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AREVA

AFS-09-0421

✓CCN: 169563

December 22, 2009

RPP-WTP
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BY PDC

Ms. Jennifer Broadbent
Subcontract Administrator
Bechtel National, Inc.
2435 Stevens Center Place
Richland, Washington 99354

Dear Ms. Broadbent:

BECHTEL NATIONAL, INC. CONTRACT NO. 24590-CM-HC4-HXYG-00211 IQRPE STRUCTURAL INTEGRITY ASSESSMENT REPORT FOR HLW HOP MISC. UNITS (SILVER MORDENITE HOP-ABS-00002/3) (IA-3002378-000)

The integrity assessment of the subject units has been completed per the contract requirements and is enclosed for your use. The assessment found that the design is sufficient to ensure that each unit is adequately designed and has sufficient structural strength, compatibility with the waste(s) to be processed/stored/treated, and corrosion protection to ensure that it will not collapse, rupture, or fail.

If you have any questions, please contact Tarlok Hundal at (509) 371-1975, or via email at tarlok.hundal@areva.com.

Sincerely,

Fred R. Renz
Contract Management
AREVA Federal Services LLC
Richland Office

llm

cc: D. C. Pfluger, MS 5-L w/enclosure (2)

AREVA Federal Services LLC
2101 Horn Rapids Road, RC-19, Richland, WA 99354, P. O. Box 840, Richland, WA 99352
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IQRPE STRUCTURAL INTEGRITY ASSESSMENT REPORT FOR HLW HOP MISC. UNITS (SILVER MORDENITE HOP-ABS-00002/3)

Please note that source, special nuclear and byproduct materials, as defined in the Atomic Energy Act of 1954 (AEA), are regulated at the U.S. Department of Energy (DOE) facilities exclusively by DOE acting pursuant to its AEA authority. DOE asserts, that pursuant to the AEA, it has sole and exclusive responsibility and authority to regulate source, special nuclear, and byproduct materials at DOE-owned nuclear facilities. Information contained herein on radionuclides is provided for process description purposes only.

IQRPE STRUCTURAL INTEGRITY ASSESSMENT REPORT FOR HLW HOP MISC. UNITS (SILVER MORDENITE HOP-ABS-00002/3)

"I, Tarlok Hundal have reviewed, and certified a portion of the design of a new tank system or component located at the Hanford Waste Treatment Plant, owned/operated by Department of Energy, Office of River Protection, Richland, Washington. My duties were independent review of the current design for the HLW HOP Misc. Units (Silver Mordenite HOP-ABS-00002/3), as required by the Washington Administrative Code, *Dangerous Waste Regulations*, Section WAC-173-303-640(3) (a) through (g) applicable components."

"I certify under penalty of law that I have personally examined and am familiar with the information submitted in this document and all attachments and that, based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment."

The documentation reviewed indicates that the design fully satisfies the requirements of the WAC.

The attached review is ten (10) pages numbered one (1) through ten (10).

TARLOK SINGH HUNDAL
STATE OF WASHINGTON
20241
REGISTERED
PROFESSIONAL ENGINEER

Signature

12/22/09
Date

Scope	Scope of this Integrity Assessment	This Integrity Assessment addresses two Miscellaneous Units (MUs), the Silver Mordenite Columns (HOP-ABS-00002/3) which are components of the HLW Melter Offgas Treatment Process System (HOP). These MUs are located in Room H-B001B at Elevation (-) 21'-0" in the High Level Waste Vitrification Building.
Summary of Assessment		For each item of "Information Assessed" (i.e., Criteria) on the following pages, the items listed under "Source of Information" were reviewed and found to furnish adequate design requirements and controls to ensure that the design fully satisfies the requirements of Washington Administrative Code (WAC), Chapter 173-303 WAC, *Dangerous Waste Regulations,* WAC-173-303-640, *Tank Systems.*

References	Material Requisition, Specifications, and Plant Drawings	<u>Material Requisition (MR):</u> 24590-QL-MRA-MBT0-00001, Rev. 3, Offgas Columns (Silver Mordenite) QL2. <u>Specifications:</u> Following Specifications including their revision and specification change notices (SCNs) are listed in the MR document listed above: 24590-HLW-3PS-MBT0-T0001, Engineering Specification for Silver Mordenite Column Design and Fabrication; 24590-WTP-3PS-MV00-T0001, Engineering Specification for Pressure Vessel Design and Fabrication; 24590-WTP-3PS-G000-T0001, General Specification for Supplier Quality Assurance Program Requirements; 24590-WTP-3PS-G000-T0002, Engineering Specification for Positive Material Identification (PMI); 24590-WTP-3PS-G000-T0003, General Specification for Packaging, Shipping, Handling, and Storage Requirements; 24590-WTP-3PS-FB01-T0001, Engineering Specification for Structural Design Loads for Seismic Category III/IV Equipment and Tanks; 24590-WTP-3PS-MTSS-T0001, Engineering Specification for Tank Welding; 24590-WTP-3PS-SS00-T0002, Engineering Specification for Welding of Structural Stainless Steel and Welding of Carbon Steel to Stainless Steel; 24590-WTP-3PS-P000-T0001, Engineering Specification for Piping Material Classes. <u>Plant Drawings</u>: 24590-HLW-M5-V17T-00004, Rev. 5, Process Flow Diagram HLW Vitrification Melter 1 Secondary Offgas Treatment (System HOP); 24590-HLW-M5-V17T-20004, Rev. 1, Process Flow Diagram HLW Vitrification Melter 2 Secondary Offgas Treatment (System HOP); 24590-HLW-P1-P01T-00001, Rev. 8, HLW Vitrification Building General Arrangement Plan at EL. (-) 21'-0"; 24590-HLW-M6-HOP-00008, Rev. 2, HLW Melter 1 Secondary Offgas Treatment Sheet 2 of 3; 24590-HLW-M6-HOP-20008, Rev. 2, HLW Melter 2 Secondary Offgas Treatment Sheet 2 of 3.

References (cont'd)	Vendor Drawings, Mechanical Systems Data Sheets, and System Description	Vendor Drawings (Bechtel Code 1 Drawings*): 24590-QL-POA-MBT0-00001-01-18-00E, General Arrangement Silver Mordenite Offgas Columns; 24590-QL-POA-MBT0-00001-01-19-00E, General Arrangement Silver Mordenite Offgas Columns; 24590-QL-POA-MBT0-00001-11, Rev. 00E, Base Frame Assembly; 24590-QL-POA-MBT0-00001-01-0038, Rev. 00C, Base Frame Assembly; 24590-QL-POA-MBT0-00001-01-03, Rev. 00E, Housing Weldment; 24590-QL-POA-MBT0-00001-01-04, Rev. 00E, Housing Weldment; 24590-QL-POA-MBT0-00001-01-05, Rev. 00F, Top Weldment; 24590-QL-POA-MBT0-00001-01-06, Rev. 00F, Top Panel Weldment; 24590-QL-POA-MBT0-00001-01-07, Rev. 00F, Top Panel Weldment; 24590-QL-POA-MBT0-00001-01-08, Rev. 00D, Bottom Panel Weldment; 24590-QL-POA-MBT0-00001-01-09, Rev. 00D, Side Panel Weldment; 24590-QL-POA-MBT0-00001-01-10, Rev. 00D, End Panel Weldment; 24590-QL-POA-MBT0-00001-01-12, Rev. 00C, Inlet Housing Weldment; 24590-QL-POA-MBT0-00001-01-13, Rev. 00B, Outlet Housing Weldment; 24590-QL-POA-MBT0-00001-01-23, Rev. 00D, Cover Assembly; 24590-QL-POA-MBT0-00001-01-24, Rev. 00B, Lifting Lug Assembly; 24590-QL-POA-MBT0-00001-01-0032, Rev. 00C, Spreader Bar Assembly; 24590-QL-POA-MBT0-00001-01-0033, Rev. 00B, Lifting Details. * Vendor Fabrication Drawings; reviewed, and approved by Bechtel National Inc. Mechanical Systems Data Sheets: 24590-HLW-MKD-HOP-00014, Rev. 7, Melter 1 Silver Mordenite Column (HOP-ABS-00002); 24590-HLW-MKD-HOP-00017, Rev. 7, Melter 2 Silver Mordenite Column (HOP-ABS-00003). System Description: 24590-HLW-3YD-HOP-00001, Rev. 1, Systems Description for HLW Melter Offgas Treatment Process and Process Vessel Vent Extraction (HOP and PVV Systems).

Information Assessed		Source of Information	Assessment
Design	Vessel design standards are appropriate and adequate for the vessel's intended use.	Drawings, Specifications, and Mechanical Systems Data Sheets listed above under References; ASME AG-1-1997, Code on Nuclear Air and Gas Treatment; ASME AG-1a-2000, Addenda to ASME AG-1-1997, Code on Nuclear Air and Gas Treatment; ASME N509-1989, Nuclear Power Plant Air-Cleaning Units and Components; ASME Boiler & Pressure Vessel (B & PV) Code, Section VIII, Div. 1, Rules for Construction of Pressure Vessels.	The Silver Mordenite Columns (HOP-ABS-00002/3) are components in the HLW Melter Secondary Offgas Treatment Process System (HOP). These columns are located in Room H-B001B at elevation (-) 21'-0" as shown on the HLW Vitrification Building General Arrangement Plan drawing. They are accessible for maintenance. The Engineering Specification for Silver Mordenite Column Design and Fabrication requires that these columns be designed, fabricated, and tested in accordance with a consistent set of requirements taken from ASME AG-1-1997, ASME AG-1a-2000, and ASME N509-1989. Supplementary requirements are specified in the Engineering Specification for Silver Mordenite Column Design and Fabrication. The supplementary requirements include structural design requirements, positive material identification, fabrication tolerances, acceptable welding procedures for the Silver Mordenite Column assemblies, welder qualifications and testing records, NDE inspections and records, and packaging, shipping, handling and storage requirements. The column housings pressure boundaries are to be designed in accordance with the ASME B & PV Code, Section VIII, Div. 1. The columns are identified as Quality Level (QL-2) and Seismic Category (SC-III) in the Mechanical Systems Data Sheets. These are adequate and acceptable design standards for the Silver Mordenite Columns intended use.

Information Assessed		Source of Information	Assessment
Design (cont'd)	If a non-standard vessel is to be used, the design calculations demonstrate sound engineering principles of construction.	Drawings and Mechanical Systems Data Sheets listed above under References; ASME AG-1-1997, Code on Nuclear Air and Gas Treatment; ASME AG-1a-2000, Addenda to ASME AG-1-1997, Code on Nuclear Air and Gas Treatment; ASME Boiler & Pressure Vessel (B & PV) Code, Section VIII, Div. 1, Rules for Construction of Pressure Vessels; 24590-QL-POA-MBT0-00001-04-02, Rev. 00D, Analysis and Design Report Construction of Pressure Vessel (Design Calculation).	The Silver Mordenite Columns (HOP-ABS-00002/3) are components in the HLW Melter Secondary Offgas Treatment Process System (HOP). These columns are standard offgas treatment assemblies that are shop fabricated. The Mechanical Systems Data Sheets require that the ASME AG-1/1a and ASME Section VIII, Division 1 assemblies be delivered after design, fabrication, inspection, and testing. Review of the vendor drawings and Design Calculation demonstrates that sound engineering principles of design/construction have been used. The analysis conclusions are reasonably appropriate satisfying all criteria and loading conditions and loading combinations thereof showing the stresses of components within allowable limits.

Information Assessed		Source of Information	Assessment
Design (cont'd)	Vessel has adequate strength, after consideration of the corrosion allowance, to withstand the operating pressure, operating temperature, and seismic loads.	Mechanical Systems Data Sheets, Specifications, and Drawings listed above under References; ASME AG-1a-2000, Addenda to ASME AG-1-1997, Code on Nuclear Air and Gas Treatment; ASME Boiler & Pressure Vessel (B & PV) Code, Section VIII, Div. 1, Rules for Construction of Pressure Vessels; Uniform Building Code (UBC), 1997, International Conference of Building Officials; 24590-QL-POA-MBT0-00001-04-02, Rev. 00D, Analysis and Design Report Construction of Pressure Vessel (Design Calculation); 24590-QL-POA-MBT0-00001-07-02, Rev. 00E, Seismic Data Report (Design Calculation); 24590-QL-POA-MBT0-00001-07-03, Rev. 00C, Thermal Analysis Report (Design Calculation); 24590-QL-POA-MBT0-00001-07-06, Rev. 00C, Structural Analysis Report (Design Calculation); 24590-HLW-N1D-HOP-00006, Rev. 3, Corrosion Evaluation (HOP-ABS-00002/3) HLW Silver Mordenite Column.	The Mechanical Systems Data Sheets identify the Silver Mordenite Columns operating pressure and temperature ranges, the materials selected for the columns shells and internal supports, the corrosion allowance(s), and the columns quality levels which determine the requirements for seismic design. The Engineering Specifications for Silver Mordenite Design and Fabrication requires specific consideration of the operating pressures and temperatures and seismic loads in the design process. ASME Section VIII, Div. 1 requires that corrosion allowance material be considered when evaluating the adequacy of vessel components for these loads at end of life. Detailed requirements for seismic design of the columns are furnished in the Engineering Specification for Structural Design Loads for Seismic Category III/IV Equipment and Tanks. Seismic design loads are taken from the UBC and Level C service limits are taken from ASME AG-1 and ASME, Section VIII, Div. 1. The vendor drawings show that each Mordenite Column's overall primary enclosure shell structure is about 237" L x 183" W x 84" H. It is built with 1/4" and 3/8" thick 316L stainless steel plates (max. 0.03% C dual certified) hereinafter known as 316L stainless steel material. Design Calculations reviewed show that the Silver Mordenite Columns will withstand operating pressure, temperature, and seismic loads for the specified design life.

Information Assessed		Source of Information	Assessment
Foundation	Vessel foundation will maintain the load of a full vessel.	Specifications listed above under References; 24590-WTP-DC-ST-01-001, Rev. 12, Structural Design Criteria. 24590-QL-POA-MBT0-00001-07-06, Rev. 00C, Structural Analysis Report (Design Calculation); 24590-HLW-S0C-S15T-00018, Rev. 0C, HLW Environmental, Dead, and Live Loads (Design Calculations); 24590-HLW-DGC-S13T-00115, Rev. A, HLW Validation of Concrete for Slab El.(-)21' and Walls from El. (-) 21' for RGM (Design Calculations).	The Engineering Specification for Silver Mordenite Column Design and Fabrication requires that the Silver Mordenite Column Support Frames are to be designed in accordance with the provisions in the Structural Design Criteria. Design Calculation reviewed show that the support frame is adequately designed to sustain applicable loads such as seismic and temperature. The support in turn is welded to the concrete embed plates. The Silver Mordenite column's components process dry gaseous matter without any liquids, therefore, load of full vessel will be including its own weight and pertinent equipments within them. The Design Calculations reviewed also show that the foundation slab is designed to sustain full operating load of the Silver Mordenite Columns.
	If in an area subject to flooding, the vessel is anchored.	Mechanical Systems Data Sheets and Specifications listed above under References; 24590-HLW-PER-M-02-003, Rev. 3, Flooding Volume for the HLW Facility.	The Silver Mordenite Columns (HOP-ABS-00002/3) are components in the HLW Melter Secondary Offgas Treatment Process System (HOP). This system handles offgas vapors from the melters and process vessels ventilation. Room H-B001B contains only components of this offgas system, therefore, there are no local sources of liquids to flood the cell except for firewater from the sprinkler system. Design for flooding is not a required load case in the Flooding Volume document, Mechanical Systems Data Sheets, or the Engineering Specification for Silver Mordenite Column Design and Fabrication. The columns are anchored to provide for adequate seismic resistance.

Information Assessed		Source of Information	Assessment
Foundation (cont'd)	Vessel system will withstand the effects of frost heave.	Drawings listed above under References; 24590-WTP-DC-ST-01-001, Rev. 12, Structural Design Criteria.	The Structural Design Criteria document requires that all structural foundations extend a distance below grade that exceeds the depth of the frost line in order to preclude frost heave. The frost line is 30 in. below grade. The plant drawings show that the Silver Mordenite Columns are located below grade at Elevation (-) 21'-0" inside the HLW Building, therefore, are not subject to the frost heave effects.
Waste Characteristics	Characteristics of the waste to be stored or treated have been identified (ignitable, reactive, toxic, specific gravity, vapor pressure, flash point, storage temperature)	Mechanical Systems Data Sheets and System Description listed above under References; 24590-HLW-N1D-HOP-00006, Rev. 3. Corrosion Evaluation, Silver Mordenite Column, HOP-ABS-00002 & 3 (HLW). 24590-WTP-PER-PR-03-002, Rev. 3, Control of Toxic Vapors and Emissions from WTP Tank and Miscellaneous Unit Systems; 24590-WTP-PER-PR-03-001, Rev. 1, Prevention of Hydrogen Accumulation in WTP Tank Systems and Miscellaneous Treatment Unit Systems.	The Mechanical Systems Data Sheets present the offgas specific gravity, operating temperatures and pressures. The Corrosion Evaluation report addresses the chemical composition of the offgas and the normal operation and potential accident temperatures to select appropriate compatible Silver Mordenite Column materials for the waste to be processed. The mitigation and control of the waste's hazards are appropriately addressed in the Prevention of Hydrogen Accumulation document and Control of Toxic Vapors and Emissions document. These two documents do not specifically list the Mordenite Columns to exhibit any dangerous waste characteristics such as reactive or ignitable. The System Description document and Control of Toxic Vapors and Emissions document describe that the columns are designed to remove gaseous I-129 and volatile forms of chlorine and fluorine from the offgas. The columns design is required to provide an intact housing pressure boundary during normal operations and during and after earthquake loads.

	Information Assessed	Source of Information	Assessment
Waste Characteristics (cont'd)	Vessel is designed to store or treat the wastes with the characteristics defined above and any treatment reagents.	System Description listed above under References; 24590-HLW-N1D-HOP-00006, Rev. 3, Corrosion Evaluation, Silver Mordenite Column HOP-ABS-00002 & 3 (HLW).	The Corrosion Evaluation document demonstrates that the Silver Mordenite Columns are designed to process the Melter Offgas as discussed above. The System Description document discusses normal and abnormal operations for the columns (HOP-ABS-00002/3). Additional reagents will not normally be added to the Silver Mordenite Columns during normal operations.
	The waste types are compatible with each other.	System Description listed above under References.	The System Description document for the HLW HOP System does not describe any operations where incompatible wastes are mixed in these Silver Mordenite Columns.
Corrosion	Vessel material and protective coatings ensure the vessel structure is adequately protected form the corrosive effects of the waste stream and external environments (expected to not leak or fail for the design life of the system)	24590-HLW-N1D-HOP-00006, Rev. 3, Corrosion Evaluation, Silver Mordenite Column HOP-ABS-00002 & 3 (HLW).	The Corrosion Evaluation report selection of 316L stainless steel provides improved resistance to pitting corrosion, stress corrosion cracking, and crevice corrosion. The Silver Mordenite column's components process dry gaseous matter without any liquids and the Corrosion Evaluation report identifies no significant corrosion of the evaluated Mordenite components, therefore, it recommends no corrosion allowance which appears to be appropriate and acceptable.

Information Assessed		Source of Information	Assessment
Corrosion (cont'd)	Corrosion allowance is adequate for the intended service life of the vessel.	Mechanical Systems Data Sheets and Drawings listed above under references; 24590-HLW-N1D-HOP-00006, Rev. 3, Corrosion Evaluation, Silver Mordenite Column HOP-ABS-00002 & 3 (HLW); 24590-QL-POA-MBT0-00001-04-02, Rev. 00D, Analysis and Design Report Construction of Pressure Vessel (Design Calculation).	The basis for the Silver Mordenite Columns material selection, without corrosion allowance is provided in the Corrosion Evaluation report. However, conservatively, 0.04 in. corrosion allowance is listed in the Mechanical Systems Data Sheets. Design Calculation and drawings reviewed show that vessel thickness is adequate for its intended service life of 40 years.
Pressure Relief	Pressure controls (vents and relief valves) are adequately designed to ensure pressure relief if normal operating pressures in the vessel are exceeded.	System Description and Mechanical Systems Data Sheets listed above under References; 24590-HLW-N1D-HOP-00006, Rev. 3, Corrosion Evaluation, Silver Mordenite Column HOP-ABS-00002 & 3 (HLW).	The System Description provides a discussion of the normal operating conditions for the HLW Melter Offgas Treatment Process (HOP System). The pressure limits for the Booster Extraction Fans (HOP-FAN-00001A/B/C & HOP-FAN-00009A/B/C) and the Stack Extraction Fans (HOP-FAN-00008A/B/C & HOP-FAN-00010A/B/C) are 60 in. water gage (about 2.2 psi) which is less than the internal and external design pressure of 3 psi listed on the Mechanical Systems Data Sheets for the Silver Mordenite Columns. Therefore, the columns are designed for pressures which are higher than the pressure capabilities of the offgas system extraction fans.

Master Distribution Schedule for WTP Project Subcontract Management Group

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☐ Pre-Award/Award Package ☐ Executed Change Order Package
☐ Executed Amendment Package ☐ Back Charge ☐ Closeout Package

Subcontract Number:	24590-CM-HC4-HXYG-00211
Subcontract Title:	Tank Integrity Design Assessments
Subcontractor Name:	AREVA Federal Services LLC
Subcontract Administrator:	Jennifer Broadbent

PDC Document Number	Rev	Document Title	Rev
CCN #169563		IQRPE Structural Integrity Assessment Report For HLW HOP Misc. Units (Silver Mordenite HOP-ABS-00002/3) (IA-3002378-000)	

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Master Distribution Schedule for WTP Project Subcontract Management Group

Subcontract Number:	24590-CM-HC4-HXYG-00211
Subcontract Title:	Tank Integrity Design Assessments
Subcontractor Name:	AREVA Federal Services LLC
Subcontract Administrator:	Jennifer Broadbent

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