



U.S. Department of Energy
Office of Inspector General
Office of Audits and Inspections

Audit Report

The Department of Energy's \$12.2 Billion
Waste Treatment and Immobilization
Plant – Quality Assurance Issues – Black
Cell Vessels



Department of Energy
Washington, DC 20585

April 25, 2012

MEMORANDUM FOR THE SECRETARY

FROM: 
Gregory H. Friedman
Inspector General

SUBJECT: INFORMATION: Audit Report on "The Department of Energy's
\$12.2 Billion Waste Treatment and Immobilization Plant – Quality
Assurance Issues – Black Cell Vessels"

INTRODUCTION

The Office of Inspector General received allegations concerning aspects of the quality assurance program at the Department of Energy's \$12.2 billion Waste Treatment and Immobilization Plant (WTP) project in Hanford, Washington. The WTP is a key element in the Department's strategy for remediating its significant legacy inventory of high-level nuclear waste.

In brief, it was alleged that quality assurance records for critically important "black cell" waste processing vessels were not traceable to work performed. To shield plant workers from intense radiation that will occur during WTP operations, processing vessels will be located in sealed compartments called black cells. Black cells are enclosed rooms where inspection, maintenance, repair or replacement of equipment or components is impracticable because there is no engineered access. Additionally, there are other vessels in the WTP facilities that are considered "hard-to-reach" because of location and expected difficulty of performing repairs or maintenance. Processing vessels in black cells and hard-to-reach areas must last for WTP's 40-year expected design life without in-service inspection and maintenance.

In response to the allegations, we initiated an audit to determine whether the Department was meeting quality assurance requirements for the fabrication of vessels located in black cells and hard-to-reach areas of WTP. The audit focused on vessels that were received and installed prior to mid-2005, as additional vessels of this type have not been received since that time. The review covered, as well, the quality assurance and oversight programs that were in place in that same time frame.

RESULTS OF AUDIT

Our review substantiated the allegation. In short, we found that the Department had procured and installed vessels in WTP that did not always meet quality assurance and/or contract requirements. For the vessels that we reviewed, we identified multiple instances where quality assurance records were either missing or were not traceable to the specific area or part of the vessel. We also found that the Department paid the WTP contractor a \$15 million incentive fee for production of a vessel that was later determined to be defective. Although the Department demanded return of the fee, it did not follow up on the matter and the fee was never reimbursed.

The importance of black cells and hard-to-reach components cannot be over stated. Premature failure of these components could potentially impact safety, contaminate large portions of a multi-billion dollar facility and interrupt waste processing for an unknown period of time. For these reasons, we have made several recommendations designed to strengthen quality assurance controls at WTP. We have also recommended a more intense effort to recover contractor fee for the nonconforming vessel.

This memorandum and the attached report describes the history of our involvement in this issue, our conclusions and findings, recommendations for corrective actions, and the response of Departmental managers to our work.

BACKGROUND

Bechtel National, Inc. is responsible for construction of the Department of Energy's \$12.2 billion WTP. The WTP mission is to treat and encapsulate in glass the majority of the 53 million gallons of waste that amassed from decades of plutonium production at the Department's Hanford Site.

WTP vessels are required to be designed, fabricated, tested and inspected in accordance with requirements established by *The American Society of Mechanical Engineer's Boiler and Pressure Vessel Code*. To reduce the risk of vessel failure, additional requirements are imposed on the fabrication of black cells and hard-to-reach areas including enhanced material traceability, nondestructive examination (NDE¹) and material identification testing. The WTP also requires a number of the vessels to comply with *The American Society of Mechanical Engineer's Quality Assurance Program Requirements for Nuclear Facilities*, a consensus standard that requires, among other things, that quality assurance records are sufficient to demonstrate that work meets specifications; qualified individuals performed all work; materials used were appropriate for nuclear activities; and, quality records are traceable to the parts in a manner that assures that identification is established and maintained.

FINDINGS AND CONCLUSIONS

Our review of WTP related allegations revealed a number of instances where these quality assurance requirements were not completely followed for processing vessels installed in black cells and/or hard-to-reach areas. Specifically, we found that Bechtel had not obtained or maintained:

- (1) Weld maps, identifying the specific location of each weld; (2) information on welding procedures, the qualifications of the welder, materials used in the vessels and NDEs; and, (3) positive material tests, which ensure that the materials used to fabricate the vessels were compatible with expected operating conditions. Our review of available supporting evidence also revealed that not all required records were available to demonstrate that components or welds were tested. Material and services were also not traceable on a number of vessels. This occurred despite the vessel subcontract requirements for information availability to ensure that vessel fabrication met technical specifications; and,

¹ NDE methods, such as radiography (x-rays) or ultrasonic, are used to detect voids, lack of fusion, or other imperfections that would cause the weld to fail during operations.

- Radiographs showing the integrity of welds, as required by its contract. Bechtel allowed fabricators to use an alternative NDE procedure, ultrasonic inspection, that did not produce independently verifiable records such as would be available with the use of radiographs. These records were important since Bechtel's quality assurance inspectors who observed the ultrasonic inspections performed by the fabricators were not qualified to interpret test results per the contract's technical specification. Although ultrasound inspection may be appropriate for certain conditions and is allowed by Bechtel's contract requirements with its suppliers, we found no evidence that two of the subcontractors requested or received Bechtel's approval for the use of alternative NDE methods, as required.

In addition, we noted that the Department may have overpaid incentive fee to Bechtel based on its level of performance. Specifically, Bechtel was paid \$30 million in incentive fee for the delivery and installation of vessels into WTP facilities. When the Department learned that one of the vessels was nonconforming, it instructed Bechtel to return \$15 million in performance fee. However, neither the Department's Office of River Protection nor Bechtel could provide evidence that the fee was returned to the Department.

Weaknesses in quality assurance records associated with black cell and hard-to-reach processing vessels occurred because of deficiencies in Bechtel's implementation of its quality assurance program and a lack of Department oversight. Specifically, Bechtel employed inspectors located at the contractor locations to witness work performed and execute a progressive and final review and approval of quality assurance record packages. However, in our judgment, because the on-site inspectors lacked the welding qualifications to interpret weld NDE results, Bechtel's acceptance process was inadequate. Additionally, Bechtel's receipt and inspection procedures were deficient in that reviews of quality assurance records that accompanied the vessels were limited to basic procedures, such as determining that the expected numbers of pages of documentation were received. Also, the Department failed to identify weaknesses in Bechtel's processes that allowed the deficiencies to occur; raising questions as to the quality of the Department's contract administration and oversight.

The matters discussed in this report come at a time when concerns about safety at WTP have been raised and the Department is working to ensure a proactive safety culture at WTP. To its credit, the Department took prompt action on some of the issues identified during our audit. For instance, after receiving the original June 2010 allegation, the Department conducted technical surveillances in August 2010, that confirmed some of the issues in the complaint and required Bechtel to take steps to correct the deficiencies and conduct a review to determine the extent of the condition. After our audit identified additional concerns that had not been identified by Bechtel or through the Department's surveillance, the Department performed another surveillance that confirmed some of the findings identified in this audit report. On September 15, 2011, the Department ordered Bechtel to correct these additional deficiencies. On November 17, 2011, the Department concurred with the corrective action plan to address these additional deficiencies, actions which included a review of quality documentation associated with received black cell and hard-to-reach area vessels. It further required a review of programmatic changes implemented after these vessels were received to ensure adequacy. While these actions are encouraging, we are concerned that the prior reviews performed by Bechtel and the Department failed to fully identify the extent of the problems with the missing or incomplete quality assurance documents, and that weaknesses in oversight still exist.

MANAGEMENT REACTION

The Office of Environmental Management concurred with the report's recommendations and its comments were generally responsive to our recommendations. Management officials noted improvements that have been made since the last vessels were delivered and outlined a number of corrective actions that have recently been initiated. Management disagreed with our assertion, however, that Bechtel's on-site inspectors needed to possess the same technical qualifications as the subcontractor welders whose work they were inspecting. While we acknowledge that governing criteria do not mandate that on-site inspectors possess the same qualifications, we believe that given the importance of the vessel welds to the effective performance of WTP and the extreme consequences associated with vessel failures, it would be prudent to require that on-site inspectors be fully qualified to reduce the risk of fabrication errors.

Management comments are included in their entirety in Appendix 3.

Attachment

cc: Deputy Secretary
Associate Deputy Secretary
Under Secretary for Nuclear Security
Senior Advisor for Environmental Management
Chief Health, Safety and Security Officer
Chief of Staff

REPORT ON THE DEPARTMENT OF ENERGY'S \$12.2 BILLION WASTE TREATMENT AND IMMOBILIZATION PLANT – QUALITY ASSURANCE ISSUES – BLACK CELL VESSELS

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THE DEPARTMENT OF ENERGY'S \$12.2 BILLION WASTE TREATMENT AND IMMOBILIZATION PLANT – QUALITY ASSURANCE ISSUES – BLACK CELL VESSELS

QUALITY ASSURANCE RECORDS

In June 2010, the Office of Inspector General (OIG) received an allegation that quality assurance records for the "black cell" processing vessels were not traceable to work performed at the Waste Treatment and Immobilization Plant (WTP). Because this was a concern that could potentially affect the safety of the WTP workforce, the OIG initially contacted the Department of Energy's (Department) Office of Health, Safety and Security. On August 3, 2010, that office asked the Department's Office of River Protection (ORP) to assess whether welds on containment vessels in the black cells at WTP could be verified to be in compliance with specifications. Accordingly, ORP conducted surveillance on one vessel from each of the five subcontractors hired to fabricate vessels for WTP to verify that all nondestructive examination (NDE) of welds and weld records met Bechtel National, Inc. (Bechtel) contract requirements.

Based on ORP's review of the five vessels, some of the issues in the complaint were confirmed. The surveillance identified a missing NDE record that would have documented tests performed to ensure weld quality as well as a missing weld map, a diagram that helps establish traceability of quality assurance records to specific areas or parts of the vessel. As a result, ORP ordered Bechtel to correct the deficiencies identified in the surveillance report, and perform an extent of condition assessment in order to ascertain whether the problems were limited to the specific vessel, or represented a broader problem. Bechtel's extent of condition review evaluated 3 of 17 vessels provided by one subcontractor and concluded that the missing NDE record was an isolated incident. However, Bechtel also concluded that weld maps were missing for all 17 vessels provided by that subcontractor, which included 12 that were located in black cells.

In response to concerns raised in the allegation, we initiated this audit to provide a more comprehensive review of whether the Department was meeting quality assurance requirements for the fabrication of black cell and hard-to-reach processing vessels for WTP. This review focused on vessels that were received and installed prior to June 2005, because additional black cell vessels have not been received since that time. The quality assurance, supplier qualification and oversight programs reviewed were also those in place for that same time period. During fieldwork, we identified additional concerns that had not been identified by the Department's surveillance or Bechtel's extent of condition reviews. After we discussed these concerns with the ORP representatives, ORP performed another surveillance that confirmed the findings

identified in this audit report. Our review included an examination of seven vessels, which were reviewed for compliance with quality assurance requirements contained in Bechtel's contract, to determine whether the Department was ensuring that these requirements were met for the fabrication of black cell and hard-to-reach processing vessels for WTP.

Our review results showed that Bechtel had not met its contract requirements for the fabrication of black cell and hard-to-reach processing vessels. Specifically, of the seven vessels:

- NDE records, which provide evidence that welds met specifications, were missing for two vessels;
- Quality assurance records providing traceability of weld filler material, welding procedures, welders and NDEs to the associated area of use or part of the vessel were incomplete for six vessels; and,
- Positive Materials Identification (PMI) records, which provide evidence that materials and components underwent testing, were missing four tests for two vessels. In addition the subcontractor requirement to develop PMI maps could not be verified or was incomplete for all seven vessels reviewed.

Further, two of Bechtel's subcontractors deviated from their contract requirements for weld examination without appropriate authorization.

In our judgment, the identification of missing quality assurance records for materials and components used in black cell and hard-to-reach vessels was a serious matter. We concluded that the absence of such records reduced the Department's ability to demonstrate that WTP can begin operations and efficiently complete the mission.

Nondestructive Examination of Vessels

Two of the seven vessels we reviewed were missing certain NDE records that provide evidence that welds met specifications. The purpose of NDE is to provide confidence that welds are less likely to fail during WTP's expected 40-year design life. The Department required that specific welds essential to containing the radioactive waste are examined. NDEs of welds are used to detect voids, lack of fusion or other imperfections that may cause a weld to fail during operations.

Specifically, we found that NDE records were missing for vessels supplied by two different Bechtel suppliers, Harris Thermal Transfer Products (Harris) and Joseph Oat Corporation. Regarding Joseph Oat Corporation, we could not identify NDE records of the welds for top and bottom heads of the vessel. Follow-up action by ORP substantiated the missing quality assurance records and also identified another missing NDE record for a nozzle. Bechtel attempted to obtain the missing NDE records for this vessel from the fabricator, but was unable to because the fabricator did not maintain the records as required by its quality assurance program. Further, the heads of the vessel were fabricated by a subcontractor that had purged the NDE records because the code retention period had expired.

Prior to our audit, ORP had conducted a review in response to the initial allegation that determined that one vessel, provided by Harris, was also missing NDE records for one of the vessel's nozzles. Subsequently, Bechtel conducted an extent of condition review that analyzed 3 of 17 vessels provided by Harris. Bechtel did not identify any additional missing NDE records for the three vessels reviewed and concluded it was an isolated incident that warranted no further action. However, the combined results of our review and ORP surveillance showed that Bechtel's extent of condition review for missing NDE records was not adequate.

While we recognize that the number of welds missing NDE records represented a small percentage of total welds, the fact that Bechtel could not provide documentation demonstrating that all welds had been tested is troubling because a weld failure will essentially make the vessel unusable due to the inability to fix or repair a vessel after the start of operations.

Traceability of Vessel Fabrication

In addition to missing NDE records, we found that for six of the seven vessels the quality assurance records were incomplete because all material, welding procedures, welders and NDEs were not traceable to the associated item. Nuclear quality standard requires that material and services used are appropriate for the nuclear activities and traceable to the items in a manner that assures that identification is established and maintained from initial receipt and fabrication up to, and including, installation and use. Bechtel incorporated these requirements into its Quality Assurance Manual for WTP. Accordingly, all vessel subcontractors were required to submit a weld map identifying the specific location of

each weld used in the fabrication of the vessel as well as information on the welding procedures, the welder, material used and the location of the NDE.

However, we identified incomplete documentation regarding traceability of quality records for six of the seven vessels we reviewed, including missing or incomplete weld maps, and traceability to weld procedures or the welder. In addition, five vessels had incomplete records pertaining to traceability of the welding filler material used. Welding filler material is used to affix the pieces of the stainless steel vessel together. Bechtel's subcontracts state, "All records pertaining to the NDE, base materials, filler materials, fabrication, and inspection shall be traceable to the area and part inspected and be accessible for Buyer's (Bechtel) examination." When we requested these records, Bechtel officials were unable to provide them, and further indicated the records were not available from the subcontractors.

ORP's earlier surveillance review also identified a missing weld map for the same vessel missing the NDE records for one of the vessel nozzles; consequently, weld filler material and weld records were not traceable for that vessel.

Positive Material Identification

We also found that the seven vessels we reviewed did not meet contract requirements for PMI, which provides confirmation that the material used to fabricate the vessel is compatible with the expected operating conditions. The PMI was to be performed on the assembled vessel and required the subcontractor to test each and every component and weld. The subcontractor was also required to provide a PMI map of the fabricated vessel that identified each component and weld, showing the locations of PMI testing. However, rather than a map, most suppliers we reviewed provided a matrix of each test and the component or weld tested. As a limited review, we compared this matrix to the bills of materials and determined that two components and two welds were not tested on two of the vessels. Furthermore, without a PMI map, there is no traceability to identify the test locations of the components or welds on the vessel.

Deviation from Contractor Requirements

Bechtel also allowed two of its subcontractors to deviate from its NDE contract requirements without appropriate authorization. These two vendors utilized ultrasonic examination to determine deformities in the welds. The contract required subcontractors to

use radiography as the preferred method to examine welds that make up the primary confinement for the vessel. If the contractor considered it impractical to perform radiographic testing, the contractor could propose ultrasonic examination to Bechtel.

Neither subcontractor submitted a Supplier Deviation Disposition Request (SDDR) form to Bechtel to request authorization for changing the approved examination method from radiography to ultrasonic. The SDDR process establishes the reason for deviating from the requirement and ensures that a technical engineering review is performed. Rather than a SDDR, both contractors submitted fabrication drawings for approval that depicted the nozzles on the vessel and indicated in some instances that the NDE method would be ultrasonic. When asked if this was appropriate, Bechtel stated that in no case should the drawing approval process be used to substantiate, or otherwise justify changes in, NDE methods to code welds without submittal of an SDDR form. However, this practice circumvented the SDDR process that was required for each fabricator's contract. Ultrasonic testing may be advantageous in some instances where weld geometry or thickness impact radiographic examination results. However, the main advantage of radiography is that a physical record (film) is created that can be used for further analysis.

Quality Assurance Implementation and Oversight

The Department and Bechtel, at the time these vessels were procured, did not provide what in our view was the necessary oversight to ensure that Bechtel and its vessel subcontractor adequately implemented the Quality Assurance Program. We concluded weaknesses in quality assurance records associated with the vessels occurred because Bechtel placed an overreliance on inspectors, referred to as a Supplier Quality Representative (SQR), located at the contractor locations where the vessels were built. We found that the SQRs had not ensured that all necessary steps were taken to develop and maintain essential quality assurance records. Bechtel's receipt verification procedures were also limited in scope and did not include a thorough review of quality assurance records.

Source Verification

We identified several weaknesses with Bechtel's quality assurance process at the subcontractor locations where the vessels were built even though Bechtel placed a SQR at the subcontractor locations to monitor the quality of work being performed. The SQR witnessed work performed and executed a progressive and final review and approval of quality assurance record packages. This receipt method, also known as "Source Verification," was implemented in

accordance with Bechtel's material acceptance plan that requires the SQR to witness inspections, examinations or tests at predetermined points. However, we identified several concerns with the source verification process:

- Bechtel's SQRs were not qualified to review specific attributes required by Bechtel's material acceptance plans. Bechtel's source verification process relied on the skills and knowledge of the SQR to witness welding and NDE activities and to verify procedural compliance and that workers are qualified. However, the material acceptance plan also required the evaluation of NDE results. We determined that none of the 16 SQRs were qualified to interpret weld NDE results, because they were not qualified to either a Level II or III weld inspector. Management noted and we agree that Bechtel's procedures did not require that the SQRs be qualified as weld inspectors. However, in our opinion, Bechtel's source verification program should be augmented to either review or test NDE film results by qualified individuals because the receipt inspection process does not provide for further review; and,
- Bechtel's SQRs did not ensure that complete records packages were compiled for each of the vessels. The SQR is the only individual that reviews the quality records for completeness and compliance with the contract. Prior to the release of a vessel for delivery, the SQR is responsible for the progressive and final review and approval of the supplier-generated quality records packages that accompany the vessel. However, the SQRs approved incomplete records packages that were missing weld maps, NDEs of welds, positive material test and other documentation.

Receipt Verification

Additionally, Bechtel's receipt inspection process for the vessels was not as robust as we would have expected. Specifically, Bechtel's receipt inspection process did not ensure that the vessels procured conformed with quality assurance record requirements contained in Bechtel's contract. Rather, Bechtel's inspection process focused primarily on reviewing for damage and cleanliness. The requirements for verifying receipt of quality assurance records were very cursory and only included verifying that the expected number of pages existed for each document category.

Department Oversight

The Department provided inadequate oversight over Bechtel's quality assurance process and did not adequately assess Bechtel's internal controls for oversight of its subcontractors. The Department's oversight of Bechtel was ineffective in identifying weaknesses in Bechtel's processes that contributed to the receipt of vessels that did not conform to contract requirements. Surveillances performed by the Department were not comprehensive enough to detect the inadequacies in Bechtel's source verification program and to identify the missing quality assurance documentation. It is recognized that ORP developed its Bechtel subcontractor surveillance program in response to black cell vessel quality assurance issues identified in 2003 with specific focus on reviewing work done at the subcontractor locations. ORP visited two black cell vessel subcontractors, Harris and Northwest Copper Works, in 2004. These inspections were performed to ensure subcontractor compliance with requirements during the vessel fabrication process. ORP returned to these locations in July 2009 following the restart of black cell vessel fabrication after project seismic issues were resolved. To the Department's credit, these subsequent reviews were more extensive and involved reviewing procedures and other quality assurance controls.

In addition, the Department did not ensure that Bechtel's quality assurance processes were sufficient and commensurate with the importance or complexity of the item or service being delivered. That is, highly complex equipment associated with a project as massive as WTP may require more than one method of acceptance to ensure conformance. Bechtel's receipt inspection program was unsuccessful in detecting that SQRs had not validated that the vessels met the specified contractual requirements before releasing them for delivery. Had Bechtel effectively verified conformance with contractual requirements, including the need to maintain complete quality assurance records, the error rate would likely have been substantially lower. We also noted that the Department did not ensure Bechtel's use of appropriate personnel for the performance of different functions in the receipt process; for example, welds should be verified only by qualified weld inspectors. Finally, the Department did not ensure that Bechtel had safeguards in place to identify deviations from contract specification. The contract required that all vessels that have any deviation from inspection procedures be technically justified and approved by Bechtel. However, there was no methodology in the material acceptance plan to identify NDE deviations.

Other Matters

In addition to the issues identified above, we determined that Bechtel was paid a \$15 million fee in 2003 for a vessel that did not conform to contract requirements because it lacked adequate quality assurance records.

The Department did not take aggressive action to retrieve the \$15 million fee payment. A letter issued to Bechtel on February 11, 2004, identified that the welds on the vessel had not been fully examined to ensure that weld defects were discovered. This specific requirement was included in the contract with Bechtel. The Department further criticized Bechtel's construction and acceptance testing program for not disclosing that the vessel had not undergone full examination prior to the setting of the vessel in the High Level Waste facility. The Department's letter noted that Bechtel had also failed to include this requirement for the vessel supplier. In this letter, the Department requested Bechtel return the \$15 million fee payment by February 20, 2004. If not returned by that date, the letter stated that the Department would offset the amount against the next cost invoice submitted by Bechtel. In its response, dated February 18, 2004, Bechtel asserted that it didn't completely agree with many of the assertions of the Department; but concluded that a point-by-point response would not bring closure to the issue. As an alternative, Bechtel expressed its desire to discuss the issue with the Department to find a mutually acceptable resolution. Bechtel then submitted a letter to close out open issues on the vessel dated July 12, 2004. We requested the evidence of the resolution; however, there were no records of the meeting or indications that Bechtel repaid the fee. Department officials confirmed there was no documentation indicating that the fee had been repaid or offset against any subsequent invoices.

In addition, we determined that a second \$15 million fee payment was paid in 2005 for four vessels, one of which we determined was nonconforming because it lacked adequate quality assurance records. Regarding the second performance fee, at the time we determined the vessel was nonconforming, a different fee criteria applied which denied the Department the ability to recover fee for a nonconforming vessel after it had been installed.

Programmatic Impact

The weaknesses we observed in the quality assurance of black cell vessels resulted from shortcomings in the quality assurance, supplier qualification and oversight programs that were in place at the time the last black cell vessel was received in 2005. Management stated that a number of improvements had been made to these programs. However, the application and effectiveness of these changes could not be verified because black cell vessels have

not been received since the changes were implemented. Without ensuring that quality assurance improvements are in place and operating effectively and that the necessary quality assurance records are acquired, the Department may not be able to demonstrate that WTP facilities are ready for operation and will operate as intended. These records have significant value to the Department and are required to demonstrate that WTP meets project requirements. The lack of quality assurance records could impact operability of WTP including the Department's ability to efficiently complete WTP's mission. The lack of such records could also result in delays and cost overruns to address flaws in materials that lack adequate documentation. Finally, such records could be used to establish a baseline to allow the Department to operate the facility beyond its 40-year design life.

RECOMMENDATIONS

Although the Department has taken a number of actions to address the deficiencies that we identified, we believe that additional actions are necessary to verify the implementation and effectiveness of the corrective actions for black cell and hard-to-reach vessels and prevent unnecessary risk to the operation and mission of WTP. Accordingly, we have made several recommendations to strengthen the Department's quality assurance processes and to recoup performance fees paid by the Department for a nonconforming vessel. To address the problems in this report, we recommend that the Senior Advisor for Environmental Management, direct the Office of River Protection to:

1. Conduct an independent evaluation of Bechtel's current quality assurance processes for black cell and hard-to-reach area vessels to make certain the processes are comprehensive and adequate for ensuring compliance with all Federal requirements, and correct any identified deficiencies;
2. Review quality assurance documentation associated with black cell and hard-to-reach area vessels and verify all necessary actions have been taken by Bechtel to ensure the receipt of all necessary records required by the project;
3. Ensure Bechtel makes certain that vessel fabricator suppliers and service providers possess the necessary qualifications to perform the task, and that any qualification deficiencies are corrected, as part of the ongoing Bechtel corrective actions for black cell and hard-to-reach area vessels;

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4. Evaluate the Department's current oversight program and implement any required changes, as necessary, to ensure Bechtel's quality assurance processes promptly identify and remediate any less than adequate quality assurance weaknesses; and,
 5. Determine whether the \$15 million performance fee payment for a nonconforming vessel was returned to the Department and, if not, take necessary action to recoup the fee from Bechtel.

**MANAGEMENT AND
AUDITOR COMMENTS**

The Office of Environmental Management concurred with the report's recommendations and its comments were generally responsive to our recommendations. Management commented on improvements that have been made since the last vessels were delivered and it outlined a number of corrective actions recently initiated. Specifically, actions are underway to evaluate process improvements implemented since 2005; evaluate supplier quality documentation associated with all black cell and hard-to-reach vessels; ensure that Bechtel's suppliers are qualified; evaluate recent process improvements on the Department's oversight program; and, resolve the issue pertaining to the fee paid to Bechtel for a nonconforming vessel. However, management disagreed with our assertion that Bechtel's on-site inspectors needed to be qualified to either a Level II or III weld inspector to interpret NDE results. Management stated that technical requirements do not mandate this type of qualification for the personnel performing this role, and that it is sufficient that the inspectors verify that another individual conducting the weld examination be qualified. Specifically, management asserted that technical standards require those performing NDE of welds to be qualified to a Level II or III weld inspector, but does not require this of anyone else.

We acknowledge that management's comment regarding Bechtel's on-site inspectors is technically correct. However, given the importance of the vessel welds to the effective performance of WTP, we believe that it would be prudent that the on-site inspectors be fully qualified to interpret NDE results in order to provide additional assurance that the vessels received have been fabricated per specifications. Bechtel's quality assurance plan relies almost exclusively on the inspectors for material acceptance procedures; and the material acceptance plan specifically identifies evaluation of weld examination results to be performed. Therefore, we believe the individual performing that role should be qualified to interpret the results of the weld examination. This

additional level of assurance is consistent with the principles in *Quality Assurance Program Requirements for Nuclear Facilities*, which suggest that the extent of verification activities be commensurate with the importance of the items being supplied and that individuals who verify performance of work activities for the purpose of acceptance be qualified to perform the inspection tasks.

Management's comments are included in Appendix 3.

OBJECTIVE

To determine whether the Department of Energy (Department) was meeting quality assurance requirements for the fabrication of "black cell" and "hard-to-reach" processing vessels for the Waste Treatment and Immobilization Plant (WTP).

SCOPE

We conducted this audit from March 2011 to April 2012. We conducted work at Department Headquarters in Washington, DC, and at the Hanford Site in Richland, Washington. The scope of the audit was to review procurement packages related to vessels that exist in black cells or in areas that were hard-to-reach in WTP. Our review focused on the issues contained in the allegation made to the Office of Inspector General.

METHODOLOGY

To accomplish the audit objective, we:

- Obtained and reviewed Bechtel National, Inc.'s (Bechtel) Quality Assurance Manual and policies and procedures to determine how Bechtel determines vessel fabrication contract requirements and how it ensures that these requirements are met;
- Obtained and reviewed procurement documentation for seven vessels that were selected based on a judgmental sample determined by risk associated with previous reviews;
- Researched Federal and Departmental regulations, policies and procedures; and,
- Interviewed key personnel in the Office of Environmental Management; Office of Health, Safety and Security; Office of River Protection; and, Bechtel.

We conducted this performance audit in accordance with generally accepted Government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objective. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objective. Accordingly, we assessed significant internal controls and compliance with laws and regulations to the extent necessary to satisfy the audit objective. In particular, we assessed the Department's implementation of the *GPR Modernization Act of 2010* and determined that it had established performance measures for project management. Because our review was limited, it would not necessarily have

Appendix 1 (continued)

disclosed all internal control deficiencies that may have existed at the time of our audit. We did not rely upon computer-processed data to accomplish our audit objective.

An exit conference was held with Department officials on April 12, 2012.

PRIOR AUDIT REPORTS

- Audit Report on [*The Procurement of Safety Class/Safety Significant Items at the Savannah River Site*](#) (DOE/IG-0814, April 2009). The audit found that the Department of Energy (Department) had procured and installed safety-class and safety-significant structures, systems and components that did not meet *The American Society of Mechanical Engineer's Quality Assurance Program Requirements for Nuclear Facilities* quality standards. These failures occurred because Departmental controls were not adequate to prevent and/or detect quality assurance problems. Additionally, management did not effectively communicate quality assurance concerns between several Departmental program elements operating at the Savannah River Site. The procurement and installation of these nonconforming components resulted in cost increases. In general, the internal control weaknesses we discovered could have permitted, without detection, the procurement and installation of safety-critical components that did not meet quality assurance standards. In a worst case scenario, undetected, nonconforming components could fail and injure workers or the public.
- Audit Report on [*Quality Assurance Standards for the Integrated Control Network at the Hanford Site's Waste Treatment Plant*](#) (DOE/IG-0764, May 2007). The audit found that the Waste Treatment Plant control system acquired by the Department did not meet applicable quality assurance standards, specifically, those required for "an activity affecting the immobilization of radioactive high-level waste." As a result, the system does not meet the stringent procedures, plans, specifications or work practices associated with nuclear quality standards. Under the circumstances, we concluded that the Department cannot be sure that the Waste Treatment Plant's current system is suitable for processing nuclear waste.



Department of Energy

Washington, DC 20585

March 21, 2012

MEMORANDUM FOR RICKEY R. HASS
DEPUTY INSPECTOR GENERAL
FOR AUDITS AND INSPECTIONS
OFFICE OF INSPECTOR GENERAL

FROM:  DAVID HUIZENGA
SENIOR ADVISOR
FOR ENVIRONMENTAL MANAGEMENT

SUBJECT: Management Response to the Office of Inspector General's
Draft Audit Report on "Quality Assurance of Black Cells at the
Waste Treatment Plant," Inspector General-30 (A11RL011)

The Office of Environmental Management (EM) appreciates the opportunity to review the Office of Inspector General's (OIG) draft report, "Quality Assurance of Black Cells at the Waste Treatment Plant."

The OIG review of the black cell and hard-to-reach area vessels at the Waste Treatment Plant (WTP) received from 2003-2005 highlighted certain weaknesses in Bechtel National, Inc.'s (BNI) nuclear quality supply chain that occurred during project procurements from 2002 to 2003. The draft report underscored the need for the Department of Energy (DOE) to ensure that those weaknesses have been corrected and that opportunities for improvement are implemented in programs and processes that impact quality, quality assurance programs, supplier qualification, contractor oversight, and departmental oversight.

The report correctly acknowledges that a number of programmatic improvements have been implemented since the vessels under review were received. Reviews conducted by the DOE, Office of River Protection (ORP), and BNI on equipment procured under American Society of Mechanical Engineers, Nuclear Quality Assurance -1 (ASME NQA-1) since 2005, have demonstrated that further improvements have been made in programs and processes specifically in the areas of quality assurance programs and supplier qualification. Both DOE and BNI recognize that a robust and compliant quality assurance program on a project the size of WTP requires continual improvement.

The OIG report identified five recommendations. EM agrees with the recommendations. EM does not agree with the OIG position that Contractor Supplier Quality Representatives (SQRs) were not sufficiently qualified because they were not certified Level II or Level III weld inspectors per the requirements of the American Society of Nondestructive Testing (ASNT) Recommended Practice No. SNT-TC-1A, "*Personnel Qualification and Certification in Nondestructive Testing*."



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The memorandum transmitting the draft report requested detail on the corrective actions planned and the target or actual completion dates for the recommendations. The attached actions summarize initial progress that EM and BNI have made to date with respect to the recommendations. Both EM and BNI understand that additional actions are necessary to close out these recommendations and will provide the OIG with a detailed plan of actions, including specific activities and dates associated with those activities, once the final report is received. A detailed explanation on the EM/ORP position on fee milestone payment and SQR qualification is also provided.

The Department will outline the actions, including the schedule, and advise the OIG of its progress for implementing the recommendations by using the process established in the Departmental Audit Reporting and Tracking System.

If you have any questions, please feel free to contact me or Mr. Matthew Moury, Deputy Assistant Secretary for Safety, Security, and Quality Programs, at (202) 589-5151.

Attachment

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ATTACHMENT

Office of Environmental Management Response to the Office of Inspector General Draft Report on “Quality Assurance of Black Cells at the Waste Treatment Plant,” Inspector General -30 (A11RL011) Recommendations

The Department of Energy (DOE) or Office of Environmental Management (EM) suggests that the title of the audit report be changed to “*Quality Assurance of Black Cell Vessels at the Waste Treatment Plant*” as the black cells consist of a multitude of components including concrete, liner, ventilation, piping, etc., which were not within the scope of this review.

- 1. “Conduct an independent evaluation of Bechtel’s current quality assurance process for black cell and hard-to-reach area vessels to make certain they are comprehensive and adequate for ensuring compliance with all Federal requirements, and correct any identified deficiencies.”**

In November 2011, Bechtel National Inc., (BNI) responded to a DOE Office of River Protection (ORP) review and formally committed to evaluate the process improvements implemented since 2005 to ensure black cell and hard-to-reach area vessels meet quality assurance (QA) requirements. In addition, in August 2011, ORP placed a hold on all future black cell vessel installations until key design verification activities are independently reviewed and ORP project management formally concurs the vessels can be installed.

A BNI project team was established to coordinate the closure of vessel technical issues, completion of vessel fabrication, confirmation of design, and review of supplier quality verification documentation of black cell and hard-to-reach area vessels. ORP will perform independent oversight of the contractor’s completion of these activities and will document surveillances to ensure proper quality verification documentation is obtained for each of the vessels. The schedule and results of the BNI and ORP oversight will be provided to the Office of Inspector General (OIG) in the Departmental Audit Reporting Tracking System (DARTS) updates.

- 2. “Review quality assurance documentation associated with black cell and hard-to-reach area vessels and verify all necessary actions have been taken by Bechtel to ensure the receipt of all necessary records required by the project.”**

In November 2011, BNI responded to an ORP review and formally committed to evaluate supplier quality documentation associated with welding, Nondestructive Examination (NDE), and Positive Material Identification for all received black cell and hard-to-reach vessels currently included in the design. BNI is performing detailed reviews of all received black cell and hard-to-reach area vessels to verify that the vessels and supporting documentation meet applicable requirements. Deficiencies identified during these reviews will be documented and corrected in accordance with project

requirements. The BNI Supplier Quality Organization will perform the quality documentation review and BNI's QA office (a different office from the BNI Supplier Quality office) will also conduct surveillances to evaluate the scope of the reviews for completeness and the rigor of the completed reviews. ORP staff will separately verify the results of these surveillances by conducting a vertical slice audit of black cell and hard-to-reach vessel procurement. The results of these activities will provide assurance that the quality of black cell and hard-to-reach vessels will meet applicable quality assurance and procurement requirements, including the receipt and preservation of all necessary records associated with the quality assurance of black cell and hard-to-reach vessels. Furthermore, BNI has committed to modify its procurement and receiving processes for all black cell and hard-to-reach vessels to include a second 100 percent review of all quality verification documents. The schedule and results of the BNI surveillances and reviews and the ORP audit will be provided to the OIG in DARTS updates.

3. "Ensure Bechtel makes certain that vessel fabricator suppliers and service providers possess the necessary qualifications to perform their task, and that any qualification deficiencies are corrected, as part of the ongoing Bechtel corrective actions for black cells and hard-to-reach area vessels."

BNI is required by its DOE contract and its NQA-1-2000 QA program to ensure that all suppliers of quality items and services meet the NQA-1 QA requirements specified in the suppliers' contracts. In order to determine whether these requirements are met, the BNI Supplier Qualification Organization audits each supplier to verify the adequacy of their quality assurance program and its execution prior to adding them to the Waste Treatment Plant (WTP) Project Evaluated Supplier List (ESL). Only qualified suppliers on the ESL can supply NQA-1 quality items and services. BNI significantly strengthened and improved its supplier audit process in response to the ORP 2009 vendor commercial grade dedication quality review and as a result, all black cell and hard-to-reach vessel suppliers have been subjected to the enhanced and more rigorous supplier qualification audits, with two exceptions: one supplier is scheduled to be audited this month (March 2012) and the second supplier will be audited prior to its resuming work on the project.

Deficiencies in supplier QA programs and QA program execution were documented and are tracked to closure by the BNI Supplier Qualification Organization. Potential impacts on equipment that is in the fabrication process or that has been previously shipped to the WTP project were evaluated and documented for each identified supplier deficiency. In addition to the actions that have been previously taken, BNI will be requested to conduct a review of the enhanced audits conducted on the black cell/hard-to-reach vessel suppliers to assure sufficient rigor was applied during the review of the qualifications of the vessel suppliers' inspection personnel in accordance with the requirements of American Society of Nondestructive Testing (ASNT) Recommended Practice No. SNT-TC-1A, "*Personnel Qualification and Certification in Nondestructive Testing*." If deficiencies are noted during the review, they will be documented in the WTP Corrective Action program.

ORP performs oversight of the BNI Supplier Qualification audit process by observing supplier audits on a sampling basis and issuing surveillance reports that document any deficiencies observed in the conduct of the audit. Since 2010, ORP's Quality Assurance Team performed oversight of BNI supplier qualification audits at 14 suppliers. Six more oversight activities are planned for the remainder of 2012. As part of this oversight, ORP will perform a surveillance of BNI actions taken to verify that vessel fabricators, suppliers, and service providers possess the necessary qualifications to perform their tasks. ORP oversight provides the Department two-fold assurance that BNI's Supplier Qualification audit process is sustaining the recent improvements and that there is reasonable assurance that WTP procurements comply with QA requirements.

4. **“Evaluate the Department’s current oversight program and implement any required changes, as necessary, to ensure Bechtel’s quality assurance processes promptly identify and remediate any less-than-adequate quality assurance weakness.”**

As a result of the OIG's Audit, *Quality Assurance Standards for the Integrated Control Network at the Hanford Site's Waste Treatment Plant*, (DOE/IG-0764, May 2007), ORP committed to strengthen its QA function with increased Federal and contractor support staff (DOE Action Plan - Commitment 3). ORP completed the actions by staffing the Environmental Safety and Quality Assistant Manager position, adding four Federal QA professionals, and augmenting Federal staffing with contract QA professionals.

This additional QA staffing has resulted in an increase of the Federal QA oversight of BNI QA activities, including the reviews of every change to the BNI QA manual, annual QA audits of the implementation of the BNI QA program, and focused oversight of the BNI Supplier Qualification program and its implementation at suppliers. With respect to the Department's current oversight program, this additional QA staffing has increased the Department's oversight ability of BNI QA activities. As a result of this increased oversight capability, ORP will evaluate the effectiveness of recent process improvements to its oversight program, including organizational changes and procedure updates and document the results in a surveillance report. The ORP Assessment Program Committee will review the results of this surveillance report, recommend changes, and track the changes to implementation. The schedule and results of the ORP surveillance and any identified improvements will be provided to the OIG in DARTS updates.

5. **“Determine whether the \$15 million performance fee payment for a nonconforming vessel was returned to the Department and, if not, take necessary action to recoup the fee from Bechtel.”**

DOE independently verified, and confirmed with the contractor, that the \$15 million fee in question was not returned.

ORP issued letter 04-AMWTP-020 on February 11, 2004, requesting the fee to be returned. BNI responded with letter CCN 078918 on February 20, 2004, stating that BNI

would like to discuss the issues with DOE. BNI subsequently issued letter CCN 090257 on July 12, 2004, that included a summary of the final closure status of open issues for the vessel.

However, there are two questions remaining: whether BNI in fact completed the work at a later date in a way that qualified to earn the fee, and whether the determination of fee, as part of Modification A143 in 2009, represented a settlement of all fee issues prior to that date, including this one, such that DOE does not have any ability to require the return of fee at this time.

Modification A143 was issued January 16, 2009. The purpose of the modification was as follows:

“The purpose of this contract modification is to: (i) restructure Section B – SUPPLIES OR SERVICES AND PRICES/COSTS; (ii) update sections C, F, H, I, and J (as described below); and (iii) incorporate a Contractor Statement of Waiver and Release of Claims as of the date of this modification.”

This modification was a complete restructuring of the contract, to include conversion from a cost-plus incentive-fee contract to a cost-plus award-fee contract with award and multiple fee incentives. The Statement of Waiver and Release of Claims was also stated as being “in consideration for Modification No. A143.” Modification A143 included the final fee determination for all performance prior to Modification A143, as follows:

“(a) A – Final Fee Determination for Work Prior to Modification No. A143: The final fee determination for all performance prior to Modification No. A143 is \$102,622,325. This is composed of \$54,500,000 of previously paid fee for schedule milestones, and \$48,123,325 of previously paid provisional fee (which is considered earned).” The work or performance associated with the \$15 million fee payment at issue appears to have been performed prior to Modification A143.

EM takes seriously the obligation to be a good steward of the taxpayer’s dollars. EM, with the assistance of the Office of General Counsel, is working diligently to come to resolution of this matter, including consideration of whether later actions by the contractor rectified issues surrounding the black cells such that the fee was in fact earned, and, regardless, whether a subsequent contract settlement modification affects DOE’s ability to recover the previously paid fee. We will inform the OIG of our conclusions when that review is complete.

There have been significant improvements in the process and documentation for contract fee milestones since 2004. There are currently 60 fee-bearing Activity Milestones in the contract. The contract now includes Section J – “List of Attachments” and Attachment P, “Completion Definition Sheets for Incentive Fee C.1 Activity Milestone Completion Incentive.” This attachment specifies the requirements the contractor must meet to successfully complete the milestones. When the contractor believes it has completed a milestone, the contractor completes an Activity Milestone Definition Sheet, attaches all

supporting documentation, and submits it to ORP for review. ORP performs a formal surveillance within 30 days of the submittal. The review includes the documentation submitted by the contractor, in addition to a physical review of the work in the field. At completion of the review, ORP either disapproves and rejects the milestone submittal; requests additional information to complete the review and validation process; or validates the completion of the milestone and approves the contractor to submit an invoice for payment. The entire process is formally documented and included in the contract file.

Response to OIG position on Supplier Quality Representatives Qualification

The OIG report stated, “in our opinion, individuals assigned responsibility for verifying that the welding was performed to specification should have Level II or III welding qualifications.” ASME NQA-1 requires that personnel who perform the NDE of welds be qualified as a Level II/III inspector per SNT-TC-1A, but does not require any others to be so qualified. In addition, ASME Code interpretation QA08-009, issued on October 12, 2010, states that “Section 301 (Nondestructive Examination (NDE)) applies only to personnel performing the listed nondestructive examination methods.” This interpretation related to NQA-1-2000, requirement 2, section 301, but the language is the same as that in NQA-1-1989, the NQA-1 edition applicable to the vessels reviewed by OIG, supplement 2S-2. Supplement 2S-2, which provided “amplified” requirements for the qualification of NDE personnel, was implemented for personnel who perform NDE.

Other personnel associated with the acceptance process, such as supplier quality representatives (SQRs), are not required to be qualified as Level II or III weld inspectors. SQRs are dispatched to the vendor sites and were and continued to be used to perform a source verification function (i.e. verify conformance with contract/purchase requirements). SQRs do not perform NDE. NQA-1-1989, supplement 2S-1 specifies criteria for certification of “personnel who perform inspection and testing to verify conformance to specified requirements for the purpose of acceptability.” BNI procedurally implemented qualifications and technical competences for SQRs consistent with supplement 2S-1. Specific to NDE, the SQRs verified conformance to applicable QA standards by, among other things, reviewing documentation demonstrating that radiographic film was appropriately accepted by a Level II/III inspector and witnessing NDE activities. As a result of the OIG position stated above, ORP agrees with the need to assure a clear definition of NDE acceptance activities. Consequently, ORP will assure the SQR responsibilities for witnessing NDE activities and reviewing of NDE records are clearly defined so that there is no uncertainty regarding the qualifications required to perform these functions.

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