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ISSUED BY
RPP-WTP PDC

AFS-14-0143

AREVA

April 21, 2014

Ms. Tess Klatt
Subcontract Administrator
Bechtel National, Inc.
2435 Stevens Center Place
Richland, Washington 99354

Dear Ms. Klatt:

**BECHTEL NATIONAL, INC. CONTRACT NO. 24590-CM-HC4-HXYG-00240 IQRPE STRUCTURAL INTEGRITY ASSESSMENT REPORT FOR LAW LVP CAUSTIC COLLECTION TANK (LVP-TK-00001) (IA-3010235-000)**

The integrity assessment of the subject LAW LVP Caustic Collection Tank has been completed per the contract requirements and is enclosed for your use. The assessment found that the design is sufficient to ensure that the LAW LVP Caustic Collection Tank 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,

Elizabeth W. Smith, C.P.M
Subcontract Administrator
AREVA Federal Services LLC
Richland Office

Enclosure (1)

LK

cc: D. C. Pfluger, MS5-I w/enclosure (2)

24590-CM-HC4-HXYG-000240-02-00011 Rev. 00A.

IA-3010235-000

# IQRPE STRUCTURAL INTEGRITY ASSESSMENT REPORT FOR LAW LVP CAUSTIC COLLECTION TANK (LVP-TK-00001)

**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 LAW LVP CAUSTIC COLLECTION TANK (LVP-TK-00001)

"I, Tarlok Singh 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 LAW LVP Caustic Collection Tank, 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 seven (7) pages numbered one (1) through seven (7).

TARLOK SINGH HUNDAL
STATE OF WASHINGTON
20213
REGISTERED
PROFESSIONAL ENGINEER

Signature

4/21/14
Date

| | | |
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| **Scope** | Scope of this Integrity Assessment | This Integrity Assessment is for LAW Secondary Offgas/Vessel Vent Process (LVP) System, Caustic Collection Tank (LVP-TK-00001), located in Room L-0218, at Elevation 28'-0" of the LAW Vitrification Building as shown on General Arrangement Drawing 24590-LAW-P1-P01T-00004.<br><br>**Note: This report supersedes the previous issued integrity assessment report: BNI CCN #: 139508 (AREVA NC Inc., Report No. - AREVA-IA-101, Rev. 0)** |
| **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,* Section WAC-173-303-640 (3) (a) through (g) applicable elements of the *Tank Systems.* |

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| References | Material Requisition, Specifications, Drawings, Mechanical Data Sheet, and System Description. | Material Requisition:<br>24590-CM-MRC-MVA0-00002, Rev. 1 (including Supplements S0001 and S0002): Pressure Vessels, Shop Fabricated, Medium (N053).<br><br>Specifications:<br>The following Specifications with their respective revision and Specification Change Notices (SCNs) are listed in the above listed Material Requisition:<br>24590-WTP-3PS-G000-T0001, Engineering Specification for Supplier Quality Assurance Program Requirements;<br>24590-WTP-3PS-G000-T0002, Engineering Specification for Positive Material Identification (PMI) for Shop Fabrication;<br>24590-WTP-3PS-G000-T0003, Engineering Specification for Packaging, Handling, and Storage Requirements;<br>24590-WTP-3PS-MV00-T0002, Engineering Specification for Seismic Qualification Criteria for Pressure Vessels;<br>24590-WTP-3PS-FB01-T0001, Engineering Specification for Structural Design Loads for Seismic Category III & IV Equipment and Tanks;<br>24590-WTP-3PS-AFPS-T0001, Engineering Specification for Shop Applied Special Protective Coatings for Steel Items and Equipment;<br>24590-WTP-3PS-MTSS-T0001, Engineering Specification for Tank Welding.<br><br>Plant Drawings:<br>24590-LAW-P1-P01T-00002, Rev. 7, LAW Vitrification Building General Arrangement Plan at El. 3'-0";<br>24590-LAW-P1-P01T-00004, Rev. 5, LAW Vitrification Building General Arrangement Plan at El. 28'-0";<br>24590-LAW-DB-S13T-00028, Rev. 4, LAW Vitrification Building Main Building Partial Conc Forming Plan Zone 5 @ El. (+) 28'-0";<br>24590-LAW-M5-V17T-00011, Rev. 5 (+DCN #s 24590-LAW-M5N-V17T- 00012 and 00029), Process Flow Diagram LAW VIT Secondary Offgas Treatment (System LVP);<br>24590-LAW-M6-LVP-00002003, Rev. 0 (+DCN #s 24590-LAW-M6N-LVP- 00092, 00102, and 00106), P & ID-LAW Secondary Offgas/Vessel Vent Process System Caustic Collection Tank LVP-TK-00001.<br><br>Vender Fabrication Drawings (Bechtel Status Code 1 Drawings = As-Built Drawings: Approved and Accepted by Bechtel):<br>24590-CM-POA-MVA0-00019-03-00003, Rev. 00C (+DCN # 24590-LAW-VDCN-M-13-00001), LAW Caustic Collection Tank (LVP-TK-00001) General Arrangement;<br>24590-CM-POA-MVA0-00019-03-00009, Rev. 00D (+DCN # 24590-LAW-VDCN-M-13-00001) LAW Caustic Collection Tank (LVP-TK-00001) Nozzle Details;<br>24590-CM-POA-MVA0-00019-03-00010, Rev. 00C (+DCN # 24590-LAW-VDCN-M-13-00001) LAW Caustic Collection Tank (LVP-TK-00001) Nozzle Details Continued;<br>24590-CM-POA-MVA0-00019-03-00015, Rev. 00B, LAW Caustic Collection Tank (LVP-TK-00001) General Notes.<br><br>Mechanical Data Sheet:<br>24590-LAW-MTD-LVP-00001, Rev. 1, LAW Caustic Collection Tank (LVP-TK-00001).<br><br>System Description:<br>24590-LAW-3YD-LOP-00001, Rev. 3, System Description for the LAW Primary Offgas (LOP) and Secondary Offgas/Vessel Vent (LVP) Systems (including SDCN #s 24590-LAW-3YN-LOP-00011, 00012, 00013, and 00015). |

| | Information Assessed | Source of Information | Assessment |
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| Design | Tank design standards are appropriate and adequate for the tank's intended use. | Mechanical Data Sheet, Specifications, and Drawings listed above under References;<br><br>API-650 Standard, American Petroleum Institute, Welded Steel Tanks for Oil Storage. | The Mechanical Data Sheet requires that the LAW Caustic Collection Tank, LVP-TK-00001 be designed to the API-650 Standard's applicable requirements, which are appropriate for the tank operating with waste liquid within the pressure and temperature ranges specified for this tank. The tank's quality level is commercial (CM) grade and its seismic category (SC) is SC-III. Supplementary requirements are specified in the engineering specifications. Supplementary requirements address the tank design, positive material identification, lifting attachment design, fabrication tolerances, acceptable welding procedures for the tank, welder qualifications and testing records, NDE inspections and records, and lifting, packaging, shipping, handling and storage requirements. As discussed above, the design standards are appropriate and adequate for the tank's intended use. As shown on the drawings, the LAW Caustic Collection Tank, LVP-TK-00001 is a vertical tank with a 13 ft ID and a height of 14 ft 4 in. with a self supporting cone roof. The cone roof is built with a 1/4" minimum thick plate. The shell and bottom floor are built of 5/16" minimum thick plates. The tank is anchored to the steel framing under concrete floor at Elev. 28'-0". Material for the tank's cone roof, shell, and bottom floor is SA-240 316 stainless steel (0.030% maximum carbon content, dual certified), hereafter referred to as 316 stainless steel. The tank has internal piping, spray nozzle, and other appurtenances made of other grades of stainless steel material. Tank's operating volume is about 7,325 gallons and the total internal volume is about 14,593 gallons. |
| | If a non-standard tank is to be used, the design calculations demonstrate sound engineering principles of construction. | Mechanical Data Sheet, Specifications, Material Requisition, and Drawings listed above under References;<br><br>API-650 Standard, American Petroleum Institute, Welded Steel Tanks for Oil Storage;<br>24590-CM-POA-MVA0-00019-02-00002, Rev. 00C, Design Calculations for LAW Caustic Collection Tank (LVP-TK-00001). | The LAW Caustic Collection Tank, LVP-TK-00001 is a standard API-650 tank. The Mechanical Data Sheet requires that the API-650 tank be delivered after design, fabrication, inspection, and testing per API-650 Standard. This is a shop fabricated tank that is delivered for service in the LAW Facility. Review of the Design Calculations document for this tank shows that it has been designed as a standard tank per applicable requirements of API-650 standard and Specifications and other documents listed in the Material Requisition for the tank. The aforementioned statements and the vendor fabrication drawings of the tank reviewed demonstrate that sound engineering principles of design, construction, and fabrication have been used for the tank. |

| | Information Assessed | Source of Information | Assessment |
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| Design (cont'd) | Tank has adequate strength, after consideration of the corrosion allowance, to withstand the operating pressure, operating temperature, and seismic loads. | Mechanical Data Sheet, Specifications, Drawings, and Material Requisition listed above under References;<br><br>API-650 Standard, American Petroleum Institute, Welded Steel Tanks for Oil Storage;<br>UBC 1997, Uniform Building Code, International Conference of Building Officials;<br>24590-CM-POA-MVA0-00019-02-00002, Rev. 00C, Design Calculations for LAW Caustic Collection Tank (LVP-TK-00001). | The Mechanical Data Sheet identifies tank's operating pressure and temperature ranges, the selected materials, the corrosion allowance, the quality level, and the seismic category. The API-650 Standard and supplement Engineering Specifications for the tank require specific consideration of the operating pressures, temperatures, and seismic loads in the design process. API-650 Standard requires that corrosion allowance thickness be added to the nominal tank design thickness when evaluating the adequacy of the tank components for these loads at the end of life. The Mechanical Data Sheet identifies the tank's Seismic Category as SC-III. For SC-III tanks, the detailed requirements for seismic load determination (per UBC 1997) are furnished in the Specification for Structural Design Loads for Seismic Category III & IV Equipment and Tanks. Review of the Design Calculations document of this tank shows that the tank has adequate strength after consideration of corrosion allowance to withstand the applicable operating pressure, temperature, and seismic loads for the specified design life of the tank. Furthermore, approval and acceptance of the vendor fabrication drawings by Bechtel National Inc. (BNI) is an added assurance that all applicable requirements stated above and as described in the documents (including daughter documents) listed in Material Requisition for the tank have been met. |
| Foundation | Tank foundation will maintain the load of a full tank. | Drawings listed under References;<br><br>API-650 Standard, American Petroleum Institute, Welded Steel Tanks for Oil Storage;<br>24590-CM-POA-MVA0-00019-02-00002, Rev. 00C, Design Calculations for LAW Caustic Collection Tank (LVP-TK-00001);<br>24590-WTP-DB-ENG-01-001, Rev. 1Q, Basis of Design. | The API-650 Standard specifies the requirements for the design of the tank supports and ensures their adequate design. Review of the Design Calculations document of the tank shows that the tank's support components (shell and bottom plate) have adequate strength to maintain the load of the full tank. Furthermore, Chapter 14 of the Basis of Design document requires that the foundation underlying the tank support must be adequate to support the loads from full tank. It should be noted that the current revisions of the drawings (due to VDCN-M-13-00001) reviewed show the incoming scrubber drain line was lowered, which also required lower elevation of the tank's overflow pipe. This change resulted in reduced volume and lesser load of the tank for evaluation of the underlying supporting foundation, which is out of scope of this assessment. The assessment of the adequacy of the underlying foundation is part of a separate integrity assessment report for the Secondary Containment of the tank. |

| | Information Assessed | Source of Information | Assessment |
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| **Foundation (cont'd)** | If in an area subject to flooding, the tank is anchored. | Mechanical Data Sheet and Drawings listed under References;<br><br>24590-CM-POA-MVA0-00019-02-00002, Rev. 00C, Design Calculations for LAW Caustic Collection Tank (LVP-TK-00001);<br>24590- LAW-SSC-S15T-00032, Rev. A, Steel Framing Elevation +28' (Non-Process and Effluent Cells) (includes Design Calc. of Anchors for LVP-TK-00001 - pp. A63-A65) and w/ECCN # 24590-LAW-SSE-S15T-00055;<br>24590-LAW-PER-M-02-002, Rev. 7, Dangerous Waste Permit (DWP) Liner Heights in the LAW Facility. | Dangerous Waste Permit Liner Heights document provides information to compute liner heights for effective secondary containment due to flooding in various rooms of LAW facility. The Liner Heights document and drawings show that Room L0128 containment wall is 4 ft high where LVP-TK-00001 is located. This flooding height is inclusive of the ruptured tank inner volume thus does not exert any buoyant force on the tank. The Mechanical Data Sheet also does not require any evaluation of anchoring the tank due to flooding. However, the Design Calculations and drawings show that the tank is anchored to the concrete floor for other applicable forces including seismic loads. |
| | Tank system will withstand the effects of frost heave. | Drawings listed under References;<br><br>24590-WTP-DC-ST-01-001, Rev. 13, Structural Design Criteria. | The Structural Design Criteria requires that all outdoor structural foundations shall extend into the surrounding soil below the 30 in. frost line depth; to preclude any frost heave effects. As shown on the drawings, the tank is located inside/interior of the building at above grade (at floor Elev. 28'-0") and the building's lower level floor is at Elevation (-) 21'-0", therefore, tank's foundation is not subject to the frost heave effects. |

| | Information Assessed | Source of Information | Assessment |
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| **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 Data Sheet listed above under References;<br><br>24590-LAW-N1D-LVP-00002, Rev. 2, Corrosion Evaluation - Caustic Collection Tank LVP-TK-00001 (LAW);<br>24590-WTP-PER-PR-03-002, Rev. 3, Control of Toxic Vapors and Emissions from WTP Tank and Miscellaneous Unit Systems;<br>24590-WTP-PER-PR-03-001, Rev. 1, Prevention of Hydrogen Accumulation in WTP Tank Systems and Miscellaneous Treatment Unit Systems. | The Mechanical Data Sheet presents process conditions and design parameters of the tank, such as the waste specific gravity, temperatures, and pressures, etc. The Corrosion Evaluation document addresses the pH range and chemical composition of the waste and selects appropriate tank materials and the corrosion allowance. Waste characteristics that are hazardous, such as ignitability, reactivity, and toxicity are appropriately addressed in the Control of Toxic Vapors and Emissions document and Prevention of Hydrogen Accumulation document. These two aforementioned documents do not specifically list this tank to exhibit any hazardous characteristics. Additionally the tank is grounded to control ignition sources. |
| | Tank is designed to store or treat the wastes with the characteristics defined above and any treatment reagents. | System Description listed above under References:<br><br>24590-LAW-N1D-LVP-00002, Rev. 2, Corrosion Evaluation - Caustic Collection Tank LVP-TK-00001 (LAW). | The Corrosion Evaluation document demonstrates that the tank is designed to process the wastes discussed above. The System Description discusses normal and abnormal operations for the LVP tank. To neutralize the collected acid gases, a 5 molar sodium hydroxide solution is added to the Caustic Collection Tank. A spray jet nozzle is provided for washdown during maintenance periods. |
| | The waste types are compatible with each other. | Drawings and System Description listed above under References. | The System Description for the LAW (LVP) does not describe any operations where incompatible wastes are mixed in this tank for processing. The LVP tank receives scrubbing liquid from the Caustic Scrubber (LVP-SCB-00001), located at upper floor (Elev. 48'-0") as shown in drawings and as described in the System Description document. The collected waste is routinely pumped to the LAW pretreatment facility Alkaline Effluent Tanks (RLD-VSL-00017A/B) via caustic blowdown pumps (LVP-PMP-00002A/B) for further processing. |

| | Information Assessed | Source of Information | Assessment |
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| **Corrosion Protection** | Tank material and protective coatings ensure the tank structure is adequately protected from the corrosive effects of the waste stream and external environments (expected to not leak or fail for the design life of the system). | Mechanical Data Sheet listed above under References;<br><br>American Petroleum Institute standard, API-650, Welded Steel Tanks for Oil Storage;<br>24590-LAW-N1D-LVP-00002, Rev. 2, Corrosion Evaluation - Caustic Collection Tank LVP-TK-00001 (LAW). | The Corrosion Evaluation document shows that the LAW Caustic Collection Tank, LVP-TK-00001 normally operates at atmospheric pressure, a pH of 9 (may be raised to 14), and at a temperature range of 142°F to 149°F. The tank is designed per API-650 standard and for a temperature of 180°F. Other pertinent tank operation and design information is provided in the Mechanical Data Sheet. Washdown of the tank is considered using the internal spray jet nozzle. The selected 316 stainless steel material with a corrosion allowance of 0.04 in. is adequate for the 40-yr design life of the tank. |
| **Corrosion Allowance** | Corrosion allowance is adequate for the intended service life of the tank. | Mechanical Data Sheet listed above under References;<br><br>24590-LAW-N1D-LVP-00002, Rev. 2, Corrosion Evaluation - Caustic Collection Tank LVP-TK-00001 (LAW);<br>24590-CM-POA-MVA0-00019-02-00002, Rev. 00C, Design Calculations for LAW Caustic Collection Tank (LVP-TK-00001). | The bases for the LVP tank's material selection and corrosion allowance are furnished in the Corrosion Evaluation document and in the Mechanical Data Sheet. Selection of 316 stainless steel material with a corrosion allowance of 0.04 in. for a service life of 40 years is adequate and appropriate for the intended use of the tank. The Design Calculations appropriately account for the corrosion allowance of 0.04 in. for computing the required thickness of the tank components. |
| **Pressure Relief** | Pressure controls (vents and relief valves) are adequately designed to ensure pressure relief if normal operating pressures in the tank are exceeded. | Drawings listed above under References. | The LAW Caustic Collection Tank, LVP-TK-00001 is provided with an unrestricted overflow through a 6" diameter pipe and the drawings also show that the tank is vented near the apex of its conical roof to prevent any build up of the gases and/or over pressurization of the tank. |

# Master Distribution Schedule for WTP Project Subcontract Management Group



**SUBMITTAL TRANSMITTAL:** ☒ First Submittal ☐ Re-Submittal ☐ QVRP Package ☐ RFI
☒ No Review Required ☐ No Review Required Re-Submittal ☐ Submittal Supplement

**CORRESPONDENCE:** ☐ With Attachment ☐ W/O Attachment (letter only) ☐ RFI
☐ Fax as Original (Letter Only) ☐ Fax as Original (With Attachment)

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

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| **Subcontract Number:** | 24590-CM-HC4-HXYG-00240 |
| **Subcontract Title:** | Tank Integrity Design Assessments |
| **Subcontractor Name:** | AREVA Federal Services LLC |
| **Subcontract Administrator:** | Tess Klatt |

| PDC Document Number | Rev | Document Title | Rev |
|---|---|---|---|
| 24590-CM-HC4-HXYG-00240-02-00011 | 00A | IQRPE Structural Integrity Assessment Report For LAW LVP Caustic Collection Tank (LVP-TK-00001) (IA-3010235-000) | |
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