Enclosure 2

INDEPENDENT REVIEW OF IMPROVEMENTS TO Y-12 CONDUCT OF OPERATIONS AND WORK PLANNING AND CONTROL PROCEDURES

MAY 21-25, 2012

Independent Review of Improvements to Y-12 Conduct of Operations and Work Control

Conducted for the National Nuclear Security Administration Y-12 Site Office

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APPROVED FOR PUBLIC RELEASE

This document has been approved for release to the public by
Original signed by Scott A. Hawks 6/7/12
Y-12 Site Office Classification Officer Date

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Executive Summary

At the request of the Y-12 Site Office (YSO), a small team of subject matter experts (SMEs) conducted a one week assessment of the progress made by the site in improving the conduct of operations specifically related to procedure usage as defined in the B&W Y-12 Conduct of Operations Performance Improvement Plan (COPIP). The team also included members with specific expertise in the work planning and controls processes who evaluated work planning improvement efforts as defined by the B&W Y-12 Work Planning and Control Performance Improvement Plan (WP&C PIP). The details of the team are listed below. The assessment took place the week of 21 May, 2012.

Conduct of Operations:

The conduct of operations performance improvement plan implemented at the site has clearly had positive impact in improving operations in the facilities observed (nuclear operations facilities). Operators had good awareness of the plan, associated standing orders, and enhancements still underway (a relatively small number of procedures observed by the team had completed the upgrades specified in the plan). The operators understood the bases for the changes and were for the most part supportive of the process and agreed that the improvements were beneficial to them in the execution of their daily operations in the facilities. Place-keeping methods were well understood by operators observed. In most cases this place-keeping process was executed as directed and operators uniformly agreed that the place-keeping process was helpful. When any questions were raised regarding a step or an outcome in a procedure, operators were quick to seek involvement of their supervisors and sought clarity in the direction they were given prior to continuing the procedure. Conduct of operations training developed at Y-12 is excellent, particularly with its emphasis on hands-on activities. This training appropriately involves and engages personnel at all levels. Y-12 would benefit by maximizing both the number of people offered this training and the pace at which production personnel complete the training.

Continued improvements are needed to achieve the expectations outlined in the improvement plan. On numerous occasions, operators were observed conducting additional actions outside the scope of the written procedure that were obviously germane to the operations being performed. When questioned about this, many operators replied that these additional actions involved “skill of the craft,” or were otherwise needed to complete the process (in no case were unsafe or inappropriate actions observed). These actions however, demonstrate a lack of operator engagement in assuring the quality and accuracy of the procedures. Procedure writers are essential in maintaining control over the overall documentation process and the use of appropriate language in the procedure. However, ensuring that procedures are accurate and complete on the floor requires engaging operators in their development and operator ownership, commitment, and attention to detail in order to realize the improvements outlined in the improvement plan. This is particularly important in that it appears that the Y-12 work force, like that of much of the Nuclear Security Enterprise, contains a large percentage of experienced workers eligible, or near-eligible, for retirement. Inherent knowledge needs to be captured in procedures or there is risk that it will be lost.

Improvement in communications in the conduct of procedures would also have a great impact on furthering the plan goals. During some observed work, Y-12 employed a "reader assist – worker" methodology in the execution of procedures (this is not defined in conduct of operations program documents, only reader/worker is discussed). With the exception of a few complex processes that involve physical separation of reader and worker, this process does not require direct repeat back of statements by the worker to the reader and vice versa. While this method is not deficient in and of itself, operators require additional training and understanding regarding key elements of communication. When specific parameters are required in the execution of procedures, those specific parameters should be shared verbatim between the operator and reader. Further, communications in general should focus on key safety elements important to execution of the current operation rather than extensive discussion of standard safety considerations.

Relatively few procedures that had been upgraded through the improvement process were available to be observed during this assessment and the rate at which procedures are being revised is lagging. Only seven of hundreds of procedures have been revised thus far with only several tens more in the process. It would benefit the site and contribute to the realization of the goals of the improvement plan if this process could be achieved in more expeditious manner. Deployment of procedure development guidance and goals for the procedure writers is also needed. This would help ensure consistent and timely implementation of procedure improvement principles and add efficiency to the procedure improvement process. Further, additional consideration of the procedure categorization system may be warranted. There remains a lack of clarity around the expectations for Reference Use (and Information Use) procedures, and further evaluation is needed to ensure that the procedures for a given operation are best suited for the work being performed in that specific area.

Work Planning and Control:

Work planning and control activities were assessed to evaluate the progress made to date in executing the B&W Y-12 improvement plan for these activities. The improvement process was begun recently (February 2012) and only limited time has been available to implement the changes outlined. Oversight was performed of maintenance activities in the field, work packages were reviewed, and personnel were interviewed. While some activity level work was observed, the Team was impacted by the lock out/tag out (LO/TO) suspension in-progress during the review. Improvements have been made in work planning and control. Specifically, workers and work-planners have scheduled a regular period for the joint work-planning and control activities, job pre-briefs are improved overall, and work scopes are better defined in work packages. This has resulted in improved communication of hazards, cost savings, and increased productivity. In addition, the maintenance supervisor oral board process was found to add significant value to supervisor evaluation and development. Finally, post-work feedback and end-of-shift briefings have provided valuable input on actual effort required, parts needed, work package improvements, and worker skill requirements.

The Work Planning & Control Improvement Plan (Y/IA-452) commits to "a consistent, high degree of formality of operations while conducting maintenance activities" and further states that "management must set clear expectations to achieve" the goals of the Plant; further, Y/AI-452 notes that it intends the

approach taken to be consistent with the conduct of operations improvement plan. In conduct of operations training for production it is clearly stated that, for procedures with step-by-step instructions, that they be conducted in the manner written. A similar expectation is not clear, though, from wording used in work packages—if, in fact, executing maintenance activities by following step-by-step instructions is an expectation. Such uncertainty was also reflected in a "work complete" nuclear work package where a LO/TO that was originally imposed by the JHA process had been removed without review by the original team that developed the Job Hazards Analysis (JHA). The Integrated Work Control Manual (IWCM) and Work Planning Guide are not clear on this subject. These examples indicate the continued existence of clarity issues with regard to expectations regarding the rigor with which work packages are to be followed or changed and modified by the work supervisor.

As part of the work planning and control improvement process, a post-planning evaluation process or "workability review" has been instituted (IWCM Chapter 5). The requirements for this process were reviewed, and while this process provides a potentially useful final check prior to work package release, currently the individual completing the review (the Work Coordinator) does not possess a skill set equivalent to the individuals who performed the AJHA hazard controls determination. Thus, it does not meet the requirements of the JHA Manual to "Review and establish controls (including the required permits) to ensure they do not conflict or create additional hazards."

Improvement in the integration of work-planning and execution processes could also yield significant benefits to the activities conducted at this site. Interference between planned jobs and other activities was observed on several occasions indicating deficiencies in the coordination process. As work packages are focused to address specific hazards related to the activity, a greater coordination burden is necessarily shifted to supervisory personnel, who need to be aware of the change and shoulder the responsibility for communication of all applicable hazards that exist in the work environment – even if they are not specifically addressed in the work package.

Purpose and Approach

This Independent Assessment was to evaluate the progress B&W Y-12 has made against the short, mid, and long-term actions contained in the Performance Improvement Plans for Conduct of Operations and Work Planning and Control. This was accomplished largely by observing operations being performed using procedures in several facilities, review of the process being used to revise procedures, review of many procedures, review of work packages and hazard analyses, observation of maintenance operations as they took place, and a review of the Conduct of Operations Training. A summary of the assessment activities carried out by the Team is contained in Annex A. Prior to arrival at Y-12, the Team members each reviewed relevant documents that are listed in Annex B. In addition, during the week prior to the visit, most of the Team members participated in a video teleconference with B&W Y-12 and YSO personnel to discuss some of the progress made to date.

Team Members

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Conduct of Operations Assessment Results

Overview

The team was able to observe conduct of operations and the use of production and dismantlement procedures in several Y-12 nuclear and non-nuclear facilities. To date seven procedures had completed the revision process outlined in the procedure improvement plan. The use of four of these revised procedures was specifically observed during this review. Twenty-four additional procedures and nineteen additional operations within the nuclear facilities were observed and evaluated. The sample size was sufficient to support the judgments by the team that the COPIP is being effectively implemented and adherence to procedures has improved. Place-keeping using the circle/slash method is being employed for all Continuous Use procedures and for some Reference Use procedures (i.e., when directed by supervisors).

Those procedures that have gone through the revision process as described in the COPIP are, for the most part, improved. Those that have been revised later in the process show greater improvement than those done early. While the revision process is working overall, the Team is concerned with the limited numbers that have been revised and the slow pace of revision.

The Team observed effective communications between the operators conducting production and dismantlement activities but believe this could be strengthened, particularly in the undefined "reader assist-worker" method. More formality in worker acknowledgement of instructions and step completion would increase assurance of compliance with procedures and catch any mistakes made in the process. Formal worker repeat back and reader acknowledgement should be considered for complex, hazardous, and process-critical steps, similar to the formal "reader-worker" procedures.

The Team noted that the "skill of the craft" is an important element in completion of many of the operations observed. Operators frequently performed steps that were not included in formal procedures in order to accomplish their tasks. The Team believes it is critical that these unwritten steps be captured during the procedure revision process both for transfer of knowledge from more experienced to less experienced workers and to sustain quality of product as the workforce changes. Engagement in and ownership of the procedure revision process should be encouraged among all of the craft, supervisors, engineers, SMEs and procedure writers to ensure this implicit knowledge is captured.

Specific activities observed in each of the facilities are noted below.

9212

The conduct of E-Wing Casting – Batch Make-up Reference procedure (Y58-37-65-027) was observed. The procedure involved the weighing of material into appropriately sized batches for follow-on casting operations. All of the operators involved in the process had received training on place-keeping required for Continuous Use procedures. The operators had a good understanding of the process and the procedure governing the process and were able to explain process requirements and limits. The procedure was followed and executed without error. The first step in the procedure requires verification of airflow in the make-up hood. The operators checked this airflow once at the start of the

procedure. They also stated the flow was observed after the lunch break, though the procedure did not specify a frequency. The procedure could be improved by adding an appropriate frequency specification such as “once at the start of the shift,” or “each time a new batch is prepared.” The procedure also specified that “swarf” material may be contained in the metal; however the operators could not give a consistent definition of what constituted “swarf” material. Further, the operators did not exhibit a clear understanding of the basis for proper placement of pieces or parts, though they diligently complied with the requirement. The Job Hazards Analysis (JHA) for this task contained several standard industrial requirements, which diluted focus on the key hazards of this process.

The operations of the Carbon Burner Furnace were observed. The operators had received training on the standing orders on place-keeping. The operation was in progress at the time of the observation and the operators were taking readings on the furnace process. During this time, a walk-through of the startup procedure was conducted. As the logs were discussed, the operators demonstrated some lack of knowledge in the handling of out-of-specification readings in the log. They initially stated that an Alarm Response Procedure (ARP) should be used, but such a procedure did not exist. One of the procedure steps required an air flow of less than 11scfm be established. The gauge was difficult to read and a piece of masking tape had been placed at the 11scfm point. If this tape is required, it should be formally added under the operator aid program. During the walk through of the startup, it was noted that one of the furnaces was out of service. There was however, no marking or notes indicating this status on the equipment. Further, the steps allowing operation of either furnace were not marked by the operators to indicate which furnace was being used. The operators stated that the procedure was written for both furnaces to be used simultaneously. The observer had to prompt one of the operators to return to the appropriate portion of the procedure during the walk though.

The 75 Ton Break Press Operation using a Reference Use procedure was observed. The operators had received training on place-keeping and the standing order. The operators were clear and articulate on the operation of the mechanical equipment and procedures. The operators were able to discuss the process limits and their bases. It was noted in one case that the operator did not complete the batch card associated with the breaking operation that was observed. When this was discussed, it was also noted that there were errors on the batch card preceding the breaking operation.

The Filter and Separation Station Operation was observed. During the pre-job briefing, the Reference Use procedure governing this operation was reviewed and a walk down of the procedure was discussed. Criticality safety and controls were discussed extensively. Other hazards such as trip hazards and pinch points were also discussed. The operator was provided the opportunity to request information and ask questions. The operator did request the use of a filter aid, and the supervisor approved this request. Four complete cycles were observed (two coolant bottles and two “pickling” solutions). The Filter and Separation procedure (job performance aid) was posted at the station and was available for reference. The procedure was followed without any observed deviations. At several points during the procedure, work surfaces were meticulously cleaned. The instructions for cleaning are contained in a separate procedure, but the skill of the operator was such that she did not need to refer to that procedure. Similarly, movement and cleaning of safe bottles and pour off of diluted contents were also observed and those steps are not in this procedure. In accordance with this procedure, the separation vessel was cleaned between each batch of product. Equipment labeling was checked against the procedure, and all

observances were accurate. Following the filtration operation, the operator used shears to cut the filters prior to placement in the muffle pans. When asked, the operator noted that this was done to prevent a folded filter from opening the muffle pan. This is obviously "skill of the craft," since it is not included in the written procedure.

Five complete cycles of Operating Rod Mill and Sieve operations were observed. All of the equipment called out in the Reference Use procedure was present and operable. Both operators were experts on the procedure and had a complete understanding of criticality safety limits. All of the procedures were followed explicitly with no observed deviations. Excellent housekeeping was observed. Four identical cans were used for four different types of materials being separated inside the glove box. While the operators knew which cans were to dispense or receive which materials, consideration should be given to uniquely labeling each can so that inadvertent remixing of materials (which would result in rework not in a safety issue) could be avoided.

Collecting Condenser Effluent Sample for Submission to Lab (Y50-37-92-503 section 4.2) operations was observed. This is a Continuous Use procedure and circle/slash place-keeping was employed. This procedure requires one operator. This procedure is performed daily and the operators are rotated on a weekly basis, so the same operator will conduct this operation every day in a week. The operator was knowledgeable of expected responses. Step 9 of the procedure was to record necessary information on the log, the operator performed this step during step 3 (the 1 minute sparge). The operator did not think that it was a problem to conduct a step out of order in a Continuous Use procedure because the step was only to log that the sample has been taken. An SSW qualified escort directed the procedure stopped and the shift manager was informed. Step 10 of the procedure is to ensure the sample is transferred to an approved storage location in a Material Access Area (MAA), the operator has been leaving the sample at the posted radiation control (Radcon) boundaries and a Radcon tech has been picking up the sample, such that the operator was not ensuring that the sample gets to a proper storage location. The operator did not know that Y70-37-103, Containers and Material Handling, allows him to frisk the sample bottle and transport it to a proper storage location within an MAA himself, without Radcon support. Step 8 is to ensure process water flow indicates 85-90gpm but it does not say what to do if it does not read 85-90gpm, the use of the word ensure appears to direct action to the operator to achieve 85-90gpm but the operator did not know how to do it. The word "ensure" is used on 4 of the 10 steps in the procedure.

Restoring Vacuum Producer to Service from Warm Standby (Y50-37-92-503 section 4.4) operations was observed. This is a Continuous Use procedure and circle/slash place-keeping was employed. This procedure is performed daily and the operators are rotated on a weekly basis, so the same operator will conduct this operation every day in a week. The operator was knowledgeable of expected system response. Step 1 is to open a steam valve; the operator slowly opened the steam valve while monitoring pressure on a gage in order to prevent water hammer. The procedure contains no cautions or notes about the possibility of water hammer or how to prevent it and does not include anything about monitoring pressure rise or what pressures to expect. Step 2 is to ensure alarms are cleared on the control panel, the operator does this by pressing the reset button and verifying no alarm lights but the procedure does not direct the operator to press the reset button or to verify all lights are off. This illustrated "skill of the craft" knowledge necessary for successful completion of the operation.

Collecting a Sample (Y58-37-003) was observed. This is a Reference Use procedure, the procedure was available and out at the work station, and place-keeping was not employed. The operators were knowledgeable in their requirements and conducted every step of the procedure as written. The pre-job brief was not very interactive as the supervisors talked through the steps rather than having the operators lead the discussion.

9204-2E

Assembly operations were observed per Procedure Y51-01-B2-GX-212. The notes, precautions, and prerequisites included in this procedure were extensive and were not reviewed in detail prior to the operation. The procedure revisions require weekly verification. In one case, procedures in use had not been verified by the required date. Some of the notes in this procedure contained action statements such as "operator will verify." A note section should not require action on the part of the operator. This procedure was stopped and started at various steps; however, it was not clear, for any given step, when stopping and restarting were acceptable. Some steps were performed out of sequence when the procedure was entered at a step other than the beginning. The operators said this was required since they had restarted the procedure, but the procedure didn't indicate any such requirement. Some operators were weak in identifying the locations of requirements in the procedure. One procedure was stopped with two steps remaining to be performed; however the place-keeping was erased.

The procedure directed recordings of data in the data sheets, but in some cases, data was required but not called out in the procedure. Installation of vacuum fixtures was called out, but removal of the fixtures was not. Some vacuum fixtures were tested for leakage while others were not. In one case, a plastic hammer was used for alignment; however, this was not specified or noted in the procedure as an allowable method for achieving alignment.

During one operation, vacuum was lost during a part alignment. The operators stopped and sought advice from the supervisor, who directed the crew to realign the part and proceed, as realignment is an operation that can be repeated as necessary.

Air was applied to vacuum fixtures on a number of occasions to affect release although this actions was not included or noted in the procedure. During one process, a wait time was required. The operator incorrectly recorded the start time for the waiting period, but he later caught and corrected his mistake. Other elements requiring time monitoring were not recorded on the data sheet for the component.

On a vacuum leak check, the operator reported to the reader that vacuum was "good" rather than reporting the vacuum was maintained at great than 22" as required by the procedure. The procedure required a four hour cure time for an adhesive operation. During this time, greater than 300 psi of pressure was applied. While the operators knew and executed this requirement, it was not contained in the procedure.

Certain actions were included in the follow sheets that were not included as action steps in the procedure, though the action was required by the follow sheet. In sections 5.4 and 5.5 of procedure Y51-01-B2-GX-212 a note allowed for re-leveling of the component through step 15 of these sections. Much earlier than step 15, position verification with second check was required. If re-leveling occurred

(as allowed by the note) following the position verification, this verification would be invalidated. In one section of the procedure the verification of two components was required. The follow sheet however contained only one check block for verification.

Another section of the procedure required a weight to be applied to a component for a curing period. The procedure specified greater than 25lbs of pressure not to exceed 100lbs. A twenty pound leveling fixture was added, and then an additional component of unknown weight was added. The weight of the added component should be known to ensure the requirements of the procedure are properly met.

Certain activities conducted by the operator were not covered or were incompletely covered by the procedure. For example, several steps call for cleaning of parts as necessary with no elaboration. The cleaning process was specified for some of these steps, for others it was not. Cleaning with dry cheese cloth, cleaning with cheese cloth soaked in a cleaning agent, and wire-brushing were all observed. At several points in the operation, cranes were used to move various sub-assemblies. These actions were not included in the procedure. At two points in the operation, air was blown into a fixture to assist in leveling a part. These steps were also not included in the procedure. Successful completion of this operation relied on the "skill of the craft" rather than complete documentation of the steps needed to complete it.

An Unpacking Operation using Continuous Use Procedure Y51-01-B2-Y-106 was observed. The pre-job briefing was observed prior to starting the operation. Overall activities in the building and specifics of the operation to be performed were discussed. The supervisor conducted a Q&A session with the operators regarding the unpacking operation itself, assignments, expected conditions, prestart inspection of crane inspection date, slings, and cables, hazard controls, and conditions and responses to stop work. The operators appeared to be fully knowledgeable of the procedure and functions to be performed. Crane inspection date, cables and slings were inspected before the start of work. Parts cards were inspected before proceeding. Although the procedure reader stated that this can be done at any time during the unpacking operation, this crew chose to check the parts card before proceeding with the task. The procedure does not include this step. The procedure reader explained their action as "skill of craft" in that they did not want to find out later there was a problem with a mismatch in paperwork. This is a Continuous Use procedure and circle/slash place-keeping was diligently followed. This is not a reader/worker procedure, however, the workers performing a specific function acknowledged when a step was completed. After a container was opened, a crane was attached to a lifting sling that encompassed the item within the container. The item was then lifted out and placed into a fixture on a dolly. Each dolly contained only one fixture. Because of the dates when the items were originally packed, lifting slings included in the containers could only be used one time until after they were inspected. The sling was inspected, confirmed to be in good condition, and a new inspection sticker with that date was affixed to it. The order of using first and inspecting later might be considered for a process change to conducting the inspection first. The operators noted that they have a lifting fixture available to them in the event the slings are deemed to not be satisfactory. No deviations from the procedure were noted during two iterations of unpacking.

Cutting Operations using Continuous Use procedure Y50-01-B2-181 were observed. Place-keeping using the circle/slash method was observed. All of the cuts were computer-controlled using programming

instructions in the Machining Specification which is included in the Procedure notebook. The operators were completely comfortable with the operation and no deviations from the Procedure were noted.

A Dismantlement Operation conducted using Y50-01-B2-180 was observed. This is a Continuous Use procedure and circle/slash place-keeping was being practiced. Warnings are embedded in the procedure immediately prior to the operation of concern. There are very few general cautions and limitations at the beginning of the procedure. All of the operations were conducted under PPE equipped with air filtration systems. While positioned some distance away, the observer could hear communications between the crew, including from the procedure reader, because the operators had to shout to be heard over the air filter pumps. No deviations from procedures were observed.

Packing and Leak Testing Operations conducted under Y51-01-B2 and Leak Testing conducted under Y51-01-B2-R-074 was observed. These are both Continuous Use procedures and were being used in parallel to conduct the operation. Circle/slash place-keeping was being followed. The assembly was leak-tested prior to being placed in the shipping container. Multiple units were being packed and the Leak Tester was functionally tested before being attached to either the item or the container after it was sealed. Reader-assist was used, rather than the defined reader/worker method. The worker acknowledged hearing the steps read but did not repeat them back. The reader did conduct a peer check of the torque settings on the wrench the worker used to tighten bolts on the shipping container. Following closure of the container, the container itself was leak tested. During that test, the crew prepped the second assembly for packaging. No deviation from procedure was observed.

Dismantlement Operations (Y50-01-B2-190 and Y50-01-B2-161) were observed. These are Continuous Use procedures. Circle/slash place-keeping was utilized. These processes are conducted using a team of operators. A reader was assigned to read important steps, notes, and warnings but reader/worker method was not utilized. The task requires performance of steps that are not in the procedure for successful completion. For example as part of section 5.2 of the disposition procedure, parts were oiled and bagged but the procedure does not direct parts to be oiled or bagged.

The disassembly step in the procedure does not include precisely how to disassemble, it just says disassemble and disposition the parts. The disassembly is conducted using a hammer and chisel, a power screw driver, multiple cleaning and oiling steps, and a special jig to push out some retaining pins. The special jig used to push the pins is not included in section 4.2 (special tools, test equipment, parts, and supplies). JHA 0700495 directs the use of approved hand tools for this procedure; however, section 4.2 does not contain any hand tools. When the area supervisor was asked what constitutes an approved tool he said that he approves the tools used. Operators were recording part numbers and recording weights but the procedure does not direct these to be documented, a catch-all step at the end says to ensure all data has been recorded but by that point it is too late to recover data that might have been missed.

The procedure does not direct operators to compare actual weight of parts to expected weight and does not direct action if those weights differ by more than the tolerance. The procedure has a step that directs operators to clean parts if contamination exists but provides no inspection criteria and does not specify how to clean the parts other than directing what type of solvent to use.

An operator was observed to operate the vacuum rigging assembly in accordance with a Reference Use lifting and handling procedure. The operators did not actually reference the lifting and handling procedures or have it available. The operator conducted a four minute hold with the vacuum pump running rather than securing the vacuum pump for four minutes as the procedure directs.

The procedure for lathe operations does not include the specific jig that is used in the lathe to hold the piece being cut and does not include how much pressure to put the part under when loading it into the lathe or the depth of the cut.

Later in the week, additional dismantlement operations were observed in accordance with Y50-01-B2-190 as the guiding procedure, along with Y50-01-B2-161 and Y50-01-029 as required supplemental procedures. Both Y50-01-B2-161 and Y50-01-B2-190 had been revised as part of the procedure improvement process. Three sections of this operation were being performed simultaneously by different teams of operators, which is permitted by Section 5 NOTE 1 of Y50-01-B2-190. Each team was observed to have the procedure out and available and to use place-keeping when required to do so.

Section 5.5 is designated as a Continuous Use section of this procedure. It was observed that 5.5 [1] was performed initially for all parts that were going to be put through the process that morning, and then each part was put back into storage until the operators were ready for further step completion. The procedure (Section 5, NOTE 2) does allow parts to be returned to storage at any time. However, this suggests that the manner in which the operations are performed may not match the way that the operational steps are described in the procedure, especially since discussion with the operators suggested that work is generally scheduled to perform this procedure on multiple parts during the shift.

Further, while Section 5.6, 5.7 and 5.8 were designated to be Continuous Use, it was noted that steps in each of these sections were actually performed by different operators who were required to perform multiple sections of the procedure simultaneously. So, while Team 1 performed part of Step [1] in this section, they also completed Step [1] of Section 5.2 (a Reference Use section of the same procedure) and they passed off some parts to Team 2 who were performing Steps [2] and [3] in Section 5.2 of this procedure, along with a different procedure Y50-01-029. Again, this suggests that the organization of the procedure, the integration of this procedure with others used during the same operations, and the designation of the procedure sections as Continuous Use may in fact not best support the operators in how this task is actually performed.

Dismantlement Operations (Y58-37-003) were observed. This is a Continuous Use procedure. This procedure was conducted using a team of operators. Circle/slash place-keeping was utilized. A reader was assigned to read important steps, notes, and warnings but the defined reader/worker method was not performed. In some cases, the procedure did not provide specific direction and these deficiencies were covered by operator knowledge; for example, using the crane during disassembly to lift two pieces apart. This procedure was stopped momentarily when it was noted that the walk-in hood was not operating properly. The procedure was restarted only when hood flow was restored.

During the lunch period, a flow gage on the walk-in hood had been replaced and air flow had been reduced to minimum as part of the installation verification checks and the flow left at minimum levels. The dismantlement procedure field preparations section includes starting up the walk-in hood. Since

the walk-in hood was used in the morning and left running, the reader assumed this field preparation was completed and it was not repeated after the lunch break.

Circle/slash place-keeping was not being utilized for the field preparations portion of the procedure even though it directs actions. The procedure to start up the walk in hood (Y58-01-B2-117) was posted on the hood. The building manager keeps a binder of all field procedures that are verified weekly but this posted procedure was not tracked in that binder. One operator aid was spot checked and it was in the operator aid binder in the shift manager's office.

A procedure validation operation was observed. During this process a number of improvements to the procedure were identified and captured for improving the procedure. The operators actively provided input and were engaged in making the procedure better. These comments were captured on the validation form. This validation process was well executed.

<u>9204-2 and 9225-03</u>

Work observed in 9204-2 was performed in accordance with Reference Use procedures. However, in each case, the operating procedure was supplemented by other documentation.

In the machine shop, Y50-18-04-116 was being performed. This operating procedure provides general instructions for operating the equipment, but does not include details related to the parts being machined. Those details were found in Machine Specification documents, supplemented by Numerical Control (NC) program documents. The Machine Specification includes a step which indicates which NC program to use, but provides an option (e.g., use NC program 1 or NC program 2). However, per discussion with the operator, the specific NC program to use is specified by the supervisor and the NC program document is included with the documents provided to the operator. The Machine Specification revision is listed and controlled on Product Information Control Summary SR 040 report.

The Machine Specification and NC documents are not controlled or formatted as operating procedures. The machine specification documents are developed by the process engineers and include a symbol to indicate what information from the specification must be included on the "follow card" that accompanies the part. However, the follow card provided to the operators is blank, and does not include details about what information needs to be recorded. This makes it difficult to ascertain if required information is missing[1].

The operating procedure provided as an Information copy included a red-line change from the previous day (5/21/2012). The change was a non-intent change to correct a "cut-and-paste" error included in one of the notes. This procedure had been approved in January 2012, and was effective as of 4/24/2012. Thus, this procedure had been in use for a number of weeks before the error was identified.

Non-routine work is also performed in the machine shop according to unique developed by the Y-12 process engineer. One Machine Specification discussed during this review identified two (typographical)

[1] The information required for the follow card via the Machine Specification may be different for different parts, thus the part card is blank so that different cards do not need to be used with different parts.

errors that would have led to unclear instructions to the operators. In both cases, the number of samples to be machined had been changed from what was originally planned, but these numbers had been updated incorrectly in the machine specification document. The document indicated "ten (3) and three (8) samples" were to be machined [note the mismatch between the text and numeric numbers]. There was also a drawing in the document nominally indicating where the original samples were to be drawn from – this drawing had not been updated when the number of samples increased. Discussion with the process engineer indicated that this drawing was just guidance and that the Machine Specification would have included a note to require the use of the drawing if location of the samples was critical.

Two different operations in the rubber shop in 9204-2 were also observed, both in accordance with Reference Use procedures. The operators performing Y50-18-53-075 were observed to be circle/slash place-keeping their procedure using an erasable marker on the procedure in a plastic sleeve. The operator reported that he had been instructed to use place-keeping by his supervisor, even for this Reference Use procedure. However, a couple of issues were noted with performance of the procedure. First, Step 5.6 [10] states "If required, THEN weigh the parts." Step 5.6[11] states that "IF required, THEN add data to the Tracking Database," and there is a proceeding note that says that "Required data can be added to the Tracking Database at any time during the performance of this procedure." While completing Step 5.6[10], the operators were observed completing a log sheet for each part that included not only the weight, but also dimensional measurements. Neither the dimensional measurements, nor completion of the log sheet was called out in the procedure. Per discussion with the operators, the information from this log sheet was going to be entered in the Tracking Database at some later point to complete step 5.6[11]. Further, in addition to the procedure the operators were also using a work order that provided specific information about the parts being made. The work order (dated 3/17/10) was well worn, and had two weights red-lined, with new weights written in by-hand. Neither of these changes was initialed or dated. Per the operators, the product engineer had long ago noted that these two values were reversed on the work order and had made the red-line change. The operators believed that a new version of the work order had been issued, and that both the product engineer and inspector had a copy of the current version. However, this version had not been provided for use by the operators.

Dryer Unloading operations (4.8[3] to 4.8[61] of Y51-18-51-011) were observed. This is a Continuous Use procedure, and place-keeping was employed. During the conduct of the procedure, three different readers were utilized including at one point the process engineer. The defined reader/worker method was not followed; instead they were utilizing a "reader-assist" routine which is undefined in the conduct of operations manual. The reader would read a step and then the operator would perform the step and then inform the reader that the step was completed. Communications between the reader and worker varied widely in formality, with some steps being a verbatim repeat back and other steps much more informal. On multiple occasions, the process engineer was observed to acknowledge an expected low flow alarm. Circle/slash place-keeping was used, but contrary to Chapter 16 of the Y-12 Conduct of Operations Manual, the reader would circle/slash steps that were not conducted rather than writing N/A. A method of place-keeping for repeated steps was employed and effective. Operators had adequate level of knowledge on precautions and limitations. One operator aid was spot checked to the operator aid reference book with no discrepancies noted.

DML packing operations (section 5.5 of Y51-18-51-012) was observed. This is a Reference Use procedure; place-keeping was not required or employed. One step directs the operator to discard the first product produced; the operator did not know the reason why. Both this procedure and the dryer unloading procedure required the operators to write down specific data on specific forms, when asked the operators did not know the importance of writing down this data and its use as objective quality evidence. The operator had trouble establishing the correct atmosphere in the glove box airlock and increased N_2 purge rate in accordance with 5.14.1 of that procedure (Y51-18-51-012). The operator was not certain how to read the N_2 purge rate on float gage DMLG-FL-201 and 202 and set the purge rate at 9scfm, the procedure calls for 1-8 scfm of N_2 purge flow. The procedure to establish N_2 purge rate requires throttling a valve that is approximately 12 feet above the ground, the valve is neither accessible nor does it provide good throttling characteristics as it is a 90 degree ball valve. The operator operated the overhead valve with a stick.

Procedure section 5.14.1 applies to all three glove boxes in the space. It includes a note that allows steps to be performed in any order. Steps 1 and 2 apply to one of the glove boxes, steps 3 and 4 apply to a second, and steps 5 and 6 apply to the third. It would be simpler if these actions were split up by glove box. The procedure requires the operator to install two clamps on a rubber hose but it isn't specific in exactly how or where, by operator knowledge the best place to place the clamps is in the middle of the hose with an inch of spacing and mechanisms facing away from each other.

The procedure also directs the operators to install two large hose clamps around the outside of a cover, through operator experience it was discovered that it is best to put the tightening mechanisms on opposite sides of the container to prevent ripping or damaging the rubber. This best practice is not captured in the procedure.

The daily pre-use checks for this procedure are minimal; they are to check N_2 purge flow and verify no alarms. However, if the moisture monitor select switch is not monitoring the correct location then a high moisture condition would not cause an alarm. The daily pre-use checks do not include a maximum moisture content value to check; rather it relies on the moisture monitor to be functioning correctly, calibrated, and alarming at the correct set point. The daily pre-use checks do not include checking the gloves or other flexible couplings on the glove box for damage.

One of the glove boxes was out of service but not posted as out of service. One gage that was not being utilized during the operation was out of calibration without an out of calibration sticker, however the out of calibration gage was identified on a calibration printout the supervisor had and he was aware of the out of calibration condition. When asked, one of the operators could not locate the building emergency operations procedures.

PPtF Operations were observed. The operators were very familiar with the procedure that was used in the process and had received training in the place-keeping requirements and the procedure improvement process. These operations were in a relatively new building, and valve and process labeling was excellent and clearly provided a benefit to the operators in executing the procedures as written. The operators were able to discuss and demonstrated expected responses to procedural steps and had an understanding of the steps needed to place the operation in a safe condition should an emergency situation arise.

The procedures governing this process required the operators to "ensure" valve positions in a number of steps. During the execution of these "ensure" steps, the operators repositioned valves on a number of occasions. In discussion with the operators, it was clear that in some cases when "ensure" was used and the valves/switches were not in the expected positions, they would need to stop the procedure. The action "verify" vice ensure should be used in those cases. Another step in this same procedure required the operator to verify that a pin had "remained in place." There was no locking device, sign-off, or position indicator on the pin. It was therefore impossible for the operator to complete this action as written. This procedure also included a pen and ink change. The process and approvals for pen and ink changes were reviewed and the process was conducted correctly and the correct version of the procedure was verified to be in use.

Conduct of Operations Training Assessment

A regularly scheduled session of the Production organization's Conduct of Operations continuing operator training was observed. The training was conducted over approximately five hours. The audience consisted of eight personnel, six hourly workers and two management personnel. A total of five training personnel were involved (two lecturers, three evolution leaders), from a broad spectrum of production groups. The format and content included less than 1/3 of the time on lecture and more than 2/3 of the time spent in two evaluated evolutions. The lecture included: an introduction which described "why we are here" along with a concise statement of the learning objectives; a well framed video with a personal statement from the Vice President for Production, which outlined in his own words his objectives for the training, including the statement that sometimes "going slower can mean going faster;" the types of briefs were then addressed, crew/shift brief, pre-job brief and post-job brief; a discussion of "why we need procedures" followed, noting the top-level advantages of providing clear direction, along with consistency and reliability—clear emphasis was provided on the Production expectation that procedures were to be followed step-by-step, unless specifically directed otherwise; the concept of reader/worker procedure execution was addressed and differentiated from "reader assist worker" (although this was not entirely clear and is no clearer in the Conduct of Operations Manual); the final topic, covered in detail, was the Production expectations for place-keeping in procedures.

The hourly workers were split into three two-person teams, the management personnel acted as the Work Supervisor and Shift Managers. The "shift supervisor" developed and provided a shift brief. Training personnel provided two of the three pre-job briefs while the "supervisor" provided the remaining pre-job brief. The procedures in use had pre-arranged errors/unclear areas that the personnel being trained were expected to deal with. A training staff member (one of the lecturers) acted as an all-purpose Subject Matter Expert (SME, i.e., provided RadCon, System Engineer, Safety Specialist) to provide guidance, as required, to the work teams. The work areas included a glove box, ventilation hood and fairly complex electrical/mechanical system. These provided a high-quality environment for the trainees to test their understanding of procedural compliance. The training personnel had detailed evaluation procedures to guide and provide feedback for each of the three evolutions. Each worker team got to participate in two work evolutions, both of which were evaluated immediately after completion. At the end of training, trainees provided both formal and informal

feedback to the training team. Overall, the training was excellent, with the mix of focused lecture materials and evolution-based, practical reinforcement deemed to be particularly effective.

Assessment of Procedure Revision Process

A review of procedures before and after revision through the Performance Improvement Process indicates that the revised procedures are generally improved over their previous revisions. In one case, the scope of a single procedure had been broken up into multiple procedures which greatly reduced the complexity of each individual procedure. In other cases, the number of precautions and limitations has been significantly reduced, and the specific hazards previously identified in precautions and limitations have been embedded into the procedure at the appropriate step or removed altogether. This certainly enhances the potential for operators to relate these hazards and controls to the work being performed, and to have the information easily available when it is needed. Many of the revised procedures include a reference to source requirement documents (e.g., CSAs, TSRs, other administrative procedures) at individual action steps, which is an excellent tool for change control as it provides information that will help ensure that steps that implement requirements are not changed without appropriate review and approval.

However, it is also noted that only seven procedures have been improved to-date under the procedure improvement process. It was observed that some of these improved procedures have been revised multiple times since being initially re-issued, and that at least one of the procedures revised early in the process (e.g., Y50-01-B2-160, in fall of 2011) does not display some of the improvements incorporated into the recently upgraded procedures. For example, this procedure still has a significant number of precautions and limitations and references included in the action steps that are actually references to the precautions and limitations rather than to other source requirement documents.

The Team's review also included procedural review and observations of a significant number of operations that had not yet been through the procedure improvement process. This review identified a number of opportunities for continuous improvement of the procedures improvement process as well as with the actual procedures. While a number of these issues had been specifically identified in the Procedures Improvement Plan as needing improvement, others were not previously identified. Thus, a careful review of the procedures is warranted to ensure that all issues, including the following, are addressed.

- Excessive use of Notes throughout procedures
- Action steps explicitly (or implicitly) contained in Cautions, Warnings and Notes
- Inspection and/or other decision criteria not specified
- No instructions on what to do if certain conditions are not met
- If-Then statements that do not provide instructions on what to do in all situations
- Instructions to take measurements without instructions on where to record the information

A review of the Procedure Improvement Plan (Nov 2011) provides a detailed implementation process and areas for improvement for technical procedures used in the Production Division. These areas for improvement are essentially a "punch list" of the procedural issues identified in previous assessments. It may be necessary to expand beyond this list of issues to look more broadly at procedural improvements that can be implemented to improve operational performance.

One such area for improvement was identified around the current implementation of procedure use categorization. A number of different issues were identified, including:

- There has been insufficient consideration as to how procedures intended for each type of use should be developed, structured and formatted. The Manager of the Procedures and Production Support group suggested that development of a procedure would be the same, regardless of how the procedure as intended to be used. However, it is important to recognize that intended use should establish tailored expectations for content, format or other differences between these types of procedures.

- While the expectations for use of Continuous Use procedures are clear (especially with the addition of the place-keeping requirements), there appears to be some confusion on expectations for Reference Use and Information Use procedures. First, the distinction between Reference Use and Information Use procedures is not clear based on the definitions in the Conduct of Operations Manual and discussions with personnel. The Conduct of Operations Manual (Y14-001) Chapter 16 defines the categorization of procedure use as Continuous Use, Reference Use, Information Use or Multiple Use. The definition of Reference Use is for "activities for which the consequences of an improper action are not immediate and are recoverable" and the definition of Information Use is for "activities which are performed frequently and are within the knowledge and skills of experienced individuals." However, the requirements for how each of these categories of procedures will be used described in the Conduct of Operations Manual are the same.

- Chapter 16: Appendix B further includes a flowchart to help in the determination of Level of Use. The decision points focus on equipment operability/reliability, personnel safety, compliance with Authorization Basis requirements, or impact on safety systems. A number of significant factors not explicitly addressed in use categorization flowchart include: frequency of task performance (although this is specifically called out in the Categorization definitions), the impact of an error on product quality, whether the completed procedure needs to be maintained as a record, whether the procedure will be used in a reader-worker format, or other factors. Further, one of the decision points leading to a determination of a Reference Use procedure asks "will the consequences of errors be detected and/or corrected prior to the end of the described activity", which is a different description than provided earlier regarding consequences which are not immediate and are recoverable.

- The Conduct of Operations Manual also requires that operators using Reference Use procedures (and Information Use procedures) "review the procedure following performance to ensure all steps were accomplished." While many operators did have their Reference Use procedures out during operations, it was not clear that all were performing this post-completion review.

Another area for consideration is the number of different procedure types in use for production activities, and the applicability of the Procedure Improvement Plan to only some of these procedure types. Y15-232 Technical Procedure Process includes *Appendix B: Use Type Decision Matrix Part A, Specifying Technical Procedure Type*, which is used to determine which of twelve different procedure types should be used for different activities. While definitions of each procedure type are included in *Appendix A: Acronyms and Definition of Terms*, and many of the procedure types are specific for certain types of operation, for other types there is little specific guidance on when or why they should be used in lieu of other procedure types. For example, there is no guidance provided in either Y15-232 or the Conduct of Operations Manual as to when JPAs should be developed instead of a SOP. Further, this system of procedures means that in some cases, operators are working to multiple documents simultaneously.

It was also noted that Y-12 does not have a Writer's Guide (or similar document) that articulates procedure-writing principles or guidance for those writing procedures. While a software tool (Technical Procedure Authoring Tool - TPAT) is used to ensure that the procedures are formatted consistently, specific information about how Y-12 expects future procedures to be written are not yet codified for those not currently involved in the Procedure Improvement Plan (PIP) to follow. This results in missed opportunities for relatively simply changes to be made to procedures that are undergoing revision for other (non-PIP) reasons. For example, clarifying the use of the word "ensure", or removing imprecise language such as "as necessary" are changes that could be made as procedures are undergoing routine revisions, if this was communicated to a broader set of procedure owners. Further, considering different prioritizations for procedures to be revised through the PIP (e.g., rather than the highest hazard procedures, consider the most frequently used procedures or those being used in a reader-assist worker manner) may allow progress to be made more quickly, and have the proposed improvements visible to a broader spectrum of operators sooner.

A number of the observations during this review found situations where the operators were using "skill of the craft" to complete tasks that were not specifically included in the procedures but are required for successful completion of the operation. There are two major concerns with this; first, in order to ensure that important knowledge is captured for future procedure users, it is necessary that all steps be identified and captured in the procedure. Second, this is indicative of a lack of ownership of these procedures by the Operators, and their supervisors and managers. Everyone involved in the work does not yet see the value in identifying and capturing potential procedural improvements real-time, so that these changes can be incorporated into future procedure revisions.

A review of Chapter 16 of the Conduct of Operations Manual also noted the following:

- There is a section of the Chapter with the heading "General Guidance and Good Business Practices" that includes a number of requirements (as indicated by SHALL) statements. While this heading is probably a result of language in the previous revision of the DOE Conduct of Operations Order, it provides a lack of clarity around what are really requirements.

- Section C of the General Guidance and Good Business Practices addresses Supervisory Review of Procedures. The first NOTE states that the "supervisory review is required to ensure data and place-keeping has been properly documented." The subsequent requirements address the need

to submit a completed procedure to supervision for review post-job completion. A later NOTE states that "A procedure is not considered performed and completed until the results or acceptance criteria have been reviewed and approved by the manager/Shift Manager." However, many of the procedures observed in use during this review did not require any procedure steps to be signed-off, and would not result in any completed procedure to be turned in for this review. Place-keeping often occurred using a grease-pencil (or similar) on a laminated copy of the procedure and was then erased immediately after (or even during) procedure completion. Even if a procedure was turned in for review, it is not clear how the supervisor would ensure that place-keeping had been properly documented. The only thing that the supervisor could review is whether the circle/slash marks were next to each step – not how/when these marks were made. Thus, it is not clear the applicability of this section, or how place-keeping could be reviewed, other than administratively.

- Appendix A (#2) provides an example of how to complete a procedure, data sheet or round sheets if the data collected does not fill or use all space provided. The example provided to illustrate this instruction does not actually match the instruction ("No Further Entries" is not included).

Activity-Level Work Planning and Control Assessment

Overview

Work planning and control activities were assessed to evaluate the progress made to date in executing the Y-12 improvement plan for these activities. This improvement process was begun recently and hence less time has been available to implement the changes outlined in the improvement plan. The LO/TO suspension that was in effect during the time period that this review was conducted limited the sample size and the complexity of work that could be reviewed in the field. While the comments and opportunities for improvement provided in this report are supported by the work the Team was able to review, a broader sample would have allowed for more refined recommendations to be generated by the team.

A total of eleven (11) work packages were reviewed, including seven (7) nuclear work packages (5 complex, 2 minor) and four (4) non-nuclear work packages (3 minor and 1 dispatch). Twelve (12) work evolutions in the field were overseen; these included five (5) nuclear jobs and seven (7) non-nuclear jobs. In addition, pre-shift, pre-job and post-job briefs were observed and numerous interviews conducted. A critique of a problem with the performance of a nuclear preventive maintenance procedure and a maintenance supervisor oral board were also observed.

Improvements have been made and have favorably impacted work planning and control at the Y-12 National Security Complex. Specifically, workers and work-planners have set aside a scheduled period for the joint work-planning and control activities, job pre-briefs are improved overall, and work scopes are better defined in work packages. This has resulted in improved communication of hazards, cost savings[2] and increased productivity.

Nuclear Work

<u>Nuclear Work Packages</u>

Nuclear work and non-nuclear work are addressed by separate sections of the Integrated Work Control Manual (IWCM, Y18-012). This is considered a best practice, clearly delineating the special expectations for nuclear work—in fact, nuclear work packages are also differentiated by printing the instructions on yellow ("canary") paper. This is also considered a good practice.

Two nuclear planners were interviewed and seven (7) nuclear work packages were reviewed. Work planners clearly described the difference between planning nuclear work and non-nuclear work during interviews; the most salient features to the planners were the need to solicit and accept detailed hazard identification and controls information from a variety of subject matter experts and the level of detail

[2] The pre-job briefings and planner/craft pre-job walk-downs provide opportunities to better understand tool and material requirements for each maintenance activity allowing use of existing material stocks rather than ordering additional new materials.

expected in the work packages. They described the process of joint automated job hazard analysis (AJHA) planning meetings and noted that often it took more than one session to completely develop a suite of hazard controls and work steps. The planners also described the central role played by systems engineers for the applicable systems being worked, including both technical input and procedural steps.

The results from the review of each work package are described below.

WO50400720 (Complex) – The package had a clear work scope description. An engineering drawing that was attached helped to add clarity to the three steps of the procedure. This package had no job specific hazard controls and none suggested themselves to the reviewer. The post work testing (PWT) deferred to the System Engineer to "inspect and approve installation."

WO50392137 (Minor) – The package had a clear statement of work scope. Three hazard controls included Fall Hazard due to elevated work, electrical LO/TO and standard electrical safety; standard wording from the AJHA was used. PWT simply required that the machine "power up" as observed by the craft; possibly a bit vague.

WO50362450 (Complex) – The package had a clear statement of work scope. Four hazard controls were placed next to the steps that required them. Clear, detailed instructions were provided for the PWT which included a logical sequence of steps, numerical values and clear acceptance criteria.

WO50398965 (Complex) – The package had a clear statement of work scope. A revision to this work package that occurred during the maintenance activity removed a hazard control—an electrical LO/TO. The change was administratively clear, using the required revision sheet and a line out/strike out in the body of the procedure; however there was no annotation of why the change was made or what concurrences were received and the change to the scope of work simply states that "LO/TO not required." The revision was signed only by the work planner and job supervisor and no reason for the revisions were noted in the space at the back of the work package reserved for notes. A subsequent interview with the planner indicated that the change was directed by the System Engineer, who the planner viewed as an electrical safety SME and the change had been reviewed with the Shift Manager. At the reviewer's request, maintenance management discussed the deleted LO/TO with an electrical safety SME from ES&H, who concurred that the change was satisfactory and provided an applicable citation from the Y-12 Electrical Safety Manual for why the LO/TO was not required.

WO 50368610 (Complex) – The work package specified a GFCI for power tools when only battery-powered tools were being used on the job. The scope of the procedure was clear, and steps generally delineated appropriate actionable items. Hazards were not included in the step, but were included in a JHA table in Section 2. The PWT appeared to be a pump operational test, not a test of the installed emergency stop (E-Stop), so it may not have been effective in ensuring the operability of the E-Stop. There was not a specific step in the procedure to test the E-Stop, and a note at the beginning of the PWT allowed either E-Stop to be operated, but the actual work was to install an additional E-Stop on the opposite side of the diked area. The actual retest sign off was to test both E-Stop buttons, but only one block was available for the "SAT / UNSAT" logging.

WO 50398578 (Complex) - This was a complex job requiring multiple crafts to perform an inspection of an electrical generator and some significant coordination between the crew and the Plant Safety and Security control center (PSS). The scope of the procedure is clear. This job also required crew members to work in the switchgear room and at the generator simultaneously. The switchgear room was approximately 100 yards from the generator, requiring some form of reliable continuous communications between the locations. This procedure was performed in conjunction with the weekly procedure (WO 50401700). It was explained to the crew in the pre-brief that the same data required in the monthly was required in the weekly, and no separate performance of the weekly PM would be required. In reviewing the scope of the weekly PM, voltage is identified as 480V System/ 120V/ 24VDC batteries system. In the monthly PM, only "24VDC" is identified under voltage. Additionally, in the actual procedure section, one step (to check the engine coolant heater) in the monthly PM requires the worker to don leather or Kevlar gloves because of the potential high temperature. The identical step in the weekly procedure does not include this precaution. The monthly procedure includes a note in section 2.1 (NOTE 1) that states that the steps are in a logical sequence, but could be performed out of order or repeated with the supervisor's permission. A similar note in Section 3.0 (NOTE 6) states that the work order shall be performed in sequence, but then states that steps may be performed out of sequence, skipped, or repeated with the supervisor's permission only after obtaining shift manager and shift engineer permission. When a step was performed incorrectly in the procedure, the job supervisor authorized re-performance under Section 2 NOTE 1, but did not obtain shift manager or systems engineer authorization. The procedure required a determination that battery voltage drop and cold crank amps were satisfactory, but provided no suggestion of what values were expected. Several cautions include action statements ("wear PPE) throughout the procedure, but do not specify the hazard (arc flash, burns). No PWT was required by this procedure; however there was a hold point for QA review of the completed procedure.

WO 50381968 (Minor) – The job site was evaluated (but no work in progress was observed). This activity was identified as minor work with an attached lift plan. The work area had the potential for both Beryllium (Be) and Radiological contamination. The procedure did not present any concerns to the observer, but the lift plan had several inconsistencies. This was identified as an ordinary lift. Section 4 of lift plan (Special Instructions) was checked "No", but Section 3 of lift plan states "Note: If any items are checked, address in Special Instructions, Section 4". Three items in Section 3 were checked, but there were no notes in Section 4. Section 5, hoisting and rigging review team member signature block was not signed. It was explained that the team approval was only required for critical lifts. Team members did sign in section 7 for attending the pre-lift meeting. The attached lift plan instructions clearly stated that the maintenance team members should review and approve the lift; it did not differentiate between critical and non-critical lifts. Section 8d was left blank with no explanation. Section 8e was left blank (but the lift plan did not call out a trial lift in section 1). The procedure had no actionable steps because the actionable steps were contained within the lift plan. Hazards were identified in the JHA portion of the work package and not included in the lift plan. There was no PWT identified, although while at the work site, IH and RadCon personnel stated that they would be sealing the open pipe ends to limit the potential release of contamination until final building demolition could occur.

Nuclear Work Execution

WO 50368610 – Add E-Stop to station. Work Package required a lockout for Step 3.2; because of the LO/TO suspension the supervisor received permission to perform only Step 3.1, installation. The supervisor adequately briefed (and reinforced) appropriate stop points. Workers were fully engaged in the pre-brief, asking many questions for clarification and understanding. The supervisor briefed the process, and then used a reverse briefing to ensure understanding. During the pre-brief the work team identified a potentially unexpected condition (water in the dike area where they had to work); collectively the team developed and implemented appropriate response actions. The pre-job brief included site workability walk down to clarify installation points for conduits. During the walk down, three vehicles traversed the area immediately adjacent to the work area but the hazard of traffic on the road was not addressed by the supervisor or other workers. The maintenance director (performing an "Enhanced Field Surveillance" (EFS)) intervened to identify the additional hazard of vehicles and appropriate controls to mitigate the hazard were implemented.

WO 50398578 - Perform a monthly operability test of a backup generator system. A pre-job brief was performed, but pre-brief item 3 (Review work instructions and initial conditions involved) was not performed to specify job assignments, critical procedural steps, etc. This resulted in the workers nearly missing critical information when starting the generator later in the procedure. The pre-job brief identified a reader for the Continuous Use procedure, but did not identify how communications were to be performed (simple acknowledgement, verbatim repeat-back, etc.). When an abnormal reading was obtained (due to the incorrect use of the digital multimeter), no one identified that the reading was abnormal. The observer identified the abnormality to the Facility Maintenance Director who intervened to correct the problem. The coordination in starting the generator was very poor. Workers appeared to be unfamiliar with the procedure. The PSS operator, who was to participate in the procedure by acknowledging and reporting various alarms, was not involved in the pre-job brief. It was unclear if this person was separately briefed before work commenced.

WO 50398419 - Pump Refurbishment. This was identified as dispatch work (32a - Performing shop work, including fabrications/repairs); therefore, there was no formal work instruction. Seven (7) pumps were in various states of assembly on the work bench; the observed procedure covered three (3) of them. Other pumps were of an unknown level of control (e.g., safety critical). The worker explained that he was replacing pump components with manufacturer-specified original parts, so the difference in control was not an issue. He explained that rebuild/refurbishment kits were obtained directly from the manufacturer or authorized distributor. The worker was extremely knowledgeable of pump construction, his jobs, and the appropriate controls. He stated that he had not received any pumps back for rework, and that the pumps he has rebuilt had never failed a post-rebuild operational test. Work and PWTs were not formally performed or documented, which is consistent with expectations for dispatch work. This did not appear to impact the quality and reliability of finished product performance.

WO 50392696 – Relamp inside a contaminated area. The package was identified as minor work because of the Be hazard permit. The procedure identified a contingency for replacing ballasts under lockout/tagout (LO/TO). The package was dated May 1, 2012, when performance of LO/TO activities were still authorized. The supervisor briefed that if the ballast was bad, work would not proceed and

ballasts would not be replaced. The shift manager lined out the part of the step allowing LO/TO to be performed. The pre-brief was used as a two way conversation between the workers and supervisors to work out the details of the process. Appropriate solutions were evaluated. A workability walk-down was conducted on site with IH personnel supporting the activity. The pre-brief and walk down did not specifically address the most likely contingency (lamp breakage), but the workers had measures in place to prevent breakage of new lamps. Mercury and broken glass were not identified as hazards in the JHA section of the procedure. Coordination between IH personnel and craft workers was excellent.

A post work test on a reactor vessel head (Service Notification Number 30648060-30648375, System Number RED-MEL-001) in room 1014 of building 9212 was observed. The procedure was missing steps, contained imprecise terms, and did not include the acceptance criteria. The cover page included a test supervisor signature block granting permission to conduct the test; however, the first step of the procedure was conducted prior to obtaining this signature. The first step of the procedure contained three separate actions: torque the head bolts, connect a pressure source, and open a valve. The first step included no inspections of the head gasket seal or visual inspection for foreign debris (which could cause damage to the seating surface and test failure). The second step, which also included multiple actions, started off with "Seal Test" in bold letters but listed no acceptance criteria nor instructions for how the test was to be conducted. The second step included a 10 minute hold but did not specify if the source of pressure was to be continuously applied during the hold or shut off. The medium to be used in the pressure test was not specified (the operators applied skill of craft knowledge to use argon). The second step also included raising pressure but didn't include what increments by which raise the pressure, direction was provided by the Equipment Test and Inspection (ET&I) technician to raise pressure in 30 psi increments. During the conduct of the procedure, the operator and the ET&I technician discussed whether or not to leave the supply valve on the argon bottle open. When initially increasing pressure, valves needed to be operated on the test rig; (a vent valve checked shut and supply valve opened) however, the work package contained no instructions to do this. While the area supervisor was reading the test procedure to the operators, the ET&I technician would provide additional direction, resulting in the operators receiving direction from two different people at the same time. The test rig itself was put together just prior to the test by the operators which may not be a problem assuming the operators are properly qualified and trained. It was not evident to the observer that the test rig was tested prior to use. The ET&I technician complete a Product Certification Checklist (PCC) but the post work test procedure did not include any requirements for documentation or reference to a PCC. The relief valve on the test rig began to lift prior to reaching test pressure and the test was suspended.

Non-Nuclear Work

<u>Non-Nuclear Work Packages</u>

While in the field, the opportunity was taken to oversee additional work that was found on-going. Thus, not all of the work packages below were reviewed by the team in detail.

WO 50400719 (Minor) – Install angle iron on oven. The work scope was clearly described and the craft worker was aware of specifics on size of cuts and holes to be drilled because he had walked the job down with the planner approximately six (6) days prior to the work being performed. This was identified

by the maintenance director as a relatively new process – craft workers were allotted two hours each Monday to work with the planners to walk down upcoming jobs. This ultimately results in fewer rewrites on packages, the ability to use up shop material without reordering, and develops an ownership / partnership within the FI&S group. The Review Team suggests the submission of this process to the DOE Lessons Learned System for dissemination to the entire DOE complex as a best practice. PWT requirements were clear.

WO 50256170 (Minor) – Crane removal of a device from a 2nd floor balcony. Work scope and material information did not identify (i.e., by equipment number) the three items to be removed. The package was identified as minor work and included a lift plan. All of the "below the hook" equipment needed was not identified in the work package's lift plan (wire rope, shackles). The lift plan logged the pre-job brief and attached details of expected fall protection from the ES&H SME.

WO 50393763 (Minor) - asbestos insulation removal. The description of the work to be performed was adequate, but the location of the piping was not specific and depended on the work supervisor to "show" the craft. The procedure included a Note that was misleading; it stated (in bold) that if glove bags are not used, 6 mil plastic should be laid on the surface. The work package, however, specifically stated that a glove bag was to be used. The work to be performed was on a small steam pipe. The job was briefed that a lockout/tagout was not required, but the maintenance director questioned that determination, based on the potential release of asbestos (melting plastic bag) and burns to workers from hot steam pipe. PWT requirements were adequate. The work package was returned to planning and safety for additional evaluation.

WO 50399653 (Dispatch) - Weld repair of a dump truck bed. This was identified as dispatch work under 32.a (performing shop work, including fabrications/repairs) and 54.a (performing incidental welding /no inspection). The work package was adequately filled out and performed under a standing hot work permit for the shop. The welder answered all five "dispatch questions" as "no", but there was local exhaust ventilation (LEV) placed approximately 10 feet from the welding area, and 5 feet above the work area. The JHA for shop welding specifies a specific IH hazard analysis "when appropriate," but no guidance on when it would be appropriate was provided. The design, installation, and use of LEV should be clearly provided and governed by a qualified person (typically an IH). Without an adequate hazard analysis for this activity, it is unclear whether the worker would know how to appropriately answer the PPE question, as the JHA identifies that a respirator may be required in certain specified conditions, but again relies on the worker engaging IH.

<u>Non-Nuclear Work Execution</u>

WO50400719 – install angle iron on oven. The procedure was well briefed. The work was executed efficiently and the shop JHA adequately addressed applicable hazards. The machine shop owned by the work team was neat, clean, and well organized.

WO 50400342 (Dispatch) - erect scaffolding. This job was reviewed during an interview with the assigned workers. The workers were aware of hazards and appropriate controls, had the correct training and knowledge, and demonstrated appropriate craft knowledge associated with scaffold

erection. This work was covered under dispatch work (35.a Assembling, inspecting, and disassembling scaffolding).

WO 50400053 (Dispatch) - Refinish a workbench top. The workers identified that the work order requested removal/resurface/replacement of table top. Workers stated that resurfacing of the tabletop in place was more appropriate, and were contacting the planner for a revision. This activity was identified as dispatch work (32a – performing shop work, including fabrications/repairs). The workers were aware of the hazards and had the PPE identified in the work order. The JHA for carpenter shop was reviewed to verify that the stated work (operation of a belt sander) was covered. The shop JHA adequately addressed power tool hazards.

WO 50256170 – Crane removal of a device from a 2nd floor balcony. There was a light fixture inside the door where the crane was to be inserted for the lift. The end of the crane came within approximately 12 inches from the energized light fixture. The supervisor explained that this was covered under the general overhead hazards, but could not state that the light fixture was specifically briefed. Further, the need for hard hats was addressed inconsistently during the job, workers in the same general area were observed both with and without hard hats; when prompted by the observer, the work supervisor required all personnel in the work area to don hard hats. In addition, it appeared that, prior to the job, the exposure of rigging equipment to contamination (radiological and Be) had not been fully evaluated and appropriate measures were decided upon between the work supervisor and Radiation Control personnel on-site. Notation of the final decision (not to try to reuse the equipment) was not made in the work package while the observers were on-site.

WO 50393763 - asbestos insulation removal. The brief appeared to be thorough and effective. This was the second time that the workers were briefed on the job this day because of work delays in the morning. Only the pre-job brief was evaluated as the procedure was returned to planning for a determination on the need for LO/TO. The supervisor was effective in the use of a reverse briefing, and was proactive in resolving job questions when asked.

WO 50388525 – restripe parking lot spaces. Two painters were working on striping a parking lot. The work was identified as dispatch work. The work package identified PPE, but there was no formal occupational exposure assessment for general paint removal other than an email from IH to the paint shop supervisor that respiratory protection was not required. While the workers were well aware of hazards and appropriate controls associated with the work order, they were insensitive to a natural phenomenon hazard. While performing the job, lightning occurred within approximately two (2) miles of the job site. Rather than seeking shelter immediately, the workers waited for an announcement on the PA system to cease outdoor activities before seeking cover.

WO 50399653 - weld repair of a dump truck bed. The work was being performed by an apprentice under the direct supervision of a journeyman. The journeyman was not wearing eye/face protection at the same level as the apprentice, so he could not view the actual activity. Control of power cords in the work area for various power tools could have been done more effectively to eliminate potential hazards. A fire watch was present and effective for the duration of the observation.

Other Observations

Lack of Clarity in Expectations for Step-by-Step Execution of Work Packages

In the Conduct of Operations training it is clearly stated that procedures with step-by-step instructions will be conducted in the manner written. This same expectation is not articulated, though, by wording used in work packages, even though the Work Planning & Control Improvement Plan (Y/IA-452) commits to "a consistent, high degree of formality of operations while conducting maintenance activities," it also states that "management must set clear expectations to achieve" the goals of the Plant; further, Y/AI-452 notes that it intends the approach taken to be consistent with the conduct of operations improvement plan. In conduct of operations training for production it is clearly stated that, for procedures with step-by-step instructions, that they be conducted in the manner written. For example, a common preparatory note in complex work packages allows steps to be performed "independently" or "repeated", "as directed by Job Supervisor." If it is the expectation that activity level work is to be conducted in the same manner as written, this apparently conflicting guidance should be reconciled. Similar uncertainty was reflected in a "work complete" nuclear work package that was reviewed; a LO/TO that was originally imposed by the JHA process had been removed; a pen and ink change had been initiated by the system engineer (SE) and followed up by the Work Planner with a revision sheet to the work package—the change had also been reviewed by the Shift Manager. When an observer questioned this hazard control removal with the planner, he indicated that that the Systems Engineer, as an electrical system engineer, was viewed as an electrical safety SME. Subsequent review of the Electrical Safety Manual by an electrical safety SME showed that the particular situation did not require a LO/TO; however, the work package administrative concern remained—what subgroup of the original team that developed the JHA should be polled for subsequent changes to the hazard control in a complex work package? The IWCM and Work Planning Guide are not clear on this subject. These examples, in addition to several more detailed in the work execution section above, indicate continued clarity issues with regard to expectations regarding the rigor with which work packages are to be followed.

Workability Review as Compared to Final JHA Team Review of Hazard Controls

As part of the work planning and control improvement process, a post-planning evaluation process or "workability review" was instituted (IWCM Chapter 5). The requirements for this process were reviewed, and while this process provides a potentially useful final check prior to work package release, currently the individual completing the review does not possess a skill set equivalent to the individuals who performed the AJHA hazard controls determination. The IWCM Chapter 5 states, as the first of eight attributes to be reviewed, that the person doing the review (the work coordinator) should "verify" that the work package "adequately addresses the hazard controls necessary to mitigate all known hazards…" Thus, it does not provide a review similar to that suggested by the Board staff in the report attached the DNFSB letter of 12/29/11 (ref page 3) which envisioned a final review by the personnel who provided the hazard controls incorporated in the work package. Thus, it is unclear whether B&W Y-12 personnel disagreed with the actions suggested by the Board staff, or believe some other actions meet the intent.

Observation of the Critique of Nuclear Job Suspension

This critique started with a detailed, factual reconstruction of the timeline of events that led to the suspension of work. The dialogue was enabled by a trained facilitator and the input from all parties was professional and factual. A computer and viewing screen was used to facilitate on-line input and revisions—this tool was effectively used. The facilitator kept the group focused on fact gathering and not drawing conclusions.

Operator Training Requirements

During interviews, maintenance work supervisors were asked how they executed their responsibility to ensure that the workers assigned to a work package were qualified to execute the scope of work. The answer consistently provided was a variant of "I get updates on my crews training status from Resource Management (or the Training database)." When asked to differentiate between skills and competence, vice mandatory training, few work supervisors could differentiate between the two. The Y-12 processes assign overall responsibility for selection, qualification, training, and training of maintenance craft personnel to the Resource Management organization within FI&S. However, the IWCM requires the work supervisor to verify that the workers assigned to a task are qualified to perform it. Interviews with management from the Resource Management organization indicated that: (1) new hires are tested and interviewed to determine entry-level craft skill competence, (2) a Resource Lead is assigned for a group of similar trade (e.g., electricians, iron workers) workers (approximately 50 workers, in 3-5 work teams) to work with the supervisors to identify and coordinate worker skill and competency training, and (3) work supervisors can (and do) identify additional training and skill development that would be beneficial to the workers under their supervision. In an interview with one Resource Leader, when presented with a number of task-specific questions that might require specific training or competency enhancement, they indicated that they would have to rely on the work supervisor to identify the required training. The Resource Leaders also indicated that the determination of specific skill proficiency was the responsibility of the work supervisor. On the other hand, interviews with several Resource Management managers indicated a number of instances where new skill training had been provided, including calibration, air conditioning, and master rigging training without be called for by work supervisors. In order to enhance the process for worker skill development and maintenance of competency, B&W Y-12 may wish to consider implementing a formal mentor program. This would pair more senior workers with less experienced workers and a regular means to evaluate whether workers have executed various areas of their skill of the craft would be established.

Maintenance Supervisor Oral Board

A maintenance supervisor oral board was observed. The board was well-organized and followed an instruction developed by the maintenance director. The board required the supervisor to review work packages for errors, brief a job using provided materials, perform a post-work / end-of-day brief of the job, and answer several scenario-based questions. The supervisor was required to demonstrate knowledge in several areas, including work control, lockout/tagout, Integrated Safety Management (ISM), general policy/procedure, training, and other relevant areas. The board used a question bank for some of the questions to maintain board integrity and consistency. The board consisted of the maintenance director and two maintenance managers. The supervisor's manager was an observer. According to the maintenance director, the board members would meet after the board to score the

supervisor, and based upon the supervisor's score, a professional development plan would be created to emphasize strong areas and develop weak areas. In this board, the supervisor that was interviewed demonstrated a high level of knowledge in most areas and performed effective briefings/debriefings. This was the fifth board, and the director explained that he will perform boards with all his supervisors to determine their level of expertise and develop individual development plans.

Hazard Information

There was a lack of formality in the issuance and retention of the assessment of hazards requested from the safety organization, such as occupational exposure assessments and an exemption from certain electrical requirements (for light bulb replacement). Both of these determinations were provided via email with no apparent chain of review and approval nor were they consistently logged in the "Notes" section of the work packages reviewed. Development, documentation, and use of consistent expectations with respect to incorporation of information provided by email and other non-work package media (e.g., telephone conversations) would be beneficial.

Post-Job Brief

A work closeout / feedback meeting for a minor work job to replace gloves in a glove box was observed. The feedback process included a review of the job, any problems that were encountered, and any crew recommendations. In this job, several recommendations were provided. The workers were queried on how they believed the information would be used. Both workers explained that they had good success with the process, and that important information was captured. Additionally, the workers identified a condition (dry rot on seal rings) and recommended that the rings be replaced with every other glove change to eliminate unnecessary down time. Other appropriate feedback was provided and recorded in the closeout. This process demonstrated a commitment to ISMS (feedback and improvement) and should be continued and expanded to ensure that the feedback loop continues to be closed on maintenance performance. Note that this process will only be effective if the changes recommended by the craft continue to be evaluated for incorporation into the work procedures in a partnering work environment. As observed, the process was very effective and well-received by the craft.

Potential Overuse of Dispatch Work Code

Y-12 uses a "dispatch" worklist to authorize jobs that only require the "skill of the craft". It appears that the use of dispatch work code 32.a, for "minor shop work", may be overlooking some specific hazards. In this limited review, this work code was used for resurfacing a table top, rebuilding a pump, and fabrication of iron parts for a dump truck bed.

Conclusions

The performance improvement plans for conduct of operations (procedures) and for work planning and control are providing positive improvements in the processes, procedures, and documentation involved in production and maintenance activities at Y-12. The formal Production organization's Conduct of Operations continuing training program is judged by the Review Team to be a best practice. B&W Y-12 should expedite training the entire production staff.

The procedures that have been upgraded show improvement. This process should be expedited to the extent possible, and adding resources to get all procedures through this first round of improvements should be considered. Clear guidance should be developed and provided to procedure writers regarding expected improvements in the documents (e.g., proper placement of cautions and warnings, elimination of imprecise terminology, etc.). In addition, engagement of staff at all levels (craft, supervisors, engineers, SMEs) in the revision process will both increase accuracy and completeness of the procedures and facilitate everyone's buy-in to the process.

As progress is made in upgrading the procedures through the established process, Y-12 should consider additional opportunities for improvement, including clarification of the definitions for procedure categories and ensuring that procedures are designed appropriately to support the work being performed and the expectations for how the procedure will be used during that work. Other procedure improvements beyond those identified in the Procedure Improvement Plan are also warranted.

It is the judgment of the team that a good start has been made on the improvement of work planning and control. While additional time is required for improvements to settle in, several noteworthy improvements have already been implemented. The walk downs in which the craft accompany the work planner prior to upcoming work are paying dividends in both safety and efficiency of maintenance activities. The post-job debriefings conducted after nuclear maintenance activities are providing similar benefit. B&W Y-12 should consider expanding these practices to all maintenance activities. Lastly, recently expanded management time observing maintenance work in the field, coupled with the SSW oversight of production activities, will be fundamental to continued progress and improvements. A number of observations have been provided regarding the need for additional clarity in work package development and execution processes to assist B&W Y-12 as it continues to improve work planning and control.

Progress must be maintained to achieve plan goals. Both performance improvement plans must be followed to their natural conclusion to achieve the stated improvements. Based on comments from the DNFSB staff in its letter, these improvements have been elusive in the past.

Specific areas that could benefit from increased management attention are captured in this report. These details should be considered as the improvement processes are executed. Opportunities for increased efficiencies were identified by the team and should be considered.

Deliverables

Quick-Look Out-Brief:	Thursday, May 24, 2012
One single Final Report with two sections:	Draft: May 25, 2012

1: CONOPS (Roberson, Wenner, Johnson, Everett)
2: WP&C (Krahn, Vinson, Williams)

Potential Follow Up VTC(s)	Week of May 28, 2012
Final Report	June 6, 2012

Assessment Notes

- Base of team operations (hot washes, report writing, etc.) will be in the Audit Center
  - Computers and computer accounts will be available
- Audit Center POCs
  - Sheila Shropshire (B&W), 574-5941
  - Joyce Echols (B&W), 574-1082
- Authorized Derivative Classifier POCs
  - Scott Hawks (YSO), ~ 6am to ~3pm, 241-7209
  - Jerry Howell (YSO), mid-morning to ~ 6pm, 241-9457
- Daily notes are to remain in the Audit Center and will be DC reviewed by Scott and/or Jerry
- May 25th Draft Report should be stored on a share drive
  - Glenn Morris will have it DC reviewed Tuesday, May 29th, and then it will be emailed to the team

Annex A. Assessment Activities Summary

Production Procedures		
Pre-job briefings attended	3	
Procedures reviewed	22	
Other documents reviewed	11	
Operations observed		
Reference Use	14	
Continuous Use	14	
CONOPS Training	1	
Total Operations Observed		23[3]
Work Planning & Controls		
Work planning meetings attended	11	
Pre-job briefings attended	10	
Post-job briefings attended	11	
Completed work packages reviewed	11	
Nuclear		
Complex	5	
Minor	2	
Dispatch		
Non-nuclear		
Complex		
Minor	3	
Dispatch	1	
Other documents reviewed	2	
Work activities observed		
Complex	4	
Minor	7	
Total work activities observed		11
Grand Total Observations		34
Grand Total Documents Reviewed		52

[3] The total operations observed is not a sum of the procedures reviewed because several of the operations involved the use of more than one procedure.

Annex B. Documents Reviewed Prior to On-site Assessment

1. Letter from the Chairman, Defense Nuclear Facilities Safety Board (DNFSB), to the Administrator, National Nuclear Security Administration (NNSA), dated August 25, 2011.
2. DNFSB Staff Issue Report, "Technical Procedures, Y-12 National Security Complex," dated July 1, 2011.
3. Conduct of Operations – Performance Improvement Plan, Babcock & Wilcox Technical Services Y-12, September 2011.
4. Letter from the Administrator, NNSA to the Chairman, DNFSB, responding the Board Chairman's letter of August 25, 2011, dated October 19, 2011.
5. Independent Assessment of Y-12 Conduct of Operations Performance Improvement Plan (COPIP), Babcock & Wilcox Technical Services Y-12, January 2012.
6. Letter from the Chairman, DNFSB, to the Administrator, NNSA, dated December 29, 2011.
7. DNFSB Staff Issue Report, Activity-Level Work Planning and Control, Y-12 National Security Complex, dated November 4, 2011.
8. Work Planning & Control Performance Improvement Plan, Babcock & Wilcox Technical Services Y-12, February 2012.
9. Letter from the Deputy Administrator for Defense Programs, NNSA, to the Chairman, DNFSB, with Enclosure 1, "Y-12 Site Office Evaluation of the Effectiveness of Contractor Actions to Improve – Procedure Development and Implementation," dated February 24, 2012.
10. Nuclear Safety Operations, Review Plan of Y/IA-452, Work Planning & Control Performance Improvement Plan Rev. 1, Babcock & Wilcox Technical Services Y-12, March 2012.
11. YSO Assessment Plan, YCON-2: Special Emphasis – Procedure Use, dated 11/28/2011.
12. YSO Assessment Plan, YCON-2: Work Planning & Control – Hazard Incorporation, dated 03/13/2012.
13. Nuclear Safety Operation Review of Work Planning & Control Performance Improvement Plan, Babcock & Wilcox Technical Services Y-12, May 2012.