



**IQRPE REVIEW –  
PRETREATMENT FACILITY HLW LAG STORAGE AND FEED BLENDING  
PROCESS SYSTEM (HLP) ANCILLARY EQUIPMENT**

"I, John T. Baxter, 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 HLW Lag Storage and Feed Blending Process System (HLP) Ancillary Equipment 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 indicate that the design intent fully satisfies the requirements of the WAC.

The attached review is eight (8) sheets numbered one (1) through eight (8).

**RFP-WTP  
RECEIVED  
JAN 22 2004  
BY PDC**



Signature John T. Baxter

Date January 21, 2004

# **STRUCTURAL INTEGRITY ASSESSMENT OF THE PRETREATMENT FACILITY HLW LAG STORAGE AND FEED BLENDING PROCESS SYSTEM (HLP) ANCILLARY EQUIPMENT**

**COGEMA-IA-024  
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.**

**Pretreatment Facility (PTF) HLW Lag Storage and Feed Blending System Process (HLP)  
Ancillary Equipment**

COGEMA-IA-024, Rev. 0

<p><b>Scope</b></p>	<p>This integrity assessment includes:</p> <ul style="list-style-type: none"> <li>a. Ancillary equipment associated with the HLP System HLW Lag Storage and Blending Process Vessels(HLP-VSL-00027A/B) as shown on drawing No. 24590-PTF-M6-HLP-P0001, Rev. 1;</li> <li>b. Ancillary equipment associated with the HLP System HLW Feed Receipt Vessel (HLP-VSL-00022) as shown on drawing No. 24590-PTF-M6-HLP-P0002, Rev. 1;</li> <li>c. Ancillary equipment associated with the HLP System HLW Lag Storage and Feed Blending Process System Vessel (HLP-VSL-00028) as shown on drawing No. 24590-PTF-M6-HLP-P0003, Rev. 1.</li> <li>d. Ancillary equipment associated with HLP System Plant Service Air Rack drawings 24590-PTF-M6-HLP-P0005, Rev.0, 24590-PTF-M6-HLP-P0006, Rev.0 and 24590-PTF-M6-HLP-P0007, Rev.0;</li> <li>e. Ancillary equipment associated with HLP System Plant Wash Rack drawings 24590-PTF-M6-HLP-P0009, Rev.0 and 24590-PTF-M6-HLP-P0010, Rev.0.</li> </ul>
<p><b>References</b></p>	<p>24590-PTF-M6-HLP-P0001, Rev. 1, P&amp;ID – PTF HLP System HLW Lag Storage and Blending Process Vessel HLP-VSL-00027A/B (Q);                  24590-PTF-M6-HLP-P0002, Rev. 1, P&amp;ID – PTF HLP System HLW Feed Receipt Vessel HLP-VSL-00022 (Q);                  24590-PTF-M6-HLP-P0003, Rev. 1, P&amp;ID – PTF HLP System HLW Feed Blending Process Vessel HLP-VSL-00028 (Q);                  24590-PTF-M6-HLP-P0005, Rev. 0, P&amp;ID – PTF HLP System HLW Lag Storage and Feed Blending Utility Services - PSA Rack (Q);                  24590-PTF-M6-HLP-P0006, Rev. 0, P&amp;ID – PTF HLP System HLW Lag Storage and Feed Blending Utility Services - PSA Rack (Q);                  24590-PTF-M6-HLP-P0007, Rev. 0, P&amp;ID – PTF HLP System HLW Lag Storage and Feed Blending Utility Services - PSA Rack (Q);                  24590-PTF-M6-HLP-P0009, Rev. 0, P&amp;ID – PTF HLW Lag Storage &amp; Feed Blending Utility Services - Plant Wash Rack (Q);                  24590-PTF-M6-HLP-P0010, Rev. 0, P&amp;ID – PTF HLW Lag Storage &amp; Feed Blending Utility Services Plant Wash Rack (Q);                  Plant Item Material Selection Data Sheet, 24590-PTF-NID-HLP-P0001, Rev. 0, Cs Concentrate Receipt Breakpots, HLP-BRKPT-00004 &amp; HLP-BRKPT-00006 (PTF)</p>

**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 assure the design intent fully satisfies the WAC requirements.

**Pretreatment Facility (PTF) HLW Lag Storage and Feed Blending System Process (HLP)  
Ancillary Equipment**

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Information Assessed	Source of Information	Discussion
<p>Ancillary equipment design standards are appropriate and adequate for the equipment's intended use.</p>	<p>24590-WTP-DC-PS-01-001, Rev 2, Pipe Stress Design Criteria including "Pipe Stress Criteria" and "Span Method Criteria"; Drawings listed above under References; ASME B31.3 Code, Process Piping, 1996 Edition, American Society of Mechanical Engineers</p>	<p>The Pipe Stress Design Criteria document identifies ASME B31.3 as the design code for piping systems of the WTP. The P&amp;ID drawings show the process piping which has a containment function as Seismic Category (SC-D) and Quality Level (QL-1). The "important to safety" plant service air equipment which must function in post Design Basis Earthquake conditions is Seismic Category (SC-I) and Quality Level (QL-1). Ancillary equipment associated with the Pulse Jet Ventilation (PJV) system is Seismic Category (SC-II) and Quality Level (QL-2) as shown on the Plant Service Air (PSA) Rack P&amp;ID drawings (P0005 through P0007). Plant Wash Rack ancillary equipment shown on P&amp;ID drawings (P0009 and P0010) is Commercial grade and Seismic Category (SC-III). These seismic categories are discussed in detail in the Pipe Stress Design Criteria document. These codes and standards are acceptable and adequate for the design of the HLP system ancillary equipment for the intended service.</p>
<p>If the ancillary equipment to be used is not built to a design standard, the design calculations demonstrate sound engineering principles of construction.</p>	<p>24590-WTP-DC-PS-01-001, Rev 2, Pipe Stress Design Criteria including "Pipe Stress Criteria" and "Span Method Criteria"</p>	<p>The ancillary equipment is built to design standards. The Pipe Stress Design Criteria document specifies that piping is to be designed in accordance with ASME B31.3.</p>

Design

Information Assessed	Source of Information	Discussion
<p>Ancillary equipment has adequate strength at the end of its design life to withstand the operating pressure, operating temperature, thermal expansion, and seismic loads. Equipment is protected against physical damage and excessive stress due to settlement, vibration, expansion, or contraction.</p>	<p>24590-WTP-DC-PS-01-001, Rev 2, Pipe Stress Design Criteria including "Pipe Stress Criteria" and "Span Method Criteria";                      ASME Boiler and Pressure Vessel (B&amp;PV) Code, Section III, Rules for Construction of Nuclear Facility Components, Division 1, Subsection NC, Appendix N and Appendix F, 1995;                      Uniform Building Code (UBC), 1997 Edition, International Conference of Building Officials;                      24590-WTP-PER-M-02-002, Rev 0, Materials for Ancillary Equipment;                      24590-WTP-DB-ENG-01-001, Rev 1A, Basis of Design</p>	<p>The Pipe Stress Design Criteria document requires the use of the ASME B31.3 Code for piping design. ASME B31.3 requires explicit consideration of operating pressure, operating temperature, thermal expansion/contraction, settlement, vibration, and corrosion allowance in the design of piping. Elements of the ASME B&amp;PV Code, Section III, Division 1, Subsection NC, Appendix N and Appendix F are used to supplement the requirements of ASME B31.3 for seismic design of SC-I/SC-II piping. Similarly, ASME B&amp;PV Code, Section III, Division 1, Subsection NC and Appendix F, and the Uniform Building Code (UBC) are used to supplement the requirements of ASME B31.3 for seismic design of SC-III/SC-IV piping. Details of the seismic design methods are discussed in the Pipe Stress Design Criteria document. The Basis of Design document specifies that mechanical equipment is to be designed for a nominal plant life of 40 years. Components in non-maintainable areas are to be designed to last the entire design life of the plant. The Materials for Ancillary Equipment document specifies that ancillary equipment downstream of a waste source vessel is to be constructed of the same or better material and with the same corrosion allowance as the source vessel itself. Using the same or better materials and corrosion allowance for downstream ancillary equipment ensures that the equipment will be able to withstand all anticipated loadings for the entire design service life.</p>

**Pretreatment Facility (PTF) HLW Lag Storage and Feed Blending System Process (HLP)  
Ancillary Equipment**

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Information Assessed	Source of Information	Discussion
<p>Ancillary equipment supports are adequately designed.</p>	<p>24590-WTP-DC-PS-01-002, Rev 2, Pipe Support Design Criteria; 24590-WTP-PER-PS-02-001, Rev. 4, Ancillary Equipment Pipe Support Design; 24590-WTP-PL-PS-01-001, Rev 1, Verification and Validation Test Plan for Bechtel's MEI50 Pipe Support Family of Programs (PCFAPPS)</p>	<p>The Pipe Support Design Criteria document considers all loadings identified in ASME B31.3 and utilizes ASME Section III, Division 1, Subsection NF and Appendix F to supplement the requirements of ASME B31.3 for seismic design of SC-III and SC-III/IV pipe supports. Loads are evaluated against the design criteria provided in ASME Section III as discussed in the Pipe Support Design Criteria document. Bounding load cases are passed to the pipe support designers from the results of the ancillary equipment piping stress analyses. Analysis is by manual calculation or approved computer programs that have been verified and validated. These are appropriate codes and standards that assure adequate design of ancillary equipment supports for the HLP system. Ancillary equipment supports are to be designed to allow a minimum of heat to be transferred to the building structures (building structures not to exceed 150 deg F for concrete and 200 deg F for steel). Design standards for vessel internal equipment supports are discussed in the integrity assessment for the HLP system vessels.</p>
<p>Seams and connections are adequately designed.</p>	<p>24590-WTP-DB-ENG-01-001, Rev 1A, Basis of Design; 24590-WTP-DC-PS-01-001, Rev 2, Pipe Stress Design Criteria including "Pipe Stress Criteria" and "Span Method Criteria", ASME Boiler and Pressure Vessel Code, Section IX, Welding and Brazing Qualifications; 24590-WTP-3PS-PF00-T0001, Rev. 1, Engineering Specification for Process Jumper Fabrication for PT and HLW</p>	<p>The Basis of Design specifies that in-cell piping that is non-maintainable will be fully welded. The Pipe Stress Design Criteria specifies the ASME B31.3 Process Piping design code for the piping systems. Welding is to be performed in accordance with the requirements of ASME B31.3 and the ASME B&amp;PV Code, Section IX. ANSI B 16.5 is specified for pipe flanges and equipment flanges where flanges are used for connections. Remote handled piping connections in the central hot cell are made using jumpers fabricated in accordance with the Engineering Specification for Process Jumper Fabrication for PT and HLW. These are appropriate codes and standards for design and fabrication of the HLP system ancillary equipment.</p>

**Pretreatment Facility (PTF) HLW Lag Storage and Feed Blending System Process (HLP)  
Ancillary Equipment**

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Information Assessed	Source of Information	Discussion
<p>The system will withstand the effects of frost heave.</p>	<p>24590-PTF-3YD-HLP-00001, Rev. 0, System Description for HLW Lag Storage and Feed Blending Process System (HLP); SDCN No. PTF-3YM-HLP-00001 for System Description No. 24590-PTF-3YD-HLP-00001; 24590-WTP-DC-ST-01-001, Rev. 1, Structural Design Criteria</p>	<p>The HLP system ancillary equipment considered in this assessment is located in a central hot cell, adjacent inaccessible process cells, and surrounding R2/C3 areas which are located inside the Pretreatment Facility. The Structural Design Criteria requires that all structural foundations shall extend into the surrounding soil below the frost line in order to preclude frost heave. The frost line is 30 in. below grade. Therefore the HLP system ancillary equipment is not subject to the effects of frost heave.</p>
<p>Characteristics of the waste to be stored or treated have been identified (ignitable, reactive, toxic, specific gravity, vapor pressure, flash point, temperature)</p>	<p>Drawings listed above under references. 24590-WTP-PSAR-ESH-01-002-02, Rev. 1, Preliminary Safety Analysis Report (PSAR) to Support Construction Authorization; PT Facility Specific Information; 24590-PTF-3YD-HLP-00001, Rev. 0, System Description for HLW Lag Storage and Feed Blending Process System (HLP); SDCN No. PTF-3YM-HLP-00001 for System Description No. 24590-PTF-3YD-HLP-00001</p>	<p>The HLP vessels provide for receipt and staging of slurry wastes from the DOE, lag storage of intermediate HLW separation products, and blending of the final feed for transfer to the HLW Vitrification Facility. The PSAR provides a summary of potential hazardous conditions associated with the PTF HLP system vessels and ancillary equipment. The System Description identifies the main important-to-safety function for the ancillary equipment to be provide primary confinement of the wastes during normal operations, upset conditions and during and after a SC-II Design Basis Earthquake. Ancillary equipment integrity is also necessary to provide continued important-to-safety functions for the HLP vessels including hydrogen dilution, waste cooling and waste containment. Plant Service Air must function to operate Pulse Jet Mixers for hydrogen control in the system vessels. Plant Service Air must be available for continued operation of the Pretreatment Vessel Vent Process System (PVP). This system must be available for control of vessel offgas and hydrogen buildup. The PVP system includes the important-to-safety air supply for the Passive Air Purge hydrogen control system used during post-Design Basis Earthquake conditions.</p>

**Pretreatment Facility (PTF) HLW Lag Storage and Feed Blending System Process (HLP)  
Ancillary Equipment**

COGEMA-IA-024, Rev. 0

Information Assessed	Source of Information	Discussion
<p>Ancillary equipment is designed to handle the wastes with the characteristics defined above and any treatment reagents.</p>	<p>24590-PTF-3YD-HLP-00001, Rev. 0, System Description for HLW Lag Storage and Feed Blending Process System (HLP); SDCN No. PTF-3YM-HLP-00001 for System Description No. 24590-PTF-3YD-HLP-00001</p>	<p>The System Description indicates that the HLP vessels are used only for lag storage and feed blending of HLW. Treatment reagents are not used in these vessels and ancillary equipment during normal operations.</p>
<p>The pH range of the waste, waste temperature and the corrosion behavior of the structural materials are adequately addressed. Ancillary equipment material and protective coatings ensure the ancillary equipment structure is adequately protected from the corrosive effects of the waste stream and external environments. The protection is sufficient to ensure the equipment will not leak or fail for the design life of the system.</p>	<p>24590-WTP-DB-ENG-01-001, Rev 1A, Basis of Design; 24590-PTF-3YD-FRP-00001, Rev. 0, System Description for HLW Lag Storage and Feed Blending Process System (HLP); SDCN No. PTF-3YM-HLP-00001 for System Description No. 24590-PTF-3YD-HLP-00001; 24590-WTP-PER-M-02-002, Rev 0, Materials for Ancillary Equipment; Plant Item Material Selection Data Sheet, 24590-PTF-NID-HLP-P0001, Rev. 0, Cs Concentrate Receipt Breakpots, HLP-BRKPT-00004 &amp; HLP-BRKPT-00006 (PTF); 24590-WTP-3PS-NN00-T0001, Rev 0, Engineering Specification for Hot and Anti-Sweat Thermal Insulation</p>	<p>The Basis of Design identifies a service design life of 40 years for the ancillary equipment. All non-maintainable items will be designed to last the life of the facility. The System Description identifies that the waste to be handled in this ancillary equipment may have up to 25 wt% solids content. The Materials for Ancillary Equipment document requires that the material selection and corrosion/erosion allowances for ancillary equipment in contact with the waste will be equal to or better than the material and corrosion allowance of the waste source vessel. Because of the more severe process conditions, a separate material selection evaluation has been made for the HLP system breakpots. This is documented in the Plant Item Material Selection Data Sheet for the breakpots. The Thermal Insulation specification requires that all insulating materials used on the outside of ancillary equipment be pre-approved for use on austenitic stainless steel in accordance with applicable ASTM procedures and tests to preclude external corrosion of ancillary equipment. Therefore, the ancillary equipment will provide the expected design service life.</p>
<p>Compatibility</p>		

**Pretreatment Facility (PTF) HLW Lag Storage and Feed Blending System Process (HLP)  
Ancillary Equipment**

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Information Assessed	Source of Information	Discussion
Corrosion Allowance	<p>24590-WTP-DC-PS-01-001, Rev 2, Pipe Stress Design Criteria including "Pipe Stress Criteria" and "Span Method Criteria";</p> <p>24590-WTP-DB-ENG-01-001, Rev 1A, Basis of Design;</p> <p>24590-WTP-PER-M-02-002, Rev 0, Materials for Ancillary Equipment;</p> <p>Plant Item Material Selection Data Sheet,</p> <p>24590-PTF-NID-HLP-P0001, Rev. 0, Cs Concentrate Receipt Breakpots, HLP-BRKPT-00004 &amp; HLP-BRKPT-00006 (PTF)</p>	<p>The Pipe Stress Design Criteria requires use of the ASME B31.3 Code for ancillary equipment design. Consideration of corrosion, including corrosion allowance, is a mandatory requirement of ASME B31.3. A required service life of 40 years is identified in the Basis of Design for ancillary equipment located in inaccessible process cells. An appropriate corrosion allowance for a 40 year service life is identified in the material selection documents for vessels HLP-VSL-00022, -00027A, -00027B and -00028. The Materials for Ancillary Equipment document requires that downstream ancillary equipment is to be constructed of equal or better materials than the source vessel, and with the same corrosion allowance as the source vessel including any additional erosion allowance where appropriate. Because of the more severe process conditions, a separate material selection evaluation has been made for the HLP system breakpots. This is documented in the Plant Item Material Selection Data Sheet for the breakpots which includes a recommended corrosion allowance.</p>
Strength	<p>P&amp;ID drawings listed under references above.</p> <p>24590-WTP-DC-PS-01-001, Rev 2, Pipe Stress Design Criteria including "Pipe Stress Criteria" and "Span Method Criteria"</p> <p>P&amp;ID drawings listed under references above.</p> <p>24590-WTP-DC-PS-01-001, Rev 2, Pipe Stress Design Criteria including "Pipe Stress Criteria" and "Span Method Criteria"</p> <p>24590-WTP-PER-PL-02-001, Rev. 3 Piping Material Class Description</p>	<p>The Pipe Stress Design Criteria document specifies ASME B31.3 as the design code for the WTP piping. ASME B31.3 requires provision be made to safely contain or relieve any pressure to which the piping may be subjected. ASME B31.3 piping not protected by a pressure relieving device, or that can be isolated from a pressure relieving device must be designed for at least the highest pressure that can be developed.</p> <p>The expected flow paths for the ancillary equipment are shown on the P&amp;ID drawings. The Pipe Stress Design Criteria document specifies the ASME B31.3 code for piping design. This code requires piping to be designed to the highest pressure that can be developed in a piping system assuring that maximum operating stresses remain within code allowables. Piping material classes are shown on the P&amp;ID drawings. The Piping Material Class Description document lists the enveloping pressure and temperature limits for each piping material class.</p>

Pretreatment Facility (PTF) HLW Lag Storage and Feed Blending System Process (HLP)  
Ancillary Equipment

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Information Assessed	Source of Information	Discussion
<p>Ancillary equipment is designed with secondary containment that is constructed of materials compatible with the waste and of sufficient strength to prevent failure (pressure gradients, waste, climatic conditions, daily operations), provided with a leak-detection system, and designed to drain and remove liquids.</p>	<p>P&amp;ID drawings listed under references above. 24590-PTF-3YD-HLP-00001, Rev. 0, System Description for HLW Lag Storage and Feed Blending Process System (HLP); SDCN No. PTF-3YM-HLP-00001 for System Description No. 24590-PTF-3YD-HLP-00001; 24590-WTP-DB-ENG-01-001, Rev 1A, Basis of Design</p>	<p>The ancillary equipment considered in this assessment is located in a central hot cell, adjacent inaccessible process cells and surrounding R2/C3 areas within the Pretreatment Facility. Secondary containment for ancillary equipment within the hot cell and process cells is provided by the liners and sumps within the cells which are outside the scope of this integrity assessment. Secondary containment in the R2/C3 areas is provided by special protective coatings, curbs and regulated drain systems which are also outside the scope of this integrity assessment. All secondary containments will be provided with drains and leak detection systems for detection of primary containment leaks as discussed in the Basis of Design document.</p>

Secondary Containment