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STRUCTURAL INTEGRITY ASSESSMENT OF THE PRETREATMENT FACILITY TREATED LAW CONCENTRATE STORAGE PROCESS (TCP) SYSTEM VESSEL (TCP-VSL-00001)

BECHTEL

Job No. 24590

Bechtel National, Inc.

SUPPLIER DOCUMENT STATUS

1. [X] **Work may proceed.**
2. [ ] **Revise and resubmit. Work may proceed subject to resolution of indicated comments.**
3. [ ] **Revise and resubmit. Work may not proceed.**
4. [ ] **Review not required. Work may proceed.**

Permission to proceed does not constitute acceptance or approval of design details, calculations, analyses, test methods, or materials developed or selected by the supplier and does not relieve supplier from full compliance with contractual obligations.

REVIEWED										

G-321 Document Category N/A
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Supersedes BNI Document No. N/A Rev. _____
[When applicable]

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[When applicable]

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24590-CM-HC4-HXYG-00138-02-04 REV. 00B

IQRPE REVIEW
OF
THE PRETREATMENT FACILITY TREATED LAW CONCENTRATE STORAGE PROCESS (TCP) SYSTEM VESSEL (TCP-VSL-00001)

"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 Pretreatment Facility Treated LAW Concentrate Storage Process (TCP) System Vessel (TCP-VSL-00001) 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 intent fully satisfies the requirements of the WAC.

The attached review is seven pages numbered 1 through 7.

TARLOK SINGH HUNDAL
STATE OF WASHINGTON
20713
REGISTERED
PROFESSIONAL ENGINEER
EXPIRES: 02/15/06

Signature

1/27/05
Date

Scope	Scope of this Integrity Assessment	The scope of this integrity assessment includes the Pretreatment Facility TCP Treated LAW Concentrate Storage Vessel (TCP-VSL-00001).
References	Material Requisition, Specifications, and Drawings.	Material Requisition: 24590-CM-MRB-MVA0-00001, Rev. 1 (including MRS Nos. S0004, S0005, S0006, S0010, S0011, and S0012): Specifications: The following Specifications with their respective revision and specification change notices are listed in the above Material Requisition: 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-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. Drawings (including drawing change notices listed in the Material Requisition referenced above): 24590-PTF-MV-TCP-00002, Rev. 0, Equipment Assembly Treated LAW Concentrate Storage Vessel TCP-VSL-00001; 24590-PTF-P1-P01T-P0001, Rev. 4, Pretreatment General Arrangement Plan at EL. 0'-0"; 24590-PTF-P1-P01T-P0009, Rev. 8, Pretreatment Facility General Arrangement Section C-C; 24590-PTF-P1-P01T-P0010, Rev. 5, Pretreatment Facility General Arrangement Section D-D; 24590-PTF-P1-P01T-P0013, Rev. 5, Pretreatment Facility General Arrangement Sect. H-H and Sect. J-J; 24590-PTF-M5-V17T-P0006, Rev. 0, Process Flow Diagram Treated LAW Concentrate Storage - System TCP.
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 controls and requirements to ensure that the design intent fully satisfies the requirements of Washington Administrative Code, WAC-173-303-640, *Dangerous Waste Regulations* for Tank Systems.

Information Assessed		Source of Information	Assessment
Design	Vessel design standards are appropriate and adequate for the vessel's intended use.	Drawings, Material Requisitions, and Specifications listed above under References; Mechanical Data Sheet, 24590-PTF-MVD-TCP-00002, Rev. 3, Treated LAW Concentrate Storage Vessel TCP-VSL-00001; ASME Section VIII, Division 1, Rules for Construction of Pressure Vessels, American Society of Mechanical Engineers.	The Material Requisition requires the use of Engineering Specification for Pressure Vessel Design and Fabrication for TCP-VSL-00001vessel. This specification requires that the vessel and all appurtenances are to be designed to the ASME Section VIII, Division 1 Code rules. These rules are appropriate for an unfired pressure vessel operating with aqueous mixed waste solutions over the pressure and temperature range specified for this vessel. Supplementary requirements are specified in this specification for Pressure Vessel Design and Fabrication. These supplementary requirements address pressure vessel fatigue analysis, positive material identification, standard fabrication tolerances, acceptable welding procedures for the vessel and appurtenances, welder qualifications and testing records, NDE inspections and records, quality assurance requirements, and packaging, shipping, handling and storage requirements. The Mechanical Data Sheet identifies the TCP vessel as Quality Level (CM, Commercial Grade) and Seismic Category (SC-III) equipment. The above stated codes and standards are adequate and acceptable for the intended use of this Commercial Grade vessel. The TCP-VSL-00001 is a vertical vessel. The drawings and Mechanical Data Sheet show its size as 318" ID by 362" tangent to tangent height, supported on 68" high cylindrical skirt which in turn is supported on a ring beam to be anchored to the floor concrete slab. Top and bottom heads are flanged and dished type. The shell, heads, and skirt are to be built with a 1 in. minimum thick plate. Material for the shell, heads, and internals is to be SA-240 316 stainless steel (with maximum 0.030% Carbon, dual certified). This material hereinafter will be described as 316L stainless steel. The maximum operating volume is to be about 129,960 gallons and the total internal volume is to be about 146,740 gallons.

	Information Assessed	Source of Information	Assessment
Design	If a non-standard vessel is to be used, the design calculations demonstrate sound engineering principles of construction.	Specifications listed above under References; ASME Section VIII, Division 1, Rules for Construction of Pressure Vessels, American Society of Mechanical Engineers.	This TCP system vessel TCP-VSL-00001 is a standard vessel. The Engineering Specification for Pressure Vessel Design and Fabrication requires that vessel TCP-VSL-00001 is to be designed and fabricated in accordance with the requirements of ASME Section VIII, Division 1 Code. The vessel is to be delivered after design, fabrication, inspection and testing with an ASME code stamp and the vessel will be registered with the National Board. It is a shop fabricated vessel for mixed waste service in the Pretreatment Facility. The vessel design standards are appropriate and adequate for the vessel's design and fabrication.
	Vessel has adequate strength, after consideration of the corrosion allowance, to withstand the operating pressure, operating temperature, and seismic loads.	Specifications listed above under References; Mechanical Data Sheet, 24590-PTF-MVD-TCP-00002, Rev. 3, Treated LAW Concentrate Storage Vessel TCP-VSL-00001; ASME Section VIII, Division 1, Rules for Construction of Pressure Vessels, American Society of Mechanical Engineers; UBC, 1997, Uniform Building Code, International Conference of Building Officials.	The Engineering Specification for Pressure Vessel Design and Fabrication requires that the TCP vessel is to be designed to ASME Section VIII, Division 1 Code rules. This code requires specific consideration of the operating pressures, temperatures, seismic loads, and corrosion/erosion allowance in the design process. Supplementary design criteria are specified in the Engineering Specifications for Seismic Qualification Criteria and Structural Design Loads for Seismic Category III & IV Equipment and Tanks to provide for the seismic design analysis. The Mechanical Data Sheet identifies the operating pressure and temperature ranges for the vessel, the materials selected in the corrosion report, the corrosion/erosion allowance, and the requirements for seismic qualification in the design. The Mechanical Data Sheet indicates that vessel TCP-VSL-00001 is to be analyzed as Seismic Category (SC-III) vessel which requires the use of the seismic design requirements in the 1997 UBC. These are appropriate codes and criteria to ensure that the vessel has adequate strength at the end of its design life.

Information Assessed		Source of Information	Assessment
Foundation	Vessel foundation will maintain the load of a full vessel.	Drawings and Specifications listed above under References.	The Equipment Assembly drawing shows the support arrangements for TCP-VSL-00001. The vessel is provided with a cylindrical skirt and a ring beam to provide for bearing on concrete and anchorage. The Engineering Specification for Pressure Vessel Design and Fabrication requirements ensure adequate vessel foundation design.
	If in an area subject to flooding, the vessel is anchored.	Specifications listed above under References.	Buoyant forces of an empty vessel in a flooded room are a mandatory standard design load case in the Engineering Specification for Pressure Vessel Design and Fabrication.
Frost Heave	Vessel system will withstand the effects of frost heave.	Drawings listed above under References; 24590-PFT-3YD-TCP-00001, Rev. 0, System Description for Treated LAW Concentrate Storage Process (TCP) including System Description Change Notice (SDCN), SDCN No. 24590-PTF-3YN-TCP-00001; 24590-WTP-DC-ST-01-001, Rev. 6, Structural Design Criteria.	The System Description and general arrangement drawings identify that vessel TCP-VSL-00001 is located in an inaccessible process cell P-0117A at Elevation 0'-0" of the Pretreatment Facility. This cell is supported by the PTF mat foundation. The Structural Design Criteria requires that all structural foundations extend into the surrounding soil below the frost line in order to preclude frost heave. The frost line is located 30 in. below finished grade. The 8-ft thick PTF mat foundation is not subject to the frost heave; therefore, the TCP system vessel will not be subject to frost heave effects.

	Information Assessed	Source of Information	Assessment
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)	Drawings listed above under References; 24590-PFT-3YD-TCP-00001, Rev. 0, System Description for Treated LAW Concentrate Storage Process (TCP) including System Description Change Notice (SDCN), SDCN No. 24590-PTF-3YN-TCP-00001; 24590-WTP-PER-PR-03-002, Rev. 1, Toxic Vapors and Emissions from WTP Tank Systems and Miscellaneous Treatment Unit Systems; 24590-WTP-PER-PR-03-001, Rev. 1, Prevention of Hydrogen Accumulation in WTP Tank Systems and Miscellaneous Treatment Unit Systems.	The System Description identifies that TCP-VSL-00001 serves as a lag storage vessel for treated LAW concentrate which is the feed stream for the Low Activity Waste process melters. The concentrate is primarily liquids with periodic small amounts of solids. The vessel is provided with a high pressure steam injection system to maintain the feed temperature. The head space of TCP-VSL-00001 is ventilated by the Pretreatment Vessel Vent Process System (PVP) to control aerosol evolution. A controlled air inlet line is provided for a positive air sweep of the vessel head space. Waste characteristics that are hazardous, such as ignitability, reactivity, and toxicity are appropriately addressed in the Toxic Vapors and Emissions document and Prevention of Hydrogen Accumulation document. These two documents do not specifically list this vessel to exhibit any hazardous characteristics. As shown on the assembly drawing, the vessel is furnished with grounding lugs to control the discharge of static electricity. Pulse Jet Mixers are provided in the vessel for mixing prior to transfers to homogenize the vessel contents. The process limit for undissolved solids is up to 20 wt. % to ensure that the concentrate can be transferred to the LAW Facility. The vessel is equipped with an internal spray ring for decontamination.
	Vessel is designed to store or treat the wastes with the characteristics defined above and any treatment reagents.	24590-PFT-3YD-TCP-00001, Rev. 0, System Description for Treated LAW Concentrate Storage Process (TCP) including System Description Change Notice (SDCN), SDCN No. 24590-PTF-3YN-TCP-00001; Plant Item Material Selection Data Sheet, 24590-PTF-N1D-TCP-P0001, Rev. 1, Treated LAW Concentrate Storage Vessel TCP-VSL-00001 (PTF).	Vessel TCP-VSL-00001 is designed to store the waste it receives. The TCP System Description document identifies that the vessel will be used for lag storage only. No additional chemical reagents will be added to the vessel contents during normal operations. The Plant Item Material Selection Data Sheet shows that the material selected for TCP-VSL-00001 takes into account the reagents added to the waste before the waste is received in the vessel.

Information Assessed		Source of Information	Assessment
Waste Characteristics	The waste types are compatible with each other.	24590-PFT-3YD-TCP-00001, Rev. 0, System Description for Treated LAW Concentrate Storage Process (TCP) including System Description Change Notice (SDCN), SDCN No. 24590-PTF-3YN-TCP-00001.	TCP-VSL-00001 is designated as a single-use vessel. The System Description document describes that the only function the vessel performs is to receive treated LAW concentrate for lag storage and to deliver treated LAW concentrate to the LAW Facility. If the treated LAW concentrate is out of specification, it is transferred to other process vessels in the Pretreatment Facility for additional treatment. Since it is a single-use vessel, the waste compatibility issue is irrelevant.
Compatibility	Vessel 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)	Plant Item Material Selection Data Sheet, 24590-PTF-N1D-TCP-P0001, Rev. 1, Treated LAW Concentrate Storage Vessel TCP-VSL-00001 (PTF).	The Plant Item Material Selection Data Sheet shows that the material selected for TCP-VSL-00001 takes into account the acidic nature of the LAW SBS condensate received from the LAW facility and the reagents added to the waste received in the vessel. The material selected for the vessel is 316L stainless steel. The material selected is adequate to provide the required 40 year service life for this vessel.
Corrosion Allowance	Corrosion allowance is adequate for the intended service life of the vessel.	Plant Item Material Selection Data Sheet, 24590-PTF-N1D-TCP-P0001, Rev. 1, Treated LAW Concentrate Storage Vessel TCP-VSL-00001 (PTF); Mechanical Data Sheet, 24590-PTF-MVD-TCP-P0002, Rev. 3, Treated LAW Concentrate Storage Vessel TCP-VSL-00001.	The corrosion allowance is recommended in the Plant Item Material Selection Data Sheet. The uniform corrosion allowance of 0.040 in. for shell and heads (plus additional 0.164 in. for the bottom head to compensate for erosion due to pulse jet mixers cyclic operations) for a 40 year vessel life is adequate for 316L stainless steel in this waste environment. The material selection is correctly carried forward to the vessel's Mechanical Data Sheet. The materials chosen, welding processes selected, surface preparation, and pre-service inspections are appropriate for this caustic waste service. The vessel design provides internal spray wash ring to provide for periodic internal cleaning of the vessel.

Information Assessed		Source of Information	Assessment
Pressure Relief	Pressure controls (vents and relief valves) are adequately designed to ensure pressure relief if normal operating pressures in the vessel are exceeded.	Drawings listed above under references.	The Equipment Assembly drawing shows that vessel TCP-VSL-00001 is equipped with an unrestricted 8 in. diameter overflow line and Process Flow Diagram drawings shows that this line drains to Plant Wash and Disposal System vessel (PWD-VSL-00033) located at a lower level, Elevation (-) 45'-0" in the PTF as shown on the general arrangement drawings. This line is much larger than any of the lines entering the vessel and therefore has an adequate flow capacity to preclude overpressure.