DEFENSE NUCLEAR FACILITIES SAFETY BOARD

625 Indiana Avenue, NW, Suite 700, Washington, D.C. 20004
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September 16, 1997

The Honorable Victor H. Reis
Assistant Secretary for Defense Programs
Department of Energy
1000 Independence Avenue, SW
Washington, D.C. 20585-0104

Dear Dr. Reis:

Enclosed for your consideration and action, where appropriate, are reports by staff members of the Defense Nuclear Facilities Safety Board (Board) concerning the Enriched Uranium Operations (EUO) restart efforts in the Building 9212 Complex at the Oak Ridge Y-12 Plant. These reports are based on observations that were made in April and late July.

The Y-12 EUO maintenance program requires improvement in the areas of configuration management, preventive maintenance, and maintenance planning and scheduling to support the restart effort. Although the efforts being pursued to address these deficiencies are still preliminary, they appear promising. However, with hundreds of maintenance deficiencies already identified, and many more to be identified by operational testing, efficient and effective development and execution of work packages is essential if the restart schedule is to be met safely.

From a safety analysis perspective, the Board's staff has concluded that the contractor appears to have performed a thorough hazard analysis of the operations scheduled for restart. However, the effort to develop a safety basis falls short of completion in that many of the dominant scenarios identified are not then further analyzed for the appropriate identification and implementation of controls.

The Board would like to reassert its support for a timely and safe EUO restart at Y-12 in order to meet national security requirements. At the same time, the Board would like you to be aware that expeditious actions to address the above issues will be required if this objective is to be achieved.

Sincerely,

John T. Conway
Chairman

c: Mr. Mark B. Whitaker, Jr.
Mr. James C. Hall

Enclosures

DEFENSE NUCLEAR FACILITIES SAFETY BOARD

August 12, 1997

MEMORANDUM FOR: G. W. Cunningham, Technical Director

FROM: W. L. Andrews, Jr.

SUBJECT: Review of Enriched Uranium Operations Restart Status at Y-12 Plant, July 22–24, 1997

This trip report presents findings of the staff of the Defense Nuclear Facilities Safety Board (Board) on the status of the Enriched Uranium Operations (EUO) restart program at the Y-12 Plant. The review was conducted July 22–24, 1997, by Board staff members S. Krahn and W. L. Andrews, Jr., with assistance from outside expert R. West.

In March and April of 1997, the Board's staff performed reviews at Y-12 in the areas of safety authorization basis and maintenance related to the EUO restart. A number of significant deficiencies were noted. Trip reports from those two reviews are provided as Attachments 1 and 2. One of the principal goals of this most recent review was to assess changes that might have taken place in those areas since the earlier reviews. The observations resulting from this review can be summarized as follows.

EUO Restart Program Status. Initial efforts to prepare EUO for restart were unfocused. A restart program for EUO was initiated after a national tasking was defined in mid-1996. The EUO restart dates were selected to meet this tasking. Lockheed Martin Energy Systems (LMES) has been slow in developing a meaningful schedule, with a critical-path schedule being developed just this month. A new schedule has been developed to complete Phase A restart by April 30, 1998. The lack of some key events in this new schedule indicates that it is high risk. Despite the risks of the current schedule, LMES is preparing a new accelerated schedule with a February 16, 1998, restart date that is likely to pose even more risk.

It is difficult to assess the new schedule since some significant items, such as cold operations and correction of Management Internal Assessment (MIA) findings, are still not included. The MIAs for the 21 processes evaluated to date developed 305 prestart findings. Of these, 129 have been corrected, but in the past 2 weeks, only 16 have been corrected. The MIAs are conducted by a small group of independent assessors. The ability of this group to conduct about 44 MIAs by early December 1997 is questionable. Additionally, the large number of prestart findings likely to be identified during the MIAs for the more complex processes yet to be assessed will require a significantly greater correction rate.

Selection and Implementation of Hazard Controls. A significant number of errors was found in a review of the selection and implementation of controls associated with a small sample of dominant scenarios in the Process Hazard Analyses (PHA) table contained in the Basis for Interim Operations (BIO). Detailed examples and comments on the selection and implementation

of hazard controls are provided in Attachment 3. Examples of the errors found include one criticality safety analysis for the pickling process that relies on data from a given number of operations for determining the maximum concentration of uranium expected in the solution, but does not provide a control to ensure that operations are limited to the conditions of this analysis. Another dominant criticality scenario in the PHA is not analyzed in the criticality safety documentation, and has not been proven to be incredible. Two explosion scenarios in the PHA table are not cross-referenced or discussed in the accident analysis chapter of the BIO, as they should be. Another explosion scenario (for the muffle furnace) also is neither cross-referenced nor discussed in the accident analysis chapter.

Maintenance. Maintenance has been a major factor in controlling the progress toward restart. A review of the maintenance program found that management of corrective maintenance has improved since a review by the Board's staff in March 1997, but that only limited progress has been made in the area of preventive maintenance. Issues raised previously about the use of Job Hazard Analyses during work planning have not been resolved. Review of work packages indicated possible continued improvement, but errors were still found.

Managers reported to the Board's staff that operational tests were revealing more problems than expected. Most managers complained of problems in scheduling and accomplishing maintenance. The staff's March 1997 review revealed numerous problems with the maintenance organization, which have been discussed with DOE. A review was conducted during this most recent visit to update the previous findings. Detailed comments are included in Attachment 4.

Future Staff Actions. In the future, the Board's staff will continue to review the EUO restart program and related activities. The staff has selected a few of the highest-hazard operations on which to focus its review as LMES gets closer to a declaration of readiness.

Attachment 1

DEFENSE NUCLEAR FACILITIES SAFETY BOARD

April 29, 1997

MEMORANDUM FOR: G.W. Cunningham, Technical Director

COPIES: Board Members

FROM: F. Bamdad

SUBJECT: Trip Report, Review Enriched Uranium Operations Restart Program at Y-12 Site, Oak Ridge Tennessee, April 14–18, 1997

1. Purpose

This trip report discusses the Defense Nuclear Facilities Safety Board (Board) staff findings on the status of the Enriched Uranium (EU) Operations Restart Program at the Y-12 Site operated by Lockheed Martin Energy Systems (LMES). The visit was conducted on April 14–18, 1997 by the Board staff members Farid Bamdad, Wayne Andrews, Monique Helfrich, and Cindy Miller, with assistance from outside expert Ralph West.

2. Summary

The following is a summary of the Board's staff observations:

- The current schedule for restart of the EU operations, which is driven by a national security tasking, seems to be optimistic and there is a potential for several months delay due to lack of resources and poor management of the milestones.

- Although the EU operations restart is a Department of Energy (DOE) pilot program for implementation of an integrated safety management system (ISMS), there appears to be a confusion about the basic principles of the concept.

- LMES appears to have performed a thorough hazards analysis of the operations scheduled for restart, however, the controls are neither clearly identified nor described in an acceptable operational safety requirements (OSR) document.

3. Background

The EU operations which consist of more than 106 processes will be performed in Building 9212. The restart program is divided into two phases, A and B. Phase A is further divided into two parts. Phase A1 includes restart of processes associated with accountability and

casting, while A2 includes rolling, forming and machining processes. Phase A1 also includes completion of authorization basis documents and their support programs. Phase B consists of restarting the processes related to inventory and metal production.

The EU operations restart schedule was developed to meet a national security tasking. Based on this schedule Phase A1 should be completed in January 1998, Phase A2 in March 1998 and Phase B in January 1999.

The authorization basis of building 9212 consists of a preliminary hazards analysis (PHA), basis for interim operation (BIO), operational safety requirements , and a safety evaluation report. The safety evaluation report is prepared by DOE field office to approve the BIO. The initial version of the BIO was submitted to DOE in January 1996. Based on the comments concerning the shortfalls in this document it was revised twice, and the latest revision was submitted and approved by DOE in December 1996. The Board staff's reviewed all these documents and discussed their comments with DOE and LMES representatives during the meetings.

4. Discussion

The following observations were made by the Board's staff:

- The schedule for restart of the EU operations appears to be optimistic and potentially will not be met. This is because the development of the authorization basis documents has been slow and resource limitations appear to have caused six to eight weeks delay already. The delay has also been exacerbated by an executive decision which postponed the start up of the program until October 1996 because of funding issues and to allow more detailed planning.

  LMES has started verification of process readiness through a Management Internal Assessment of 13 of the simpler processes that are deemed to be complete. A significant number of findings have been identified, however, a program to correct the deficiencies has not been established in order to meet the scheduled milestones.

- The EU operations restart has been selected by DOE to be a pilot program for demonstrating implementation of an ISMS at Y-12. The Board's staff reviewed this program at building 9212, and based on the discussions with the LMES representatives, concluded that the principal players have a poor understanding of the ISMS principles:

  - A Standard/Requirements Identification Document (S/RID) was prepared by LMES and submitted to DOE for review and approval in February 1997. There, however, did not appear to be a good undersatnding of the correlation between the S/RIDs and the authorization basis documents by the representatives.

- The controls identified through the hazards analysis are scattered throughout the authorization basis documents. There is not a clear understanding of what constitutes the safety envelope of the facility. LMES is in the process of implementing a program to collect all the requirements and controls identified in the authorization basis in one summary table. This table, however, would not differentiate between the safety controls (which are identified through the hazards analysis) and other assumptions and statements made in the facility description section of the BIO.

- The description of the safety management programs identified in the administrative control section of the OSR is very brief and does not refer to the site manuals or programs that are approved by DOE. Although specific procedures are referenced in the BIO, the OSR does not establish the connections. Consequently, changes to the procedures may be made (e.g., potentially degrading the safety programs) without being identified as an OSR violation.

These deficiencies were identified despite the fact that several of the presenters had attended the DOE training/workshop sessions on ISMS. It appears that DOE needs to reevaluate the training materials in order to better convey the principles of ISMS at the pilot facilities.

- The guidance provided by DOE in DOE-STD-3009-94, *Preparation Guide for U.S. Department of Energy Nonreactor Nuclear Facility Safety Analysis Reports* , is supplemented by a set of evaluation guidelines and used for identification of safety systems and OSRs. These evaluation guidelines, approved by DOE field office, are 25, 5, and 0.5 rem cumulative effective dose equivalent (CEDE) at the site boundary for accident frequencies of extremely unlikely, unlikely, and anticipated, respectively. The evaluation guidelines used for protection of the workers consist of fatality, major injury, or significant doses in excess of 100 rem CEDE. The Board's staff believe that the evaluation guidelines used for building 9212 are neither consistent with commercial industry practices nor with those accepted by the Board in the Implementation Plan for Recommendation 94-3. Furthermore, the Board's staff made the following observations:

  - The hazards analysis prepared in support of the authorization basis is a modified version of the PHA that was prepared for the SAR upgrade program about six years ago. Although this effort is not based on a systematic process hazards analysis, it appears to be comprehensive and has captured all the hazards associated with the operations at this facility.

  - The controls identified in the hazards analysis are mostly mitigative and to a large extent of confinement nature (e.g., HEPA filters). The preventive controls are either not identified or considered to be defense-in-depth, and therefore, not

incorporated into the OSRs. This is a direct result of using evaluation guidelines to identify safety systems and controls.

- Although a major portion of the building is equipped with fire sprinklers, the fire protection system is neither identified as a safety system nor covered by the OSRs. This is because a major fire in the building, shown by quantitative analysis, would not result in offsite doses exceeding the evaluation guidelines.

The Board's staff believe that a major revision to the OSR is required prior to further approval by DOE in order to better define the safety envelope of this facility.

5. Future Activities

The Board's staff will continue their effort on reviewing the restart program and the related activities. The Board's staff has selected a few relatively higher hazards operations that will focus their review on as LMES gets closer to completion of their readiness.

Attachment 2

DEFENSE NUCLEAR FACILITIES SAFETY BOARD

April 1, 1997

MEMORANDUM FOR: G. W. Cunningham, Technical Director

COPIES: Board Members

FROM: M. B. Moury

SUBJECT: Review of the Maintenance Program at the Oak Ridge Y-12 Plant, March 3-6, 1997

This report documents a March 3-6, 1997, visit made to the Oak Ridge Y-12 Plant by Defense Nuclear Facilities Safety Board (Board) staff members M. B. Moury, D. F. Owen, and S. A. Stokes and outside expert R. J. Lewis. The purpose of this visit was to review the implementation of Department of Energy (DOE) Order 4330.4B, *Maintenance Management Program,* and determine how the maintenance program supports the Enriched Uranium Operations (EUO) Restart in the Building 9212 complex. The review was performed using the tenets of integrated safety management as discussed in Board Recommendation 95-2 and DOE's Implementation Plan.[1]

Y-12 management recognizes that the EUO maintenance program needs significant upgrades in the areas of configuration management, preventive maintenance, and maintenance planning and scheduling to support the restart effort. Although the efforts being pursued to address these deficiencies are still early in their development, they appear promising.

In the context of integrated safety management, the Board's staff identified that the analysis of hazards, development and implementation of controls, and feedback on deficiencies for improvement are all in the early stages of development and operating at an elementary level. These shortcomings prevent efficient development and timely execution of work packages that address all work hazards. With 338 maintenance deficiencies currently identified as requiring correction before restart, efficient and effective development and execution of work packages is mandatory if the restart schedule is to be met safely.

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[1]The April 18, 1996, DOE Recommendation 95-2 Implementation Plan defines five safety management functions: Define Scope of Work, Analyze Hazards, Develop/Implement Controls, Perform Work, and Provide Feedback/Improvement.

EUO will be conducted in the Building 9212 complex, which has been shut down since September 1994 because of criticality concerns throughout the Y-12 complex. The current restart plan schedules a two-phased startup. The first phase, which addresses accountability, casting, rolling, forming, and machining operations, is scheduled to begin in March 1998. The second phase, which focuses on inventory and metal-forming activities, is scheduled to begin in January 1999.

Improvements in Progress. Y-12 management recognizes that the planning and conduct of maintenance require major improvements to support the EUO Restart. They have made organizational changes and begun to make program improvements. A new dedicated EUO Restart Maintenance Manager and two assistants appear to have an instrumental role in determining the magnitude of the restart effort and putting in place processes needed for timely, safe accomplishment of maintenance within EUO. The new Restart Maintenance Manager is in a position to have a positive impact on resolving communication and coordination problems between EUO line management and the Y-12 maintenance organization, along with instilling a need for schedule discipline. During the review, the Board's staff made the following observations on these efforts.

Equipment/Process Identification—The contractor recognized that the lack of consistent equipment identification nomenclature, accurate system plans, and configuration control was hampering work definition and planning. Corrective actions have been initiated, including the implementation of a formal area/equipment function description to ensure configuration control between design efforts and the maintenance program. Also, schematics are being developed, and system walkdowns are continuing to document as-is conditions. These new schematics will also be used for training and for identification of the engineering drawings associated with the systems and their components.

Upgraded Maintenance Tracking—A site maintenance database, which had fallen into disuse, has been resurrected, corrected, and revised to support the EUO Restart. This database is now used to identify, describe, set priorities among, and track maintenance deficiencies, along with matching each deficiency to a Maintenance Job Request. Four scheduling priorities are used: (1) required for restart testing, (2) required for restart operations, (3) post-restart correction, and (4) not applicable to the restart effort. A review of the database showed that of a total of 1,152 deficiencies, 778 remain open (uncorrected). Of these 778 open deficiencies, 338 are required to be corrected prior to the conduct of EUO. Plans include using this maintenance database as part of a site-wide system linking all safety-related databases.

Scheduling and Coordination with EUO Line Management—A weekly maintenance schedule is now used to schedule and coordinate those maintenance actions that are ready to be taken. The EUO Plan of the Day meeting is used to coordinate maintenance actions for each day. Although adherence to the weekly schedule is still lacking, having such a schedule provides a focus for maintenance coordination efforts.

Control of Preventive Maintenance—Preventive maintenance requirements are maintained in several different forms and databases, few of which are under the direct control of the EUO Restart Maintenance Manager. Y-12 management recognizes this problem area, but specific corrective actions have not yet been developed.

Staff Observations on Other Maintenance Issues. The staff has the following additional observations on the planning and conduct of maintenance in support of the EUO Restart.

Hazard Analysis and Development of Controls—The process for planning a maintenance evolution does not include appropriate hazard analyses for hazardous maintenance tasks. The process calls for various work permits during work planning, as well as a Job Hazard Analysis (JHA) that is performed at the first-line supervisor level, typically in the very late stages of work planning. The consideration of some potential hazards during development of work permits for maintenance tasks is being conducted in an independent or "stovepipe" manner. Work package reviews of completed JHAs indicated that thorough identification, analysis, and documentation of potential hazards are not being accomplished by this vehicle.

The JHAs reviewed, as developed by the first-line supervisors, seldom went beyond recognition of "tripping, slipping, and falling" hazards. As such, the JHA serves as a last-minute discussion paper of a limited set of hazards. It does not serve as the basis for the development of formal controls, either engineered or procedural. The maintenance work planning process at Y-12 lacks the synergistic gains in safety and efficiency that can be obtained from using a group approach to hazard analysis (e.g., participation by craft workers, engineering, and various health and safety disciplines) during the early stages of work planning so that integrated controls can be planned and implemented. This is not consistent with the requirements and guidance of DOE Order 440.1, *Worker Protection Management for DOE Federal and Contractor Employees*, which calls for a hazard abatement process that allows for incorporation of controls into facility design and procedures based on a hierarchy of (1) engineering controls, (2) administrative controls, and (3) personnel protective equipment.

The impact of this lack of proper hazard analysis during work planning was displayed prior to the execution of a maintenance work package observed by the review team. The work involved the permanent isolation of a vacuum-producing system to prevent possible backflow of fissile material into an unsafe configuration or leakage of large quantities of water into the fissile system. This isolation was to be accomplished by cutting and blanking or capping pipes and components at various locations in the system. The Operational Safety Work Permit was not in the package, and there was no way of determining whether possible radiological hazards within the system's pipes had been addressed. The review team was informed that the system had been drained as part of the lockout/tagout conducted on the system; no hazards were anticipated. At the job prebrief on the following day, a craftsman pointed out that the last time the system had been cut, airborne particulate had been present. Because of the lack of an adequate hazard analysis, this maintenance action had to be delayed so the Radiation Work Permit could be revised to account for this last-minute hazard information provided by the craftsman. The failure to conduct a proper hazard

analysis during work planning resulted in delays in accomplishing the work and could have resulted in personnel exposure.

Work Package Issues—The staff reviewed work packages for in-progress, planned, and completed maintenance actions. All packages contained deficiencies, including missing or incomplete procedures and permits, missing signatures, and inadequate post-maintenance testing (PMT).

The staff reviewed a work package for in-progress maintenance addressing modifications to a demineralizer system. The Job Planning Checklist indicated that contamination control was required and referenced a procedure followed by the acronym "ALARA." Supervisory personnel were uncertain why contamination control was required since the system was neither contaminated nor in a contaminated area. The procedure referenced was not a part of the work package, and supervisory personnel did not know what it addressed. Further investigation determined that the procedure referenced under contamination control was administrative in nature. It established the ALARA organization, cited the authority and responsibilities of the ALARA Committee and other organizational positions, and was generally irrelevant from a hazard analysis standpoint.

The staff also reviewed a work package in preparation for observing a maintenance action. The task dealt with performing preventive maintenance on the dry vacuum system. The action had already been delayed one day when it was determined that it did not appear on the weekly maintenance schedule, thereby thwarting coordination efforts. A final review meeting was conducted to complete the work package. Sufficient questions were raised at the meeting to warrant a walkdown of the maintenance area to ascertain status, further delaying accomplishment of the maintenance action.

The PMT defined and executed in the reviewed work packages was deficient. PMT for installation of fans in Building 9212 was missing entire portions of the test protocol. Supervisory reviews indicated that the tests had been adequately completed. In addition, the Board's staff reviewed a work package being developed and identified a PMT that did not meet the test design requirements because it lacked objective testing criteria. Another completed work package to replace a stainless steel valve and pipe contained no PMT for the valve. The facility also identified this deficiency in a post-maintenance work package review; however, there was apparently no action taken to correct the deficiencies.

Conduct of Work. Three in-progress maintenance actions were monitored: (1) removal, repair, and reinstallation of a steel catwalk associated with the tanker truck unloading station; (2) modifications to a demineralizer system; and (3) replacement of asbestos lagging on a piping system. The craftsmen assigned to these tasks were professional and proficient, observed safety precautions, and referred to the procedure while conducting the maintenance. First-line and maintenance supervisors were observed monitoring the progress of these tasks, talking to and directing the craft personnel conducting the work, referring to the work procedures, and answering questions.

Feedback. Although there are relatively few completed work packages available to provide feedback information, a formal mechanism or process does not exist to document applicable lessons learned in accomplishing a maintenance action. Face-to-face communication prompted by the recall of personnel appears to be the only current form of feedback. This informal approach was demonstrated when, as described above, a previously known hazard was not identified until the prebrief conducted just before the start of new work.

Future staff action is to perform another review prior to the EUO Restart to assess progress made in this area, because of the number and magnitude of the identified deficiencies and the importance of the maintenance program to EUO.

Attachment 3

Review of Hazard Control Selection and Implementation for Enriched Uranium Operations at the Y-12 Plant, Oak Ridge, Tennessee

Review of the selection and implementation of authorization basis hazard controls associated with a small sample of dominant scenarios in the Process Hazard Analyses (PHA) table contained in the Basis for Interim Operations (BIO) found a significant number of errors. One criticality safety analysis for the pickling process relies on data from a given number of operations for determining the maximum concentration of uranium expected in the solution, but does not provide for a control to ensure that operations are limited to the conditions of this analysis. Another dominant criticality scenario in the PHA is not analyzed in the criticality safety documentation, and has not been proven to be incredible. An explosion scenario in the PHA table is not cross-referenced or discussed in the accident analysis chapter of the BIO as it should be. Safety engineers could not explain the reason for this omission, but stated that they rely on personnel protective equipment (PPE) for mitigation of this type of scenario. This reliance on PPE when the PHA provides administrative controls for this scenario is not in accordance with DOE direction. Another explosion scenario for the muffle furnace also is neither cross-referenced nor discussed in the accident analysis chapter. The engineers could not explain the reason for this omission, either, but stated that they consider the scenario credible only if organics are present. They consider that the purpose stated in the operating procedure is the only control needed to prevent introduction of organics into the furnace. This is not clear in the table, and the reliance on a procedure purpose does not provide sufficient assurance of safety.

The Phase A restart of Enriched Uranium Operations at Y-12 includes 65 processes. Currently, 21 of these processes have undergone Management Internal Assessments (MIAs) following completion of material preparations and development of procedures or job performance aids (JPAs), process descriptions, criticality safety reviews (CSRs), and controlled drawings. Lockheed Martin Energy Systems (LMES) has reported completing all MIA restart findings for 7 of these processes, which are to be used for the Mutual Defense special operations. One of these processes, pickling, was reviewed in depth by the Board's staff with regard to the selection and implementation of hazard controls as developed in the authorization basis. Additionally, another process, muffle furnace, which has undergone an MIA (not all prestart findings have been reported corrected) and has been used in another special operations package was reviewed for explosive scenario controls.

Appendix A, "Dominant Scenario Listing," in the BIO (p. A-49) includes two criticality and one explosion dominant accident scenarios for the pickling process. The first criticality scenario on highly contaminated uranium solution is analyzed in the Interim Criticality Safety Evaluation (ICSE), which forms the basis for the CSR. The conclusion that no controls are required is based on the maximum concentration of uranium attained during a couple of operations, even assuming double batching of the material to be pickled. Since the process is

heated close to boiling and new acid is added periodically, the assumptions made about maximum uranium concentration are questionable. No administrative control has been put in place to ensure changing of the acid solution at a periodicity similar to that used for the calculations in the ICSE.

The second criticality scenario concerns a steam line rupture, with transfer of solution to the condensate line; this scenario is not analyzed in the ICSE. Nuclear Criticality Safety Division personnel could not explain why this analysis was not performed. They consider the scenario to be impossible, but could provide no basis for this opinion.

The explosion scenario concerns a possible zirconium/nitric acid reaction. This scenario is not included in Table 5.8, "Credited Event Scenario Classification," to provide a cross-reference to the accident analysis section of Chapter 5, "Safety Analysis," and no discussion of this scenario could be found in this chapter. The responsible safety engineers could not explain why this scenario is not included in the safety analysis chapter. During a discussion of this scenario, they stated that it should have been classified as a loss-of-confinement scenario and been shown to be mitigated by PPE. Since the PHA table provides some preventive administrative controls, this approach is not considered to meet the requirements of the DOE worker protection Order (DOE O 440.1) that requires employment of controls in the order of engineering, administrative, then PPE. A review of the JPA for the process revealed no requirement for acid-related PPE, although a posting at the pickling hood did state that acid PPE was required. During a dry run of this process, only one of two operators donned acid PPE because the other felt is was needed only for work in the hood, even though both operators were in front of holes in the hood sash during pickling operations. They apparently were unaware that the potential for an explosive reaction existed.

In view of the questions about the explosion scenario for the pickling process, the Board's staff reviewed the explosion scenario for the muffle furnace process. The one explosion scenario involves improper atmosphere (air or oxygen) leaks during the furnace operation, which causes an explosion in the furnace. Again this scenario does not appear in Table 5.8, and no related discussion could be found in Chapter 5. Discussions with the responsible safety engineers revealed that they do not believe this accident is credible because an oxygen supply to the furnace is disconnected. They do not know of any analysis of the air leak scenario described in the PHA table. They also believe that an explosion is possible only if organics are present in the material in the furnace. When questioned about how the absence of organics is assured, they stated that they rely on the purpose statement in the muffle furnace operating procedure, Y50-37-92-400, *Muffle Furnace Drying Operations*, which states the procedure "provides instructions for drying non-organic uranium bearing materials using the Muffle Furnace System." There are no statements concerning organics in the procedure. This reliance on the procedure purpose is not considered to be a positive control that assures safety.

Attachment 4

Update of Enriched Uranium Operations Maintenance Program

Management of corrective maintenance has improved at Y-12, resulting in a higher work completion rate. This improvement can be attributed to better use of the maintenance database, formation of maintenance teams, increased coordination with operations, and implementation of a consistent component/equipment identification system. Only limited progress has been made in the area of preventive maintenance, however. The maintenance organization is still attempting to define preventive maintenance requirements and determine the extent of overdue actions. Previous issues raised by the Board's staff about the use of Job Hazard Analyses (JHAs) during work planning have not been resolved. A recent Y-12 quality assurance (QA) compliance assessment identified similar issues concerning JHAs. A review of three work packages indicated possible improvement in assembling complete packages, but errors were still found.

The following are summary observations from the staff's March 1997 review, along with updates based on the July review:

- **Equipment/Process Identification**

  - *March 1997*: The contractor recognizes that a lack of consistent equipment identification nomenclature, accurate system plans, and configuration controls is hampering work definition and planning.

  - *Update*: A consistent component/equipment identification system has been implemented. System plans are being updated by walkdowns, and configuration controls are being updated during the restart effort for each process. The staff did not evaluate configuration control during the July review.

- **Upgraded Maintenance Tracking**

  - *March 1997*: A site maintenance database, which had fallen into disuse, has been corrected and revised to support EUO restart. This database is now used to identify, describe, set priorities among, and track maintenance deficiencies.

  - *Update*: The database is being used effectively for managing the program. It requires a significant amount of manual support.

- **Scheduling and Coordination with EUO Line Management**

  - *March 1997*: A weekly maintenance schedule is now used to schedule and coordinate those maintenance actions which are ready to be performed.

- *Update*: Maintenance teams have been formed and resource loaded. Use of the weekly maintenance schedule and increased coordination with operations have resulted in a higher completion rate of maintenance jobs.

- **Control of Preventive Maintenance**

  - *March 1997*: Preventive maintenance requirements are maintained in several different forms and databases.

  - *Update*: Only limited progress has been made in this area. Preventive maintenance is maintained on four databases, and another database is being developed for lubrication. The maintenance organization has access to two databases, with indication of 80 overdue actions. Access to a standards verification database was recently established, with indication that 200 maintenance actions were outstanding. Verification of entries in this database is just starting. Maintenance personnel still do not have access to the fourth database, which includes records of filter maintenance.

- **Hazard Analysis and Development of Controls**

  - *March 1997*: The process for planning a maintenance evolution does not include appropriate hazard analyses for hazardous maintenance tasks. The JHAs reviewed seldom went beyond recognition of tripping, slipping, and falling hazards. Thus, the JHAs served as a last-minute discussion paper of a limited set of hazards.

  - *Update*: No change was noted in the use of JHAs. Additionally, a recent plant QA compliance assessment review noted that the use of JHAs for EUO maintenance was not in compliance with the applicable Y-12 Plant procedure.

- **Work Package Issues**

  - *March 1997*: A staff review of work packages for completed work revealed deficiencies including missing or incomplete procedures and permits, missing signatures, and inadequate post-maintenance testing.

  - *Update*: Some problems still exist in this area. Three work packages were reviewed. The package for a low-hazard job was found to have no missing or incomplete documentation. The package for a medium-hazard job was found to be complete with the exception of a hot work permit. The third package was found to be complete with the exception of a competed surveillance procedure that was required as a post-maintenance test in addition to a test procedure. A copy of the completed procedure with no deficiencies was subsequently produced and entered into the work package.