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AREVA-07-010

Ms. Anne Weldon
Subcontracts
Bechtel National, Inc.
2435 Stevens Center Place
Richland, Washington 99354

February 1, 2007

Dear Ms. Weldon:

BECHTEL NATIONAL, INC. CONTRACT NO. 24590-CM-HC4-HXYG-00211 - STRUCTURAL INTEGRITY ASSESSMENT FOR THE PRETREATMENT IN-CELL HANDLING (PIH) SYSTEM PRETREATMENT DECONTAMINATION TANK (PIH-TK-00001) (AREVA-IA-085, REV. 0)

The integrity assessment of the subject tank (PIH-TK-00001) 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 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 feel free to contact Tarlok Hundal at (509) 373-4438.

Sincerely,

M. D. Rickenbach, Director
Engineering & Services
AREVA NC Inc.
Richland

llm

Enclosure

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

STRUCTURAL INTEGRITY ASSESSMENT FOR THE PRETREATMENT IN-CELL HANDLING (PIH) SYSTEM PRETREATMENT DECONTAMINATION TANK (PIH-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 REVIEW
FOR
THE PRETREATMENT IN-CELL HANDLING (PIH) SYSTEM PRETREATMENT DECONTAMINATION TANK (PIH-TK-00001)

"I, Tarlok S. 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 In-Cell Handling (PIH) System Pretreatment Decontamination Tank (PIH-TK-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 fully satisfies the requirements of the WAC.

The attached review is nine (9) pages numbered one (1) through nine (9).

TARLOK SINGH HUNDAL
STATE OF WASHINGTON
20213
REGISTERED
PROFESSIONAL ENGINEER

EXPIRES: 02/15/08

TS Hundal
Signature

2/1/07
Date

Scope	Scope of this Integrity Assessment	This Integrity Assessment is for the Pretreatment In-Cell Handling (PIH) System Pretreatment Decontamination Tank (PIH-TK-00001), located in Room P-0123A at Elevation 0'-0" of the PTF.
References	Material Requisition, Specifications, Mechanical Data Sheet, Plant Item Material Selection Data Sheet, and System Description	<u>Material Requisition (MR)</u>: 24590-CM-MRA-HDYR-00001, Rev. 4, Maintenance Decontamination Equip C/DS (MH051) (VHCQ) (ECI) (PUREX), Section 2 – Technical Specifications. <u>Specifications</u>: The following Specifications with their respective revision and specification change notices are listed in the above listed Material Requisition: 24590-WTP-3PS-HD00-T0001, Engineering Specification for Maintenance Decontamination Equipment; 24590-WTP-3PS-MTSS-T0001, Specification for Tank Welding; 24590-WTP-3PS-FB01-T0001, Engineering Specification for Structural Design Loads for Seismic Category III & IV Equipment and Tanks; 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-MV00-T0001, Engineering Specification for Pressure Vessel Design and Fabrication; *24590-WTP-3PS-MV00-T0002, Engineering Specification for Seismic Qualification Criteria for Pressure Vessels. * Specification not listed in MR, however, it is embedded in 24590-WTP-3PS-HD00-T0001 document. <u>Mechanical Data Sheet</u>: 24590-PTF-M0D-PIH-00015, Rev. 2, Pretreatment Decontamination Tank (PIH-TK-00001). <u>Plant Item Material Selection Data Sheet</u>: 24590-PTF-N1D-PIH-P0001, Rev. 0, Pretreatment Decontamination Tank PIH-TK-00001 (PTF). <u>System Description</u>: 24590-PTF-3YD-PIH-00001, Rev. 0, System Description for Pretreatment In-Cell Handling System.

References (cont'd)	Drawings	PTF Drawings: 24590-PTF-P1-P01T-00001, Rev. 6, Pretreatment Facility General Arrangement Plan at El. 0'-0"; 24590-PTF-M6-PIH-00001, Rev. 0, P&ID – PTF Mechanical Handling, Hot Cell Maintenance Cave P-0123A Utilities, System PIH. Vendor Fabrication Drawings (**Code 1 or Code 4 Drawings): 24590-CM-POA-HDYR-00001-06-00059, Rev. 00G, PTF Decon Tank Assembly; 24590-CM-POA-HDYR-00001-06-00060, Rev. 00E, PTF Decon Tank Weldment and Details; 24590-CM-POA-HDYR-00001-06-00061, Rev. 00E, PTF Decon Tank Weldment and Details; 24590-CM-POA-HDYR-00001-06-00062, Rev. 00E, PTF Decon Tank Cover Weldment and Details; 24590-CM-POA-HDYR-00001-06-00063, Rev. 00C, PTF Decon Tank Sparge & Pump Assembly; 24590-CM-POA-HDYR-00001-06-00064, Rev. 00C, PTF Decon Tank Sparge & Pump Details; 24590-CM-POA-HDYR-00001-06-00065, Rev. 00C, PTF Decon Tank Sparge & Pump Details; 24590-CM-POA-HDYR-00001-06-00066, Rev. 00C, PTF Decon Tank Sparge & Miscellaneous Details. **Code 1 Drawing is an "as fabricated vendor drawing" approved/accepted by Bechtel. Code 4 Drawing is an "as fabricated vendor drawing" accepted by Bechtel (no formal review required).
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 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	Tank design standards are appropriate and adequate for the tank's intended use.	Specifications, Drawings, Mechanical Data Sheet, and Plant Item Material Selection Data Sheet listed above under References; API-620, Design and Construction of Large, Welded, Low Pressure Storage Tanks, 10th edition, February 2002, American Petroleum Institute.	The Engineering Specification for Maintenance Decontamination Equipment requires that the Pretreatment Decontamination Tank (PIH-TK-00001) is to be designed and fabricated in accordance with the provisions of the API 620 Standard. Welding requirements for fabrication are furnished in the Specification for Tank Welding. Tank nozzle design and fabrication is to comply with the Engineering Specification for Pressure Vessel Design and Fabrication. The Engineering Specification for Maintenance Decontamination Equipment provides additional supplementary requirements for tank design and fabrication. These requirements address positive material identification, lifting attachment design, fabrication tolerances, welding procedures for the tank and appurtenances, welder qualifications and testing records, NDE inspections and records, quality assurance records, and lifting, packaging, shipping, handling and storage requirements. The tank's Quality Level is commercial material (CM) grade and its Seismic Category is (SC-III) as noted in the Mechanical Data Sheet for PIH-TK-00001. Tank PIH-TK-00001 is fabricated as shown on the referenced vendor fabrication drawings. It is an open top tank with 96 in. ID and an overall height of about 55 in. This tank is to be used as a decontamination soak tank for various PTF equipment items as discussed in the System Description document. The tank is equipped with a removable lid to control splashing during normal operations. The tank and its appurtenances material as identified in the Plant Item Material Selection Data Sheet and Mechanical Data Sheet is 316L stainless steel. The tank shell and bottom are fabricated of 1/2" and 5/8" thick plates, respectively. The design standards discussed above are appropriate and adequate for the tank's intended use.

	Information Assessed	Source of Information	Assessment
Design (cont'd)	If a non-standard tank is to be used, the design calculations demonstrate sound engineering principles of construction.	Specifications, Material Requisition, and Drawings listed above under References; API-620, Design and Construction of Large, Welded, Low Pressure Storage Tanks, 10th Edition, February 2002, American Petroleum Institute; 24590-CM-POA-HDYR-00001-05-00005, Rev. 00F, PTF Tank Stress and Thermal Design Calculation; 24590-CM-POA-HDYR-00001-05-00006, Rev. 00F, PTF Tank Seismic Structural Calculation.	The Engineering Specification for Maintenance Decontamination Equipment requires that the Pretreatment Decontamination Tank (PIH-TK-00001) is designed and fabricated as a standard tank, in accordance with the provisions of the API-620 Standard. Supplemental design information is included in the specifications for utilizing sound engineering principles of construction for the tank. It is a shop fabricated tank that is delivered to the WTP site after design, fabrication and testing to the requirements of the Engineering Specification for Maintenance Decontamination Equipment and API-620 Standard. Review of the PTF Tank Stress and PTF Tank Seismic calculation documents show that the tank has been designed as a standard tank per applicable requirements of API-620 Standard and other documents listed in the Material Requisition for the tank. The aforementioned statements and the vendor fabrication drawings reviewed demonstrate that sound engineering principles of construction and fabrication has been used for the tank.

	Information Assessed	Source of Information	Assessment
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, Material Requisition, and Drawings listed above under References; API-620, Design and Construction of Large, Welded, Low Pressure Storage Tanks, 10th Edition, February 2002, American Petroleum Institute; 24590-WTP-3DP-G04T-00905, Rev. 7, Determination of Quality Levels; 24590-CM-POA-HDYR-00001-05-00005, Rev. 00F, PTF Tank Stress and Thermal Design Calculation; 24590-CM-POA-HDYR-00001-05-00006, Rev. 00F, PTF Tank Seismic Structural Calculation.	The Mechanical Data Sheet identifies the Pretreatment Decontamination Tank's operating pressure and temperature ranges, the materials selected for the tank and the tank quality level which determines the requirements for seismic design. Tank PIH-TK-00001 is Quality Level (CM) and Seismic Category (SC-III). The Engineering Specification for Maintenance Decontamination Equipment and API-620 Standard require specific consideration of the operating pressures, temperatures, corrosion allowance and seismic loads in the design process. API-620 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 end of its life. Detailed requirements for seismic analysis and load determination are furnished in the API-620 Standard and the Engineering Specification for Structural Design Loads for Seismic Category III & IV Equipment and Tanks; including a discussion of Seismic Categories. Quality Levels are discussed in detail in the Determination of Quality Levels document. Review of the PTF Tank Stress and PTF Tank Seismic calculation documents show that the tank has adequate strength after the appropriate consideration of corrosion allowance, operating temperature and pressure, seismic, and other applicable loads have been accounted for. 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 documents (including daughter documents) listed in Material Requisition for the tank have been met.

	Information Assessed	Source of Information	Assessment
Foundation	Tank foundation will maintain the load of a full tank.	Specifications listed above under References; API-620, Design and Construction of Large, Welded, Low Pressure Storage Tanks, 10th edition, February 2002, American Petroleum Institute; 24590-WTP-DB-ENG-01-001, Rev. 1I, Basis of Design; 24590-CM-POA-HDYR-00001-05-00005, Rev. 00F, PTF Tank Stress and Thermal Design Calculation; 24590-CM-POA-HDYR-00001-05-00006, Rev. 00F, PTF Tank Seismic Structural Calculation.	The Engineering Specification for Maintenance Decontamination Equipment and API-620 Standard both specify requirements that ensure adequate design of tank supports. The design load cases include the load of a full tank. Review of the PTF Tank Stress and PTF Tank Seismic calculation documents show that the tank supports have adequate strength to maintain the loads of 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, 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.
	If in an area subject to flooding, the tank is anchored.	Specifications listed above under References. 24590-PTF-PER-M-04-0007, Rev. 0, Flooding Volume for Room P-0123A in the PTF Facility.	The Engineering Specification for Maintenance Decontamination Equipment includes the requirement that the tank supports and anchors shall be designed for the load case where the tank is empty and externally fully submerged. However, the Flooding Volume document shows that the computed flood height in Room P-0123A is 1.21in. above the grout level on which the 3.5 in. high steel angle tank base retainer ring sits. The lowest elevation of the tank bottom plate is higher than this tank base retainer ring, therefore, no buoyant forces act on the tank and hence there is no need for such consideration for this remotely removable tank.
	Tank system will withstand the effects of frost heave.	Drawings listed above under References; 24590-WTP-DC-ST-01-001, Rev. 11, Structural Design Criteria.	The Structural Design Criteria requires that structural foundations for all outdoor equipment shall extend into the surrounding soil below the frost line to preclude frost heave effects. The frost line for structural foundations is 30 in. The PTF foundation mat as shown on the drawings is an 8 ft thick slab and therefore, is not subject to frost heave; hence, tank PIH-TK-00001 located in room P-0123A inside the PTF is not 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)	Mechanical Data Sheet, Drawings, Plant Item Material Selection Data Sheet, and System Description listed above under References; 24590-WTP-PER-PR-03-002, Rev. 2, 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 Mechanical Data Sheet presents the waste storage temperatures and pressures. Bounding estimates for the weight of the tank liquid contents and immersed equipment are provided in the drawings. The Plant Item Material Selection Data Sheet addresses the pH range and chemical composition of the waste to select appropriate tank materials and specify the corrosion allowance. The System Description document and drawings show that the non-combustible decontamination solutions normally used in the tank include dilute nitric acid (NAR), dilute sodium hydroxide (SHR) and de-ionized water (DIW). Tank PIH-TK-00001 is a decontamination soak tank used to decontaminate the internal surfaces of equipment placed in the tank. It is an open top tank with a removable lid that provides primary confinement of the waste during normal operations, abnormal operations and during and after a Seismic Category (SC-III) level earthquake. The open top tank is ventilated by the room ventilation system to prevent flammable gas build-up. 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 aforementioned documents do not specifically list this tank to exhibit any hazardous characteristics.

	Information Assessed	Source of Information	Assessment
Waste Characteristics (cont'd)	Tank is designed to store or treat the wastes with the characteristics defined above and any treatment reagents.	Mechanical Data Sheet, Plant Item Material Selection Data Sheet and System Description listed above under References.	The Mechanical Data Sheet and Plant Item Material Data Sheet shows that the 316L stainless steel material selected for Tank PIH-TK-00001 is adequate for a design life of 40 years assuming maximum operating temperature of about 200°F with dilute nitric acid decontamination solution (0.5 M or higher). The Plant Item Material Selection Data Sheet demonstrates that the tank is designed to contain the decontamination solutions discussed above. The System Description document discusses normal operations for tank PIH-TK-00001. No additional reagents are added to the tank during normal operations. A steam sparging system is built into the tank to provide for heating and agitating the decontamination solutions. The material selected for the tank design is appropriate for the waste to be stored or treated.
	The waste types are compatible with each other.	System Description and Specifications listed above under References.	The System Description for the PTF PIH system does not describe any operations where incompatible wastes are mixed in tank PIH-TK-00001. The Engineering Specification for Maintenance Decontamination Equipment states that spent decontamination solutions are transferred to the PTF plant wash and drain disposal system using the steam ejector installed in the tank.
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, Plant Item Material Selection Data Sheet, Drawings, and System Description listed above under References.	The Mechanical Data Sheet, Plant Item Material Data Sheet, and drawings show that the 316L stainless steel material selected and used for Tank PIH-TK-00001 is adequate for a design life of 40 years assuming maximum operating temperature of about 200°F with dilute nitric acid decontamination solution (0.5 M or higher). The tank is located in the Remote Decontamination Maintenance Cave where there is ample spray equipment available to wash down the outside of the tank if necessary as discussed in the System Description. The material selected is appropriate against any corrosive effects of the waste streams and any external environment elements.

	Information Assessed	Source of Information	Assessment
Corrosion Allowance	Corrosion allowance is adequate for the intended service life of the tank.	Plant Item Material Selection Data Sheet, Mechanical Data Sheet, Drawings, and Specifications listed above under References; 24590-CM-POA-HDYR-00001-05-00005, Rev. 00F, PTF Tank Stress and Thermal Design Calculation.	The bases for Tank PIH-TK-00001 material selection and corrosion allowance are furnished in the Plant Item Material Selection Data Sheet and in Mechanical Data Sheet. The 316L stainless steel is selected for a service life of 40 years with a corrosion allowance of 0.04 in. Review of the vendor drawings, PTF Tank Stress calculations, Engineering Specification for Maintenance Decontamination Equipment shows a conservative internal corrosion allowance of 0.125 in. is specified and used in design media. Corrosion allowance specified and used for the tank is adequate and conservative for the intended use of its life.
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 and listed above under References	The drawings show that Tank PIH-TK-00001 is equipped with a 2 in. diameter overflow line that will be routed to a sump. The tank is built with an open top to accommodate a removable fitted lid (used during decontamination operation process); therefore, the tank cannot be pressurized above atmospheric (design) pressure.

Master Distribution Schedule for WTP Project Subcontract Management Group

SUBMITTAL TRANSMITTAL: ☒ First Submittal ☐ Re-Submittal ☐ QVRP Package
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CORRESPONDENCE: ☒ With Attachment ☐ W/O Attachment (letter only)
☐ Fax as Original (Letter Only) ☐ Fax as Original (With Attachment)

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

Subcontract Number:	24590-CM-HC4-HXYG-00211
Subcontract Title:	Tank Integrity
Subcontractor Name:	Areva
Subcontract Administrator:	Anne Weldon

PDC Document Number	Rev	Document Title	Rev
139506		Structural Integrity Assessment for the PIH	

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