



OFFICE OF RIVER PROTECTION

P.O. Box 450, MSIN H6-60
Richland, Washington 99352

AUG 12 2019

19-ECD-0062

Ms. Alexandra K. Smith, Program Manager
Nuclear Waste Program
Washington State
Department of Ecology
3100 Port of Benton Blvd.
Richland, Washington 99354

Ms. Smith:

SUBMITTAL OF HANFORD FACILITY RESOURCE CONSERVATION AND RECOVERY ACT PERMIT MODIFICATION NOTIFICATION FORM 24590-LAW-PCN-ENV-18-009, INDEPENDENT, QUALIFIED, REGISTERED PROFESSIONAL ENGINEER STRUCTURAL INTEGRITY ASSESSMENT REPORT

- References:
1. WA7890008967, "Dangerous Waste Portion of the Hanford Facility Resource Conservation and Recovery Act Permit for the Treatment, Storage, and Disposal of Dangerous Waste, Part III, Operating Unit 10, 'Waste Treatment and Immobilization Plant.'" 2. BNI letter from V. McCain to B.T. Vance, ORP, "Submittal of Hanford Facility Resource Conservation and Recovery Act Permit Modification Notification Form 24590-LAW-PCN-ENV-18-009," CCN: 312273, dated July 23, 2019.

This letter transmits Hanford Facility Resource Conservation and Recovery Act Permit Modification Notification Form 24590-LAW-PCN-ENV-18-009, attached, for the Washington State Department of Ecology review and approval. The form describes a requested Class 1 modification to Reference 1.

The purpose of the modification is to replace the Independent, Qualified, Registered Professional Engineer Structural Integrity Assessment Report for the Low-Activity Waste Facility Secondary Offgas/Vessel Vent Process System Miscellaneous Unit Melter Offgas Caustic Scrubber (LVP-SCB-00001) in Appendix 9.11 of Reference 1.

Washington State Department of Ecology comments resulting from review of this modification notification form and the associated information have been dispositioned.

Ms. Alexandra K. Smith
19-ECD-0062

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AUG 12 2019

If you have any questions, please contact me, or your staff may contact Gae M. Neath,
Environmental Compliance Division, (509) 376-7828.



Glyn D. Trenchard, Assistant Manager
Technical and Regulatory Support

ECD:GMN

Attachment

cc w/attach:

D.E. Casey, BNI
R. Haggard, BNI
V. McCain, BNI
D.C. Robertson, BNI
D.M. Yasek, BNI
J. Cantu, Ecology (7 hard copies & CD)
A.S. Carlson, Ecology
T.Z. Gao, Ecology
M.E. Jones, Ecology
J.K. Perry, MSA
A.C. McKarns, RL
Administrative Record (WTP H-0-8)
BNI Correspondence
Environmental Portal

cc w/o attach:

M. Johnson, CTUIR
P. Mills, CTUIR
S.L. Dahl, Ecology
D. McDonald, Ecology
J. Bell, NPT
G. Bohnee, NPT
K. Niles, Oregon Energy
P.M. Pak, RL
L. Contreras, YN

**Attachment
19-ECD-0062
(17 Pages Excluding Cover Sheet)**

**Hanford Facility RCRA Permit Modification Notification
Form 24590-LAW-PCN-ENV-18-009**

Quarter Ending Sept 30, 2019

24590-LAW-PCN-ENV-18-009

Hanford Facility RCRA Permit Modification Notification Form					
Unit: Waste Treatment and Immobilization Plant		Permit Part: Part III, Operating Unit 10			
<u>Description of Modification:</u>					
<p>This Class 11 modification requests Ecology approval and incorporation into the permit the below referenced structural integrity assessment report. The report has been updated by the Independent Qualified Registered Professional Engineer (IQRPE).</p>					
Appendix 9.11					
Replace	24590-CM-HC4-HXYG-00240-02-00013, Rev. 00A, IA-3013509-000; IQRPE Structural Integrity Assessment Report for LAW LVP Miscellaneous Unit (MU) Melter Offgas Caustic Scrubber (LVP-SCB-00001)	With	24590-CM-HC4-HXYG-00240-02-00013, Rev. 00B, IA-3013509-001; IQRPE Structural Integrity Assessment Report for LAW LVP Miscellaneous Unit (MU) Melter Offgas Caustic Scrubber (LVP-SCB-00001)		
<p>The scope of this Structural Integrity Assessment includes the Melter Offgas Caustic Scrubber (LVP-SCB-00001) associated with the LAW LVP system. The LAW LVP system receives melter offgas from the Primary Offgas System (LOP) and its primary function is to ensure removal of hazardous gases within the system. This LAW Caustic Scrubber is the final decontamination equipment in the secondary offgas treatment train and is located downstream from the Thermal Catalytic Oxidizer (TCO) unit.</p> <p>For each item of "Information Assessed" in the integrity assessment report, the items listed under the "Source of Information" column were reviewed and found to contain adequate design requirements and controls to ensure the design fully satisfies the requirements of State of Washington Administrative Code (WAC), 173-303-640 WAC, Dangerous Waste Regulations.</p> <p>This PCN updates information in Appendix 9.11 to reflect current design. This DWP component may be re-evaluated to confirm design adequacy. If the re-evaluation results in future design changes, the changes will be reviewed by Ecology in subsequent permit modifications.</p> <p>In accordance with Permit Condition III.10.C.2.e, this permit modification includes an updated IQRPE Structural Integrity Assessment Report for inclusion in Appendix 9.11.</p>					
WAC 173-303-830 Modification Class:		Class 1	Class 11	Class 2	Class 3
Please mark the Modification Class:			X		
<p>Enter relevant WAC 173-303-830, Appendix I Modification citation number: N/A</p> <p>Enter wording of WAC 173-303-830, Appendix I Modification citation:</p> <p>In accordance with WAC 173-303-830(4)(d)(i), this modification notification is requested to be reviewed and approved as a Class 11 modification. WAC 173-303-830(4)(d)(ii)(A) states. "Class 1 modifications apply to minor changes that keep the permit current with routine changes to the facility or its operation. These changes do not substantially alter the permit conditions or reduce the capacity of the facility to protect human health or the environment. In the case of Class 1 modifications, the director may require prior approval."</p>					
Modification Approved/Concur: <input type="checkbox"/> Yes <input type="checkbox"/> Denied (state reason below)		Reviewed by Ecology:			
Reason for denial:		_____ S. Dahl Date			



ISSUED BY
RPP-WTP PDC

orano

FS-19-0150

June 20, 2019

Ms. Andrea Dorsey
Subcontractor Administrator
Bechtel National, Inc.
2435 Stevens Center Place
Richland, WA 99354

Orano Federal
Services LLC

9630 Bedford St
Pasco, WA 99301

Tel: +1 509 862 4747

Dear Ms. Dorsey,

**BECHTEL NATIONAL, INC. CONTRACT NO. 24590-CM-HC4-HXYG-00240
IQRPE STRUCTURAL INTEGRITY ASSESSMENT REPORT FOR LAW LVP
MISCELLANEOUS UNIT MELTER OFFGAS CAUSTIC SCRUBBER (LVP-
SCB-00001) (IA-3013509-001)**

The integrity assessment of the subject Caustic Scrubber 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 Caustic Scrubber 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) 862-4765, or via email at tarlok.hundal@orano.group.

Sincerely,

W. Keith Wilkerson
Sr. Contract Administrator
Orano Federal Services LLC
Charlotte Office

lap
cc: J.S. Evans, w/Enclosure (1)

**IQRPE STRUCTURAL INTEGRITY ASSESSMENT REPORT
FOR
LAW LVP MISCELLANEOUS UNIT OFFGAS
CAUSTIC SCRUBBER (LVP-SCB-00001) (IA3013509-001)**

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 MISCELLANEOUS UNIT OFFGAS
CAUSTIC SCRUBBER (LVP-SCB-00001) (IA3013509-001)**

"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 Scrubber, as required by the 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*."

"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 twelve (12) pages numbered one (1) through twelve (12).



T. Hundal
Signature

6/20/19
Date

Scope	Scope of this Integrity Assessment	<p>The scope of this integrity assessment includes the Melter Offgas Caustic Scrubber (LVP-SCB-00001), also known as Miscellaneous Unit (MU) or Plant Item associated with the LVP system as shown on P&ID drawing 24590-LAW-M6-LVP-00002002. The LAW LVP system receives melter offgas from the Primary Offgas System (LOP) and its primary function is to ensure removal of hazardous gases within the system. This LAW Caustic Scrubber is the final decontamination equipment in the secondary offgas treatment train, and is located downstream from the Thermal Catalytic Oxidizer (TCO) unit.</p> <p>The Caustic Scrubber is a vertical vessel mounted on one foot high concrete pad in Room L-0304F at floor Elevation 48'-0" of the LAW facility as shown on general arrangement drawing 24590-LAW-P1-P01T-00005.</p> <p>Note: This report (IA-3013509-001) is a revision of the previous report (IA-3013509-000; BNI # 24590-CM-HC4-HXYG-00240-02-00013, Rev. 00A).</p>
	Summary of Assessment	<p>For each item listed in the "Information Assessed" (i.e., Criteria) column, on pages following the "References" pages, the related documents listed in the "Source of Information" column, were reviewed. The aforementioned documents as described in the "Assessment" column, were found to contain adequate design requirements and controls to ensure that the design fully satisfies the requirements of State of Washington Administrative Code (WAC), Chapter 173-303 WAC, <i>Dangerous Waste Regulations</i>, Section WAC-173-303-640 (3) (a) through (g) applicable elements of the <i>Tank Systems</i>.</p>

<p>References</p>	<p>Material Requisition, Specifications, and Plant Drawings</p>	<p>Material Requisition (MR): 24590-QL-MRA-MKAS-00003, Rev. 3, LAW Melters Offgas Caustic Scrubber, including TCN No. 24590-QL-MRA-MKAS-00003-T0009, -T0010, & - T0011.</p> <p>Specifications: The following Specifications with their respective revision and Specification Change Notices (SCNs) are listed in the above listed MR:</p> <p>24590-LAW-3PS-MKAS-T0001, Engineering Specification for LAW Melter Offgas Caustic Scrubber; 24590-WTP-3PS-MV00-T0001, Engineering Specification for Pressure Vessel Design and Fabrication; 24590-WTP-3PS-MV00-T0002, Engineering Specification for Seismic Qualification Criteria for Pressure Vessels; 24590-WTP-3PS-MV00-T0003, Engineering Specification for Pressure Vessel Fatigue Analysis; 24590-WTP-3PS-MVB2-T0001, Engineering Specification for Welding of Pressure Vessels, Heat Exchangers, and Boilers; 24590-WTP-3PS-G000-T0002, Engineering Specification for Positive Material Identification (PMI) for Shop Fabrication; 24590-WTP-3PS-G000-T0003, Engineering Specification for Packaging, Handling, and Storage Requirements; 24590-WTP-3PS-FB01-T0001, Engineering Specification for Structural Design Loads for Seismic Category III & IV Equipment and Tanks.</p> <p>Plant Drawings: 24590-LAW-P1-P01T-00005, Rev. 7, LAW Vitrification Building General Arrangement Plan at El. 48'-0"; 24590-WTP-MV-M59T-00026, Rev.1, Anchor Bolt Chair Details for Vertical Vessels; 24590-LAW-DB-S13T-00135, Rev. 9, LAW Vitrification Building Main Building Partial Concrete Forming Plan Zone 5 @ El. (+) 48'-0"; 24590-LAW-DG-S13T-00139, Rev. 1, LAW Vitrification Building Main Building Concrete Reinforcing for LVP-SCB-00001 @ TOC El. (+) 49'-0"; 24590-LAW-DB-S13T-00142, Rev. 3, LAW Vitrification Building Main Building Concrete Forming for LVP-SCB-00001 @ TOC El. (+) 49'-0"; 24590-PTF-DD-S13T-00201, Rev. 10, Pretreatment Facility Structural Concrete Wall Embeds Details-Sh. 2; 24590-WTP-DD-S13T-00004, Rev. 5, Civil/Structural Standards Standard Embedded Anchor Bolt Details; 24590-LAW-M5-V17T-00011, Rev. 6, Process Flow Diagram LAW Vit Secondary Offgas Treatment (System LVP); 24590-LAW-M6-LVP-00002002, Rev. 1, P&ID- LAW Secondary Offgas/Vessel Verrt Process System Caustic Scrubber LVP-SCB-00001.</p>
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References (cont'd)	<p><u>Vendor Fabrication Drawings (*Bechtel Status Code 1 Drawings):</u> 24590-QL-POA-MKAS-00003-04-00008, Rev. 00F, LAW Melter Offgas Caustic Scrubber Elevation and Orientation; 24590-QL-POA-MKAS-00003-04-00009, Rev. 00G, LAW Melter Offgas Caustic Scrubber Packing Hold Down Grid; 24590-QL-POA-MKAS-00003-04-00010, Rev. 00D, LAW Melter Offgas Caustic Scrubber Packing Support Grid; 24590-QL-POA-MKAS-00003-04-00050, Rev. B02, LAW Melter Offgas Caustic Scrubber Vessel Assembly; 24590-QL-POA-MKAS-00003-04-00051, Rev. B00, LAW Melter Offgas Caustic Scrubber Vessel Assembly; 24590-QL-POA-MKAS-00003-04-00052, Rev. 00H, LAW Melter Offgas Caustic Scrubber Vessel Assembly; 24590-QL-POA-MKAS-00003-04-00053, Rev. B01, LAW Melter Offgas Caustic Scrubber Filter Frame Assembly; 24590-QL-POA-MKAS-00003-04-00054, Rev. 00C, LAW Melter Offgas Caustic Scrubber Filter Frame Assembly; 24590-QL-POA-MKAS-00003-04-00055, Rev. 00O, LAW Melter Offgas Caustic Scrubber Vessel Weldment; 24590-QL-POA-MKAS-00003-04-00056, Rev. 00I, LAW Melter Offgas Caustic Scrubber Vessel Weldment; 24590-QL-POA-MKAS-00003-04-00057, Rev. 00O, LAW Melter Offgas Caustic Scrubber Vessel Weldment; 24590-QL-POA-MKAS-00003-04-00058, Rev. 00L, LAW Melter Offgas Caustic Scrubber Vessel Weldment; 24590-QL-POA-MKAS-00003-04-00059, Rev. 00F, LAW Melter Offgas Caustic Scrubber Filter Frame Weldment; 24590-QL-POA-MKAS-00003-04-00063, Rev. 00B, LAW Melter Offgas Caustic Scrubber Filter Frame Weldment; 24590-QL-POA-MKAS-00003-04-00064, Rev. 00E, LAW Melter Offgas Caustic Scrubber Filter Frame Weldment; 24590-QL-POA-MKAS-00003-04-00084, Rev. 00O, LAW Melter Offgas Caustic Scrubber Skirt Weldment; 24590-QL-POA-MKAS-00003-04-00085, Rev. 00G, LAW Melter Offgas Caustic Scrubber Skirt Weldment; 24590-QL-POA-MKAS-00003-04-00086, Rev. 00D, LAW Melter Offgas Caustic Scrubber Top Insulation Support Weldment; 24590-QL-POA-MKAS-00003-04-00094, Rev. 00G, LAW Melter Offgas Caustic Scrubber Top Head Weldment; 24590-QL-POA-MKAS-00003-04-00096, Rev. 00D, LAW Melter Offgas Caustic Scrubber Manway Cover Weldment; 24590-QL-POA-MKAS-00003-04-00103, Rev. 00B, LAW Melter Offgas Caustic Scrubber Filter Frame Details; 24590-QL-POA-MKAS-00003-04-00107, Rev. 00D, LAW Melter Offgas Caustic Scrubber Skirt Parts Detail; 24590-QL-POA-MKAS-00003-04-00114, Rev. 00C, LAW Melter Offgas Caustic Scrubber Vessel Flange Detail; 24590-QL-POA-MKAS-00003-04-00115, Rev. 00D, LAW Melter Offgas Caustic Scrubber General Arrangement; 24590-QL-POA-MKAS-00003-04-00117, Rev. 00C, LAW Melter Offgas Caustic Scrubber Drawing List.</p> <p>*Bechtel Status Code 1 Drawing is an "as fabricated vendor drawing" approved/accepted by Bechtel.</p> <p><u>Mechanical Data Sheet (MDS):</u> 24590-LAW-MKD-LVP-00011, Rev. 7, LAW Melter Offgas Caustic Scrubber (LVP-SCB-00001).</p> <p><u>Corrosion Evaluation:</u> 24590-LAW-NID-LVP-00001, Rev. 7, LAW Melter Offgas Caustic Scrubber (LVP-SCB-00001).</p> <p><u>System Design Description:</u> 24590-LAW-3ZD-LOP-00001, Rev. 3, LAW Primary Offgas Process (LOP) and LAW Secondary Offgas/Vessel Vent Process (LVP) System Design Description, including SDDCN # 24590-LAW-3ZN-LOP-00012.</p>
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	Information Assessed	Source of Information	Assessment
Design	Plant Item design standards are appropriate and adequate for the vessel's intended use.	<p>Specifications, Drawings, and Mechanical Data Sheet listed above under References;</p> <p>ASME Boiler and Pressure Vessel Code (B&PV), Section VIII, Division 1, Rules for Construction of Pressure Vessels, American Society of Mechanical Engineers.</p>	<p>The LAW Caustic Scrubber (LVP-SCB-00001) is considered as a vessel. It is also interchangeably termed herein as MU or Plant Item. The Engineering Specifications for LAW Melter Offgas Caustic Scrubber and Mechanical Data Sheet require that the design and fabrication be per ASME B&PV Code, Section VIII, Division 1, with the National Board Registration code stamp. Supplementary requirements for the Scrubber are specified in the listed referenced Engineering Specifications. The supplementary requirements include structural design requirements, fatigue analysis, thermal loads, positive material identification, fabrication tolerances, welding procedures, welder qualifications and testing records, NDE inspections and records, packaging, handling, and storage requirements. The MU is identified as Quality Level (Q) and Seismic Category (SC-III) in the Mechanical Data Sheet. The Vendor Fabrication drawings show that the Scrubber's top head and upper portion of shell subjected to low temperature are built with 316 stainless steel plate (max. 0.030% C; dual certified), hereinafter known as 316L stainless steel, whereas the bottom head and lower portion of shell subjected to high temperature are built with excellent corrosion resistant Hastelloy C-276 (ASME SB-575) (UNS N10276) plate. Other pertinent components of the units are also built of 316L materials (low temperature resistant components) or C-276 materials (high temperature resistant components) based on their location in the Scrubber. The design requirements specified in the codes and specifications are appropriate and adequate for the intended use of this MU.</p>

	Information Assessed	Source of Information	Assessment
Design (cont'd)	If a non-standard Plant Item is to be used, the design calculations demonstrate sound engineering principles of construction.	Material Requisition, Engineering Specifications, Mechanical Data Sheet, and Drawings listed above under References; ASME Boiler and Pressure Vessel Code (B&PV), Section VIII, Division 1, Rules for Construction of Pressure Vessels, American Society of Mechanical Engineers; 24590-LAW-MVC-LVP-00003, Rev. 0, LVP-SCB-00001, LAW Melters Offgas Caustic Scrubber, Stress Analysis with ANSYS (Design Calculation); 24590-QL-POA-MKAS-00003-07-00005, Rev. 00G, LAW Caustic Scrubber ASME Code Calculation (Design Calculation); 24590-WTP-MVC-50-00009, Rev. 0, LAW, BOF, and LAB Vessel Cyclic Datasheet Inputs (Design Calculation); including ECCN # 24590-WTP-MVE-50-00015; 24590-LAW-DDC-S13T-00058, Rev. D, Anchor Bolt and Embed Design for Caustic Scrubber (LVP-SCB-00001) at El. + 49'-0" (Design Calculation).	The LAW MU (LVP-SCB-00001) in the LAW Secondary Off-gas System (LVP) is a non-standard offgas treatment assembly that is shop fabricated. The referenced Material Requisition, Mechanical Data Sheet, and Specifications require that this vessel be designed and built using ASME B & PV Code, Section VIII, Div. 1 and delivered after design, fabrication, inspection, and testing including ASME code stamp with National Board registration number. Review of the listed Analysis/Design Calculations and drawings show that appropriate applicable load cases and combinations thereof were used utilizing sound engineering principles for the design and construction of the Scrubber. Furthermore, approval and acceptance of the vendor fabrication drawings (including various applicable change notices) by Bechtel National Inc.(BNI), is an added assurance that all applicable requirements stated above and as described in documents (including daughter documents) listed in the Material Requisition for the vessel, have been met. The BNI approved and accepted change notices documents were reviewed and found to be in compliance with the applicable design requirements.

	Information Assessed	Source of Information	Assessment
<p>Design (cont'd)</p>	<p>Plant Item has adequate strength, after consideration of the corrosion allowance, to withstand the operating pressure, operating temperature, and seismic loads.</p>	<p>Specifications, Mechanical Data Sheet, and Corrosion Evaluation listed above under References;</p> <p>ASME Boiler and Pressure Vessel Code (B&PV), Section VIII, Division 1, Rules for Construction of Pressure Vessels, American Society of Mechanical Engineers; ASME B31.3, Process Piping, ASME Code for Process Piping, American Society of Mechanical Engineers; 24590-LAW-MVC-LVP-00003, Rev. 0, LVP-SCB-00001, LAW Melters Offgas Caustic Scrubber, Stress Analysis with ANSYS (Design Calculation); 24590-WTP-MVC-50-00009, Rev. 0, LAW, BOF, and LAB Vessel Cyclic Datasheet Inputs (Design Calculation), including ECCN # 24590-WTP-MVE-50-00015; 24590-QL-POA-MKAS-00003-07-00005, Rev. 00G, LAW Caustic Scrubber ASME Code Calculation (Design Calculation).</p>	<p>The Engineering Specifications for LAW Melter Offgas Caustic Scrubber and Mechanical Data Sheet require that the Scrubber including all related components and appurtenances be designed and fabricated in accordance with the applicable sections of ASME B&PV Code, Section VIII, Division 1 and ASME B31.3 Codes. These codes require specific consideration of operating pressures, temperatures, corrosion allowance, and seismic loads in the design process. The Mechanical Data Sheet identifies the operating pressure, temperature ranges, and seismic categories for the Scrubber vessel. Corrosion allowance of 0.04" is recommended for this MU vessel as identified in the Corrosion Evaluation and Mechanical Data Sheet documents. The Specification for Seismic Design of pressure vessels specifies requirements for seismic design. The representative listed Analysis/Design Calculations reviewed show that the applicable loading parameters were appropriately considered in the design process and the MU will have adequate strength to sustain them during its design life.</p>

	Information Assessed	Source of Information	Assessment
Foundation	<p>Plant Item foundation will maintain the load of a full vessel.</p>	<p>Specifications and Mechanical Data Sheet listed above under references;</p> <p>ASME Boiler and Pressure Vessel Code (B&PV), Section VIII, Division 1, Rules for Construction of Pressure Vessels, American Society of Mechanical Engineers;</p> <p>24590-WTP-DB-ENG-01-001, Rev. 6, Basis of Design;</p> <p>24590-LAW-MVC-LVP-00003, Rev. 0, LVP-SCB-00001, LAW Melters Offgas Caustic Scrubber, Stress Analysis with ANSYS (Design Calculation);</p> <p>24590-LAW-DDC-S13T-00058, Rev. D, Anchor Bolt and Embed Design for Caustic Scrubber (LVP-SCB-00001) at El. + 49'-0" (Design Calculation).</p>	<p>The Engineering Specifications for LAW Melter Offgas Caustic Scrubber requires the use of ASME B&PV Code, Section VIII, Div. 1 for its design process. This code has adequate structural design requirements to ensure proper support for the MU. The Basis of Design document requires that the supports and foundations shall be designed adequately to sustain all applicable loads including the full weight of the vessel. The review of Analysis/Design Calculation documents shows that the supporting skirt and associated support components of the Scrubber have been designed adequately to handle the applicable loads. It should be noted that the evaluation of the Scrubber foundation (concrete floor slab @ Elev. 49'-0") is not in the scope of this report. However, it is covered in a separate integrity assessment report.</p>

	Information Assessed	Source of Information	Assessment
Foundation (cont'd)	If in an area subject to flooding, the Plant Item is anchored.	<p>Drawings, Specifications and Mechanical Data Sheet listed above under References;</p> <p>24590-LAW-PER-M-02-002, Rev. 7, Dangerous Waste Permit (DWP) Liner Heights in the LAW Facility;</p> <p>24590-LAW-DDC-S13T-00058, Rev. D, Anchor Bolt and Embed Design for Caustic Scrubber (LVP-SCB-00001) at El. + 49'-0" (Design Calculation).</p>	<p>As shown on the referenced drawings, the Scrubber is located in Room L-0304F and mounted on the raised portion (Elev. 49'-0") of the main building Floor Elev. 48'-0" of the LAW facility. The Specification for Pressure Vessel Design and Fabrication requires that supports and anchors shall be designed to secure the buoyant vessel in case the vessel is empty and submerged to the level indicated in the Mechanical Data Sheet. The Liner Heights in the LAW Facility document describes that the 4" high concrete curbed area of Room L-0304F has an open floor drain which directs any potential leaks or spills into the RLD-VSL-00004 located at lower Floor Elev. (-) 21'-0". The drawings and Mechanical Data Sheet show that the vessel is supported on a 27" high skirt with vessel bottom head much higher than the 4" high concrete curb which contains any spillages, therefore, the buoyant force load case is not applicable for anchorage consideration. However, the Scrubber is secured to concrete slab with combination of anchor bolts and embed plates to sustain other applicable design loads including seismic forces as shown in the Anchor Bolt and Embed Design document.</p>
	Plant Item system will withstand the effects of frost heave.	<p>Drawings listed above under References;</p> <p>24590-WTP-DC-ST-01-001, Rev. 14, Structural Design Criteria.</p>	<p>The Structural Design Criteria document requires that all structural foundations extend into the surrounding soil below the 30 inch frost line in order to preclude frost heave. As shown on the referenced drawings, the MU considered in this assessment is installed in the LAW facility at Floor Elev. 48'-0" which is not subject to frost heave. Therefore, the Scrubber is not subject to the frost heave effects.</p>

	Information Assessed	Source of Information	Assessment
Waste Characteristics	<p>Characteristics of the waste to be stored or treated have been identified (ignitable, reactive, toxic, specific gravity, vapor pressure, flash point, storage temperature)</p>	<p>System Design Description, Mechanical Data Sheet, and Corrosion Evaluation listed above under References;</p> <p>24590-WTP-PER-PR-03-002, Rev. 4, Control of Toxic Vapors and Emissions from WTP Tank Systems and Miscellaneous Unit Systems;</p> <p>24590-LAW-M4C-LOP-00001, Rev. 5, LAW Melter Offgas System Design Basis Flowsheets;</p> <p>CCN 280210, LAW Miscellaneous Treatment Unit Hydrogen Accumulation Documentation for the DWP Administrative Record.</p>	<p>The Mechanical Data Sheet presents the operating temperatures and pressures for MU within the scope of this assessment. The Corrosion Evaluation document address the chemical composition of the offgas in order to select appropriate MU materials and specify the corrosion allowance. The System Design Description document identifies the offgas being handled by the MU as hazardous, but not ignitable or flammable. The main safety function of the LVP system MU is to remove toxic and hazardous gas vapors from the LAW Secondary Offgas System. The Scrubber design is required to provide an intact housing pressure boundary during normal and abnormal operations during and after design level seismic events. Waste characteristics that are hazardous, such as ignitability, reactivity, and toxicity are appropriately addressed in the Control of Toxic Vapors and Emissions, Calculation of Hydrogen Generation Rates, Melter Offgas System Design Basis Flowsheets, and CCN 280210 document. The System Design Description and Control of Toxic Vapors and Emissions documents describe the LAW Scrubber as part of equipment to treat offgas and that it removes acid gases such as sulfur oxide and carbon dioxide and provides cooling before sending it to the exhausters. Review of the Calculation for Hydrogen Generation Rates, Melter Offgas System Design Basis Flowsheets, and CCN 280210 documents show that this miscellaneous unit (LVP-SCB-00001) does not pose any hydrogen generation or accumulation hazard. The LAW Melter Offgas System Design Basis Flowsheets and CNN 280210 documents state that the LAW LVP MU equipment inclusive of the LVP-SCB-00001 vessel, do not pose any hydrogen accumulation hazard.</p>

	Information Assessed	Source of Information	Assessment
Waste Characteristics (cont'd)	Plant Item is designed to store or treat the wastes with the characteristics defined above and any treatment reagents.	Corrosion Evaluation, Mechanical Data Sheet, and System Design Description listed above under References.	The Corrosion Evaluation document and the Mechanical Data Sheet adequately demonstrate incorporation of identified waste characteristics into the MU design. Normal and abnormal operating conditions are discussed in the System Design Description. Caustic solution is added as a treatment reagent prior the scrub solution being recycled back into the Scrubber vessel from the caustic collection tank (LVP-TK-00001).
Compatibility	The waste types are compatible with each other.	System Design Description listed above under References.	The Scrubber vessel is the final decontamination equipment in the secondary offgas treatment train to remove acidic gases such sulfur oxide and carbon dioxide prior to sending it to exhaust stack. It receives the treated offgas from the Catalytic Oxidizer/Reducer unit, which receives the offgas from the LAW melter and the process vessels to remove acid gases, and volatile organic compounds from the offgas constituents. The System Design Description document does not list any incompatible waste materials to be handled by the Scrubber.

	Information Assessed	Source of Information	Assessment
Compatibility (cont'd)	<p>Plant Item material and protective coatings ensure the vessel 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).</p>	<p>Corrosion Evaluation, Mechanical Data Sheet, and Specifications listed above under References.</p>	<p>The material selection process included internal corrosion considerations relevant to the operating conditions of the MUs included in this assessment. Based upon those considerations, 316L stainless steel materials (low temperature resistant components) and Hastelloy C-276 (UNS N10276) materials (high temperature resistant components) were chosen for the Scrubber vessel for components in direct contact with the offgas stream, as documented in the Corrosion Evaluation document. The selected materials are listed in the Mechanical Data Sheet under materials of construction. The material selections with corrosion allowances of 0.04" were based upon a design life of 40 years per the Engineering Specification for the Scrubber. External corrosion is not considered to be an issue because the LAW Secondary Offgas MUs operate in generally dry and actively ventilated conditions. In order to prevent release of any gases, the Mechanical Data Sheet shows to use Stainless Steel Spiral Wound sealant gaskets (316L SS-SP WND/Graphite Filled) at applicable flange joints. The top removable vessel head is installed using a Thermiculite 815 gasket. These gaskets are resilient to high temperatures and pressures; therefore, if exposed to the elements, they will prevent release of any gases. Additionally, the activation of fire suppression system controls will also mitigate any damaging effect on the gaskets. Therefore, the materials selected for these gaskets are adequate to provide the required leak proof service for the design life of the Scrubber.</p>
Corrosion Allowance	<p>Corrosion allowance is adequate for the intended service life of the Plant Item.</p>	<p>Corrosion Evaluation and Specifications listed above under References.</p>	<p>The Corrosion Evaluation document specifies a corrosion allowance of 0.04" for the Scrubber vessel. This is appropriate as the equipment operates under high and low temperature. This corrosion allowance is based upon 316L stainless steel and Hastelloy C-276 (UNS N10276) material characteristics and an intended design service life of 40 years per the Engineering Specification for the Scrubber.</p>

	Information Assessed	Source of Information	Assessment
Pressure Controls	<p>Pressure controls (vents and relief valves) are adequately designed to ensure pressure relief if normal operating pressures in the Plant Item are exceeded.</p>	<p>System Design Description and Drawings listed above under References.</p>	<p>The System Design Description provides a discussion of Off-Normal operations of the LAW Secondary Offgas System. The drawings show that Scrubber has an 8" diameter bottom drain to let the scrub solution freely flow into the Caustic Collection Tank (LVP-TK-00001) located at lower Floor Elev. 28'-0", preventing any over pressurization of the vessel. The pressure monitors and controls in the LVP systems ensure that the Scrubber is maintained at a negative pressure during the normal operation.</p>