

**Office of Health, Safety and Security
Independent Review Report**

**Waste Treatment and Immobilization Plant
Construction Quality**



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**Office of Enforcement and Oversight
Office of Health, Safety and Security
U.S. Department of Energy**

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Acronyms

BNI	Bechtel National, Incorporated
DOE	U.S. Department of Energy
HLW	High-Level Waste Facility
HSS	Office of Health, Safety and Security
LAB	Analytical Laboratory
LAW	Low-Activity Waste Facility
NCR	Nonconformance Report
PTF	Pretreatment Facility
WTP	Waste Treatment and Immobilization Plant

Independent Review Report Waste Treatment and Immobilization Plant Construction Quality

1.0 PURPOSE

The Office of Safety and Emergency Management Evaluations (Independent Oversight) within the Office of Health, Safety and Security (HSS) conducted an independent review of selected aspects of construction quality at the Hanford Waste Treatment and Immobilization Project (WTP). The review, which was performed May 9-12, 2011, was the latest in a series of ongoing quarterly assessments of construction quality performed by Independent Oversight at the WTP construction site.

2.0 BACKGROUND

The WTP is an industrial complex for separating and vitrifying millions of gallons of radioactive and chemical waste stored at the Hanford Site. The WTP complex consists of five major components: the Pretreatment Facility (PTF) for separating the waste, the High-Level Waste (HLW) and Low-Activity Waste (LAW) facilities where the waste will be immobilized in glass, the Analytical Laboratory (LAB) for sample testing, and the balance-of-plant facilities that will house support functions. The WTP is currently in the design and construction phase. Design and construction activities at WTP are managed by Bechtel National, Incorporated (BNI) under contract to the U.S. Department of Energy (DOE). Because of the safety significance of WTP facilities, and because of previously identified deficiencies in construction quality, Independent Oversight has scheduled quarterly reviews to assess the quality of ongoing construction.

3.0 SCOPE

The scope of this review encompassed various topics, including welding, concrete quality, and quality assurance/quality control documents associated with the installation of piping, pipe supports, and concrete anchors. A sample of nonconformance reports (NCRs) identified by BNI under their corrective action program was reviewed. HSS also examined BNI's corrective action to resolve an earlier finding regarding deficiencies in the installation of structural steel bolts.

HSS reviewed various construction quality documents and conducted several construction site walkthroughs, concurrent with the Office of River Protection's DOE-WTP staff. During the walkthroughs, the HSS team observed the quality of completed concrete; observed welding inspection activities; and examined completed welds on several structural steel connections, pipe joints, and pipe supports. HSS examined various documents, including drawings, specifications, and procedures associated with the installation of pipe supports, along with test reports, design criteria, and installation procedures for concrete anchors. HSS also examined a sample of BNI quality assurance surveillance reports, BNI NCRs, and the results of concrete quality control tests.

4.0 RESULTS

Welding inspection program. The welding inspection program is adequate. The DOE-WTP staff has performed various independent inspections of approximately five percent of quality-related welds. The quality of the completed welds examined by HSS was satisfactory.

Installation of piping and piping supports. In its review of drawings, specifications, and procedures that control installation of piping and pipe supports, HSS noted that references to American Society for Testing and Materials standards in one procedure, Specification 24590-WTP-3PS-PH01-T0002, Revision 5, *Engineering Specification for Installation of Pipe Supports*, appeared to be inappropriate. These inappropriate references have no immediate effect on construction quality but could affect future procurement activities for new supports or replacement parts. The DOE-WTP staff communicated this issue to BNI, and BNI will delete the inappropriate references from the specification.

Quality control tests on concrete placements. HSS reviewed the quality control test results for randomly selected concrete placements of mix number F-7, completed between December 2010 and April 2011. Mix number F-7 is a structural mix used in seismically designed structures. The quality control test results documented that the mix number F-7 concrete complied with specification requirements. Unconfined compressive strength tests demonstrated that the concrete strength exceeded the 5000 psi minimum required by design specifications. HSS also witnessed unconfined compression tests of a few field cured concrete cylinders in the site project laboratory and found them to be adequate.

Nonconformance reports. HSS reviewed NCRs issued by BNI from February 16, 2011, through May 12, 2011, to determine the type of nonconforming issues that were identified and subsequent mechanisms for resolution.

Approximately 70 percent of the NCRs were issued to resolve equipment and hardware procurement problems. Examples of procurement problems included incorrectly fabricated structural steel members, hardware/components that were delivered to the site without the required supporting documentation demonstrating compliance with purchase specifications, and hardware/equipment that did not comply with project specification requirements. A large number of the procurement-related NCRs that HSS reviewed documented deficiencies involving hardware/components that had been delivered to the project several years ago. Several NCRs were issued to document and disposition missing parts or damage that occurred during transit. HSS found that the BNI engineering organization developed appropriate corrective actions to disposition the identified problems and that the NCR process and implementation were adequate to address and resolve procurement and construction quality deficiencies.

Installation of structural steel bolts. Most of the structural steel bolts used on the project are twist-off type tension control bolts with splined ends. Proper bolt tension is achieved when the splined end is severed from the bolt by the installation crew when the bolts are tightened. In November 2010, HSS examined corrective actions for NCR 24590-WTP-NCR-CON-10-0105, which was issued to disposition six structural steel bolts discovered in the HLW on April 13, 2010, that were not properly tensioned; that is, the six bolts still had the splined ends in place. During a field inspection in November 2010 to determine the effectiveness of BNI corrective actions to resolve this problem, HSS and DOE-WTP identified two additional permanent bolts in one connection in the PTF that had not been tensioned (i.e., the splined ends were not severed). BNI issued NCR 24590-WTP-NCR-CON-10-0359 to document and disposition the two deficient PTF bolts. DOE-WTP issued a finding for this issue and other identified bolting deficiencies.

During the February 2011 site visit, HSS reviewed ongoing BNI corrective actions to further investigate and disposition improperly tensioned bolts. Corrective actions included BNI's re-inspection of all

accessible bolts in slip-critical connections in the PTF, HLW, LAW, and LAB facilities to verify that they were properly tensioned. After the February 2011 site visit, the re-inspection program was expanded to include all accessible structural steel connections. During the May 2011 site visit, BNI's re-inspection of the tensioned structural steel bolts was approximately 90 percent complete. DOE-WTP will continue to perform oversight of the BNI corrective actions to resolve improperly tensioned structural bolts.

5.0 CONCLUSIONS

HSS determined that construction quality at WTP was adequate in the areas reviewed. BNI engineering had developed appropriate corrective actions to disposition the NCRs that HSS reviewed. BNI's re-inspection effort to resolve problems with improper tensioning of structural steel bolts was approximately 90 percent complete and has progressed satisfactorily.

No findings were identified during this review. HSS offered one recommendation regarding the listing of some inappropriate design references in a pipe support installation specification. BNI agreed to delete those references, and DOE-WTP is following up on this recommendation.

6.0 ITEMS FOR FOLLOW-UP

HSS will review progress on resolving the issue with improper tensioning of structural steel bolts and how the recommendation to delete inappropriate design references from a pipe support installation specification was resolved.

APPENDIX A SUPPLEMENTAL INFORMATION

Review Dates

May 9-12, 2011

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Documents Reviewed

- DOE-WTP Surveillance Reports for March, 2011
- Construction Procedure 24590-WTP-GPP-CON-3203, Rev. 09B, Concrete Operations (Including Supply), November 3, 2009
- Construction Procedure 24590-WTP-GPP-CON-3206, Rev. 3E, Structural Steel Installation and On-Site Fabrication, November 29, 2010
- Construction Procedure 24590-WTP-GPP-CON-3503, Rev. 5B, Aboveground Piping Installation, April 7, 2011
- Construction Procedure 24590-WTP-GPP-CON-3509, Rev. 1A, Pipe Support Installation, November 9, 2010

- Construction Procedure 24590-WTP-GPP-CON-3205, Rev. 3A, Post Installed Concrete Anchors, November 24, 2009
- Specification No. 24590-WTP-3PS-FA02-T0005, Engineering Specification for Design of Post Installed Concrete Anchors for Q Applications, Rev. 1
- Specification No. 24590-WTP-3PS-SS00-T0001, Engineering Specification for Welding of Structural Carbon Steel, Rev. 7
- Specification No. 24590-WTP-3PS-PS02-T0003, Engineering Specification for Field Fabrication and Installation of Piping, Rev. 9
- Specification No. 24590-WTP-3PS-PH01-T0002, Engineering Specification for Installation of Pipe Supports, Rev. 5
- Specification No. 24590-WTP-3PS-P000-T0001, Engineering Specification for Piping Materials Classes General Description and Summary, Rev. 6
- CEL Consulting Report of Maxi-Bolt Anchor Testing for the Hanford River Protection Project Waste Treatment Plant, dated April 16, 2004
- WTP CPM Concrete Mix Designs
- BNI QA Surveillance Report numbers 24590-WTP-SV-QA-11-076 through -083, and -089
- Nonconformance Report numbers 24590-WTP-NCR-CON-11-0054 through -0088, 24590-WTP-NCR-CON-11-0091 through -0104, and 24590-WTP-NCR-CON-11-0106 through -0171. Note: Numbers 24590-WTP-NCR-CON-11-0089, -0090, and -0105 were not issued. Numbers 24590-WTP-NCR-CON-11-0055, -0123, and -0129 were canceled after it was determined that the documented concerns were not nonconforming.