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
[From Supplement A to G-321-E (E) or G-321-V (V), as applicable, or "N/A" if SSRS is used]

Supersedes BNI Document No. N/A Rev. _____
[When applicable]

Accepted by DC Pflueger (Print Name) _____ (Signature) 12/17/03 (Date)

Released by _____ (Print Name) _____ (Signature) _____ (Date)
[When applicable]

416 GP&S 7-03

24590-CM-HC4-HXYG-00138-01-18
REV. 00A

SUBCONTRACT SUBMITTAL

Best Available Copy

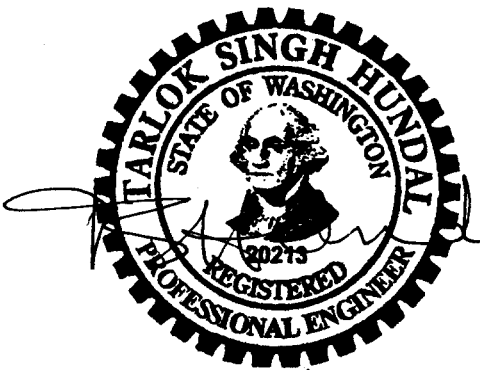
IQRPE REVIEW
Of
THE PREATREATMENT FACILITY
ULTRAFILTRATION PROCESS SYSTEM (UFP) VESSELS

"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 Facility (PTF) Ultrafiltration Process System (UFP) Vessels as required by The Dangerous Waste Regulations, namely, WAC 173-303-640(3) applicable paragraphs [i.e., (a) through (g)]."

"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 eight (8) pages numbered one (1) through eight (8) for the Ultrafilters, UFP-FILT-00001,2,3 A/B; seven (7) pages numbered nine (9) through fifteen (15) for the Ultrafiltration Feed Preparation Vessels, UFP-VSL-00001 A/B; seven (7) pages numbered sixteen (16) though twenty two (22) for the Ultrafiltration Feed Vessels, UFP-VSL-00002 A/B; and seven (7) pages numbered twenty three (23) though twenty nine (29) for the Ultrafiltration Permeate Collection Vessels, UFP-VSL-00062 A/B/C.



EXPIRES: 02/15/04

Signature

12-12-03
Date

24590-CM-HC4-HXYG-00138-01-18 Rev00A

STRUCTURAL INTEGRITY ASSESSMENT OF THE PRETREATMENT FACILITY ULTRAFILTRATION PROCESS SYSTEM (UFP) VESSELS

COGEMA-IA-029
REV. 0

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.

Scope	Scope of this Integrity Assessment	This integrity assessment includes: The six Ultrafiltration Process System, Ultrafilters: UFP-FILT-00001, 2, 3 A/B which are located in the process cells at Elevation 0'-0" in the Pretreatment Facility.
References	Drawings and Mechanical Data Sheets	Drawings: 24590-PTF-P1-P01T-P0001, Rev. 2, Pretreatment Facility General Arrangement Plan at El. 0'-0"; 24590-PTF-P1-P01T-P0008, Rev. 3, Pretreatment Facility General Arrangement Section B-B; 24590-PTF-P1-P01T-P0009, Rev. 6, Pretreatment Facility General Arrangement Section C-C; 24590-PTF-P1-P01T-P0014, Rev. 5, Pretreatment Facility General Arrangement Sect. L-L and K-K; 24590-PTF-P1-P01T-P0015, Rev. 5, Pretreatment Facility General Arrangement Sect. M-M and N-N; 24590-PTF-M5-V17T-P0010, Rev. 0, Process Flow Diagram Ultrafiltration System UFP; 24590-PTF-MV-UFP-P0003, Rev. 0, Equipment Assembly Ultrafiltration Feed Vessel (UFP-VSL-00002A); 24590-PTF-MV-UFP-P0004, Rev. 0, Equipment Assembly Ultrafiltration Feed Vessel (UFP-VSL-00002B); 24590-PTF-MV-UFP-P0005, Rev. 0, Equipment Assembly Ultrafilter Permeate Vessel (UFP-VSL-00062A); 24590-PTF-MV-UFP-P0006, Rev. 0, Equipment Assembly Ultrafilter Permeate Vessel (UFP-VSL-00062B); 24590-PTF-MV-UFP-P0007, Rev. 0, Equipment Assembly Ultrafilter Permeate Vessel (UFP-VSL-00062C). Mechanical Data Sheets: 24590-PTF-MLD-UFP-P0007, Rev. 1, Ultrafilter (UFP-FILT-00001, 2, 3 A/B)
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 the design intent fully satisfies the requirements of Washington Administrative Code, WAC-173-303-640, *Dangerous Waste Regulations.*

	Information Assessed	Source of Information	Assessment
Design	Vessel design standards are appropriate and adequate for the vessel's intended use.	Drawings listed above under References; Mechanical Data Sheets listed above under References; 24590-PTF-3PS-MLFP-TP001, Rev.1, Engineering Specification for Ultrafilters; 24590-WTP-3PS-MV00-TP001, Rev. 1, Engineering Specification for Pressure Vessel Design and Fabrication; 24590-WTP-3PS-MV00-TP003, Rev. 1, Engineering Specification for Pressure Vessel Fatigue Analysis; 24590-WTP-3PS-MVB2-T0001, Rev. 1, Engineering Specification for Welding of Pressure Vessels, Heat Exchangers and Boilers; 24590-WTP-3PS-G000-TP002, Rev. 2, Positive Material Identification (PMI); 24590-WTP-3PS-G000-T0001, Rev. 0, General Specification for Supplier Quality Assurance Program Requirements; 24590-WTP-3PS-M000-T0002, Rev. 1, General Specification for Mechanical Handling Equipment Design and Manufacture; 24590-PTF-3YD-UFP-00001, Rev. 0, System Description for Ultrafiltration Process System (UFP); SDCN No. 24590-PTF-3YN-UFP-00001, System Description for Ultrafiltration Process System (UFP);	The UFP system Ultrafilters (UFP-FILT-00001, 2, 3 A/B) are classified as vessels. The Ultafilters and all appurtenances are to be designed to the ASME Section VIII, Division 1 rules which are appropriate for pressure vessels operating with mixed waste solutions over the pressure and temperature ranges specified for these vessels. Supplementary requirements are specified in the Engineering Specification for Pressure Vessel Design and Fabrication and in Engineering Specification for Ultrafilters. Supplementary requirements address pressure vessel fatigue analysis, positive material identification, lifting attachment design, equipment drop evaluation, fabrication tolerances, acceptable welding procedures for the vessel and appurtenances, welder qualifications and testing records, NDE inspections and records, and lifting, packaging, shipping, handling and storage requirements. The Ultrafilter internals are subject to cyclic loading of filling and back flushing operations considered to be fatigue loading. Heat exchanger industry standards properly address fatigue and corrosion fatigue. These are adequate and acceptable design standards for the intended use of the vessels. The UFP Ultrafilters (UFP-FILT-00001, 2, 3, A/B) assemblies are horizontal vessels with a 16.75 in. OD and a horizontal length of 150 in. including the 10 in. Grayloc connectors at both ends and are supported on two saddles. Each Ultrafilter assembly has a welded tube bundle (241 filter tube/elements) made up of 96 in. long x 0.50 in. ID/ 0.625 in. OD porous tubes. The material for Ultrafilter and filter tube assembly is SA-240 316L stainless steel (0.030% maximum carbon content, dual certified) hereafter referred to as 316L. A corrosion allowance of 0.04 in. is specified.

	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.	Drawings listed above under References; Mechanical Data Sheets listed above under References; 24590-PTF-3PS-MLFP-TP001, Rev.1, Engineering Specification for Ultrafilters; 24590-WTP-3PS-MV00-TP001, Rev. 1, Engineering Specification for Pressure Vessel Design and Fabrication; 24590-WTP-3PS-MV00-TP003, Rev. 1, Engineering Specification for Pressure Vessel Fatigue Analysis; PDC No. 24590-WTP-PEN-03-002, PEN Title: Changes to the Permit Specification 24590-WTP-3PS-MV00-TP003, Rev. 1, Engineering Specification for Pressure Vessel Fatigue Analysis; PDC No. 24590-WTP-PEN-03-001, PEN Title: Changes to the Permit Specification 24590-WTP-3PS-MV00-TP002, Rev. 1, Engineering Specification for Seismic Qualification Criteria for Pressure Vessels; 24590-WTP-3PS-MV00-TP002, Rev. 1, Engineering Specification for Seismic Qualification Criteria for Pressure Vessels; 24590-WTP-3PS-SS90-T0001, Rev. 0, Engineering Specification for Seismic Qualification of Seismic Category I/II Equipment and Tanks; AISC 4-98, Seismic Analysis of Safety Related Nuclear Structures and Commentary.	The UFP Ultrafilters (UFP-FILT-00001, 2, 3 A/B) are standard ASME Section VIII vessels. The Mechanical Data Sheets require that the ASME Section VIII, Division 1 vessels be delivered after design, fabrication, inspection and testing with an ASME code stamp and that the vessels be nationally registered. The Mechanical Data Sheets state that the Ultrafilters are Seismic Category III and Quality Level 1, but the Engineering Specification for Ultrafilters states that for conservatism the Ultrafilters shall be designed and fabricated to satisfy the Seismic Category I and Quality Level 1 requirements. Supplemental design information is provided by the reference documents listed in the Source of Information column for utilizing sound engineering principles of construction for the vessels.

	Information Assessed	Source of Information	Assessment
Design	Vessel has adequate strength, after consideration of the corrosion allowance, to withstand the operating pressure, operating temperature, and seismic loads.	Drawings listed above under References; Mechanical Data Sheets listed above under References; 24590-PTF-3PS-MLFP-TP001, Rev. 1, Engineering Specification for Ultrafilters; 24590-WTP-3PS-MV00-TP001, Rev. 1, Engineering Specification for Pressure Vessel Design and Fabrication; 24590-WTP-3PS-MV00-TP002, Rev. 1, Engineering Specification for Seismic Qualification Criteria for Pressure Vessels; 24590-WTP-3PS-SS90-T0001, Rev. 0, Engineering Specification for Seismic Qualification of Seismic Category I/II Equipment and Tanks; AISC 4-98, Seismic Analysis of Safety Related Nuclear Structures and Commentary.	The Mechanical Data Sheets identify each Ultrafilter's operating pressure and temperature ranges, the materials selected for each vessel, the corrosion allowance(s), and the vessel quality levels which determine the requirements for seismic design. The design specifications for the Ultrafilters require specific consideration of the operating pressures and temperatures and seismic loads in the design process. ASME Section VIII, Div. 1 requires that corrosion allowance thickness shall be excluded from nominal vessel thickness when evaluating the adequacy of vessel components for these loads at end of life. The Engineering Specification for Seismic Qualification Criteria for Pressure Vessels adopts ASME Section VIII, Div. 2 design rules to address seismic design and analysis of the vessel and ASME Section VIII, Div. 1 for the vessel supports. Detailed requirements for seismic design of SC-I/II vessels are furnished in the specification for Seismic Qualification of Seismic Category I/II Equipment and Tanks. These codes and standards are adequate and appropriate for design of the UFP Ultrafilter to withstand operating pressure, temperature, and seismic loads for the specified design life.

	Information Assessed	Source of Information	Assessment
Foundation	Vessel foundation will maintain the load of a full vessel.	Drawings listed above under References; 24590-WTP-DB-ENG-01-001, Rev. 1, Basis of Design; 24590-WTP-3PS-MV00-TP001, Rev. 1, Engineering Specification for Pressure Vessel Design and Fabrication.	The Engineering Specification for Pressure Vessel Design and Fabrication requires the use of ASME B&PV Code, Section VIII, Division 1, for design of the vessel supports. This code ensures an adequate design for the vessel supports. Chapter 14 of the Basis of Design document requires that the vessel foundation design must be adequate to support the loads from full vessels.
	If in an area subject to flooding, the vessel is anchored.	24590-WTP-3PS-MV00-TP001, Rev. 1, Engineering Specification for Pressure Vessel Design and Fabrication.	Buoyant forces of an empty vessel in a flooded room are a mandatory standard design load case in this specification for Pressure Vessel Design and Fabrication.
	Vessel system will withstand the effects of frost heave.	24590-WTP-DB-ENG-01-001, Rev. 1, Basis of Design.	The Basis of Design document requires that all structural foundations extend a distance below grade that exceeds the depth of the frost line. The vessels are inside the building at floor Elevation 0'-0" and therefore, are not subject to frost heave.

	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 Sheets listed above under References; Plant Item Material Selection Data Sheet, 24590-PTF-N1D-UFP-P0004, Rev. 1, UFP-FILT-00001, 2, 3 A/B (PTF) Ultrafilter; 24590-WTP-PSAR-ESH-01-002-02, Rev. 1, Preliminary Safety Analysis Report: PT Facility Specific Information; WA7890008967, *Dangerous Waste Portion of the Hanford Facility Resource Conservation and Recovery Act Permit for the Treatment, Storage, and Disposal of Dangerous Waste,* Chapter 10, and Attachment 51, "Hanford Tank Waste Treatment and Immobilization Plant."	The Mechanical Data Sheets present the waste specific gravity, storage temperatures and pressures. The Plant Item Material Selection Data Sheet addresses the pH range and chemical composition of the waste and selects appropriate vessel materials and the corrosion allowance. Other waste characteristics that are hazardous, such as ignitability, reactivity, and toxicity are addressed by the Preliminary Safety Analysis Report for the PTF and in Part A of the Permit as an integral part of the design process. The UFP Ultrafilters provide primary confinement of the waste during normal operations, abnormal operations and during and after a Design Basis Earthquake. The vessels are grounded to control ignition sources.
	Vessel is designed to store or treat the wastes with the characteristics defined above and any treatment reagents.	Plant Item Material Selection Data Sheet, 24590-PTF-N1D-UFP-P0004, Rev. 1, UFP-FILT-00001, 2, 3 A/B (PTF) Ultrafilters; 24590-PTF-3YD-UFP-00001, Rev. 0, System Description for Ultrafiltration Process System (UFP).	The Plant Item Material Selection Data Sheet demonstrates that the vessel is designed to process the wastes discussed above. The System Description discusses normal and abnormal operations for the UFP Ultrafilters (UFP-FILT-00001, 2, 3 A/B). Acid or water for flushing will be added to these filters.
	The waste types are compatible with each other.	24590-PTF-3YD-UFP-00001, Rev. 0, System Description for Ultrafiltration Process System (UFP).	The System Description for the Ultrafiltration Process System (UFP) does not describe any operations where incompatible wastes are mixed in these ultrafilters for processing. The UFP vessels function primarily to separate, wash, or treat feed suspension waste from Ultrafiltration Feed Prep Vessels and transfer it to the Permeate Collection Vessels in the Pretreatment facility for further processing by other PTF systems.

	Information Assessed	Source of Information	Assessment
Corrosion Protection	Vessel material and protective coatings ensure the vessel structure is adequately protected form the corrosive effects of the waste stream and external environments (expected to not leak or fail for the design life of the system)	Drawings listed under References above; Mechanical Data Sheets listed under References above; Plant Item Material Selection Data Sheet; 24590-PTF-N1D-UFP-P0004, Rev. 1, UFP-FILT-00001, 2, 3 A/B (PTF) Ultrafilter; 24590-PTF-3PS-MLFP-TP001, Rev. 1, Engineering Specification for Ultrafilters; 24590-PTF-3YD-UFP-00001, Rev. 0, System Description for Ultrafiltration Process System (UFP).	The Plant Item Material Selection Data Sheet and Specifications show that the Ultrafilters (UFP-FILT-00001, 2, 3 A/B) normally operate between pH 13.8 to 14, at temperature of about 77 °F, and pressure of 100 psig. The assembly is designed for 200 psig pressure at 200 °F temperature. Potential acid cleaning operations of the vessels were also considered. The material selected is 316L and a corrosion allowance of 0.04 in. These UFP vessels are located in cells at Elevation 0'-0" in the PTF. These cells are equipped with liners, sumps and wash down nozzles to mitigate potential leaks. The UFP Ultrafilter vessels are designed to receive waste from and backwash it to Ultrafiltration Feed Vessels (UFP-VSL-0002 A/B) for filtration then send it to Ultrafilter Permeate Collection Vessels (UFP-VSL-00062 A/B/C). Therefore, the cells should remain dry during normal operations which will limit external corrosion of the vessels over the facility design life.
Corrosion Allowance	Corrosion allowance is adequate for the intended service life of the vessel.	Mechanical Data Sheets listed above under References; Plant Item Material Selection Data Sheet; 24590-PTF-N1D-UFP-P0004, Rev. 1, UFP-FILT-00001, 2, 3 A/B (PTF) Ultrafilter	The bases for the UFP vessels material selection and corrosion allowance are furnished in the Plant Item Material Selection Data Sheet. Selection of 316L material with a corrosion allowance of 0.04 in. for a service life of 40 years is adequate and appropriate. The material selections and corrosion allowances are carried forward to the Mechanical Data Sheets consistently and correctly.

	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; 24590-PTF-3PS-MLFP-TP001, Rev. 1, Engineering Specification for Ultrafilters;	The UFP Ultrafilters are in-line equipment designed to receive waste from Ultrafiltration Feed Vessels (UFP-VSL-0002 A/B) for the filtration process and then pass it to Ultrafilter Permeate Collection Vessels (UFP-VSL-00062 A/B/C) or back to Feed Vessels. They will be subjected to a maximum pressure of 180 psig during back-pulsing and are designed to withstand an air pressure of 200 psig which provides adequate safety margin. These Ultrafilters are not holding vessels, thus they don't require any overflow or relief valve mechanism; the waste is just passing thru the porous tubes to the designated tanks which have unrestricted overflow lines to prevent over pressurization as shown on the drawings.

Scope	Scope of this Integrity Assessment	This integrity assessment includes: The two Ultrafiltration Process System, Ultrafiltration Feed Preparation Vessels: UFP-VSL-00001A/B including their appurtenances or offspring items, which are located in process cells at Elevation 0'-0" in the Pretreatment Facility.
References	Drawings and Mechanical Data Sheets	Drawings: 24590-PTF-MV-UFP-P0001, Rev. 0, Equipment Assembly Ultrafiltration Feed Preparation Vessel (UFP-VSL-00001A); 24590-PTF-MV-UFP-P0002, Rev. 0, Equipment Assembly Ultrafiltration Feed Preparation Vessel (UFP-VSL-00001B); 24590-PTF-M6-UFP-P0001, Rev. 0, P & ID-PTF Ultrafiltration Feed Preparation System Vessels (UFP-VSL-00001A/B); 24590-PTF-P1-P01T-P0001, Rev. 2, Pretreatment Facility General Arrangement Plan at El. 0'-0"; 24590-PTF-P1-P01T-P0008, Rev. 3, Pretreatment Facility General Arrangement Section B-B; 24590-PTF-P1-P01T-P0009, Rev. 6, Pretreatment Facility General Arrangement Section C-C; 24590-PTF-P1-P01T-P0014, Rev. 5, Pretreatment Facility General Arrangement Sect. L-L and K-K; 24590-PTF-P1-P01T-P0015, Rev. 5, Pretreatment Facility General Arrangement Sect. M-M and N-N; 24590-PTF-M5-V17T-P0009, Rev. 0, Process Flow Diagram Ultrafiltration Feed Preparation System UFP. Mechanical Data Sheets: 24590-PTF-MVD-UFP-P0001, Rev.0, Ultrafiltration Feed Preparation Vessel (UFP-VSL-00001A); 24590-PTF-MVD-UFP-P0002, Rev.0, Ultrafiltration Feed Preparation Vessel (UFP-VSL-00001B).
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 the design intent fully satisfies the requirements of Washington Administrative Code, WAC-173-303-640, *Dangerous Waste Regulations*.

	Information Assessed	Source of Information	Assessment
Design	Vessel design standards are appropriate and adequate for the vessel's intended use.	Drawings listed above under References; Mechanical Data Sheets listed above under References; 24590-WTP-3PS-MV00-TP001, Rev. 1, Engineering Specification for Pressure Vessel Design and Fabrication; 24590-WTP-3PS-MV00-TP003, Rev. 1, Engineering Specification for Pressure Vessel Fatigue Analysis; SCN No. 24590-WTP-3PN-MV00-00004, Pressure Vessel Fatigue Analysis; 24590-WTP-3PS-MVB2-T0001, Rev. 1, Engineering Specification for Welding of Pressure Vessels, Heat Exchangers and Boilers; 24590-WTP-3PS-G000-TP002, Rev. 2, Positive Material Identification (PMI); 24590-WTP-3PS-G000-T0001, Rev. 0, General Specification for Supplier Quality Assurance Program Requirements; 24590-WTP-3PS-M000-T0002, Rev. 1, General Specification for Mechanical Handling Equipment Design and Manufacture; 24590-PTF-3YD-UFP-00001, Rev. 0, System Description for Ultrafiltration Process System (UFP). SDCN No. 24590-PTF-3YN-UFP-00001, System Description for Ultrafiltration Process System (UFP);	The UFP system Ultrafiltration Feed Preparation Vessels, UFP-VSL-00001A/B vessels and all appurtenances are to be designed to the ASME Section VIII, Division 1 rules which are appropriate for pressure vessels operating with mixed waste solutions over the pressure and temperature ranges specified for these vessels. Supplementary requirements are specified in the Engineering Specification for Pressure Vessel Design and Fabrication. Supplementary requirements address pressure vessel fatigue analysis, positive material identification, lifting attachment design, equipment drop evaluation, fabrication tolerances, acceptable welding procedures for the vessel and appurtenances, welder qualifications and testing records, NDE inspections and records, and lifting, packaging, shipping, handling and storage requirements. Some of the vessel internal equipment is subject to cyclic loading. The fatigue design standards, ASME Section VIII, Division 2, are appropriate for components with a high number of load cycles. These are adequate and acceptable design standards for the intended use of the vessels. The Ultrafiltration Feed Preparation Vessels, UFP-VSL-00001A/B assemblies are vertical vessels with a 20 ft ID and a vertical length of 25'-6" tangent to tangent, and each vessel supported on a cylindrical skirt (3/4" thick by approx. 7'-0" high) which in turn is supported on a base plate beam. Top and bottom heads are ellipsoidal with minimum thickness of 3/4" (top) and 1.07" (bottom). The shells are specified to be 1" thick (upper shell) and 1.375" (lower shell). There are eight Pulse Jet Mixer (PJM) vessels (size 36" ID x 169" High) supported from the top heads of the Feed Preparation Vessels. Material for the shells, heads and vessel's internal equipment including Pulse Jet Mixers is SA-240 316L stainless steel (0.030% maximum carbon content, dual certified). The support skirts are to be SA-240 304L stainless steel (0.030% maximum carbon content, dual certified). Both above listed stainless steel materials will hereafter be referred to as 316L and 304L, respectively. The base plate beams are A 572 Gr. 50 steel. Portions of the steam ejectors located inside the vessels are Alloy 22 (UNS # N06022). The operating volume is to be about 64,600 gallons and the total internal volume is to be about 75,600 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.	Drawings listed above under References; Mechanical Data Sheets listed above under References; 24590-WTP-3PS-MV00-TP001, Rev. 1, Engineering Specification for Pressure Vessel Design and Fabrication; 24590-WTP-3PS-MV00-TP003, Rev. 1, Engineering Specification for Pressure Vessel Fatigue Analysis; PDC No. 24590-WTP-PEN-03-002, PEN Title: Changes to the Permit Specification 24590-WTP-3PS-MV00-TP003, Rev. 1, Engineering Specification for Pressure Vessel Fatigue Analysis; PDC No. 24590-WTP-PEN-03-001, PEN Title: Changes to the Permit Specification 24590-WTP-3PS-MV00-TP002, Rev. 1, Engineering Specification for Seismic Qualification Criteria for Pressure Vessels; 24590-WTP-3PS-MV00-TP002, Rev. 1, Engineering Specification for Seismic Qualification Criteria for Pressure Vessels; 24590-WTP-3PS-SS90-T0001, Rev. 0, Engineering Specification for Seismic Qualification of Seismic Category I/II Equipment and Tanks; AISC 4-98, Seismic Analysis of Safety Related Nuclear Structures and Commentary.	The UFP Ultrafiltration Feed Preparation Vessels, UFP-VSL-00001A/B vessels are standard ASME Section VIII vessels. The Mechanical Data Sheets require that the ASME Section VIII, Division 1 vessels be delivered after design, fabrication, inspection and testing with an ASME code stamp and that the vessels be nationally registered. Supplemental design information is provided by the reference documents listed in the Source of Information column for utilizing sound engineering principles of construction for the vessels.

	Information Assessed	Source of Information	Assessment
Design	Vessel has adequate strength, after consideration of the corrosion allowance, to withstand the operating pressure, operating temperature, and seismic loads.	Drawings listed above under References; Mechanical Data Sheets listed above under References; 24590-WTP-3PS-MV-TP001, Rev.1, Engineering Specification for Pressure Vessel Design and Fabrication; 24590-WTP-3PS-MV00-TP002, Rev. 1, Engineering Specification for Seismic Qualification Criteria for Pressure Vessels; 24590-WTP-3PS-SS90-T0001, Rev. 0, Engineering Specification for Seismic Qualification of Seismic Category I/II Equipment and Tanks; AISC 4-98, Seismic Analysis of Safety Related Nuclear Structures and Commentary; 24590-PTF-3YD-UFP-00001, Rev. 0, System Description for Ultrafiltration Process System (UFP).	The Mechanical Data Sheets identify each vessel's operating pressure and temperature ranges, the materials selected for each vessel, the corrosion allowance(s), and the vessel quality levels which determine the requirements for seismic design. The design specifications for the vessels require specific consideration of the operating pressures and temperatures and seismic loads in the design process. ASME Section VIII, Div. 1 requires that corrosion allowance thickness shall be excluded from nominal vessel thickness when evaluating the adequacy of vessel components for these loads at end of life. The Engineering Specification for Seismic Qualification Criteria for Pressure Vessels adopts ASME Section VIII, Div. 2 design rules to address seismic design and analysis of the vessel and ASME Section VIII, Div. 1 for the vessel supports. Detailed requirements for seismic design of SC-I/II vessels are furnished in the specification for Seismic Qualification of Seismic Category I/II Equipment and Tanks. These codes and standards are adequate and appropriate for design of the UFP vessels to withstand operating pressure and temperature loads and seismic loads for the specified design life.

	Information Assessed	Source of Information	Assessment
Foundation	Vessel foundation will maintain the load of a full vessel.	Drawings listed above under references; 24590-WTP-DB-ENG-01-001, Rev. 1, Basis of Design; 24590-WTP-3PS-MV00-TP001, Rev. 1, Engineering Specification for Pressure Vessel Design and Fabrication.	The Engineering Specification for Pressure Vessel Design and Fabrication requires the use of ASME B&PV code, Section VIII, Division I for design of the vessel supports. This code ensures an adequate design for the vessel supports. Chapter 14 of the Basis of Design document requires that the vessel foundation design must be adequate to support the loads from full vessels.
	If in an area subject to flooding, the vessel is anchored.	24590-WTP-3PS-MV00-TP001, Rev. 1, Engineering Specification for Pressure Vessel Design and Fabrication.	Buoyant forces of an empty vessel in a flooded room are a mandatory standard design load case in this specification for Pressure Vessel Design and Fabrication.
	Vessel system will withstand the effects of frost heave.	24590-WTP-DB-ENG-01-001, Rev. 1, Basis of Design.	The Basis of Design document requires that all structural foundations extend a distance below grade that exceeds the depth of the frost line. The vessels are inside the building at floor Elevation 0'-0" and therefore, are not subject to frost heave.

	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 Sheets listed above under References; Vessel/Tank Material Selection Data Sheet, 24590-PTF-N1D-UFP-P0005, Rev. 0, UFP-VSL-00001A/B (PTF) Ultrafiltration Feed Preparation Vessels; 24590-WTP-PSAR-ESH-01-002-02, Rev. 1, Preliminary Safety Analysis Report: PT Facility Specific Information; WA7890008967, *Dangerous Waste Portion of the Hanford Facility Resource Conservation and Recovery Act Permit for the Treatment, Storage, and Disposal of Dangerous Waste,* Chapter 10, and Attachment 51, "Hanford Tank Waste Treatment and Immobilization Plant."	The Mechanical Data Sheets present the waste specific gravity, storage temperatures and pressures. The Vessel/Tank Material Selection Data Sheet addresses the pH range and chemical composition of the waste to select appropriate vessel materials and specify the corrosion allowance. Other waste characteristics that are hazardous, such as ignitability, reactivity, and toxicity are addressed by the Preliminary Safety Analysis Report for the PTF and in Part A of the Permit as an integral part of the design process. The UFP vessels provide primary confinement of the waste during normal operations, abnormal operations and during and after a Design Basis Earthquake. The vessels must retain integrity to insure that the hydrogen controls for the vessel head space continue functioning. The internal Pulse Jet Mixers must remain functional to prevent hydrogen buildup in the vessel sludge. The hydrogen dilution air supply and the PTF Process Vessel Vent System must retain integrity and remain functional to provide continuing hydrogen control. The vessels are grounded to control ignition sources.
	Vessel is designed to store or treat the wastes with the characteristics defined above and any treatment reagents.	Vessel/Tank Material Selection Data Sheet, 24590-PTF-N1D-UFP-P0005, Rev. 0, Ultrafiltration Feed Preparation Vessels, UFP-VSL-00001A/B; 24590-PTF-3YD-UFP-00001, Rev. 0, System Description for Ultrafiltration Process System (UFP).	The Vessel/Tank Material Selection Data Sheet demonstrates that the vessel is designed to process the wastes discussed above. The System Description discusses normal and abnormal operations for the UFP vessels. Compatible chemicals may be added to the vessels to maintain sodium molarity of 5M. Acid or water will be used for flushing/rinsing.
	The waste types are compatible with each other.	24590-PTF-3YD-UFP-00001, Rev. 0, System Description for Ultrafiltration Process System (UFP).	The System Description for the Ultrafiltration Process System (UFP) does not describe any operations where incompatible wastes are mixed in these vessels for processing. The UFP vessels function primarily to prepare the waste for processing by other components of the UFP in the Pretreatment facility.

	Information Assessed	Source of Information	Assessment
Corrosion Protection	Vessel material and protective coatings ensure the vessel structure is adequately protected form the corrosive effects of the waste stream and external environments (expected to not leak or fail for the design life of the system)	Drawings listed above under References; Mechanical Data Sheets listed above under References; Vessel/Tank Material Selection Data Sheet; 24590-PTF-N1D-UFP-P0005, Rev. 0, Ultrafiltration Feed Preparation Vessels, UFP-VSL-00001A/B; 24590-PTF-3YD-UFP-00001, Rev. 0, System Description for Ultrafiltration Process System (UFP).	The Vessel/Tank Material Selection Data Sheet shows that the Ultrafiltration Feed Preparation Vessels, UFP-VSL-00001A/B normally operate at atmospheric pressure, pH 13, and a temperature of about 77 °F. The assembly is designed for 15 psig pressure and 150 °F temperature. Potential acid cleaning operations of the vessels were also considered. The material selected is 316L and a corrosion allowance of 0.04 in. The PJMs are designed for 80 psig and150 °F temperature. The UFP vessels have cooling jackets around them to maintain the desired temperature of the waste. The UFP vessels are located in cells at Elevation 0'-0" in the PTF. These cells are equipped with liners, sumps and wash down nozzles to mitigate potential leaks. Therefore, the cells should remain dry during normal operations which will limit external corrosion of the vessels over the facility design life. The UFP vessels receive waste from LAW feed from FRP system (FRP-VSL-00002A/B/C/D), HLW feed system from HLP system (HLP-VSL-00022), evaporator concentrate from the FEP system (FEP-SEP-00001A/B), process condensate from RLD system (RLD-TK-0006A/B), and prepares and sends it to Ultrafiltration Feed Vessels (UFP-VSL-00002A/B) for further processing.
Corrosion Allowance	Corrosion allowance is adequate for the intended service life of the vessel.	Mechanical Data Sheets listed above under References; Vessel/Tank Material Selection Data Sheet; 24590-PTF-N1D-UFP-P0005, Rev. 0, Ultrafiltration Feed Preparation Vessels, UFP-VSL-00001A/B.	The bases for the UFP vessels material selection and corrosion allowance are furnished in the Vessel/Tank Material Selection Data Sheet. Selection of 316L material with a corrosion allowance of 0.04 in. for a service life of 40 years is adequate and appropriate. The material selections and corrosion allowances are carried forward to the Mechanical Data Sheets consistently and correctly.
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; 24590-PTF-3YD-UFP-00001, Rev. 0, System Description for Ultrafiltration Process System (UFP).	The UFP Ultrafiltration Feed Preparation Vessels, UFP-VSL-00001A/B vessels are designed to overflow through 8" diameter lines to the Plant Overflow Vessel (PWD-VSL-00033) located at Elevation (-) 45'-0", as shown on the drawings. These unrestricted overflow lines are tied to the vessel vent system to prevent over pressurization of the vessels.

Scope	Scope of this Integrity Assessment	This integrity assessment includes: The two Ultrafiltration Process System, Ultrafiltration Feed Vessels: UFP-VSL-00002A/B including their appurtenances or offspring items, which are located in process cells at Elevation 0'-0" in the Pretreatment Facility.
References	Drawings and Mechanical Data Sheets	Drawings: 24590-PTF-MV-UFP-P0003, Rev. 0, Equipment Assembly Ultrafiltration Feed Vessel (UFP-VSL-00002A); 24590-PTF-MV-UFP-P0004, Rev. 0, Equipment Assembly Ultrafiltration Feed Vessel (UFP-VSL-00002B); 24590-PTF-M6-UFP-P0002, Rev. 0, P & ID-PTF Ultrafiltration System Vessels (UFP-VSL-00002A); 24590-PTF-M6-UFP-P0003, Rev. 0, P & ID-PTF Ultrafiltration System Vessels (UFP-VSL-00002B); 24590-PTF-P1-P01T-P0001, Rev. 2, Pretreatment Facility General Arrangement Plan at El. 0'-0"; 24590-PTF-P1-P01T-P0008, Rev. 3, Pretreatment Facility General Arrangement Section B-B; 24590-PTF-P1-P01T-P0009, Rev. 6, Pretreatment Facility General Arrangement Section C-C; 24590-PTF-P1-P01T-P0014, Rev. 5, Pretreatment Facility General Arrangement Sect. L-L and K-K; 24590-PTF-P1-P01T-P0015, Rev. 5, Pretreatment Facility General Arrangement Sect. M-M and N-N; 24590-PTF-M5-V17T-P0010, Rev. 0, Process Flow Diagram Ultrafiltration System UFP. Mechanical Data Sheets: 24590-PTF-MVD-UFP-P0014, Rev.0, Ultrafiltration Feed Vessel (UFP-VSL-00002A); 24590-PTF-MVD-UFP-P0015, Rev.0, Ultrafiltration Feed Vessel (UFP-VSL-00002B).
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 the design intent fully satisfies the requirements of Washington Administrative Code, WAC-173-303-640, *Dangerous Waste Regulations.*

Design	Vessel design standards are appropriate and adequate for the vessel's intended use.	Drawings listed above under References; Mechanical Data Sheets listed above under References; 24590-WTP-3PS-MV00-TP001, Rev. 1, Engineering Specification for Pressure Vessel Design and Fabrication; 24590-WTP-3PS-MV00-TP003, Rev. 1, Engineering Specification for Pressure Vessel Fatigue Analysis; 24590-WTP-3PS-MVB2-T0001, Rev. 1, Engineering Specification for Welding of Pressure Vessels, Heat Exchangers and Boilers; 24590-WTP-3PS-G000-TP002, Rev. 1, Positive Material Identification (PMI); 24590-WTP-3PS-G000-T0001, Rev. 0, General Specification for Supplier Quality Assurance Program Requirements; 24590-WTP-3PS-M000-T0002, Rev. 1, General Specification for Mechanical Handling Equipment Design and Manufacture; 24590-PTF-3YD-UFP-00001, Rev. 0, System Description for Ultrafiltration Process System (UFP). SDCN No. 24590-PTF-3YN-UFP-00001, System Description for Ultrafiltration Process System (UFP);	The UFP system Ultrafiltration Feed Vessels, UFP-VSL-00002A/B vessels and all appurtenances are to be designed to the ASME Section VIII, Division 1 rules which are appropriate for pressure vessels operating with mixed waste solutions over the pressure and temperature ranges specified for these vessels. Supplementary requirements are specified in the Engineering Specification for Pressure Vessel Design and Fabrication. Supplementary requirements address pressure vessel fatigue analysis, positive material identification, lifting attachment design, equipment drop evaluation, fabrication tolerances, acceptable welding procedures for the vessel and appurtenances, welder qualifications and testing records, NDE inspections and records, and lifting, packaging, shipping, handling and storage requirements. Some of the vessel internal equipment is subject to cyclic loading. The fatigue design standards, ASME Section VIII, Division 2, are appropriate for components with a high number of load cycles. These are adequate and acceptable design standards for the intended use of the vessels. The UFP Ultrafiltration Feed Vessels, UFP-VSL-00002A/B assemblies are vertical vessels with a 14 ft ID and a vertical length of 30'-9" tangent to tangent, and each vessel is supported on a cylindrical skirt (1" thick by approx. 5'-0" high) which in turn is supported on a base ring beam. Top and bottom heads are semi-elliptical with minimum thickness of 5/8"(top) and 7/8" (bottom). The shells are specified to be 7/8" thick (upper shell) and 1.25" thick (lower shell). There are six Pulse Jet Mixer (PJM) vessels (size 32" ID x 184" high) supported from the top heads of the Feed Vessels. A major portion of the shell and bottom head has a 1/2" thick cooling water jacket. Materials for the shells, heads and vessels' internal equipment including the PJMs, cooling water jackets, and support skirts are SA-240 304L stainless steel (0.030% maximum carbon content, dual certified) hereafter referred to as 304L. The support base ring beams are A 572 Gr. 50 steel. Portions of the steam ejectors located inside the vessels are Alloy 22 (UNS # N06022). The operating volume is to be about 36,500 gallons and the total internal volume is to be about 40,800 gallons.

Design	If a non-standard vessel is to be used, the design calculations demonstrate sound engineering principles of construction.	Drawings listed above under References; Mechanical Data Sheets listed above under References; 24590-WTP-3PS-MV00-TP001, Rev. 1, Engineering Specification for Pressure Vessel Design and Fabrication; 24590-WTP-3PS-MV00-TP003, Rev. 1, Engineering Specification for Pressure Vessel Fatigue Analysis; SCN No. 24590-WTP-3PN-MV00-00004, Pressure Vessel Fatigue Analysis; PDC No. 24590-WTP-PEN-03-002, PEN Title: Changes to the Permit Specification 24590-WTP-3PS-MV00-TP003, Rev. 1, Engineering Specification for Pressure Vessel Fatigue Analysis; PDC No. 24590-WTP-PEN-03-001, PEN Title: Changes to the Permit Specification 24590-WTP-3PS-MV00-TP002, Rev. 1, Engineering Specification for Seismic Qualification Criteria for Pressure Vessels; 24590-WTP-3PS-MV00-TP002, Rev. 1, Engineering Specification for Seismic Qualification Criteria for Pressure Vessels; 24590-WTP-3PS-SS90-T0001, Rev. 0, Engineering Specification for Seismic Qualification of Seismic Category I/II Equipment and Tanks; AISC 4-98, Seismic Analysis of Safety Related Nuclear Structures and Commentary.	The UFP Ultrafiltration Feed Vessels, UFP-VSL-00002A/B vessels are standard ASME Section VIII vessels. The Mechanical Data Sheets require that the ASME Section VIII, Division 1 vessels be delivered after design, fabrication, inspection and testing with an ASME code stamp and that the vessels be nationally registered. Supplemental design information is provided by the reference documents listed in the Source of Information column for utilizing sound engineering principles of construction for the vessels.

Design	Vessel has adequate strength, after consideration of the corrosion allowance, to withstand the operating pressure, operating temperature, and seismic loads.	Drawings listed above under References; Mechanical Data Sheets listed above under References; 24590-WTP-3PS-MV-TP001, Rev.1, Engineering Specification for Pressure Vessel Design and Fabrication; 24590-WTP-3PS-MV00-TP002, Rev. 1, Engineering Specification for Seismic Qualification Criteria for Pressure Vessels; 24590-WTP-3PS-SS90-T0001, Rev. 0, Engineering Specification for Seismic Qualification of Seismic Category I/II Equipment and Tanks; AISC 4-98, Seismic Analysis of Safety Related Nuclear Structures and Commentary; 24590-PTF-3YD-UFP-00001, Rev. 0, System Description for Ultrafiltration Process System (UFP).	The Mechanical Data Sheets identify each vessel's operating pressure and temperature ranges, the materials selected for each vessel, the corrosion allowance(s), and the vessel quality levels which determine the requirements for seismic design. The design specifications for the vessels require specific consideration of the operating pressures and temperatures and seismic loads in the design process. ASME Section VIII, Div. 1 requires that corrosion allowance thickness shall be excluded from nominal vessel thickness when evaluating the adequacy of vessel components for these loads at end of life. The Engineering Specification for Seismic Qualification Criteria for Pressure Vessels adopts ASME Section VIII, Div. 2 design rules to address seismic design and analysis of the vessel and ASME Section VIII, Div. 1 for the vessel supports. Detailed requirements for seismic design of SC-I/II vessels are furnished in the specification for Seismic Qualification of Seismic Category I/II Equipment and Tanks. These codes and standards are adequate and appropriate for design of the UFP vessels to withstand operating pressure, temperature, and seismic loads for the specified design life.

Foundation	Vessel foundation will maintain the load of a full vessel.	Drawings listed above under references; 24590-WTP-DB-ENG-01-001, Rev. 1, Basis of Design; 24590-WTP-3PS-MV00-TP001, Rev. 1, Engineering Specification for Pressure Vessel Design and Fabrication.	The Engineering Specification for Pressure Vessel Design and Fabrication requires the use of ASME B&PV Code, Section VIII, Division I for design of the vessel supports. This code ensures an adequate design for the vessel supports. Chapter 14 of the Basis of Design document requires that the vessel foundation design must be adequate to support the loads from full vessels.
	If in an area subject to flooding, the vessel is anchored.	24590-WTP-3PS-MV00-TP001, Rev. 1, Engineering Specification for Pressure Vessel Design and Fabrication.	Buoyant forces of an empty vessel in a flooded room are a mandatory standard design load case in this specification for Pressure Vessel Design and Fabrication.
	Vessel system will withstand the effects of frost heave.	24590-WTP-DB-ENG-01-001, Rev. 1, Basis of Design.	The Basis of Design document requires that all structural foundations extend a distance below grade that exceeds the depth of the frost line. The vessels are inside the building at floor Elevation 0'-0" and therefore, are not subject to frost heave.

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 Sheets listed above under References; Vessel/Tank Material Selection Data Sheet, 24590-PTF-N1D-UFP-P0003, Rev. 0, UFP-VSL-00002A/B (PTF) Ultrafiltration Feed Vessels ; 24590-WTP-PSAR-ESH-01-002-02, Rev. 1, Preliminary Safety Analysis Report: PT Facility Specific Information; WA7890008967, *Dangerous Waste Portion of the Hanford Facility Resource Conservation and Recovery Act Permit for the Treatment, Storage, and Disposal of Dangerous Waste,* Chapter 10, and Attachment 51, "Hanford Tank Waste Treatment and Immobilization Plant."	The Mechanical Data Sheets present the waste specific gravity, storage temperatures and pressures. The Vessel/Tank Material Selection Data Sheet addresses the pH range and chemical composition of the waste to select appropriate vessel materials and specify the corrosion allowance. Other waste characteristics that are hazardous, such as ignitability, reactivity, and toxicity are addressed by the Preliminary Safety Analysis Report for the PTF and in Part A of the Permit as an integral part of the design process. The UFP vessels provide primary confinement of the waste during normal operations, abnormal operations and during and after a Design Basis Earthquake. The vessels must retain integrity to insure that the hydrogen controls for the vessel head space continue functioning. The internal Pulse Jet Mixers must remain functional to prevent hydrogen buildup in the vessel sludge. The hydrogen dilution air supply and the PTF Process Vessel Vent System must retain integrity and remain functional to provide continuing hydrogen control. The vessels are grounded to control ignition sources.
	Vessel is designed to store or treat the wastes with the characteristics defined above and any treatment reagents.	Vessel/Tank Material Selection Data Sheet, 24590-PTF-N1D-UFP-P0003, Rev. 0, Ultrafiltration Feed Vessels, UFP-VSL-00002A/B; 24590-PTF-3YD-UFP-00001, Rev. 0, System Description for Ultrafiltration Process System (UFP).	The Vessel/Tank Material Selection Data Sheet demonstrates that the vessel is designed to process the wastes discussed above. The System Description discusses normal and abnormal operations for the UFP vessels. Compatible chemicals reagents may be added to the vessels for treatment of solids washing and/or caustic leaching, or via chemical cleaning of filters through nitric acid additions. Acid or water will be used for flushing/rinsing.
	The waste types are compatible with each other.	24590-PTF-3YD-UFP-00001, Rev. 0, System Description for Ultrafiltration Process System (UFP).	The System Description for the Ultrafiltration Process System (UFP) does not describe any operations where incompatible wastes are mixed in these vessels for processing. The UFP vessels function primarily to prepare the waste for processing by other components of the UFP in the Pretreatment facility.

Corrosion Protection	Vessel material and protective coatings ensure the vessel structure is adequately protected form the corrosive effects of the waste stream and external environments (expected to not leak or fail for the design life of the system)	Drawings listed above under References; Mechanical Data Sheets listed above under References; Vessel/Tank Material Selection Data Sheet; 24590-PTF-N1D-UFP-P0003, Rev. 0, Ultrafiltration Feed Vessels, UFP-VSL-00002A/B; 24590-PTF-3YD-UFP-00001, Rev. 0, System Description for Ultrafiltration Process System (UFP).	The Vessel/Tank Material Selection Data Sheet shows that the Ultrafiltration Feed Vessels, UFP-VSL-00002A/B normally operate at atmospheric pressure, pH 13, and a temperature of about 77 °F. The assembly is designed for 15 psig pressure and 225 °F temperature. Potential acid cleaning operations of the vessels were also considered. The material selected is 304L and a corrosion allowance of 0.04 in. The UFP vessels have cooling jackets around them to maintain the desired temperature of the waste. The PJMs are designed for 80 psig and 225 °F temperature. The UFP vessels are located in cells at Elevation 0'-0" in the PTF. These cells are equipped with liners, sumps and wash down nozzles to mitigate potential leaks. Therefore, the cells should remain dry during normal operations which will limit external corrosion of the vessels over the facility design life. These UFP vessels receive waste from UFP Feed Preparation Vessels (UFP-VSL-00001A/B) to be sent to Ultrafilters (UFP-FILT-00001, 2, 3 A/B) for further processing.
Corrosion Allowance	Corrosion allowance is adequate for the intended service life of the vessel.	Mechanical Data Sheets listed above under References; Vessel/Tank Material Selection Data Sheet; 24590-PTF-N1D-UFP-P0003, Rev. 0, Ultrafiltration Feed Vessels, UFP-VSL-00002A/B.	The bases for the UFP vessels material selection and corrosion allowance are furnished in the Vessel/Tank Material Selection Data Sheet. Selection of 304L with a corrosion allowance of 0.04 in. for a service life of 40 years is adequate and appropriate. The material selections and corrosion allowances are carried forward to the Mechanical Data Sheets consistently and correctly.
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; 24590-PTF-3YD-UFP-00001, Rev. 0, System Description for Ultrafiltration Process System (UFP).	The UFP Ultrafiltration Feed Vessels, UFP-VSL-00002A/B vessels are designed to overflow through 8" diameter lines to the Plant Overflow Vessel (PWD-VSL-00033) located at Elevation (-) 45'-0", as shown on the drawings. These unrestricted overflow lines are tied to the vessel vent system to prevent over pressurization of the vessels.

Scope	Scope of this Integrity Assessment	This integrity assessment includes: The three Ultrafiltration Process System, Ultrafilter Permeate Collection Vessels: UFP-VSL-00062A/B/C including their appurtenances or offspring items, which are located in process cells at Elevation 0'-0" in the Pretreatment Facility.
References	Drawings and Mechanical Data Sheets	Drawings: 24590-PTF-MV-UFP-P0005, Rev. 0, Equipment Assembly Ultrafilter Permeate Vessel (UFP-VSL-00062A); 24590-PTF-MV-UFP-P0006, Rev. 0, Equipment Assembly Ultrafilter Permeate Vessel (UFP-VSL-00062B); 24590-PTF-MV-UFP-P0007, Rev. 0, Equipment Assembly Ultrafilter Permeate Vessel (UFP-VSL-00062C); 24590-PTF-M6-UFP-P0004, Rev. 0, P & ID-PTF Ultrafiltration Permeate Collection System Vessels (UFP-VSL-00062A/B/C); 24590-PTF-P1-P01T-P0001, Rev. 2, Pretreatment Facility General Arrangement Plan at El. 0'-0"; 24590-PTF-P1-P01T-P0008, Rev. 3, Pretreatment Facility General Arrangement Section B-B; 24590-PTF-P1-P01T-P0009, Rev. 6, Pretreatment Facility General Arrangement Section C-C; 24590-PTF-P1-P01T-P0014, Rev. 5, Pretreatment Facility General Arrangement Sect. L-L and Sect. K-K; 24590-PTF-P1-P01T-P0015, Rev. 5, Pretreatment Facility General Arrangement Sect. M-M; 24590-PTF-M5-V17T-P0011, Rev. 0, Process Flow Diagram Ultrafiltration Permeate Collection System UFP. Mechanical Data Sheets: 24590-PTF-MVD-UFP-P0005, Rev.0, Ultrafilter Permeate Collection Vessel (UFP-VSL-00062A); 24590-PTF-MVD-UFP-P0006, Rev.0, Ultrafilter Permeate Collection Vessel (UFP-VSL-00062B); 24590-PTF-MVD-UFP-P0007, Rev.0, Ultrafilter Permeate Collection Vessel (UFP-VSL-00062C).
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 the design intent fully satisfies the requirements of Washington Administrative Code, WAC-173-303-640, *Dangerous Waste Regulations.*

	Information Assessed	Source of Information	Assessment
Design	Vessel design standards are appropriate and adequate for the vessel's intended use.	Drawings listed above under References; Mechanical Data Sheets listed above under References; 24590-WTP-3PS-MV00-TP001, Rev. 1, Engineering Specification for Pressure Vessel Design and Fabrication; 24590-WTP-3PS-MV00-TP003, Rev. 1, Engineering Specification for Pressure Vessel Fatigue Analysis; SCN No. 24590-WTP-3PN-MV00-00004, Pressure Vessel Fatigue Analysis; 24590-WTP-3PS-MVB2-T0001, Rev. 1, Engineering Specification for Welding of Pressure Vessels, Heat Exchangers and Boilers; 24590-WTP-3PS-G000-TP002, Rev. 2, Positive Material Identification (PMI); 24590-WTP-3PS-G000-T0001, Rev. 0, General Specification for Supplier Quality Assurance Program Requirements; 24590-WTP-3PS-M000-T0002, Rev. 1, General Specification for Mechanical Handling Equipment Design and Manufacture; 24590-PTF-3YD-UFP-00001, Rev. 0, System Description for Ultrafiltration Process System (UFP). SDCN No. 24590-PTF-3YN-UFP-00001, System Description for Ultrafiltration Process System (UFP);	The UFP system Ultrafilter Permeate Collection Vessels, UFP-VSL-00062A/B/C vessels and all appurtenances are to be designed to the ASME Section VIII, Division 1 rules which are appropriate for pressure vessels operating with mixed waste solutions over the pressure and temperature ranges specified for these vessels. Supplementary requirements are specified in the Engineering Specification for Pressure Vessel Design and Fabrication. Supplementary requirements address pressure vessel fatigue analysis, positive material identification, lifting attachment design, equipment drop evaluation, fabrication tolerances, acceptable welding procedures for the vessel and appurtenances, welder qualifications and testing records, NDE inspections and records, and lifting, packaging, shipping, handling and storage requirements. Some of the vessel internal equipment is subject to cyclic loading. The fatigue design standards, ASME Section VIII, Division 2, are appropriate for components with a high number of load cycles. These are adequate and acceptable design standards for the intended use of the vessels. The Ultrafilter Permeate Collection Vessels, UFP-VSL-00062A/B/C assemblies are vertical vessels with a 15 ft ID and a vertical length of 21'-3" tangent to tangent, and each vessel is supported on a cylindrical skirt (9/16" thick by approximately 5'-0" high) which in turn is supported on a base plate beam. Top and bottom heads are ellipsoidal with minimum thickness of 9/16". The shells are specified to be 7/8" thick. There are total of 12 internal vessels: six Pulse Jet Mixers (PJMs) and six Charge Vessels for the Reverse Flow Diverters (RFDs). Material for the shells, heads, support skirts, and vessel's internal equipment including the PJMs, Charge Vessels, and RFDs is SA-240 316L stainless steel (0.030 % maximum carbon content, dual certified) hereafter referred to as 316L. The support base plate beams are A 572 Gr. 50 steel. The operating volume is to be approximately 30,000 gallons and the total internal volume is to be about 34,700 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.	Drawings listed above under References; Mechanical Data Sheets listed above under References; 24590-WTP-3PS-MV00-TP001, Rev. 1, Engineering Specification for Pressure Vessel Design and Fabrication; 24590-WTP-3PS-MV00-TP003, Rev. 1, Engineering Specification for Pressure Vessel Fatigue Analysis; PDC No. 24590-WTP-PEN-03-002, PEN Title: Changes to the Permit Specification 24590-WTP-3PS-MV00-TP003, Rev. 1, Engineering Specification for Pressure Vessel Fatigue Analysis; PDC No. 24590-WTP-PEN-03-001, PEN Title: Changes to the Permit Specification 24590-WTP-3PS-MV00-TP002, Rev. 1, Engineering Specification for Seismic Qualification Criteria for Pressure Vessels; 24590-WTP-3PS-MV00-TP002, Rev. 1, Engineering Specification for Seismic Qualification Criteria for Pressure Vessels; 24590-WTP-3PS-SS90-T0001, Rev. 0, Engineering Specification for Seismic Qualification of Seismic Category I/II Equipment and Tanks; AISC 4-98, Seismic Analysis of Safety Related Nuclear Structures and Commentary.	The UFP Ultrafilter Permeate Collection Vessels, UFP-VSL-00062A/B/C vessels are standard ASME Section VIII vessels. The Mechanical Data Sheets require that the ASME Section VIII, Division 1 vessels be delivered after design, fabrication, inspection and testing with an ASME code stamp and that the vessels be nationally registered. Supplemental design information is provided by the reference documents listed in the Source of Information column for utilizing sound engineering principles of construction for the vessels.

	Information Assessed	Source of Information	Assessment
Design	Vessel has adequate strength, after consideration of the corrosion allowance, to withstand the operating pressure, operating temperature, and seismic loads.	Drawings listed above under References; Mechanical Data Sheets listed above under References; 24590-WTP-3PS-MV-TP001, Rev.1, Engineering Specification for Pressure Vessel Design and Fabrication; 24590-WTP-3PS-MV00-TP002, Rev. 1, Engineering Specification for Seismic Qualification Criteria for Pressure Vessels; 24590-WTP-3PS-SS90-T0001, Rev. 0, Engineering Specification for Seismic Qualification of Seismic Category I/II Equipment and Tanks; AISC 4-98, Seismic Analysis of Safety Related Nuclear Structures and Commentary; 24590-PTF-3YD-UFP-00001, Rev. 0, System Description for Ultrafiltration Process System (UFP).	The Mechanical Data Sheets identify each vessel's operating pressure and temperature ranges, the materials selected for each vessel, the corrosion allowance(s), and the vessel quality levels which determine the requirements for seismic design. The design specifications for the vessels require specific consideration of the operating pressures and temperatures and seismic loads in the design process. ASME Section VIII, Div. 1 requires that corrosion allowance thickness shall be excluded from nominal vessel thickness when evaluating the adequacy of vessel components for these loads at end of life. The Engineering Specification for Seismic Qualification Criteria for Pressure Vessels adopts ASME Section VIII, Div. 2 design rules to address seismic design and analysis of the vessel and vessel supports. Detailed requirements for seismic design of SC-I/II vessels are furnished in the specification for Seismic Qualification of Seismic Category I/II Equipment and Tanks. These codes and standards are adequate and appropriate for design of the UFP vessels to withstand operating pressure, temperature, and seismic loads for the specified design life.

	Information Assessed	Source of Information	Assessment
Foundation	Vessel foundation will maintain the load of a full vessel.	Drawings listed above under references; 24590-WTP-DB-ENG-01-001, Rev. 1, Basis of Design; 24590-WTP-3PS-MV00-TP001, Rev. 1, Engineering Specification for Pressure Vessel Design and Fabrication.	The Engineering Specification for Pressure Vessel Design and Fabrication requires the use of ASME B&PV code, Section VIII, Division I for design of the vessel supports. This code assures an adequate design for the vessel supports. Chapter 14 of the Basis of Design document requires that the vessel foundation design must be adequate to support the loads from full vessels.
	If in an area subject to flooding, the vessel is anchored.	24590-WTP-3PS-MV00-TP001, Rev. 1, Engineering Specification for Pressure Vessel Design and Fabrication.	Buoyant forces of an empty vessel in a flooded room are a mandatory standard design load case in this specification for Pressure Vessel Design and Fabrication
	Vessel system will withstand the effects of frost heave.	24590-WTP-DB-ENG-01-001, Rev. 1, Basis of Design.	The Basis of Design document requires that all structural foundations extend a distance below grade that exceeds the depth of the frost line. The vessels are inside the building at floor Elevation 0'-0" and therefore, are not subject to frost heave.
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 Sheets listed above under References; Vessel/Tank Material Selection Data Sheet, 24590-PTF-N1D-UFP-P0008, Rev. 0, UFP-VSL-00062A/B/C (PTF) Ultrafilter Permeate Collection Vessel; 24590-WTP-PSAR-ESH-01-002-02, Rev. 1, Preliminary Safety Analysis Report: PT Facility Specific Information; WA7890008967, *Dangerous Waste Portion of the Hanford Facility Resource Conservation and Recovery Act Permit for the Treatment, Storage, and Disposal of Dangerous Waste,* Chapter 10, and Attachment 51, "Hanford Tank Waste Treatment and Immobilization Plant."	The Mechanical Data Sheets present the waste specific gravity, storage temperatures and pressures. The Vessel/Tank Material Selection Data Sheet addresses the pH range and chemical composition of the waste to select appropriate vessel materials and specify the corrosion allowance. Other waste characteristics that are hazardous, such as ignitability, reactivity, and toxicity are addressed by the Preliminary Safety Analysis Report for the PTF and in Part A of the Permit as an integral part of the design process. The UFP vessels provide primary confinement of the waste during normal operations, abnormal operations and during and after a Design Basis Earthquake. The vessels must retain integrity to insure that the hydrogen controls for the vessel head space continue functioning. The internal Pulse Jet Mixers must remain functional to prevent hydrogen buildup in the vessel sludge. The hydrogen dilution air supply and the PTF Process Vessel Vent System must retain integrity and remain functional to provide continuing hydrogen control. The vessels are grounded to control ignition sources.

	Information Assessed	Source of Information	Assessment
	Vessel is designed to store or treat the wastes with the characteristics defined above and any treatment reagents.	Vessel/Tank Material Selection Data Sheet, 24590-PTF-N1D-UFP-P0008, Rev. 0, UFP-VSL-00062A/B/C (PTF) Ultrafilter Permeate Collection Vessel; 24590-PTF-3YD-UFP-00001, Rev. 0, System Description for Ultrafiltration Process System (UFP).	The Vessel/Tank Material Selection Data Sheet demonstrates that the vessel is designed to process the wastes discussed above. The System Description discusses normal and abnormal operations for the UFP vessels. Compatible chemicals reagents may be added to the vessels for treatment of solids washing and/or caustic leaching, or via chemical cleaning of filters through nitric acid additions. Acid or water will be used for flushing/rinsing.
	The waste types are compatible with each other.	24590-PTF-3YD-UFP-00001, Rev. 0, System Description for Ultrafiltration Process System (UFP).	The System Description for the Ultrafiltration Process System (UFP) does not describe any operations where incompatible wastes are mixed in these vessels for processing. The UFP vessels function primarily to prepare the waste for processing by other components of the UFP in the Pretreatment facility.
Corrosion Protection	Vessel material and protective coatings ensure the vessel structure is adequately protected form the corrosive effects of the waste stream and external environments (expected to not leak or fail for the design life of the system)	Drawings listed above under References; Mechanical Data Sheets listed above under References; Vessel/Tank Material Selection Data Sheet; 24590-PTF-N1D-UFP-P0008, Rev. 0, UFP-VSL-00062A/B/C (PTF) Ultrafilter Permeate Collection Vessel; 24590-PTF-3YD-UFP-00001, Rev. 0, System Description for Ultrafiltration Process System (UFP).	The Vessel/Tank Material Selection Data Sheet shows that the Ultrafilter Permeate Collection Vessels, UFP-VSL-00062 A/B/C normally operate at atmospheric pressure, pH 13, and temperature of about 77 °F. The assembly is designed for 15 psig pressure and 120 °F temperature. Potential acid cleaning operations of the vessels were also considered. The material selected is 316L and a corrosion allowance of 0.04 in. The PJMs and Charge Vessels are designed for 80 psig and 120°F temperature. The UFP vessels are located in cells at Elevation 0'-0" in the PTF. These cells are equipped with liners, sumps and wash down nozzles to mitigate potential leaks. Therefore, the cells should remain dry during normal operations which will limit external corrosion of the vessels over the facility design life. These UFP vessels receive permeate from Ultrafilters (UFP-FILT-0001, 2, 3 A/B) to be sent to Cesium Ion Exchange or to solids wash to Effluent Collection for further processing.

	Information Assessed	Source of Information	Assessment
Corrosion Allowance	Corrosion allowance is adequate for the intended service life of the vessel.	Mechanical Data Sheets listed above under References; Vessel/Tank Material Selection Data Sheet, 24590-PTF-N1D-UFP-P0008, Rev. 0, UFP-VSL-00062A/B/C (PTF) Ultrafilter Permeate Collection Vessel.	The bases for the UFP vessels material selection and corrosion allowance are furnished in the Vessel/Tank Material Selection Data Sheet. Selection of 316L material with a corrosion allowance of 0.04 in. for a service life of 40 years is adequate and appropriate. The material selections and corrosion allowances are carried forward to the Mechanical Data Sheets consistently and correctly.
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; 24590-PTF-3YD-UFP-00001, Rev. 0, System Description for Ultrafiltration Process System (UFP).	The UFP Ultrafiltration Permeate Collection Vessels, UFP-VSL-00062A/B/C vessels are designed to overflow through 6" diameter lines to the Plant Overflow Vessel (PWD-VSL-00033) located at Elev.(-) 45'-0", as shown on the drawings. These unrestricted overflow lines are tied to the vessel vent system to prevent over pressurization of the vessels.