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

03-OSR-0204

Mr. J. P. Henschel, Project Director
Bechtel National, Inc.
2435 Stevens Center
Richland, Washington 99352

Dear Mr. Henschel:

CONTRACT NO. DE-AC-01RV14136 – CORROSION/EROSION OF IMPORTANT-TO-SAFETY (ITS) COMPONENTS ASSESSMENT - INSPECTION REPORT A-03-OSR-RPPWTP-015

This letter forwards the results of the U.S. Department of Energy, Office of River Protection review of Bechtel National, Inc. (BNI) corrosion/erosion of ITS components assessment on the Waste Treatment and Immobilization Plant during the period April 22 through May 22, 2003. The inspectors concluded the BNI organization was effectively implementing the corrosion/erosion program and proactively examining the activities of other BNI line organizations to assure effective implementation.

Details of the inspection are documented in the enclosed inspection report. 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:WJP

Enclosure

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

Enclosure
03-OSR-0204
A-03-OSR-RPPWTP-015

U.S. DEPARTMENT OF ENERGY
Office of River Protection

INSPECTION:	Corrosion/Erosion for Important-to-Safety Components
REPORT NO.:	A-03-OSR-RPPWTP-015
FACILITY:	Bechtel National, Inc.
LOCATION:	2435 Stevens Center Richland, Washington 99352
DATES:	April 22, 2003 (on-site) May 19 – May 22, 2003 (in-office review)
INSPECTORS:	W. Pasciak, Inspection Lead E. Gilbert, Consultant
APPROVED BY:	P. Carier, Verification and Confirmation Official WTP Safety Regulation Division

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Corrosion/Erosion for Important-to-Safety Components Assessment Inspection Report

EXECUTIVE SUMMARY

INTRODUCTION:

This was the second inspection of Bechtel National, Inc. corrosion/erosion program activities.

Significant Observations and Conclusions:

Evaluation of effects of corrosion/erosion is being done in a manner consistent with the Safety Requirements Document, Appendix H, "Ad Hoc Implementing Standard For Erosion/Corrosion and Assessments."

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Corrosion/Erosion for Important-to-Safety (ITS) Components Assessment Inspection Report

1.0 REPORT DETAILS

1.1 Introduction

This inspection provides an assessment of the Contractor's performance of implementation of Appendix H of the Safety Requirements Document (SRD), "Ad Hoc Implementing Standard For Erosion/Corrosion and Assessments" (Implementing Standard). The Implementing Standard requires the Contractor to document on a Material Selection Data Sheet (MSDS) the assumed process chemistry conditions for ITS components. The Implementing Standard also requires that a Corrosion Evaluation (CE) is performed for all ITS components potentially subject to corrosion and erosion phenomena. The CE provides 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.

Details and conclusions regarding this inspection are described below.

1.2 Overview review of approach to material selection for ITS components (Inspection Technical Procedure (ITP) I-123)

1.2.1 Inspection Scope

The inspectors examined the Contractor's documentation associated with the evaluation of corrosion/erosion as required by the Implementing Standard. The Implementing Standard requires that CEs are performed for ITS systems components. There are three documents used in the development of a CE and are the following:

> Material Selection Data Sheets (MSDS): These documents provide information from process engineering. They contain 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 Report (MSR): The Materials Selection Report documents the process for material selection and provides some of the limits and considerations in selecting materials. Also, it provides details regarding the different types of corrosion and provides guidance for performing corrosion evaluations.
>
> Material Selection Guides (MSG): The Material Selection Guides are facility scope process flow diagrams, where the specific type of material is indicated for each pipe, tank or component. The material indicated on these guides comes from the CEs, and depict an overview of the use of materials. They provide an indication of the expected materials based on the process chemistry at a particular location in each facility.

1.2.2 Observations and Assessments

The inspectors observed MSDSs were attached to each CE. The information contained in the reviewed MSDS was consistent with the requirements of the Implementing Standard. The inspectors found the MSDS contained information necessary to perform CEs such as temperature, pH, chemical composition, flow rates and mass balance data.

The characteristics and resistance of each alloy to the different types of corrosion during exposure to the expected reactants, as described on the MSDS, were addressed in the MSR and found consistent with methods of determining corrosion/erosion allowance as presented in *Suggested Good Practice Regarding Corrosion Allowance* (Implementing Code: ASME SEC VIII, *Boiler and Pressure Vessel Codes*, Appendix E) and *Pressure Design of Components* (Implementing Code: ASME B31.1, *Process Piping*, Section 304).

1.2.3 Conclusions

The inspectors concluded the information contained in the reviewed MSDS was consistent with the requirements of the Implementing Standard.

1.3 Assessment of Corrosion Evaluations (ITP I-123)

1.3.1 Inspection Scope

The inspectors reviewed completed CEs to determine if they provided the requisite corrosion analyses, material selection recommendations corrosion allowances and operating limitations. The inspectors interviewed Contractor staff involved in preparing CEs.

1.3.2 Observations and Assessments

Through interviews and information provided by the Contractor staff, the inspectors determined thirty-three systems had been sent out for bid. Eight vessels were in the process of being ordered and fifteen vessels had already been ordered.

The inspectors reviewed the following CEs 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**
BSA-VSL-00002 (HLW)	Breathing Service Air Receiver	24590-LW-N1D-bsa-00001, Rev. 0
CHW-HX-00001A/B (PTF)	Recirculating Chilled Water Loop Heat Exchanger	24590-PTF-N1D-CHW-00004, Rev. 0
CHW-HX-00003A/B (LAW)	SBS Vessels Cooling Heat	24590-LAW-N1D-CHW-00002,

	Exchangers	Rev. 0
CHW-VSL-00023 (PTF)	Recirculating Chilled Water Expansion Tank	24590-PTF-N1D-CHW-00002, Rev. 0
CNP-VSL-00003 (PTF)	Cs/Tc Concentrate Storage Vessel	24590-PTF-N1D-CNP-00009, Rev. 1
CNP-VSL-00004 (PTF)	Cs Evaporator Recovered Nitric Acid Vessel	24590-PTF-N1D-CNP-00006, Rev. 1
CXP-VSL-00004 (PTF)	Caustic Rinse Collection Tank	24590-PTF-N1D-CXP-00007, Rev. 0
CXP-VSL-00005 (PTF)	Cs Reagent Vessel	24590-PTF-N1D-CXP-00008, Rev. 0
FEP-VSL-00017A/B (PTF)	LAW Evaporator Feed Vessels	24590-PTF-N1D-FEP-00002, Rev. 1
FRP-VSL-00002A-D, V11020 A-D, System PT-FRP (110)	LAW Feed Receipt Vessels	24590-PTF-N1D-FRP-00001, Rev. 1
HDH-VSL-00002 (HLW)	DHL Canister Decontamination Vessel	24590-LAW-N1D-HDH-00003, Rev. 2
HOP-VSL-00903 & HOP-VSL-00904 (HLW)	Melter 1 & 2 SS Condensate Vessels	24590-HLW-N1D-HOP-00009, Rev.3
LFP-VSL-00001, LFP-VSL-00002, LFP-VSL-00003, LFP-VSL-00004, LFP-VSL-00005, LFP-VSL-00006	LAW Melter Feed Preparation & Feed Vessels	24590-LAW-N1D-LFP-00004, Rev. 0
LOP-VSL-00001, LOP-VSL-00002, LOP-VSL-00003, V22101, V22201, V22301, System LQW-LOP (231, -232, -233)	SBS Condensate Vessel	24590-LAW-N1D-LOP-00002, Rev. 0
NAR-TK-00007 (PTF)	0/5M Nitric Acid Head Tank	24590-PTF-N1D-NAR-00001, Rev. 0
NLD-TK-00006 (HLW)	C2 Drains Collection Tank	24590-HLW-N1D-00001, Rev. 1
NLD-VSL-00005, T25032, System LAW-NLD (520)	C1/C2 Drain Collection Tank	24590-LAW-N1D-NLD-00002, Rev. 0
PCW-HX-00002A/B &PCW-HX-00003A/B E29001A&B, System HLW-945	HLW Cooling Water Heat Exchanger	24590-LAW-N1D-PCW-00005, Rev. 0
PCW-HX-00004A/B E29001AB, System LAW-PC (945)	Cooling Water Plate Heat Exchanger	24590-LAW-N1D-PCW-00002, Rev. 0
PCW-HX-00005A/B & PCW-HX-00006A/B E29002AB & E29003AB, System LAW-PCW (945)	Cooling Water Plate Heat Exchanger	24590-LAW-N1D-PCW-00004, Rev. 0
PCW-HX-00007A & PCW-HX-00007B E29004A&B, System LAW-PC (945)	Cooling Water Heat Exchangers	24590-LAW-N1D-PCW-00007, Rev. 0
PCW-HX-00017 (HLW)	HLW Plant Cooling Water Heat Exchanger	24590-HLW-N1D-PCW-00007, Rev. 0
RDP-VSL-00002A/B/C (PTF)	Spent Resin Slurry Vessels	24590-PTF-N1D-RDP-00001, Rev. 0
RLD-VSL-00004, C3/C5 Drains/Sump Collection Vessel	Drain/Sump Collection Vessel	24590-LAW-N1D-RLD-00001, Rev. 3

SCW-HX-00001 (PTF)	HLW Plant Cooling Water Heat Exchanger	24590-PTF-N1D-SCW-00001, Rev. 0
SCW-VSL-00007 (PTF)	Non-Active Condensate Vessel	24590-PTF-N1D-SCW-00002, Rev. 0
UFP-VSL-00001-A/B, V12010 AB, System PT-230	Evaporator Concentrate Buffers	24590-PTF-N1D-UFP-00005, Rev. 0
UFP-VSL-00002A, UFP-VSL-00002B, V12011 AB, System PT-UFP (230)	LAW Ultrafiltration Feed Vessels	24590-PTF-N1D-UFP-00003, Rev. 0
UFP-VSL-00062-A/B/C, V12015 ABC, System PT-UFP (230)	LAW Permeate Hold Vessels	24590-PTF-N1D-UFP-00008, Rev. 0

The inspectors found the CEs contained the following:

1) Summary of corrosion expected from each selected material;
2) acceptable margins, within the corrosion allowance, were considered for the selected lowest cost material; and
3) design considerations were made to reduce factors which contribute to localized corrosion.

Based on the above, the inspectors concurred with the choice of materials recommended in the CEs.

1.3.3 Conclusions

The inspectors concluded the reviewed CEs were consistent with the requirements of the implementing standard.

1.4 Assessment of the Status of the Evaluation of Corrosion of ITS Components & Selection of Materials (ITP I-123)

1.4.1 Inspection Scope

The Implementing Standard requires that CEs are performed for ITS systems components and that components are selected consistent with the recommendations of the CEs. The CEs must be completed prior to the components being procured so that their recommendations can be reflected in the MSDS (formerly titled Mechanical System Data Sheets) which specify material requirements to the vendor. The inspectors reviewed several MSDSs of the ITS items that have gone out for bid to determine if the CEs had been performed on the items and if the MSDSs were consistent with the CEs. The inspectors also reviewed the status of other completed CEs.

1.4.2 Observations and Assessments

The inspectors reviewed twenty-nine MSDSs and compared them with their associated CEs. The twenty-nine MSDSs are listed below:

Material Selection Data Sheets Reviewed by Inspectors		
Component Designation & Description	**MSDS Number**	**CE Number**
BSA-VSL-00002 (HLW) Breathing Service Air Receiver	Imbedded in CE	24590-LW-N1D-bsa-00001, Rev. 0
CHW-HX-00001A/B (PTF) Recirc Chilled Water Loop Heat Exchanger	Information Imbedded in CE	24590-PTF-N1D-CHW-00004, Rev. 0
CHW-HX-00003A/B (LAW) SBS Vessels Cooling Heat Exchangers	Information Imbedded in CE	24590-LAW-N1D-CHW-00002, Rev. 0
CHW-VSL-00023 (PTF) Recirculating Chilled Water Expansion Tank	Information Imbedded in CE	24590-PTF-N1D-CHW-00002, Rev. 0
CNP-VSL-00003 (PTF) Cs/Tc Concentrate Storage Vessel	CNP-VSL-00003	24590-PTF-N1D-CNP-00009, Rev. 1
CNP-VSL-00004 (PTF) Cs Evaporator Recovered Nitric Acid Vessel	CNP-VSL-00004	24590-PTF-N1D-CNP-00006, Rev. 1
CXP-VSL-00004 (PTF) Caustic Rinse Collection Tank	Caustic1X Rinse Collection Vessel (CXP-VSL-00004)	24590-PTF-N1D-CXP-00007, Rev. 0
CXP-VSL-00005 (PTF) Cs Reagent Vessel	Cs1X Reagent Vessel (CXP-VSL-00005)	24590-PTF-N1D-CXP-00008, Rev. 0
FEP-VSL-00017A/B (PTF) LAW Evaporator Feed Vessels	FEP-VSL-00017A/B	24590-PTF-N1D-FEP-00002, Rev. 1
FRP-VSL-00002A-D, V11020 A-D, System PT-FRP (110) LAW Feed Receipt Vessels	FRP-VSL-00002A/B/C/D	24590-PTF-N1D-FRP-00001, Rev. 1
HDH-VSL-00002 (HLW) HLW Canister Decontamination Vessel	Canister Decontamination Vessel VSL-00002	24590-LAW-N1D-HDH-00003, Rev. 2
HOP-VSL-00903 & HOP-VSL-00904 (HLW) Melter 1 & 2 SBS Condensate Vessels	SBS Condensate Vessel/V32101	24590-HLW-N1D-HOP-00009, Rev.3
LFP-VSL-00001, LFP-VSL-00002, LFP-VSL-00003, LFP-VSL-00004, LFP-VSL-00005, LFP-VSL-00006 LAW Melter Feed Preparation & Feed Vessels	LAW Melter Feed & Feed Preparation Vessels/VSL-00001, -2, -3, -4, -5, -6	24590-LAW-N1D-LFP-00004, Rev. 0
LOP-VSL-00001, LOP-VSL-00002, LOP-VSL-00003, V22101, V22201, V22301, System LQW-LOP (231, -232, -233) SBS Condensate Vessel	LAW SBS Condensate Vessels/V22101, V22201, V22301	24590-LAW-N1D-LOP-00002, Rev. 0

NAR-TK-00007 (PTF) 0/5M Nitric Acid Head Tank	Information Imbedded in CE	24590-PTF-N1D-NAR-00001, Rev. 0
NLD-TK-00006 (HLW) C1/C2 Drains Collection Tank	C1/C2 Drains Collection Vessel V35011	24590-HLW-N1D-00001, Rev. 1
NLD-VSL-00005, T25032, System LAW-NLD (520) C1/C2 Drain Collection Tank	C1/C2 Drain Collection Tank	24590-LAW-N1D-NLD-00002, Rev. 0
PCW-HX-00002A/B &PCW-HX-00003A/B E29001A&B, System HLW-945 HLW Cooling Water Heat Exchanger	Information Imbedded in CE	24590-LAW-N1D-PCW-00005, Rev. 0
PCW-HX-00004A/B E29001AB, System LAW-PC (945) Cooling Water Plate Heat Exchanger	Information Imbedded in CE	24590-LAW-N1D-PCW-00002, Rev. 0
PCW-HX-00005A/B & PCW-HX-00006A/B E29002AB & E29003AB, System LAW-PCW (945) Cooling Water Plate Heat Exchanger	Information Imbedded in CE	24590-LAW-N1D-PCW-00004, Rev. 0
PCW-HX-00007A & PCW-HX-00007B E29004A&B, System LAW-PC (945) Cooling Water Heat Exchangers	Information Imbedded in CE	24590-LAW-N1D-PCW-00007, Rev. 0
PCW-HX-00017 (HLW) HLW Plant Cooling Water Heat Exchanger	Information Imbedded in CE	24590-HLW-N1D-PCW-00007, Rev. 0
RDP-VSL-00002A/B/C (PTF) Spent Resin Slurry Vessels	Spent Resin Slurry Vessels RDP-VSL-00002A/B/C	24590-PTF-N1D-RDP-00001, Rev. 0
RLD-VSL-00004, C3/C5 Drains/Sump Collection Vessel	C3/C5 Drains/Sump Collection Vessel (RLD-VSL-00004); RLD-EDIC-00001A, -00001B,-00001C; RLD-PMP-00002A/B	24590-LAW-N1D-RLD-00001, Rev. 3
SCW-HX-00001 (PTF) HLW Plant Cooling Water Heat Exchanger	Information Imbedded in CE	24590-PTF-N1D-SCW-00001, Rev. 0
SCW-VSL-00007 (PTF) Non-Active Condensate Vessel	Information Imbedded in CE	24590-PTF-N1D-SCW-00002, Rev. 0
UFP-VSL-00001-A/B, V12010 AB, System PT-230 Evaporator Concentrate Buffers	UFP-VSL-00001A/B	24590-PTF-N1D-UFP-00005, Rev. 0
UFP-VSL-00002A, UFP-VSL-00002B, V12011 AB, System PT-UFP (230) LAW Ultrafiltration Feed Vessels	UFP-VSL-00002A/B	24590-PTF-N1D-UFP-00003, Rev. 0
UFP-VSL-00062-A/B/C, V12015 ABC, System PT-UFP (230) LAW Permeate Hold Vessels	UFP-VSL-00062A/B/C	24590-PTF-N1D-UFP-00008, Rev. 0

On-location Inspection Report, IR A-03-OSR-RPPWTP-001, Section 1.6, stated that Contractor staff indicated that open items would be resolved before the systems were sent out for bid. During the on-site period of the inspection (April 22, 2002), a number of open items appeared on the CEs for vessels listed below that were out for bid and ordered. The CEs containing open items are listed below.

Vessels for bid with open issues

* PCW-HX-00007A, PCW-HX-00007B, E29004 AB, System LAW-PCS (945)
* PCW-HX-00017 (HLW)
* CHW-HX-00001A/B (PTF)
* CHW-HX-00003A/B (LAW)
* CHW-VSL-00023 (PTF)

Vessels ordered with open issues

* FRP-VSL-00002A-D (PO: QL-SRA-MTF5-0001)
* UFP-VSL-00001-A/B
* NLD-VSL-00005 (PO: CM-POA-MVA0-00004)
* SCW-VSL-00007 (PTF) (On hold)
* LOP-VSL-00001, -00002, -00003 V22101, V22201, V22301 & Offspring Items (On hold)

Examples of open items are the following: For SBS Condensate Vessels, LOP-VSL-00001 and LOP-VSL-00002 the CE stated that further review of fatigue/corrosion fatigue, vapor phase corrosion, erosion, galvanic corrosion should be done as information becomes available. For cell Evaporator Concentrate Buffers, UFP-VSL-00001-A/B, the CE stated that the frequency/extent of acid cleaning should be established and that further review of corrosion fatigue, vapor phase corrosion, erosion, and thermogalvanic corrosion should be done.

By the end of the inspection period (May 22, 2003), the Contractor stated the open issues for the above CEs were resolved and revised CEs closing out the open items were generated and in the process of final approval. The inspector verified the open issues were resolved on the revised CEs, but the signatures for approval were incomplete. Reviews of the finalized CEs (signed-off) will be completed during a follow-up inspection.

The issue of closing out open items before ordering equipment was previously discussed in Inspection Report IR-A-03-OSR-RPPPWTP-001, Section 1.6. During that inspection, Contractor staff told the inspectors CE open items would be resolved before the equipment was ordered. This issue was discussed with Contractor representatives on June 16, 2003. During that meeting the Contractor stated that the issue of ordering items prior to the closure of all CE open items would be reviewed and actions taken as necessary to ensure that controls are in place to ensure procurement does not occur until open items are resolved. This in an inspection follow-up item (A-03-OSR-RPPWTP-015-01).

1.4.3 Conclusions

Some items remain open on some CEs for vessels that were ordered. However, the Contractor indicated that the open issues have been resolved and the revised CEs are in the approval process.

2.0 EXIT MEETING SUMMARY

The inspectors presented preliminary inspection results to members of Contractor management at an exit meeting on June 10, 2003. 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

D. Adler, Materials Engineer
J. Divine, Materials Engineer
E. Smith, Safety Program Engineer
S. Vail, Mechanical Systems Engineer

3.2 List of Inspection Procedures Used

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

3.3 List of Acronyms

AB	authorization basis
BNI	Bechtel National, Inc.
CE	Corrosion Evaluation
DOE	U.S. Department of Energy
IR	Inspection Report
ITS	important-to-safety
MDS	Mechanical System Data Sheet
MSDS	Materials Selection Data Sheet
MSR	Materials Selection Report
MSG	Materials Selection Guide
ORP	Office of River Protection
OSR	WTP Safety Regulation Division
QA	Quality Assurance
QAM	Quality Assurance Manual

QC	Quality Control
SRD	Safety Requirements Document
WTP	Waste Treatment and Immobilization Plant

3.4 List of Items Opened, Closed, and Discussed

Opened

None

Discussed

None