANCE

Maintenance: EFFECTIVE PERFORMANCE

Operations: EFFECTIVE PERFORMANCE

F.5 OPPORTUNITIES FOR IMPROVEMENT

This OA inspection identified the following opportunities for improvement. These potential enhancements are not intended to be prescriptive or mandatory. Rather, they are intended to be reviewed and evaluated by the responsible line management, and accepted, rejected, or modified as appropriate, in accordance with site-specific program objectives and priorities.

YSO

1. **Revise the Building 9204-2E SAR to identify NNSA's acceptance of no CAAS coverage for one of the areas in Building 9204-2E based upon administrative and engineering controls that a criticality accident is "beyond extremely unlikely."**

BWXT

1. **Clarify the safety analysis documenting the rationale for not including CAAS detection coverage in one area of Building 9204-2E.** Specific actions to consider include:

   - Revise the safety documentation to address containers (e.g., dollies) that provide spacing for units on the floor and inherent aspects about the holding fixture.
   - Discuss how these engineering controls provide additional protections with existing administrative controls and other engineering features to support the conclusion that a criticality accident in this area is "beyond extremely unlikely."

2. **Provide a single point accountability and authority for modifications. This practice has been used by the commercial nuclear power industry for over 10 years and has resulted in significant safety and efficiency improvements.** Specific actions to consider include:

   - Develop a sitewide modification process that addresses the following elements:

     – Assemble of a modification-specific team with representatives from all affected organizations: design, safety basis, operations, maintenance, construction, security, radiation protection, etc.

     – Designate a responsible engineer with authority and responsibility to prepare and implement all phases of the modification process, including planning, design, unreviewed safety question evaluation, procurement, implementation, post mod testing, and return to operation.

     – Prepare a draft USQD at the onset of the modification process (at the time design inputs are prepared) and keep it current as the design progresses. The USQD should be authored by the responsible engineer, with input from all affected organizations, and should include an evaluation of the risk associated with use of the unvalidated design inputs.

   - Provide additional training to design and fire protection organizations on configuration control, maintenance of the safety basis, and the unreviewed safety question process.

3. **Evaluate the generic impact of the use of unvalidated drawings to support design modifications.**

4. **Improve fire protection system outage planning.** Consider instituting the following procedures and practices:

   - Formally designate one planning package that provides instructions for setting up, entering, and returning to normal from the outage as the "Lead" package.

   - Formally identify in that package the points where the various work packages are to be commenced and concluded, including all organizations that may be required to perform work during the outage.

   - Reduce the potential for worker confusion and error by eliminating the current profusion of maintenance job request work package planning documentation redundancy and duplication where possible.

5. **Ensure that personnel working on safety class or safety-significant systems are appropriately qualified.** Specific actions to consider include:

   - Institute a training policy that ensures that personnel performing Category I or II procedures are qualified. Include provisions requiring that personnel first witness the performance of the procedure by others experienced with the procedure, and that this be documented in personnel training records.

   - Enhance instructions on work stoppage when procedures are inadequate and on protocols for procedure usage, in particular for system restoration.

6. **Modify surveillance and test procedures to incorporate all NFPA requirements.** Specific actions to consider include:

   - Ensure that existing procedures are modified to incorporate the missing surveillance requirements, or obtain NNSA approval of a deviation.

   - Review the fire protection design and identify needed changes to allow some tests to be performed (e.g., the section control valve flow test).

   - Develop a database of installed sprinkler head types to support keeping appropriate spares on hand.

7. **Ensure that surveillance procedures are reviewed and modified in a timely manner to address issues (such as standing orders) that directly impact criteria for and decisions on system operability.**

8. **Modify CAAS response procedures to facilitate their use and integration with other CAAS procedures.** Consider enhancing the CAAS alarm procedure by explicitly identifying who is to use the procedure, highlighting the sections that pertain to response to an actual criticality actuation, and referencing other applicable documents, such as the "Criticality Accident Event Recorder Operation," "Response to a Nuclear Criticality," and other applicable emergency response procedures (e.g., event classification).

9. **Determine whether relocation of fire response equipment is needed during a criticality event and, if needed, develop instructions and ensure that fire department personnel are appropriately trained on those instructions.**