U.S. Department of Energy
Office of River Protection
P.O. Box 450
Richland, Washington 99352

02-OSR-0620

Mr. R. F. Naventi, Project Manager
Bechtel National, Inc.
2435 Stevens Center
Richland, Washington 99352

Dear Mr. Naventi:

CONTRACT NO. DE-AC-01RV14136 – INSPECTION REPORT A-03-OSR-RPPWTP-001 – ON-LOCATION INSPECTION REPORT FOR THE PERIOD OCTOBER 11 THROUGH DECEMBER 4, 2002

This letter forwards the results of the U.S. Department of Energy, Office of River Protection review of Bechtel National, Inc., construction performance on the Waste Treatment and Immobilization Plant for the period October 11 through December 4, 2002. No Findings were identified. Details of the inspection are documented in the enclosed inspection report.

Inspection activities included assessing forms, rebar, and embedment installations, concrete placements, Low Activity Waste cold joint preparations, erosion/corrosion mitigation activities, industrial health and safety performance, and observation of balance-of-plant construction activities. Construction and Industrial Health and Safety performance was good during this period.

If you have any questions, please contact me, or your staff may call Robert C. Barr, WTP Safety Regulation Division, (509) 376-7851.

Sincerely,

Roy J. Schepens
Manager

OSR:JWM

Enclosure

cc w/encl:
W. R. Spezialetti, BNI

Enclosure
02-OSR-0620
A-03-OSR-RPPWTP-001

U.S. DEPARTMENT OF ENERGY
Office of River Protection

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| INSPECTION: | On-location Inspection Report for the Period October 11 through December 4, 2002 |
| REPORT NO: | A-03-OSR-RPPWTP-001 |
| FACILITY: | Bechtel National, Inc. |
| LOCATION: | 2435 Stevens Center<br>Richland, Washington 99352 |
| DATES: | October 11 through December 4, 2002 |
| INSPECTORS: | J. McCormick-Barger, Sr. Regulatory Technical Advisor, Inspection Lead<br>J. Bruggeman, ORP Site Representative<br>B. Harkins, ORP Facility Representative<br>M. Evarts, Consultant<br>H. Doan, Consultant<br>J. Mohatt, Consultant<br>R. Gilbert, Consultant<br>D. Wallace, Consultant<br>D. Kirsch, Consultant |
| APPROVED BY: | P. Carier, Verification and Confirmation Official<br>WTP Safety Regulation Division |

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# EXECUTIVE SUMMARY
# On-location Inspection Report for Period of October 11 through December 4, 2002
# Inspection Report Number A-03-OSR-RPPWTP-001

## INTRODUCTION

This inspection of Bechtel National, Inc. (the Contractor) construction activities covered the following areas:

- Adequacy of Fire Protection Piping System Work Activities (Section 1.2)
- Adequacy of Forms, Reinforcement Steel, and Embedded Steel Items and Associated Concrete Placements (Section 1.3)
- Adequacy of Low Activity Waste (LAW) Cold Joint Recovery Actions (Section 1.4)
- Industrial Health and Safety (IH&S) Oversight (Section 1.5)
- Adequacy of Erosion/Corrosion Mitigation Activities (Section 1.6)
- Adequacy of Balance-of-Plant Construction Activities (Section 1.7)
- Review of Inspection Follow-up Items (Section 1.8)

**Significant Observations and Conclusions:**

- The Contractor had accomplished hydrostatic testing, cleaning, and flushing of fire service water piping systems in accordance with established requirements. (Section 1.2)
- With minor exceptions, installation of reinforcement steel and placement of concrete was performed in accordance with approved specifications, procedures, and authorization basis requirements. (Section 1.3)
- Testing of the dowels, to be used in the LAW cold joint, was performed in accordance with the special instructions and applicable American Society for Testing and Material (ASTM) requirements, and actions to prepare the LAW cold joint concrete for eventual concrete placement were being performed in accordance with adequate plans, procedures, and requirements. (Section 1.4)
- The Contractor had acceptably implemented their program for industrial health and safety, with a few minor exceptions, which were promptly corrected during the inspection period. (Section 1.5)

- Activities to upgrade the Potain Tower Cranes to comply with electrical and safety code requirements were being conducted in an acceptable manner. (Section 1.5)

- The Contractor had established and conducted a program for mitigation of erosion/corrosion effects in accordance with specified requirements. (Section 1.6)

- A number of electrical code deficiencies were identified during inspections of high mast lighting, warehouse, and fuel dispensing station construction activities. Most deficiencies were addressed during the inspection period. However, four deficiencies remained unresolved and will be reviewed at a later date. Resolution of these deficiencies is being tracked as Assessment Follow-up Items. (Section 1.7)

- Portions of Fire Alarm Acceptance Testing of the High Level Waste Change House and the Combo Shop were conducted in accordance with the approved procedure and met acceptance criteria. (Section 1.7)

- Hydrostatic Testing of portions of the potable water and sanitary sewer systems were conducted in accordance with procedures and met acceptance criteria. (Section 1.7)

- Pretreatment facility drain piping leak testing was successfully performed. However, the field engineer performing testing on drain piping did not initially have a copy of the test requirements and acceptance criteria in possession before doing the test and was not initially knowledgeable regarding the acceptance criteria. (Section 1.7)

- Two previously identified Findings and one Occurrence Report were closed during this inspection period. (Section 1.8)

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# ON-LOCATION INSPECTION REPORT FOR PERIOD OF OCTOBER 11 THROUGH DECEMBER 4, 2002

## 1.0 REPORT DETAILS

### 1.1 Introduction

This inspection assessed the Contractor's performance of important-to-safety (ITS) recovery activities associated with the Low Activity Waste (LAW) basemat concrete cold joint; installation of forms, reinforcing steel, and embedments; concrete placements; and erosion/corrosion mitigation for conformance with regulatory requirements, specified in the Quality Assurance Manual (QAM), Safety Requirements Document (SRD), design documents, approved work procedures, and committed codes and standards. The inspection also reviewed the Contractor's implementation of firewater piping system construction activities, and aspects of its Industrial Health and Safety program, including observing Contractor and subcontractor worker safety practices.

In addition, this inspection assessed the Contractor's performance of Balance-of-Plant (BOP) work activities not classified as ITS. Specifically, the inspectors examined several installations of temporary power, fire alarm testing, and hydrostatic testing of BOP piping systems for conformance with established industry standards and design requirements.

Details and conclusions regarding this inspection are described below.

### 1.2 Adequacy of Fire Protection Piping System Work Activities (ITP I-138)

#### 1.2.1 Inspection Scope

The SRD, Volume II, Section 4.5, safety criterion required the Contractor to conform with National Fire Protection Association (NFPA) 801, *Standard for Facilities Handling Radioactive Materials*, 1995 Edition. NFPA 801 required conformance with several other NFPA standards, including NFPA-24, *Standard for the Installation of Private Fire Service Mains and their Appurtenances*, 1992 Edition.

The inspectors examined four hydrostatic test packages for conformance with SRD Safety Criteria specified in Volume II, Section 4.5, *Fire Protection*, requirements, observed the conduct of hydrostatic testing on four fire protection piping segments, and observed two piping system flushes to determine whether the activities conformed to NFPA-24 requirements.

#### 1.2.2 Observations and Assessments

The inspectors examined the following documents governing the installation, flushing and cleaning, and hydrostatic testing of the Fire Service Water System:

- 24590-BOF-M6-FSW-00001, *Piping & Instrument Diagram Fire Protection System Fire Water Main Loop System FSW,* Revision 2, dated June 3, 2002.

- 24590-BOF-C2-C12T-00024, *Firewater, Potable Water, Plant Service Air Yard Utility Composite Plan- Area 24,* Revision 2, dated August 29, 2002.

- 24590-BOF-C2-C12T-00016, *Firewater, Potable Water, Plant Service Air Yard Utility Composite Plan- Area 16,* Revision 2, dated August 29, 2002.

- 24590-BOF-C2-C12T-00020, *Firewater, Potable Water, Plant Service Air Yard Utility Composite Plan- Area 20,* Revision 2, dated August 29, 2002.

- 24590-BOF-C2-C12T-00022, *Firewater, Potable Water, Plant Service Air Yard Utility Composite Plan- Area 22,* Revision 2, dated September 9, 2002.

- 24590-BOF-C2-C12T-00015, *Firewater, Potable Water, Plant Service Air Yard Utility Composite Plan- Area 15,* Revision 2, dated September 9, 2002.

- 24590-BOF-C2-C12T-00027, *Firewater, Potable Water, Plant Service Air Yard Utility Composite Plan- Area 27,* Revision 3, dated September 9, 2002.

- 24590-BOF-C2-C12T-00031, *Firewater, Potable Water, Plant Service Air Yard Utility Composite Plan- Area 31,* Revision 3, dated September 10, 2002.

- 24590-BOF-3PS-PZ41-T0001, *Engineering Specification For Underground Fire Protection Piping Mains,* Rev. 3, dated October 14, 2002.

A previous review of the *Engineering Specification For Underground Fire Protection Piping Mains* was documented in the U.S. Department of Energy, Office of River Protection (ORP) Inspection Report IR-02-014. However, this specification had been revised to Revision 3 since the previous review. The inspectors concluded the revised specification and other documents described above continued to conform to the Codes and Standards required by SRD Safety Criterion 4.5 and contained applicable installation requirements to perform the work.

The inspectors examined test packages 24590-WTP-PTR-P-02-0058, Revision 0, *BOF* [Balance-of-Facility] *Areas 16, 20, and 24*; 24590-WTP-PTR-P-02-0071, Revision 0, *BOF Area 22*; 24590-WTP-PTR-P-02-0072, Revision 0, *BOF Area 15*; 24590-WTP-PTR-P-02-0080, Revision 0, *BOF Areas 17, 18, and 21*; and 24590-WTP-PTR-P-02-0077, Revision 0, *BOF Areas 27 and 31*. The inspectors verified proper test boundaries were specified, valve line-ups were proper and thorough, and the required test parameters had been specified. In addition, the inspectors verified the calibration of the pressure gauge was current, the appropriate calibration stickers were affixed, and the gauge range conformed to the requirements established by NFPA, *Standard for the Installation of Private Fire Service Mains and their Appurtenances.*

The inspectors examined the Contractor's Flushing and Cleaning packages 24590-WTP-FTR-P-02-015, Revision 0, *BOF Areas 17, 18, and 22*; and 24590-WTP-FTR-P-02-016, Revision 0,

*BOF Areas 18, and 22*. The inspectors verified the flush boundaries were specified and the valve line-ups were proper and thorough. The inspectors observed the flush of the system, as described in the above referenced packages, and observed the flow rates were the maximum flow rates available to the systems under fire conditions as required by *Engineering Specification For Underground Fire Protection Piping Mains*, Section 6.2. The flow rates were achieved by the use of 2 onsite fire pumps. The flush water was observed to be clean and free of foreign material. The inspectors concluded the flushing and cleaning of the systems were performed in accordance with the Contractor's specifications and referenced codes.

The inspectors observed the conduct of hydrostatic testing on a portion of the fire service water piping in Areas 15, 16, 17, 18, 20, 21, 22, 24, 27 and 31, and verified the hydrostatic testing had been conducted in accordance with the Contractor's established requirements and NFPA 24. The system tests conformed to established requirements regarding leakage and time at pressure.

### 1.2.3 Conclusions

The inspectors concluded the Contractor had accomplished hydrostatic testing, cleaning, and flushing of fire service water piping systems in accordance with established requirements.

## 1.3 Adequacy of Forms, Reinforcement Steel, and Embedded Steel Items and Associated Concrete Placements (ITP I-113)

### 1.3.1 Inspection Scope

The inspectors examined the Contractor's and subcontractor's procedures and engineering technical specifications governing the installation of reinforcement steel, embedment plates, and structural concrete, to determine whether the specified activities conformed to authorization basis (AB) and industry codes and standards, specified in the SRD, Volume II, Safety Criterion 4.1-2. Further, the inspectors examined the installation of reinforcing steel and concrete placement activities in the field to assess whether those activities had been conducted in accordance with Contractor program, procedure, and AB requirements.

### 1.3.2 Observations and Assessments

The inspectors examined the following documents governing the installation and inspection of ITS structural concrete:

- 24590-WTP-3PS-D000-T0001, *Engineering Specification For Concrete Work,* Revision 2, dated July 31, 2002.

- 24590-WTP-3PS-DB01-T0001, *Engineering Specification For Furnishing and Delivering Ready-Mixed Concrete,* Revision 4, dated September 4, 2002.

- 24590-BOF-3PS-C000-T0001, *Engineering Specification For Material Testing Services,* Revision 2, dated July 12, 2002.

- 24590-WTP-3PS-FA01-T0001, *Engineering Specification For Furnishing of Anchor Bolts (Rods),* Revision 1, dated February 5, 2002.

- 24590-WTP-GPP-CON-3203, *Concrete Operations (Including Supply),* Revision 1, dated October 1, 2002.

A previous review of the *Engineering Specification For Furnishing and Delivering Ready-Mixed Concrete* was documented in IR-02-014. However, the specification had been revised to Revision 4 since the previous review. The inspectors concluded the revised specification and the other documents described above continued to conform to the Codes and Standards required by SRD Safety Criterion 4.1.2, and contained the necessary installation requirements to perform the work.

In preparation for a walk down of recently installed reinforcement steel and other components incorporated within the placement, the inspectors examined ten drawings in the areas of concrete reinforcement, forming, and arrangement, and examined construction work activities on the High Level Waste (HLW) and LAW buildings for conformance with the requirements of the applicable drawings. The inspectors concluded the ten drawings were the most current revisions at the time of the walk down.

**Installation of Forms, Reinforcement Steel, and Embedments**

The inspectors witnessed in-process final inspections performed by a Quality Control (QC) inspector on the LAW perimeter wall placement LAW-0011. These inspections included verifying exterior wall reinforcement, embed plates, form configuration, clear cover requirements, splice lengths, joint preparation, and final clean up conformed to applicable drawings and procedure requirements. The inspectors concluded the QC inspector was thorough in verifying applicable reinforcement steel and related components within the placements, and was knowledgeable regarding the applicable specifications. The inspectors performed a general inspection of the above items and other attributes shown on the drawings applicable to the items being inspected. The inspectors concluded the inspections performed by the QC inspector were acceptable and the above attributes conformed to established requirements.

**Concrete Placements**

The inspectors examined Concrete Pour Cards for the placements discussed above, and concluded the required signatures were in place prior to the start of the placements.

The inspectors observed field engineering staff performing concrete receipt activities and observed their review of the batch tickets, as required by Section 3.11.2 of *Concrete Operations (Including Supply).* The inspectors observed a field engineer directing the Material Testing subcontractor to perform additional testing of the delivered concrete to ensure conformance with specification requirements. The inspectors concluded, with the below discussed exception, these activities were performed in accordance with established requirements.

During basemat placement HLW-0005B, a QC inspector observed a concrete truck discharging concrete with a suspect slump and thus requested the testing subcontractor to perform a slump test. The testing subcontractor obtained a sample from the suspect concrete truck and while the testing subcontractor was testing for slump, the concrete from the concrete truck was inadvertently put in the placement. The slump tested at 5-1/4 inches (the requirement was 4 inches plus or minus 1 inch); therefore, the concrete did not conform to the design requirements. The Contractor issued a Non-Conformance Report (24590-WTP-NCR-CON-02-229) for discharging one load of concrete from a concrete truck with too low of slump. Because of the lack of communication with the concrete truck drivers about when to discharge concrete into the hoppers, the Contractor subsequently designated one individual (a field engineer) for each concrete discharge location with the responsibility of ensuring the concrete would meet specification requirements before the concrete is placed to eliminate any further communication problems with the concrete truck drivers. During subsequent placements, the inspectors verified designated field engineers were assigned to each discharge location and were adequately controlling truck discharges.

The inspectors observed the Materials Testing subcontractor field technicians performing concrete receipt activities, observed the review of batch tickets, and observed recording of information required by Section 3.2.1 of the *Engineering Specification for Material Testing Services*. The inspectors concluded these activities were performed in accordance with the specification.

The inspectors examined the conduct of testing for concrete temperature, slump, and unit weight, and observed filling and capping the 6-inch by 12-inch compressive test cylinders, and the field storage of the test cylinders for the placements identified above. The inspectors concluded the Material Testing subcontractor technicians were performing these testing activities in accordance with their procedures, the applicable American Society for Testing and Materials (ASTM) standards, and Contractor's specifications.

The inspectors witnessed the placement of concrete on the LAW perimeter wall placements LAW-0011 and LAW-0013. The inspectors concluded the concrete was being produced, placed, consolidated, and tested in accordance with procedures, specifications, and required codes and standards. During inspections of the placements, the inspectors concluded the Contractor was conforming with the maximum 24 inch lift height, as required by Section 3.7.4 of *Engineering Specification for Concrete Work*. The inspectors observed the 4-foot per hour maximum placement rate, established by the panel manufacturer, was being maintained. This process was being performed by use of a cut-away tremie system, which insured the concrete was being placed in a controlled manner within the wall. The process also ensured the concrete did not exceed the maximum free fall distance, as outlined in Section 3.7.1 of *Engineering Specification for Concrete Work.*

On November 1, 2002, the Contractor determined Engineering had not been performing the design and detailing of reinforcing steel in accordance with AB requirements. The Contractor wrote, and the inspectors examined, Corrective Action Report (CAR) number 24590-WTP-CAR-QA-02-270, *Structural Design Criteria not in compliance with SRD* (CAR 02-270), dated November 1, 2002. The CAR documented design and detailing of reinforcing steel for the HLW and PT buildings had been done, contrary to AB requirements provided by the SRD, in

accordance with American Concrete Institute (ACI) standard 349, *Code Requirements for Nuclear Safety-Related Concrete Structures*, 2001 Edition, Chapter 21 and ACI 318, *Building Code Requirements for Structural Concrete*, 1999 Edition, Chapter 21. The SRD, Appendix C, Section 7.0, required the design and detailing of reinforcing steel be done only by ACI 318, 1999 Edition, Chapter 21, by the statement "Replace Chapter 21 of ACI 349-01 with Chapter 21 of ACI 318-99." The Contractor's engineering organization determined using certain parts of Chapter 21 in both documents was necessary and the SRD restriction was not appropriate.

The Contractor suspended further ITS concrete placements for the HLW and Pretreatment (PT) buildings pending the completion of certain corrective actions. The Contractor issued a Decision-to-Deviate (24590-WTP-DTD-ENG-02-007) on November 15, 2002 (CCN 045045), and specified an Authorization Basis Change Notice (ABCN)would be issued for review by the ORP WTP Safety Regulation Division (OSR) within 30 days of the Decision-to-Deviate. The Contractor had reviewed, by surveillance, issued-for-construction drawings for the HLW and PT buildings for compliance to the design criteria as amended by the Decision-to-Deviate. The Contractor considered the completion of these actions sufficient to release the hold on further HLW and PT concrete placements. The inspectors examined the Decision-to-Deviate and concluded it would, if approved, resolve the issue of performance of design and detailing of the HLW and PT reinforcing steel in a manner not consistent with the as approved SRD. The inspectors reviewed the surveillance (24590-WTP-SV-QA-02-657, *Follow-up for CAR 24590-WTP-CAR-QA-02-270-Items 2 &* 3, dated November 19, 2002) results of the Contractor's review of other HLW and PT drawings and concluded the results supported a decision to resume ITS concrete placement activities in the HLW and PT buildings.

The Contractor modified CAR-02-270, on November 20, 2002, documenting the completion of actions to support the resumption of ITS concrete placement and notified Construction of the release.

In addition, the Contractor specified certain long-term actions to ensure similar problems do not exist in other structural design documents. The inspectors examined these actions and concluded the incomplete actions would not affect the decision to resume ITS concrete placements in the HLW and PT buildings.

The inspectors witnessed in-process final inspections performed by a Contractor QC inspector on the HLW basemat placement HLW-0005B and the PT North Tunnel basemat placement PTF-C-0004A. These inspections included verifying the location of the basemat reinforcement steel and embed plates, form configuration, clear covers requirements, splice lengths, joint preparation, and final clean up conformed to applicable drawings and procedure requirements. The inspectors concluded the QC inspector was thorough in verifying applicable reinforcement steel, and related components within the placements, as well as being knowledgeable regarding the applicable specifications. The inspectors performed a general inspection of the items noted above, and other attributes shown on the drawings applicable to the items being inspected, with the SRD exception noted above. The inspectors identified no discrepancies with the items and concluded the inspections performed by the QC inspector were acceptable.

The inspectors witnessed the placement of concrete on the HLW basemat placement HLW-0005B and the PT basemat placement PTF-C-0004A. During inspections of the placement of

concrete, the Contractor was maintaining the 24-inch lift height as required by Section 3.7.4 of the *Engineering Specification for Concrete Work,* furthermore, the inspectors observed the 4-foot per hour placement rate as outlined from the panel manufacture, was being maintained. The inspectors concluded the concrete was being produced, placed, consolidated, and tested in accordance with procedures, specifications, and required codes and standards.

**Cold-Weather Concrete Placement**

The inspectors reviewed the Contractor's concrete specification and construction procedure (*Engineering Specification for Concrete Work & Concrete Operations)* for code compliance for cold-weather concrete placement. Paragraph 5.3.6.5, "Protection", stated, "Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures, and mechanical injury. Protect concrete during the curing period such that the concrete temperature does not fall below the requirements of 4.2.2.7- Concrete temperature." Paragraph 3.12.4 stated "Maintain the surface temperature of the concrete for 72 hours after completion of the placement in accordance with Table 5. Keep placement temperatures of concrete within 20 degrees F of Table 5." Paragraph 3.10.3.4 stated "The CS [Construction Superintendent] will install the appropriate protection to assure that the surface temperature of the concrete is maintained for 72 hours after completion of the placement in accordance with Table 5 of 24590-WTP-3PS-D000-T0001, Concrete Work."

The inspectors concluded the specification conformed to the codes and standards required by SRD Safety Criterion 4.1.2 and contained the necessary requirements to perform the work.

### 1.3.3 Conclusions

The inspectors concluded the following:

- The Materials Testing subcontractor procedures addressed required codes and standards specified in SRD, Safety Criterion 4.1-2. Concrete testing was performed in accordance with the technical specifications, procedures, and applicable ASTM requirements.

- Reinforcement steel installations and other attributes associated with the concrete placements for the LAW perimeter wall placements LAW-0011 and LAW-0013, HLW basemat placement HLW-0005B, and PT North Tunnel basemat placement PTF-C-0004A were, with one exception, performed in accordance with established procedures, specifications, and drawings. Qualified inspectors were performing QC activities for this work in a thorough manner, and QC activities were documented as required by procedures. One concrete truck was tested based on QC concerns regarding slump; although the slump was out-of-specification, the concrete was inadvertently put in the placement. A non-conformance report (NCR) was written and adequate corrective actions were taken to address communications problems that resulted in the non-conforming concrete being placed.

- Actions taken to resolve the issues regarding design and detailing of reinforcing steel to ensure conformance with the AB requirements were thorough and comprehensive. The

Contractor provided adequate justification for the decision to resume ITS concrete placements.

- Cold weather concrete placement provisions in engineering procedures conformed to the codes and standards required by SRD Safety Criterion 4.1.2 and contained the necessary requirements to perform the work.

## 1.4 Adequacy of LAW Cold Joint Recovery Actions (ITP I-113)

### 1.4.1 Inspection Scope

On July 11, 2002, the Contractor prematurely terminated concrete placement LAW-0001 due to the concrete batch plants' inability to supply concrete at less then or equal to 70°F. This action resulted in an unplanned concrete cold joint. The Contractor issued an NCR and performed a root cause analyses of the event and began taking actions to recover from the event. The original LAW-0001 placement was documented in inspection report IR-02-008[1], Section 1.8. This inspection focused on an interim review of the Contractor's recover actions to prepare the cold joint for future concrete placements. Observations of existing concrete preparation, inspection, and evaluation activities were conducted.

The inspectors examined the Contractor's program and procedures for testing shear dowel pull out tension. This testing was performed to qualify dowels for restoration of design shear strength associated with the LAW basemat cold joint repair. In addition, the inspectors observed portions of the dowel pull out testing to determine whether the testing was conducted in accordance with established requirements.

The inspectors examined the activities of Olson Engineering, Inc., a company that specialized in evaluating placed concrete, during their efforts to test the soundness of the existing concrete at the cold joint location in the LAW basemat. The inspectors inspected the activities of Olson Engineering, Inc. against the codes and standards specified in SRD Volume II and the Contractor's QAM regarding the performance of engineering work, measuring and test equipment qualification, and personnel qualification. In addition, the inspectors examined calculation 24590-LAW-S0C-S15T-00011, *Foundation Basemat Cold Joint Evaluation*, performed to verify the adequacy of the Contractor's planned actions to restore cold joint shear resistance capacity to design levels.

### 1.4.2 Observations and Assessments

The LAW foundation basemat cold joint formed an unfinished concrete surface that resulted from an interruption of the concrete placement. The initial design thickness of the basemat was established to preclude the installation of shear reinforcement. The design was based on the un-

[1] ORP letter from R. J. Schepens to R. F. Naventi, BNI, "Inspection Report IR-02-008 – On-Location Inspection Report for the Period May 24 through July 16, 2002, Including an Assessment of Contractor Readiness to Perform Partial Construction Authorization Activities, 02-OSR-0352, dated August 26, 2002.

reinforced shear capacity of the concrete. The Contractor planned to restore the design shear resistance capacity at the cold joint by both concrete bond and shear friction of newly installed reinforcing steel dowels. Grouting reinforcing steel dowels into the existing concrete cold joint surface would tie the placements together across the interface. In order to ensure performance of the reinforcing steel dowels, qualification testing of the dowels was performed on a test slab constructed to test reinforcing steel dowel pull out capacity. The purpose of the pull out test was to demonstrate the dowels grouted in concrete would develop the full strength of the dowel before concrete failure. A test population of dowels was established utilizing the provisions provided in ACI 355 A1.4, *Evaluating the Performance of Post-Installed Mechanical Anchor in Concrete*. Test results from the test pad were relied on for verification of design assumptions and provided sufficient information to preclude the need to tests dowels within the actual cold joint.

The inspectors examined the following documents governing the tensile capacity testing of the reinforcing steel dowels in the test pad:

- 24590-LAW-SI-C-02-008, S*pecial Instructions for Construction Work Packages,* dated October 10, 2002.

- ASTM E 488, *Standard Test Methods for Strength of Anchors in Concrete and Elements*, 1996 Edition.

The inspectors observed pull out testing of the ten-inch embedded size five reinforcing steel dowels (centered in hole and perpendicular to the surface - five each for various embedded depths). CEL Consulting personnel performed the testing with assistance from Contractor personnel. A hydraulic ram with an electric pump and associated hardware, connected the installed dowels to the calibrated loading and measurement system. Load and displacement were measured using an electronic load cell and linear variable displacement transducer, respectively, and recorded on a computer-based electronic data acquisition system. With the exception of the four-inch embedded dowels discussed below, all ten-inch dowels were loaded to failure between one and three minutes after the initial load application. Contractor QC and Quality Assurance personnel were actively witnessing the testing.

The inspectors examined cone shaped plugs of concrete from the test slab resulting from the pull out testing of dowels embedded at a depth of four-inches, conducted the day before and not witnessed by the inspectors. The concrete failed before the dowels failed, as expected. The grouted dowel pulled a cone-shaped plug of concrete from the test slab. The inspectors visually inspected the plugs and resulting holes to confirm failure mode. The Contractor determined the four-inch dowel embedment depth would not provide the degree of shear strength restoration desired for the cold joint repair. The inspectors agreed with the Contractor's conclusion.

The inspectors examined calculation 24590-LAW-S0C-S15T-00011, *Foundation Basemat Cold Joint Evaluation*, Revision 0, dated November 18, 2002, to determine the technical adequacy of the calculation and whether the calculation had been generated, checked, and approved as required by the Contractor's QAM requirements governing design documents specified in Policy Q-03.1 (Design Control), Sections 3.5 (Design Analysis) and 3.6 (Design Verification). The

inspectors found the calculation was technically adequate and was generated, checked, and approved, as required. In addition, the calculation did not contain any unverified assumptions.

The inspectors examined the following documents relating to impact echo (IE) testing of the LAW cold joint and determined they were technically adequate:

- 24590-LAW-SI-C-02-009, *Special Instruction for Final Impact Echo (IE) Testing on the LAW Cold Joint*, dated November 18, 2002

- Measuring and Test Equipment (M&TE) Calibration Interval Approval Form for Impact Echo Gauge with Test Head number 01080365, Serial number CTG-01, dated November 14, 2002

- Measuring and Test Equipment Calibration Interval Approval Form for Aluminum Test Cylinder, Serial number 0001, dated November 14, 2002

- The completed Employee Training Profile for Olson Engineering, Inc. staff member performing the IE testing

- The Olson Engineering, Inc. report of the Core Test Program Results (transmitted by letter dated November 13, 2002 (Contractor document number 24590-CM-HC4-CY05-00001-03-01, approved for work to proceed by the Contractor's responsible engineer on November 20, 2002).

The inspectors also examined NCR 24590-WTP-NCR-CON-02-093, documenting the existence of the cold joint, and determined the NCR had been updated (November 14, 2002) with an approved interim disposition specifying the preparation and investigation actions necessary to repair the cold joint. The NCR update provided and approved the Olson Engineering instrument calibration instructions, Impact Echo Test Method, and Final non-destructive testing Plan for Concrete Soundness Check. The inspectors concluded the interim disposition provided a thorough plan for preparation of the concrete cold joint surface, investigation of the concrete conditions, and installation of the dowels.

The inspectors concluded the M&TE documentation demonstrated current calibration, the equipment operator had been trained to the Contractor's training requirements, and the Special Instruction had been reviewed and approved by the proper people (i.e.: Lead Civil Field Engineer, Design Engineer, QC inspector, Field QC Manager, Field Engineering Manager, and Olson Engineering, Inc. The inspectors determined the Olson Engineering, Inc. Core Test Program results demonstrated good quality concrete (the concrete conformed to compressive strength requirements and was free of unacceptable voids) and had been reviewed and approved by the Contractor's responsible engineer.

The inspectors witnessed both informal and formal IE testing of the cold joint. The inspectors concluded the testing was being performed in accordance with the test program and methodology specified in the NCR update. Initial, informal IE testing identified some areas where concrete was not sound. The Contractor removed additional concrete in these areas. Following

completion of this removal activity, Olson Engineering, Inc. conducted formal IE testing of the entire cold joint and concluded the concrete was sound and free of unacceptable voids.

### 1.4.3 Conclusions

The inspectors concluded the Contractor had:

- Ensured testing of the dowels in the test slab was performed in accordance with the Special Instructions and applicable ASTM requirements.

- Generated, checked, and approved a technically adequate calculation to determine the adequacy of the methodology planned to restore cold joint shear capacity to design margins, as required.

- Assured M&TE documentation demonstrated current calibration, the equipment operator had been trained to the Contractor's training requirements, and the Special Instruction had been reviewed and approved.

- Demonstrated the concrete in the cold joint area was good quality concrete (the concrete conformed to compressive strength requirements and was free of unacceptable voids) and ensured the Olson Engineering, Inc. Core Test Program results had been reviewed and approved by the Contractor's responsible engineer.

- Provided an interim disposition, which included a thorough plan for preparing the concrete cold joint surface and investigating the concrete conditions.

- Ensured the Impact Echo testing was being performed in accordance with the approved test program and methodology, specified in the applicable NCR update, and the concrete was sound and free of unacceptable voids.

## 1.5 Industrial Health and Safety (IH&S) Oversight (ITP I-161)

### 1.5.1 Inspection Scope

Inspections in this area focused on the Contractor's implementation of the Contract industrial health and safety requirements described in the Office of River Protection Manual (ORPM) M 440.1-2*, Industrial Hygiene and Safety Regulatory Plan for the Waste Treatment Plant Contractor*. Specifically, the inspectors assessed compliance to the requirements of the Contractor's *Non-Radiological Worker Safety and Health Plan*, PL-W375-IS00001, Revision 1, dated March 12, 2001, for the WTP, which had been reviewed and approved by the OSR, along with applicable requirements specified in ORP M 440.1-2. Areas reviewed included trenching and shoring, hoisting and rigging, other operational areas, emergency preparedness, and recording of injuries and illnesses and associated case management.

### 1.5.2 Observations and Assessments

**Trenching/Shoring**

The inspectors examined the Contractor's trenching operations to determine Contractor compliance with excavation permit requirement that all un-shored exposed faces were to be maintained at a slope of 1.75:1. The inspectors observed, and explained to the Contractor, three areas of the trenching operations had slopes that did not conform to the criteria for safe personnel entry. One area was located in a "pot-hole" in the P trench area and two areas were noted in the utilities trench adjacent to the rear of the T-11 facility. All areas were discussed with the Contractor's representative. Another portion of P trench was barricaded with red danger tape awaiting an updated work plan and job hazard analysis. The trench was provided with a trench box. The trench was required to bisect and go under the existing buried electrical casement. The inspectors observed that sloughing had occurred and some significant planning was required to ensure the bisecting trench was constructed in a manner that conformed to 24590-WTP-GPP-SIND-029, *Excavation and Trenching*, Revision 0, dated September 28, 2002. According to the Contractor's representative, the job was put on hold until the Contractor could revise the Job Hazards Analyzes to provide necessary and conforming safety for the workers. The inspectors re-examined the P-trench job on November 7, 2002, and determined the detailed planning and execution allowed for completion of the excavation in a manner that conformed to the Contractor's excavation procedure.

On November 7, 2002, the inspectors also re-inspected all trenches and excavations within the WTP site in the company of the Contractor's Safety Engineer. All trenches and excavations, which were open for personnel access, were sloped in accordance with the existing excavation permits. The inspectors reviewed the manner in which the excavation permits were issued, closed, or held open by the field engineer /competent person. The inspectors reviewed a random selection of daily inspections completed by the competent person and determined they were complete and in accordance with the above referenced procedure.

The inspectors inquired regarding the level and degree of training and experience the competent person had received prior to assuming the position and determined the person possessed a technical degree and had derived on-the-job-training from construction experience. Nevertheless, the inspectors determined the Contractor's competent persons should also attain training in the regulatory safety aspects of excavation and shoring from a knowledgeable entity. 29 CFR 606 specifies the competent person is one who is (in part) capable of predicting hazardous or dangerous situations. Such situational training in prediction can only be derived from mentoring or situational training from another competent individual with extensive experience. The Contractor indicated additional training would be provided by either class room training or mentoring from another competent person.

The trenching and shoring aspects of the construction operation were found to conform to the requirements of the Contractor's procedure.

## Hoisting and Rigging

### Potain Tower Cranes

The Contractor purchased three large French made Potain Model MD 1400 Tower Cranes (Serial No. 90004). These cranes were not Underwriter Laboratory listed or otherwise certified by a Nationally Recognized Testing Laboratory, indicating they met the required electrical and safety standards. Inspectors inspected the cranes and identified and discussed with Contractor management the electrical and safety concerns discussed below.

To address the electrical and safety concerns discussed below, the crane supplier contracted with TUV Rheinland (TUV), a National Recognized Testing Laboratory (NRTL) listed by the Occupational Safety and Health Administration, to inspect the cranes, provide a crane compliance evaluation, and once deficiencies were corrected, certify the cranes meet equivalent code and safety requirements. On November 21, 2002, the inspectors (including the OSR electrical inspector and an OSR industrial health and safety inspector) examined the tower crane as a follow-up of the previous inspections by OSR's electrical inspectors and TUV. This inspection was to assess the adequacy of TUV's assessment and the Contractor's corrective action plan to address the issues.

The inspectors met with the Contractor's equipment superintendent, members of the Contractor's electrical staff, and the tower crane manufacturer's on-site representative. The inspectors inquired into the status of all items from the prior inspections by TUV and OSR electrical inspectors. After the inquiry, the inspectors conducted a physical inspection of the tower crane. The manufacturer's on-site representative and a member of the Contractor's electrical staff accompanied the inspectors throughout the physical inspection of the tower crane.

The inspectors used the following standards as the basis for the inspection:

- NFPA 70 – 2002 National *Electrical Code* (This was used for consistency with TUV's report).
- NFPA 79 – 1997, *Electrical Standard for Industrial Machinery*
- ASME [American Society of Mechanical Engineers] B30.3-1996 with revisions, *Construction Tower Cranes*
- WAC 296-155 *Safety Standards for Construction Work* (WISHA).

In addition to the previously items identified by the OSR electrical inspectors and TUV, eight items were identified for follow-up action:

1. Vertical connection of cables through boots into junction or other electrical boxes did not have provisions for strain relief. This was necessary to prevent tension from being transmitted to terminals (NFPA 70 Article 400.10).

2. The junction box for the main power supply (Legs A, B, and T) did not have an indication of its rating. The suitability of the junction box for this application should be included in the research of the wiring by TUV and verified as appropriate or replaced.

3. Connectors rated 380-415 volts were installed at various locations for 480 volt circuits; this does not meet the requirements of NEC-1999 Article 110.4 which states *"The voltage rating of electrical equipment shall not be less than the nominal voltage of a circuit to which it is connected."*

4. Control panel did not have the required working clearance as described in NEC-1999 Article 610.57, *"The dimension of the working space in the direction of access to live parts that are likely to require examination, adjustment, servicing, or maintenance while energized shall be a minimum of 750 mm (2 ½ ft)."*

5. Power and Control Circuits were installed in the same raceway/bundled together. The suitability of this installation should be included in the research of the wiring by TUV to determine compliance with the requirement of NEC-1999 Article 725.

6. Enclosures were required to be evaluated for equivalent NEMA rating by TUV and an identification label installed on each enclosure (NEC-1999 Article 430.91 *"Enclosure type number shall be marked on the motor controller enclosure.")*

7. Transfer switch (rated 160 amps) with overcurrent protection of 600 amps does not meet the requirements of NEC-1999 Article 110.10 which states: "*The overcurrent protective devices, the total impedance, the component short-circuit current ratings, and other characteristics of the circuit to be protected shall be selected and coordinated to permit the circuit-protective devices used to clear a fault to do so without extensive damage to the electrical components of the circuit."*

8. TUV should determine suitability (either appropriate or need to replace) of internal wiring and transformers during their research.

The Contractor had also previously determined an electrical connector ring was needed to meet the requirements of ASME B30.3.

The items identified below will need to be resolved and verified by the OSR inspectors prior to placing the crane into service. However this will happen over a period of time as the crane assembly is completed and the system is tested.

Preparation of the cranes for construction operations will be performed in three "stages." These stages have different levels of control and, therefore, different risks are associated with each stage. These stages are identified as:

- *Assembly.* During this stage, electrical systems will be energized to perform required tests of the electrical power and control systems and to operate motors to spool the wire rope and reeve the cranes. This work will be done in a controlled environment with appropriate procedures and precautions. Work on the crane would not take place when

adverse weather conditions are present. All items below identified as assembly priority, should be resolved and verified by Contractor staff before energizing the system for assembly tasks.

- *Testing and Certification*. When assembly of the crane is complete the TUV will work with Potain to perform the required tests, which will include operation of hoists under maximum load conditions. Tests will be performed under optimal conditions using established safety procedures. All testing priority items identified below, should be resolved by the Contractor and verified by OSR inspectors prior to testing.

- *Construction Operations*. When the crane is put in to duty for construction operations the crane use will be under the control of the Contractor and subject to site operating procedures. All operations items identified below, should be resolved by the Contractor and verified by the OSR inspectors prior to placing the crane in construction service.

The following table summarizes the identified items, their status, as determined on November 21, 2002, and a risk-based priority for correction. The inspectors determined the Contractor and supplier had a plan for timely corrective action for these items.

| **Item (Initiator)** | **Status** | **Priority** | | |
|---|---|---|---|---|
| | | Assembly | Testing and Certification | Operations |
| Electrical Connector Ring (Contractor) | In procurement | | X* | |
| **Auxiliary Winch Panel** | | | | |
| Plug holes (OSR/TUV) | Incomplete plugs on site | X | | |
| Broken E-stop (TUV) | In transit | X | | |
| Oper. Cabin Panel Schem. (TUV) | Being updated by Potain | | | X |
| Miniature Aux. Host box name plate (TUV) | Incomplete – name plates on site | | X | |
| **General** | | | | |
| Panel Name Plates (TUV) | Incomplete – name plates onsite | | X | |
| Non UL Breakers (TUV) | 80% complete | X | | |
| Lightning Protection (TUV) | Potain researching | | | X |
| E-Stop Painting (TUV) | Not done –work to be done on site | | X | |
| Ground Labels (TUV) | 90% complete | | X | |
| Condensation Heater – Aux. Hoist (TUV) | Not installed | | X | |

| | | | | |
|---|---|---|---|---|
| Wiring identification (OSR) | Incomplete – Potain to research | | X Identification completed | X Labeling completed |
| Strain relief on terminals (OSR) | Newly identified | | X | |
| Verification of Main Power Junction Box Rating (OSR) | Newly identified | | | X |
| Relocation of cables from catwalks (TUV) | Complete | | | |
| Main Disconnect (TUV) | Reported as complete | | | |
| Equipment grounding (TUV) | Complete | | | |
| 415 Volt Connectors used on 480 Volt System (OSR) | Unresolved | | X | |
| Control Panel working clearance less then required (OSR) | In progress by Contractor | | X | |
| Power and control circuits installed in same raceway (OSR) | Unresolved | | | X |
| Enclosure not rated/identified (OSR) | Unresolved | | | X |
| Transfer with rated 160 Amps – protected at 600 Amps (OSR) | In progress by Contractor | | X | |
| Transformers not approved (TUV) | Unresolved | | | X |

* The conductor ring may be installed after start of operations. However, if it not UL listed, it must be approved by TUV. Further, during the period that the crane is operational (without the conductor ring), certain Contractor procedures must be in place to protect the conduit.

In addition to the electrical issues discussed above, the Contractor's Senior Safety Engineer determined and evaluated several industrial safety design violations (29 CFR 1926.1053, Ladders) in the ladder-way system for the Potain tower cranes. The design violations were observed and inspected by the inspectors with the Contractor's representative. The items observed were as follows:

- 29 CFR 1926.1053 states ladder rungs will be designed to minimize slipping. Some rungs were observed tightly abutted to horizontal support members of the boom, effectively creating a larger outside rung diameter than allowed in American National Standards Institute (ANSI) A.134 and creating a potential slipping hazard.

- 29 CFR 1926.1053 states a minimum perpendicular clearance between fixed ladder rungs and any obstruction behind the ladder shall be at least 7". Some rungs within the

transition area of the boom had only 2.5" of clearance.

- 29 CFR 1926.1053(a)(14)&(15) states the minimum perpendicular clearance between the center-line and any obstruction on the climbing side of a ladder shall be 30," except where a deflection device is provided where it can be reduced to 24." The free clearance, within the transition area of the boom, was measured to be 21." During a subsequent inspection, the inspectors observed the clear distance was even less as some rungs had been moved away from obstructions. In addition, in some cases the minimum clear width from the centerline of the rung to obstructions was less than the16" required by 29 CFR 1926.1053(a)(4)(i).

- The landing hatch covers above the transition area were required to be pushed open onto the platform floor before ascent and grabbed from the floor of the platform and closed during descent. This practice placed the climber in an awkward position (requiring the climber to face partially away from the ladder, which did not conform to 29 CFR 1926.1053(b)(20) which states the person shall face the ladder.

To address the first issue, the Contractor took prompt action to increase the free space of some rungs. However, the action taken by the Contractor to date had not resulted in conformance to the requirements of ORP M 440.1-2. ORP M 440.1-2, Section 3.3, Variance Procedure, provides the Contractor with a means to request a variance for contractually prescribed IH&S requirements. The Contractor was informed of this provision and instructed to either comply with the IH&S requirements or process variance requests as needed. The Contractor immediately implemented the requirement to utilize fall restraint when employees use the portion of the ladder that is non-conforming. They plan to investigate the problem and determine if engineering solutions are available or if a variance request should be considered. In the mean time, the Contractor committed to continue to implement fall restraint requirements in the area in question.

**General Industrial Safety**

The inspectors walked down LAW, HLW, and PT facility construction areas. The purpose of the walkdown was for the inspectors to gain current operational knowledge and observe for safe work practices. The inspectors determined observed work practices were conforming to the applicable Contractor procedures. The inspectors attended a toolbox meeting conducted by the ironworkers' foreman at the HLW construction site. The foreman discussed the requirements for hearing protection at the site and responded to workers questions.

The inspectors accompanied the Contractor's safety and health representative on an inspection of the warehouse construction site, the direct hire craft conex shops, and other miscellaneous areas. The inspectors and the safety and health representative noted subcontractor personnel were not all wearing required eye protection, were using a scaffold that had not been inspected in five days from the date of inspection (inspections required each day prior to use), were using a damaged sledge hammer, and were working in close proximity to a breaker box that had exposed leads and terminals.

A subcontractor worker informed the inspectors the panel was not energized at the time of the inspection. However, the same worker informed the inspectors the panel could become energized. Upon further investigation by the Contractor's safety and health representative, the inspectors were informed this panel had not been energized during the period the inspectors were in the area.

The Contractor's safety and health representative contacted the subcontractor management to correct or resolve the noted deficiencies. The issues noted above were resolved and the inspectors determined the subcontractor was conforming to the Contractor's procedures.

General housekeeping in the craft conex shops was good with the exception of one area. In one conex, excess material and junk had accumulated. The Contractor's foreman indicated crews were preparing to clean the area. Upon revisiting the conex, the inspectors determined the debris had been removed and housekeeping had improved and conformed to Contractor procedures.

The inspectors noted the Contractor had fabricated work platforms and brackets for retrieval winches for personnel extraction while performing maintenance and operations within manholes. The fabricated platforms had drawing numbers marked on each and were equipped with a winch for personnel retrieval. Through inspection of the platforms and by discussions with the Contractor's general foreman, the inspectors validated platform anchorage and installation of the retrieval system conformed to the manufacturer's specifications and requirements.

The inspectors noted a worker had contacted an industrial hygienist for replacement respirator cartridges. The industrial hygienist checked the workers training and qualification card and then issued the new cartridges from a clean and controlled storage area. This noted practice demonstrated conformance with sound industry practice and the Contractor's procedures.

**Emergency Preparedness**

On July 30, 2001, ORP issued a letter[2] to the Contractor informing the Contractor of the ORP's intent to issue a Contract change that would require the Contractor to develop and implement a Construction Emergency Response Plan compliant with applicable requirements of the *Hanford Emergency Management Plan*, DOE/RL-94-02, and the operational emergency and abnormal event reporting requirements of HFID 232.1B, *Notification and Reporting of Operational Information.* This letter contained as an attachment, requirements for the Construction Emergency Response Plan to comply with HFID 232.1B and DOE/RL-94-02, provided the construction site met the definition of an Administrative Facility. On September 24, 2001, ORP issued a letter[3] instructing the Contractor to implement this Contract change. The Contractor prepared and the ORP reviewed 24590-WTP-GPP-SIND-019, *Emergency Management Program*, Revision 1, and 24590-WTP-GPP-SIND-003, *Emergency Action Plan*, Revision 1,

[2] ORP letter from C. B. Reid to R. F. Naventi, BNI, "Clause I.82, 'Changes – Cost Reimbursement – Alternate III;' Clause I.117, 'Laws, Regulations, and DOE Directives;' and Section J, Attachment E, 'List of Applicable Directives,' (List B)," 01-OSR-0280, dated July 30, 2001.
[3] ORP letter from M. K. Barrett to R. F. Naventi, BNI, "Clause I.82, 'Changes – Cost Reimbursement – Alternate III," 01-AMIC-228, dated September 24, 2001.

both dated September 27, 2001. ORP determined the above program and plan met Contract requirements. This review was documented in inspection report IR-01-004.[4]

During this inspection, the inspectors reviewed 24590-WTP-GPP-SIND-019-01A, *Emergency Management Program*, Revision 1A with amendments, and 24590-WTP-SIND-003-01A, *Emergency Action Plan,* Revision 1A with amendments, both dated March 5, 2002. The inspectors determined the revised program and plan continued to comply with the contractually required emergency preparedness requirements described above.

The inspectors reviewed the Occupational Health subcontractor's protocols and program for emergency response, examined their inventory of emergency support equipment, and interviewed the subcontractor's supervisory representative. No concerns were identified.

The inspectors reviewed emergency preparedness surveillance 2450-WTP-SV-QA-02-059, performed by the Quality Assurance organization to determine compliance with the emergency management program and plan described above. A compliance deficiency was identified and documented in a Corrective Action Request (CAR) Number 24590-WTP-CAR-QA-02-071 regarding failure of the site alarm to operate. Open items noted in the surveillance and the CAR were adequately addressed and closed.

The inspectors verified specific requirements within the Contractor's emergency management program and plan were being performed, such as; independent third party assessments, a formal critique of each drill, the recording of open items and subsequent closure, and updating the hazard assessment based upon progress and changes on the construction site. The Hanford fire department had sent emergency response personnel and vehicles to the site regularly, so they would be knowledgeable of the site layout and capable of quick and unabated response. The onsite Occupational Health subcontractor's procedures required medical personnel to respond to any serious incident on site and provide immediate patient care while awaiting the arrival of the fire department.

Based upon a review of the documents and verification of emergency preparedness actions described above, the inspectors determined the emergency preparedness activities for the current phase of construction were being implemented in accordance with the Contractor's emergency management program and plan, and conformed to contractually mandated emergency preparedness requirements.

**Recording of Injuries and Illnesses and Case Management**

On August 9, 2002, the inspectors evaluated the Contractor's management of injured or restricted workers against the newly issued 29 CFR 1904, *Occupational Injury and Illness Recording and Reporting Requirements*. Case management is not defined within the above referenced Code of Federal Regulation. However, it is a commonly used term in industry that describes how injured or ill workers are cared for by their employers and how the medical staff

[4] ORP letter from R. C. Barr to R. F. Naventi, BNI, "Phase A, Limited Construction Readiness Inspection Report, IR-01-004, 01-OSR-0391, dated October 23, 2001.

and employer's management interact to foster the workers timely return to work. The inspectors reviewed the Contractor's Occupational Safety and Health Administration (OSHA) 300 log (the log), which was the official record for entry of serious injuries or accidents. The inspectors interviewed the Contractor's safety and health staff responsible for maintaining the log as well as the supervisor of the Occupational Health subcontractor who managed the first aid station and assisted in the care of the seriously injured. The inspectors examined the Contractor's record-keeping practices of restricted cases on the OSHA 300 Log as they applied to specific requirements within 29 CFR 1904.7 *General Recording Criteria*. The inspectors specifically examined the Contractor's decision logic used for "lining out" originally entered restricted injury cases. The evaluation required the health care professional to review medical histories of cases, coupled with discussions with the personnel responsible for maintaining the log.

Based upon the above, the inspectors concluded the case management practices for injured workers were being managed in accordance with 29 CFR 1904 and the recording practices within the Log were in conformance with the specific requirements of 29 CFR 1904.7.

### 1.5.3 Conclusions

The inspectors concluded, with the exception of a few minor instances, the Contractor had acceptably implemented the program for industrial health and safety. With the exception of the Tower Crane issues described above where work is ongoing, identified discrepant conditions were promptly and acceptably corrected and the inspectors determined the Contractor had met the applicable requirements of ORP M 440.1-2.

## 1.6 Adequacy of Erosion/Corrosion Mitigation Activities (ITP I-123)

### 1.6.1 Inspection Scope

This inspection assessed the Contractor's performance of implementation of Appendix H of the SRD, "Ad Hoc Implementing Standard For Erosion/Corrosion and Assessments" (Implementing Standard). The Implementing Standard required the Contractor to document on a Material Selection Data Sheet the assumed process chemistry conditions for ITS components. The Implementing Standard also required a Corrosion Evaluation (CE) be performed for all ITS components potentially subject to corrosion and erosion phenomena. The CE must provide corrosion analyses, material selection, corrosion allowance, and operating limitations. The inspectors interviewed Contractor staff involved in preparing CEs and reviewed a sampling of CEs for consistency with the requirements described in the Implementing Standard.

### 1.6.2 Observations and Assessments

The inspectors examined the Contractor's documentation associated with the evaluation of corrosion/erosion as required by the Implementing Standard. The Contractor did not have implementing procedures for this standard.

The Implementing Standard required CEs be performed for ITS systems components. The CEs documented the evaluation of the identified process chemistry on potential materials, they provide recommended material and corrosion allowances, and they were being used by the design engineers in developing a mechanical system data sheet (MDS), which specifies material for construction of components. The inspectors reviewed a sample of these documents to determine whether the process described in the Implementing Standard was followed in preparing CEs. There were three documents used in the development of CEs:

- Material Selection Data Sheets (MSDS): These documents provided information from process engineering. They contained system specific information such as mass balance calculations, composition of chemical components, and other system specific information such as temperature, pH, and flow velocities.

- Materials Selection Reports (MSR): The MSRs documented the process for material selection and provided some of the limits and considerations in selecting materials. Also, it provided details regarding the different types of corrosion and provided guidance for performing corrosion evaluations.

- Material Selection Guides (MSG): The MSGs were facility scope process flow diagrams, where the specific type of material was indicated for each pipe, tank, or component. The material indicated on these guides came from the CEs, and depicted an overview of the use of materials. They provided an indication of the expected materials based on the process chemistry at a particular location in each facility.

The inspectors observed the MSDSs were attached to each CE. The information contained on the MSDSs reviewed was found to be consistent with that required by the Implementing Standard because they contained information necessary to perform CEs such as temperature, pH, chemical composition, flow rates, and mass balance data.

The inspectors reviewed the MSRs for consistency with the requirements of the Implementing Standard. The MSRs identified construction materials predicted to be compatible with expected process reactants as described on the MSDSs for the design lifetime of the plant. The MSRs also provided a description of the basic corrosion processes and described the results of corrosion tests and field tests that define the ranges of concentrations of reactants and the conditions of temperature that limit the applications for each candidate alloy. The characteristics and resistance of each alloy to the different types of corrosion during exposure to the expected reactants, as described on the MSDSs, were addressed in the MSRs and were found consistent with methods of determining corrosion/erosion allowance as presented in *Suggested Good Practice Regarding Corrosion Allowance* (Implementing Code: ASME Section VIII, *Boiler and Pressure Vessel Codes*, Appendix E) and *Pressure Design of Components* (Implementing Code: ASME B31.1, *Process Piping*, Section 304).

As CEs were completed, the materials specialist compared the results to the MSGs to ensure their results were consistent with other components in the immediate vicinity. Review of the MSGs and discussions with corrosion specialist staff concluded they provided a useful tool to

ensure consistency of material selection at every point in the process, and support the overall requirements of the Implementing Standard to ensure appropriate materials are selected.

The Implementing Standard stated the CE was prepared by a metallurgist and checked by a corrosion specialist. The inspectors' review of the sampled CEs determined this preparation and review requirement was being followed. There were two individuals currently involved in performing the CEs, one did the evaluation and the other check it. Both individuals had appropriate corrosion and metallurgical experience and training. The Implementing standard further stated the CE recommendations, particularly those affecting the operation of the facility, were reviewed by Operations, and the CE was further reviewed by a materials and engineering technology specialist and by a corporate materials specialist. The inspectors determined these reviews were taking place as each CE was accepted by Operations and by a materials and engineering technology specialist. Concurrence by the corporate materials specialist did not appear on the CEs, but was occurring telephonically according to Contractor staff.

The inspectors examined 11 CEs during this inspection, listed below. These CEs were reviewed to determine if the appropriate materials were recommended in the CEs based on requirements of the Implementing Standard.

| **Corrosion Evaluations Reviewed by Inspectors** | | |
|---|---|---|
| **Component Designation*** | **Description** | **CE Number** |
| HCP-VSL-00001 & HCP-VSL-00002, V31001 & V31002, System HLW-HCP (110) | HLW Concentrate Receipt Vessel | 24590-HLW-N1D-HCP-00003, Revision 0 |
| HFP-VSL-00001 V31101, System HLW HFP (131) | HLW Feed Preparation Vessel | 24590-HLW-N1D-HFP-00003, Revision 0 |
| HFP-VSL-00002 V31102, System HLW-HFP (131) | Melter Feed Vessel | 24590-HLW-N1D-HFP-00004, Revision 0 |
| **HOP-VSL-00903 (HLW)** | SBS Condensate Vessel | **24590-HLW-N1D-HOP-00009, Revision 2** |
| LCP-VSL-00001, LCP-VSL-00002 & LCP-VSL-00003 V21001 & V21002 & V21003, System LAW-LCP (110) LAW | Concentrate Receipt Vessel | 24590-LAW-N1D-LCP-00001 |
| PWD-VSL-00044, V15009A, System PT-PWD (550) | Plant Wash Vessel | 24590-PTF-N1D-00001, Revision 0 |
| **PWD-VSL-00033 (PTF)** | **Ultimate Overflow Vessel** | **24590-PTF-N1D-PWD-00005, Revision 1** |
| **PWD-VSL-00046 (PTF)** | **C3 Area Floor drains Collection Vessel** | **24590-PTF-N1D-PWD-00006, Revision 1** |
| **RLD-VSL-00004 V25002, System LAW-RLD (510)** | **Drain/Sump Collection Vessel** | **24590-LAW-N1D-00001, Revision 2** |
| RLD-VSL-00007 V35002, System HLW RLD (510) | Acid Waste Vessel | 24590-HLW-N1D-RLD-00001, Revision 0 |
| RLD-VSL-00008 V35003, System HLW RLD (510) | Plant Wash and Drain Vessel | 24590-HLW-N1D-RLD-00006, Revision 0 |

*Systems out for bid are in bold font

The CE for each system provided the technical assessment and summary of the effects of the reactants and conditions described on the MSDS. The CE included an assessment of General Corrosion based on results cited from a list of References. The least expensive alloys with predicted corrosion significantly less than the corrosion allowance were recommended. Results of DOE sponsored independent lab tests, not included in the CE References, were used to verify the conservatism of the predicted corrosion.

The inspectors were concerned that continuous operation of Vessel RLD-VSL-00004 at the bounding low pH and chloride levels listed on the MSDS could potentially challenge the 40 mil corrosion allowance for 316L stainless steel. Contractor staff re-reviewed the application of 316L stainless steel for Vessel RLD-VSL-00004 and determined it was acceptable because operation of the vessel at the bounding low pH would be infrequent, the limited amounts of solution present during operation at the low pH could be held within the confines of the more corrosion resistant bottom shell, the presence of nitrates not listed on the MSDS would reduce corrosion, and the wall thickness of Vessel RLD-VSL-00004 provided an actual corrosion allowance of 70 mils. The inspectors concurred with the Contractor's conclusions.

Because the applied stresses on the vessels (internal pressures) were low, stress corrosion cracking was not expected to be a limiting type of corrosion. Where other corrosion types raised concerns, special design considerations, such as low flow velocity and baffles, were included in the design to control erosion and wear. Where possible, crevices were limited to reduce crevice corrosion. To reduce microbiologically induced corrosion, periodic flushing by operations was specified. Based on the results of the review, the inspectors concluded the Contractor's choice of materials, recommended in the CEs, was acceptable.

The Implementing Standard required CEs be performed for ITS systems components and components be selected consistent with the recommendations of the CEs. The CEs must be completed prior to the components being procured so their recommendations could be reflected in the MSDS, which specify material requirements to the vendor. The inspectors reviewed several MDS of the ITS items that had gone out for bid to determine if the CEs had been performed on the items and if the MDS were consistent with the CEs. The inspectors also reviewed the status of other completed CEs.

The inspectors determined approximately 70 CEs had been completed for ITS systems. Of these 70, 10 systems had been sent out for bid. Some of the approved CEs still had open items needing to be addressed. Of the sample of CEs reviewed by the inspectors that were out for bid, none had remaining open items. Contractor staff indicated open items would be resolved before the systems were sent out for bid.

After a CE was prepared, an MDS was prepared which specified the materials for construction of components to the vendor. According to Contractor staff, a corrosion specialist was to review and concur on the MDS to ensure the material specified was consistent with the recommendations of the CE. Six MDS were reviewed and compared with their associated CEs. The six MDS reviewed by the inspectors are listed in the table below. In each case the material specifications contained in the MDS were found to be consistent with the recommendations of the associated CEs; however, there was no indication a corrosion specialist had reviewed or concurred in the material specifications on the MDS.

| Mechanical Data Sheets reviewed by inspectors | | |
|---|---|---|
| **Component Designation & Description** | **MDS Number** | **CE Number** |
| HCP-VSL-00001 & HCP-VSL-00002, V31001 & V31002, System HLW-HCP (110)<br>HLW Conc. Receipt Vessel | 24590-HLW-MV-HCP-VSL-00001 & -00002 | 24590-HLW-N1D-HCP-00003, Revision 0 |
| HFP-VSL-00001 V31101, System HLW HFP (131)<br>Feed Preparation Vessel | 24590-HLW-MV-RLD-VSL-00001 | 24590-HLW-N1D-HFP-00003, Revision 0 |
| HFP-VSL-00002 V31102, System HLW HFP (131)<br>Melter Feed Vessel | 24590-HLW-MV-RLD-VSL-00002 | 24590-HLW-N1D-HFP-00004, Revision 0 |
| HOP-VSL-00903 (HLW)<br>SBS Condensate Vessel | 24590-HLW-MV-HOP-VSL-00903 | 24590-HLW-N1D-HOP-00009, Revision 2 |
| RLD-VSL-00007 V35002, System HLW RLD (510)<br>Acid Waste Vessel | 24590-HLW-MV-RLD-VSL-00007 | 24590-HLW-N1D-RLD-00001, Revision 0 |
| RLD-VSL-00008 V35003, System HLW RLD (510)<br>Plant Wash & Drain Vessel | 24590-HLW-MV-RLD-VSL-00008 | 24590-HLW-N1D-RLD-00006, Revision 0 |

### 1.6.3 Conclusions

The inspectors concluded the following:

- The information contained on the MSDS reviewed was found to be consistent with that required by the Implementing Standard. The approach described by the MSR for determining appropriate alloys was found to be acceptable and generally consistent with industry practice for determining corrosion/erosion allowance (Implementing Code: ASME Section VIII, *Boiler and Pressure Vessel Codes*, Appendix E, *Suggested Good Practice Regarding Corrosion Allowance* and Implementing Code: ASME B31.1, *Process Piping*, Section 304, *Pressure Design of Components*). The Contractor's process for conducting CEs, while not controlled by an implementing procedure, was consistent with the requirements of the Implementing Standard.

- The CE summarized the corrosion expected for each candidate alloy. The lowest cost alloy with an acceptable margin within the corrosion allowance was considered to be acceptable. The expected corrosion for the recommended materials under the assumed conditions was consistent with corrosion results from independent DOE laboratory test reports. Design considerations reduced factors that might enhance localized corrosion. The inspectors concluded the Contractor's choice of materials, recommended in the CEs, was acceptable.

- CEs for those items that had been sent out for bid were complete and all CE open items had been addressed. For the MDS reviewed, the material specifications contained in them were consistent with the associated CEs. While only approximately 10 ITS systems had been sent out for bid, approximately 70 CEs had been completed on ITS systems at the time of the inspection.

- The Contractor had established and implemented a program for mitigation of erosion/corrosion effects in accordance with specified requirements.

## 1.7 Adequacy of BOP Construction Activities (ORP M 414.1-4)

### 1.7.1 Inspection Scope

The inspectors reviewed selected balance-of-plant (BOP) construction activities to determine if the Contractor was performing these activities in accordance with the Contractor's QAM, approved design, technical specifications, construction procedures, work packages, and other related documents.

### 1.7.2 Observations and Assessments

**High Mast Lighting**

The inspectors examined High Mast Lighting Pole number HM-7, located per drawing 24590-BOF-C2-50-00002, *RPP-WTP Yard Lighting Location Plan, Revision 0,* dated May 9, 2002, for compliance to the 1999 National Electrical Code specified in Paragraph 2 of 24590-WTP-3PI-E000-00001, *Engineering Specification for Electrical Bulk Materials*, Revision 2, dated October 18, 2002. Temporary Generator RL53-018 powered the HM-7 Pole. The inspectors examine the generator terminations, 30-amp disconnect installation, 30-amp breaker box located inside of light pole, and grounding. The following electrical code deficiencies were identified:

- NEC-1999 Article 310-12(c) requires *"Conductors that are intended for use as ungrounded conductors, whether used as a single conductor or in multiconductor cables, shall be finished to be clearly distinguishable from grounded and grounding conductors."* The Contractor had installed unidentified white ungrounded conductors.

  The inspectors discussed this deficiency with Contractor electrical field engineers and the Contractor subsequently labeled the ungrounded conductors. This resolved this issue.

- NEC-1999 Article 110-14(a) requires "*Terminals for more than one conductor and terminals used to connect aluminum shall be so identified."* The Contractor had two equipment grounding conductors installed under a lug listed for one conductor in the 30-amp disconnect.

  The inspectors discussed this deficiency with Contractor electrical field engineers and the Contractor subsequently installed each grounding conductor under separate lugs. This

resolved this issue.

- NEC-1999 Article 400-10 requires "*Flexible cords and cables shall be connected to devices and to fittings so that tension is not transmitted to joints or terminals."* The Contractor had installed SOW cord on the load-side of the 30-amp breaker box without strain relief; the terminations were supporting the cable.

  The inspectors discussed this deficiency with electrical field engineers and the Contractor subsequently provided the required strain relief. This resolved this issue.

- Contractor instruction *General Requirements for Grounding Portable and Vehicle Mounted Generators, Light Plants, Welders and Metal Structures* provided applicable requirements for grounding portable and vehicle mounted generators. The instruction required "*All generators that are rated over 5,000 watts, used to supply power to any temporary, permanent, portable or fixed equipment or structure(s), will require two grounding electrodes (driven ground rods) at the generator."* The Contractor had not grounded the generator.

  The inspectors discussed this deficiency with electrical field engineers and the Contractor subsequently removed the generator. This resolved this issue.

- The *Engineering Specification for Electrical Bulk Materials,* Paragraph 3.1 required *"All electrical components, devices, and accessories included in this specification shall be UL listed and labeled as defined in NFPA 70, Article 100."* There was no listing/label on the 30-amp breaker box.

  The inspectors discussed this deficiency with electrical field engineers and the Contractor was researching this issue at the end of the inspection period. This item will be tracked as assessment follow-up item A-03-OSR-RPPWTP-001-A01.

**Warehouse Electrical Inspection**

Prior to energizing, the inspectors examined the following electrical equipment for compliance with the 1999 National Electrical Code required by specification *RPP WTP Field Construction Warehouse,* Section 16010, Paragraph 1.2, dated November 13, 2002. This equipment was installed by Power City Electric in the Field Construction Warehouse (T-13):

- Main Distribution Panelboard – MDP (1200 amp main)
- 75 KVA Transformer – XFMR 1
- Lighting Panelboard – L1 (150 amp main)
- 50 KVA Transformer – XFMR 2
- Panelboard – TC1 (200 amp main).

For the above listed equipment the inspectors examined items such as conductors, terminations, overcurrent protection, grounding requirements and workmanship. With the exceptions listed

below, the inspector determined the equipment met the requirements of the National Electrical Code.

- Transformer XFMR-1 did not comply with the referenced code. The equipment grounding conductor, routed with the secondary conductors from the transformer to lighting panelboard – L1, is required to be a #4 AWG as per National Electrical Code Article 250-30(a)(1) and Table 250-66. A #6 AWG equipment grounding conductor was installed as specified in Power City Electric Drawing *WH-E-01*, *Electrical Notes, Legend and Schedules,* Revision 0, dated April 5, 2002.

  The inspectors discussed this deficiency with electrical field engineers and the Contractor subsequently corrected the deficiency. The inspector verified the #6 AWG conductor was replaced with a #2 AWG conductor. Power City Electric Drawing *WH-E-01*, *Electrical Notes, Legend and Schedules* was being redlined to reflect this change. This resolved this issue.

- Transformer XFMR-2 also did not comply with the referenced code. The equipment grounding conductor routed with the secondary conductors from the transformer to lighting Panelboard – TC1, is required to be a #4 AWG as per National Electrical Code Article 250-30(a)(1) and Table 250-66. A #4 AWG equipment grounding conductor was also required per Power City Electric Drawing *WH-E-01*, *Electrical Notes, Legend and Schedules,* Revision 0, dated April 5, 2002. However, the Contractor installed a #6 AWG equipment-grounding conductor.

  The inspectors discussed this deficiency with electrical field engineers and the Contractor subsequently corrected the deficiency. The inspectors verified the Transformer XFMR-2 equipment-grounding conductor routed to Panelboard TC1 was replaced with a #4 AWG conductor. This resolved this issue.

**Fuel Dispensing Station**

The inspector examined the electrical equipment for the Fuel Dispensing Station (Reference Field Sketch FSK No. 24590-BOF-FSK-CON-T-02-002, Revision 0, dated October 8, 2002) located north of Warehouse T-13, for compliance to the 1999 National Electrical Code as required by the *Waste Treatment Plant Specification for Electrical Bulk Materials and Services*. The inspector examine the 480-volt 30-amp disconnect, 25-KVA single-phase transformer, 60-amp 3-pole fused emergency shutoff disconnect switch, and 120/240-volt 100-amp three-phase Panelboard. With the following exceptions, the installation met the National Electrical Code requirements:

- NEC-1999 Article 250-32(b)(1) requires *"An equipment grounding conductor as described in 250.118 shall be run with the supply conductors and connected to the building or structure disconnecting means and to the grounding electrode(s). The equipment grounding conductor shall be used for grounding or bonding of equipment, structures, or frames required to be grounded or bonded."* The Contractor did not connect the equipment-grounding conductor to the grounding electrode as required.

The inspectors discussed this deficiency with electrical field engineers and the Contractor was researching this item. This item will be tracked as assessment follow-up item A-03-OSR-RPPWTP-001-A02.

- NEC-1999 Article 240-22 requires *"No overcurrent device shall be connected in series with any conductor that is intentionally grounded, unless one of the following two conditions is met: (1) The overcurrent device opens all conductors of the circuit, including the grounded conductor, and is designed so that no pole can operate independently. (2) Where required by 430.36 or 430.37 for motor overload protection."* The Contractor had fused the neutral (grounded conductor) in the emergency shutoff switch.

  The inspectors discussed this deficiency with electrical field engineers and the Contractor jumpered the #4 AWG grounded conductor (rated 70 amps) with a #8 AWG conductor (rated 40 amps). The inspectors reviewed this change and informed the electrical field engineers that this was not acceptable because it did not resolve the code requirement. The Contractor was reviewing this situation at the end of this inspection period. Follow-up on this issue will be also be tracked as Assessment Follow-up Item A-03-OSR-RPPWTP-001-A02

- NEC-1999 Article 310-15(b)(2) requires *"Where the number of current-carrying conductors in a raceway or cable exceeds three, the allowable ampacity of each conductor shall be reduced as shown in Table 310.15(B)(2)(a)."* The Contractor installed 13 current carrying conductors in 1" rigid conduit routed from the panelboard to the fuel station without applying the 50% adjustment factor.

  The inspectors discussed this deficiency with electrical field engineers and the Contractor replaced the 20-amp circuit breakers with 15-amp breakers to meet the above requirement. The inspectors verified these actions were completed. This resolves this issue.

- NEC-1999 Article 110-3(b) requires "*Listed or labeled equipment shall be installed and used in accordance with any instructions included in the listing or labeling."* The Contractor had installed a 208/120-volt three-phase four-wire panelboard as a 120/240-volt single-phase, three-wire panelboard.

  The inspectors discussed this deficiency with electrical field engineers and the Contractor was researching this item. Follow-up of this item will also be tracked as Assessment Follow-up Item A-03-OSR-RPPWTP-001-A02.

**Fire Alarm Acceptance Test**

The inspector observed the conduct of portions of Fire Alarm Acceptance Test Procedure, 221022 (Subcontract Submittal number 24590-CM-HC1-UA11-00001 dated May 7, 2002, for the HLW Craft Change House and the Combination Shop, performed by Siemens Building Technologies and Power City Electric, and witnessed by Grant Construction Company. The installer, test personnel and witnesses were knowledgeable in the requirements of the ATP and

contract requirements. The tests were successfully performed in accordance with the procedure requirements.

The inspectors also observed portions of Fire Alarm Acceptance Procedure – 221018 (Subcontract submittal #24590-CM-HCI-UA11-00001, dated May 7, 2002) for the Warehouse, performed by Siemens Building Technologies and Power City Electric, and witnessed by Grant Construction Company. The installer, test personnel and witnesses were knowledgeable in the requirements of the ATP and contract requirements. The test was successfully performed in accordance with the procedure. However, the Synchronization of the alarms and lights were not functioning correctly, this portion of the ATP will be re-tested and verified after the Contractor corrects this problem.

**Hydrostatic Pressure Testing of PVC Potable Water Piping**

The inspectors examined the hydrostatic test package and observed the conduct of hydrostatic testing on one PVC Potable Water Piping segment to determine whether the testing conformed to the documents described below, and established requirements in the engineering specifications listed below.

The inspectors examined the following documents governing the installation and testing of the PVC Potable Water System:

- 24590-BOF-3PS-PX12-T0001, *Engineering Specification For PVC Potable Water Piping Installation,* Revision 2, dated March 3, 2002

- 24590-BOF-M6-DOW-00001, *Domestic Water System Domestic Water Distribution,* Revision 1, dated February 2, 2002.

The inspectors examined test packages 24590-WTP-PTR-P-02-0068, Revision 0, *BOF Areas 16, 17, 20, and 24 Trench A & E*; and 24590-WTP-PTR-P-02-0082, Revision 0, *BOF Area 19*, and verified the proper test boundary's were specified, valve line-ups were thorough, and the required test parameters had been specified. The test packages contained the requirements of the above listed specifications and referenced codes. The inspectors verified the calibration of the pressure gauge was current, and the appropriate calibration sticker was affixed.

The inspectors observed the conduct of hydrostatic testing on a portion of the potable water piping in areas 16, 17, 19, 20, and 24 Trench A & E, and verified the hydrostatic testing had been conducted in accordance with the Contractor's established requirements and AWWA C605 (94)**,** *Underground Installation of Polyvinyl Chloride (PVC) Pressure Pipe and Fittings for Water*, dated July 1, 1995. The system tests conformed to established requirements regarding leakage and time at pressure and the test packages were competed as required.

**Hydrostatic Pressure Testing Sanitary Sewers**

The inspectors examined five hydrostatic exfiltration test packages and observed the conduct of the exfiltration test method on five Sanitary Sewer Piping segments to determine whether the testing conformed to the documents described below, and other established requirements in the

engineering specification listed below.

The inspectors examined the following documents governing the installation and testing of the Sanitary Sewer Piping System:

- 24590-BOF-3PS-CD01-T0001, *Engineering Specification For Furnishing and Installation of Sanitary Sewers,* Revision 2, dated March 3, 2002

- 24590-BOF-CD-SND-00002, *Sanitary Sewer System Plan Area 2,* Revision 5, dated June 27, 2002

- 24590-BOF-CD-SND-00005, *Sanitary Sewer System Plan Area 5,* Revision 4, dated June 27, 2002.

The inspectors examined test packages 24590-WTP-PTR-P-02-0060, Revision 0, *BOF/ Area 2;* 24590-WTP-PTR-P-02-0033, Revision 1, *BOF/ Area 5;* 24590-WTP-PTR-P-02-0048, Revision 0, *BOF/ Area 5;* 24590-WTP-PTR-P-02-0070, Revision 0, *BOF/ Area 2*; and 24590-WTP-PTR-P-02-0069, Revision 0, *BOF/ Area 5*, and verified proper test boundaries were specified, valve line-ups were thorough, and the required test parameters had been specified.

The inspectors observed the conduct of the hydrostatic exfiltration testing on a portion of the sanitary sewer piping system in Areas 2 and 5, and verified the exfiltration test method had been conducted in accordance with the Contractor's established requirements, and the system test conformed to requirements regarding leakage and time at pressure.

**Pretreatment Facility Drain Pipe Leak Testing**

The inspectors examined testing on sections of the PT Facility basemat drain piping to determine whether the testing was performed in accordance with the requirements of 24590-WTP-3PS-PS02-T0003, *Engineering Specification for Field Fabrication and Installation of Piping*, Revision 0, dated June 17, 2002.

Section 3.7.3.4(a) of Specification 24590-WTP-3PS-PS02-T0003 required a 10-foot static head of water to be held for 15 minutes with no drop in the water level. The inspectors examined leak testing performed on PT basemat drainpipe headers C-1, C-2, C-3, and C-4. The leak test work package referred to the requirements for pressure testing of gravity drainage systems, contained in the above discussed specification.

The inspectors observed the field engineer (FE) did not have a copy of the leak testing requirements while performing the first test on drain header C-3. The FE witnessed a drop in water level in the standpipe of about ½ inch. When questioned regarding the acceptability of the level drop, the FE stated the belief the level drop was due to plug leakage. Rain prevented the visual inspection of the pipe and plugs to determine the location of the leakage. In addition, the FE did not demonstrate a thorough knowledge of the testing requirements because the FE filled in the test data on the data sheet, signed the sheet, and requested the inspectors to sign the owner's signatures block. The FE did not have the testing requirements and acceptance criteria in possession during the test. When the inspectors requested to see the acceptance criteria, the

FE went back to his office and was able to find a single page of Specification 24590-WTP-3PS-PS02-T0003 in his file cabinet. The page handed to the inspectors did contain the requirements for testing gravity drainage systems. After obtaining the testing requirements and acceptance criteria, the FE correctly determined the test just performed was not valid and decided to perform a repeat of the test later in the day. The inspectors observed the re-test and determined the test was performed in accordance with specified requirements and met the acceptance criteria. Following completion of test C-3, the Contractor tested C-1, C-2, and C-4. The inspectors observed these 3 tests also met specified requirements and acceptance criteria.

### 1.7.3 Conclusions

During this inspection period a number of inspections of balance-of-plant construction activities were conducted. The following is a summary the results of these inspections:

- A number of electrical code deficiencies were identified during inspections of high mast lighting, warehouse, and fuel dispensing station construction activities. Most deficiencies were addressed during the inspection period. However, four deficiencies remained unresolved and will be reviewed at a later dated. Resolution of these deficiencies is being tracked as Assessment Follow-up Items.

- Portions of Fire Alarm Acceptance Testing of the HLW Change House, Warehouse, and Combination Shop were conducted in accordance with the approved procedure. The portions of the test observed met acceptance criteria.

- Hydrostatic Testing of portions of the potable water and sanitary sewer systems were conducted in accordance with procedures and met acceptance criteria.

- PT facility drain piping leak testing was successfully performed. However, the FE performing testing on drain piping did not initially have a copy of the test requirements and acceptance criteria in possession before doing the test and was not initially knowledgeable regarding the acceptance criteria.

## 1.8 Closure of Inspection Items (Inspection Administrative Procedures (IAP) A-105 and A-106)

The following Findings and Occurrence Reports were reviewed to determine if they could be closed. The inspectors reviewed the Contractor's description of the Findings and Occurrence Reports, the corrective actions, and other information provided. The inspectors verified by records review the corrective actions stated were appropriately completed.

**1.8.1 (Closed IR-02-008-01a-FIN)** Contractor inadvertently used a form release agent to cure the finished portion of the LAW Pour 1 horizontal surfaces. The Contractor provided their response to the Finding on October 17, 2002, by letter CCN 043649 and documented the discrepancy by NCR 24590-WTP-NCR-CON-02-094 on July 12, 2002.

In their response, the Contractor agreed with the Finding and pointed out the cause was due to the inadvertent delivery, by transportation, of form release agent to the LAW jobsite instead of curing compound and the failure of the construction organization to verify the material as curing compound prior to application to the finished concrete surfaces.

As immediate corrective action, the Contractor removed the form release agent, applied the proper curing compound, and documented the situation using the nonconformance reporting process. The corrective actions to avoid further Findings included improved segregation of the products in the site storage area, improved labeling of the products, and training of personnel that handle the products regarding the need to assure the selection and use of proper products.

The Contractor dispositioned the NCR 'use-as-is.' The inspectors examined the technical justification for the disposition and concluded the Contractor had exercised sound technical judgment and timely corrective actions in their disposition. The inspectors examined Quality Assurance Surveillance Report 24590-WTP-SV-QA-02-594, *Storage of Curing Compound and Form Sealant*, Revision 0, dated October 23, 2002, documenting the improved segregation and labeling of containers of curing compound and form release agent. The inspectors discussed the completion of corrective actions with responsible field engineering personnel and determined the corrective actions had been completed as stated.

Based upon the above, this Finding is closed.

**1.8.2 (Closed IR-02-008-02-FIN)** Contractor design drawing for welding on HLW C5 duct failed to implement the SRD requirements that welding for fabrication and installation of C5 duct shall be in accordance with ANSI/ASME AG-1. The Contractor provided their response to the Finding in a letter dated October 17, 2002 (CCN 043649), and documented the discrepancy by Corrective Action Report (CAR) 24590-WTP-CAR-QA-02-129, dated June 27, 2002.

In their response, the Contractor agreed with the Finding and pointed out the cause was an administrative oversight in completing the AB change documentation to include ASME B31.3 in the SRD.

As corrective action, on June 27, 2002, the Contractor issued a Decision-to-Deviate (DTD) (document number 24590-HLW-DTD-HV-02-001) from the AB and submitted the ABCN) 24590-WTP-ABCN-ESH-02-018 to DOE/ORP on August 6, 2002, by letter CCN 036707. The ABCN was approved on September 11, 2002, by letter number 02-OSR-0437. The inspectors examined these documents and verified the Finding was resolved by the approved ABCN and the SRD had been corrected to reflect the correct requirements.

Based upon the above, this Finding is closed.

**1.8.3 (Open Occurrence Report RP-BNRP-RPPWTP-2002-0006)** Damage to Model LS 278 H LINKBELT 250 Ton Crawler Crane in the Luffing Configuration. On July 1, 2002, the main boom on a 250 Ton Model LS 278 H Linkbelt crawler crane configured for luffing operation was damaged while the operator was in the process of repositioning the boom. The crane had been used during the day to lift wooden mat bundles weighing approximately 8,000 lbs. Later in the day, the operator was in the process of repositioning the boom after placing a load of timbers,

when the operator and oiler heard a “popping” sound originating in the boom. The crane was stopped; the boom was lowered slightly, and visually inspected for damage. During the equipment inspection by the operator and the oiler, the Contractor determined the heel section of the main boom, above and below the boom stops, was damaged. No injuries occurred as a result of this event.

A Contractor investigation of the event was documented in 24590-WTP-RPT-CON-02-087, Revision 0, *Root Cause Analysis for Damage Incurred by Boom Butt Section of LS-278 Crawler in the Luffing Configuration*, dated August 12, 2002. The Contractor's corrective actions resulting from the above incident, as documented in the root cause analysis, and the inspectors’ assessment regarding the closure status of the corrective actions are as follows:

- Cease lifting operations with the crane.

  The inspectors verified the Contractor ceased lifting operations with the crane. (Completed)

- Provide a detailed plan to lower the main boom and prevent further damage.

  The inspectors verified the Contractor developed and implemented a detailed plan to lower the main boom and prevent further damage. (Completed)

- Have factory and dealer representatives on-site to provide technical and maintenance assistance.

  The inspectors verified the Contractor had adequate onsite interface with factory representative and had factory documentation of the crane’s maintenance and operations history. (Completed).

- Update the daily, monthly, and annual checklist to include inspections of limit switches and settings on the crane console.

  The inspectors validated updating the daily, monthly, and annual checklist through inspection of the revised inspection forms. The inspectors had observed one new inspection form had been completed by both the Contractor and the factory representative. (Completed)

- Provide enhanced training to operators and others on load moment indicators as measured by inspection of the visual angle of the boom and limit switch settings.

  The inspectors verified training was conducted by review of training records and training media provided by the Contractor. (Completed)

- Limit switches would be set at main-boom angle (in luffing mode) at 87 degrees in addition to the 90.2 degree setting by the factory.

The inspectors observed installation of the main boom switches. The computer required operating console computer chip had been installed based upon discussions with the general foreman and operator. The inspectors determined the required mechanical and electronic safe operations couldn't be field evaluated until the crane is configured in the luffing mode. (Open)

- A Safety Task Analysis Risk Reduction Talk (STARRT) card and lift plan was to be completed by the Contractor when main boom exceeded 87 degrees in luffing mode.

  The inspectors could not validate this action, as no crane had yet been placed in the luffing configurations. (Open)

- A factory representative will be on site to certify all necessary repairs to equipment.

  The inspectors could not validate closure of this item because this action has not yet been completed. (Open)

- Specific training will be provided, with support from the factory technical personnel, when an operator is introduced to a new crane or configuration.

  The inspectors reviewed and validated all specific training media and attendance forms provided to all operators. The inspectors determined the classroom training was specifically directed at the use of set limits, warnings, and operational practices. The inspectors were able to validate much of the training had been accomplished. However, the required proficiency training by the factory representative was not validated due to lack of a luffing configured crane. (OPEN)

- One operating engineer foreman will be the primary contact with the factory representative.

  The inspector confirmed a named foreman had been identified as the primary contact with the factory representative. (Completed)

- Add an additional limit switch on the luffing jib that would activate at between 71-72 degrees in addition to the switch set at 75 degrees. Also add hi-limit jib warning indicators on the crane console.

  The inspectors were not able to validate this action because of the lack of a luffing configured crane. (Open)

- Provide ergonomic corrections for operating levers in cab (main boom versus jib controls).

  The inspector inspected the modified control handles and determined the shape change had been altered significantly to readily tell the difference by feeling the lever. The operator expressed satisfaction with the shape change to the inspectors. (Completed)

Based on the above, this item will remain open until the Contractor has completed the remaining items. This will not occur until a site crane is configured in a luffing configuration.

**1.8.4 (Closed Occurrence Report RP-BNRP-RPPWTP-2002-0011)** Near-Miss Working around a 480 V Cable. On September 25, 2002, two Contractor employees were removing metal T-posts, which were used to support a 480V electrical conduit from a partially back-filled trench. When the backfill continued to a certain depth, the Contractor determined to remove the support posts and free the conduit. In the process of attempting to extract the T-posts from the trench, one employee noted that the fin, at the bottom of the post, was making contact with the conduit. The employees then stopped their extraction and began to clear the backfill material from under the conduit at which time one employee felt a "tingle." Work was stopped, supervision was informed, and the service for the conduit was locked and tagged out. The inspectors examined the event scene and determined the outer casing had been cut. After removal of the casing, the Contractor determined one leg of the 480V line had been compromised.

The cause of the event was determined to have resulted from an excessive amount of backfill being placed over the conduit prior to removing the post. The Contractor's corrective actions resulting from the above incident, as documented in the Occurrence Report, and the inspectors' assessment regarding the closure status of the corrective actions are as follows:

- Provide all personnel with knowledge of risks working with T-Posts.

  The Inspectors validated this was completed by reviewing the toolbox topic for November 7, 2002.

- Survey all existing excavations for similar conditions using T-posts and make any necessary corrections, and ensure back filling in other excavations do not cover other T-posts.

  The inspectors inspected every listed excavation for procedure compliance and the presence of "T-posts". The inspectors noted no T-posts. Further the competent person gave a verbal notification they had found no T-posts in use. However, the Contractor had not followed proper procedures in closing out this open commitment item in the Contractor’s accident inspection report in that they had not formally signed off their inspection results in the file. The Contractor was informed of this requirement by the inspectors. The responsible field engineer issued a memo to the senior safety engineer and the senior safety engineer included that closure memo in the Contractor's accident report file. The inspectors reviewed the inspection memo and found the memo to be adequate.

The inspectors determined this item was satisfactorily closed.

## 2.0 EXIT MEETING SUMMARY

The inspectors presented preliminary inspection results to members of Contractor management at an exit meeting on December 4, 2002. The Contractor acknowledged the observations and conclusions. The inspectors asked the Contractor whether any materials examined during the inspection should be considered limited rights data. The Contractor stated no limited rights data were examined during the inspection.

## 3.0 REPORT BACKGROUND INFORMATION

### 3.1 Partial List of Persons Contacted

J. Betts. Deputy Project Manager
F. Marsh, Deputy Project Manager
W. Clements, Construction Manager
F. Beranek, Environmental, Safety, and Health Manager
D. Klein, Nuclear Safety Manager
G. Shell, Quality Assurance Manager
B. Spezialetti, Regulatory Safety
W. Klinger, Assessment Manager
B. Niemi, Safety Programs Engineer
E. Smith, Safety Programs Engineer
D. Foss, Safety Programs Engineer
M. Platt, Safety Programs Lead
M. Ensminger, Quality Control Supervisor
G. McClain, General Superintendent
S. Goldsmith, Field Engineer
D. Neal, QA Engineer
S. Vail, Mechanical Systems Engineer
M. Hoffmann, Deputy Manager of Mechanical Systems
J. Divine, Materials Engineer
D. Adler, Corrosion Specialist

### 3.2 List of Inspection Procedures Used

Inspection Technical Procedure I-112, "Geotechnical/Foundation Inspection"

Inspection Technical Procedure I-113, "Structural Concrete Inspection"

Inspection Technical Procedure I-123, "Corrosion/Erosion Evaluation Assessment"

Inspection Technical Procedure I-138, “Inspection of Fire Protection System Inspection, Testing, and Maintenance”

Inspection Technical Procedure I-161, “Industrial Health and Safety Inspection”

ORP Instruction ORP M 414.1-4, "WTP Balance-of-Plant Construction Oversight Program"

## 3.3 List of Items Opened, Closed, and Discussed

Opened

| | | |
|---|---|---|
| A-03-OSR-RPPWTP-001-A01 | Assessment Follow-up Item | The 30-amp High Mast Lighting breaker box was not listed/label. (Section 1.7.2) |
| A-03-OSR-RPPWTP-001-A02 | Assessment Follow-up Item | An equipment-grounding conductor was not connected to the grounding electrode, the neutral wire was fused in the emergency shutoff switch, and a 208/120-volt three-phase four-wire panelboard was used as a 120/240 single-phase three-wire panelboard at the fuel dispensing station. (Section 1.7.2) |

Closed

| | | |
|---|---|---|
| IR-02-008-01a-FIN | Finding | Failure to assure curing compound was applied to finished concrete surfaces on pour LAW-0001 instead of form release compound. (Section 1.8.1) |
| IR-02-008-02-FIN | Finding | Failure to assure welding on HLW C5 duct implemented the SRD requirement that welding for fabrication and installation of C5 duct shall be in accordance with ANSI/ASME AG-1. (Section 1.8.2) |
| RP-BNRP-RPPWTP-2002-0011 | Occurrence Report | Near-Miss Working around 480 V Cable. (Section 1.8.4) |

Discussed

| | | |
|---|---|---|
| RP-BNRP-RPPWTP-2002-0006 | Occurrence Report | Damage to Model LS 278 H LINKBELT 250 Ton Crawler Crane in the Luffing Configuration. (Section 1.8.3) |

## 3.4 List of Acronyms

| | |
|---|---|
| AB | authorization basis |
| ABCN | Authorization Basis Change Notice |
| ACI | American Concrete Institute |

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|---|---|
| ANSI | American National Standards Institute |
| ASME | American Society of Mechanical Engineers |
| ASTM | American Society for Testing and Material |
| AWG | American Wire Gage |
| BNI | Bechtel National, Inc. |
| BOF | Balance of Facilities |
| BOP | Balance of Plant |
| CAR | Corrective Action Report |
| CE | Corrosion Evaluation |
| CS | Construction Superintendent |
| DCN | Design Change Notice |
| DOE | U.S. Department of Energy |
| DTD | Decision-to-Deviate |
| FE | field engineer |
| FPDC | Field Project Document Control |
| HLW | High Level Waste |
| IE | Impact Echo |
| IH&S | Industrial Health and Safety |
| IR | Inspection Report |
| ITS | important-to-safety |
| LAW | Low Activity Waste |
| MDS | Mechanical System Data Sheet |
| MSDS | Materials Selection Data Sheet |
| MSR | Materials Selection Report |
| MSG | Materials Selection Guide |
| M&TE | Measuring and Test Equipment |
| NCR | Nonconformance Report |
| NDE | Nondestructive Examination |
| NFPA | National Fire Protection Association |
| NRTL | Nationally Recognized Testing Laboratory |
| ORP | Office of River Protection |
| ORPM | Office of River Protection Manual |
| OSHA | Occupational Safety and Health Administration |
| OSR | Office of Safety Regulation |
| PDC | Project Document Control |
| PT | Pretreatment |
| QA | Quality Assurance |
| QAM | Quality Assurance Manual |
| QC | quality control |
| SC | Safety Criteria |
| SRD | Safety Requirements Document |
| STARRT | Safety Task Analysis Risk Reduction Talk |
| TUV | TUV Rheinland |
| WTP | Waste Treatment and Immobilization Plant |