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 | | | | | | | | | |
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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) DC Pflueger (Signature) 6/2/04 (Date)

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

416 GP&S 7-03

# 24590-CM-HC4-HXYG-00138-02-00034
# REV. 00A

## SUBCONTRACT SUBMITTAL

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R10315962

COGEMA-IA-059, Rev. 0

# IQRPE REVIEW – PRETREATMENT FACILITY (PTF) ELEVATION 0'-0" CESIUM ION EXCHANGE PROCESS (CXP) ANCILLARY EQUIPMENT

"I, Douglas W. Hendrickson, 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) Elevation 0'-0" Cesium Ion Exchange Process (CXP) 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 thirteen (13) pages numbered one (1) through thirteen (13).

DOUGLAS W. HENDRICKSON
STATE OF WASHINGTON
33907
REGISTERED PROFESSIONAL ENGINEER

May 2004

EXPIRES 06/10/2005

Signature

27 May 2004
Date

24590-CM-HC4-HXYG-00138-02-00034, REV. 00A

# STRUCTURAL INTEGRITY ASSESSMENT OF THE PRETREATMENT FACILITY (PTF) ELEVATION 0'-0" CESIUM ION EXCHANGE PROCESS (CXP) ANCILLARY EQUIPMENT

**COGEMA-IA-059**
**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.**

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| **Scope** | Scope of this Integrity Assessment | This integrity assessment includes:<br>a. Ancillary Equipment associated with the PTF Cesium Ion Exchange Process Vessels System as shown on drawing 24590-PTF-M6-CXP-P0001, Rev 0;<br>b. Ancillary Equipment associated with the PTF Cesium Ion Exchange Columns System as shown on drawing 24590-PTF-M6-CXP-P0002, Rev 0;<br>c. Ancillary Equipment associated with the PTF Cesium Ion Exchange Columns System as shown on drawing 24590-PTF-M6-CXP-P0003, Rev 0;<br>d. Ancillary Equipment associated with the PTF Cesium Ion Exchange Utilities Services - PSA Rack as shown on drawing 24590-PTF-M6-CXP-P0005, Rev 0;<br>e. Ancillary Equipment associated with the PTF Cesium Ion Exchange Utilities Services Plant Wash Rack as shown on drawing 24590-PTF-M6-CXP-P0007, Rev 0;<br>f. Ancillary Equipment associated with the PTF Cesium Ion Exchange Treated LAW Collection Vessels System as shown on drawing 24590-PTF-M6-CXP-P0010, Rev 0;<br>g. Ancillary Equipment associated with the PTF Cesium Ion Exchange Utilities Services - PSA Rack as shown on drawing 24590-PTF-M6-CXP-P0011, Rev 0;<br>h. Ancillary Equipment associated with the PTF Cesium Ion Exchange Utilities Services - PSA Rack as shown on drawing 24590-PTF-M6-CXP-P0012, Rev 0;<br>i. Ancillary Equipment associated with the PTF Cesium Ion Exchange Utilities Services - Plant Wash Rack as shown on drawing 24590-PTF-M6-CXP-P0013, Rev 0 |

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| References | System Description and System Description Change Notices, Drawings – PFD, P&ID, GA, PSAR, | 24590-PTF-3YD-CXP-00001, Rev. 0, System Description for the Cesium Ion Exchange Process - System CXP;<br>24590-PTF-3YN-CXP-00002, System Description Change Notice (SCDN) for System Description Number 24590-PTF-3YD-CXP-00001, Rev. 0;<br>24590-PTF-M5-V17T-P0012, Rev. 0, Process Flow Diagram, Cesium Ion Exchange Process Vessels System CXP;<br>24590-PTF-M5-V17T-P0013, Rev. 0, Process Flow Diagram, Cesium Ion Exchange Process Columns System CXP;<br>24590-PTF-M5-V17T-P0025, Rev. 0, Process Flow Diagram, Cesium Ion Exchange Process Collection Vessels System CXP;<br>24590-PTF-M6-CXP-P0001, Rev 0, P&ID - PTF Cesium Ion Exchange Process Vessels System;<br>24590-PTF-M6-CXP-P0002, Rev 0, P&ID - PTF Cesium Ion Exchange Columns System;<br>24590-PTF-M6-CXP-P0003, Rev 0, P&ID - PTF Cesium Ion Exchange Columns System;<br>24590-PTF-M6-CXP-P0005, Rev 0, P&ID - PTF Cesium Ion Exchange Utilities Services - PSA Rack;<br>24590-PTF-M6-CXP-P0007, Rev 0, P&ID - PTF Cesium Ion Exchange Utilities Services Plant Wash Rack;<br>24590-PTF-M6-CXP-P0010, Rev 0, P&ID - PTF Cesium Ion Exchange Treated LAW Collection Vessels System;<br>24590-PTF-M6-CXP-P0011, Rev 0, P&ID - PTF Cesium Ion Exchange Utilities Services - PSA Rack;<br>24590-PTF-M6-CXP-P0012, Rev 0, P&ID - PTF Cesium Ion Exchange Utilities Services - PSA Rack;<br>24590-PTF-M6-CXP-P0013, Rev 0, P&ID - PTF Cesium Ion Exchange Utilities Services - Plant Wash Rack;<br>24590-PTF-P1-P01T-P0001, Rev. 3, Pretreatment Facility General Arrangement Plan at EL. 0'-0";<br>24590-PTF-P1-P01T-P0003, Rev. 0, Pretreatment Facility General Arrangement Plan at EL. 56'-0";<br>24590-WTP-PSAR-ESH-01-002-02, Rev. 1A, Preliminary Safety Analysis Report (PSAR) to Support Construction Authorization; PT Facility Specific Information |

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| References | Mechanical Systems Data Sheets, and Plant Item Material Selection Data Sheets | 24590-PTF-MVD-CXP-00007, Rev. 1, Mechanical Systems Data Sheet: Vessel, CXP-VSL-00001;<br>24590-PTF-MVD-CXP-00015, Rev. 1, Mechanical Systems Data Sheet: Vessel, CXP-VSL-00004;<br>24590-PTF-MVD-CXP-00016, Rev. 2, Mechanical Systems Data Sheet: Vessel, CXP-VSL-00005;<br>24590-PTF-MVD-CXP-00021, Rev. 1, Mechanical Systems Data Sheet: Vessel, CXP-VSL-00026A;<br>24590-PTF-MVD-CXP-00022, Rev. 1, Mechanical Systems Data Sheet: Vessel, CXP-VSL-00026B;<br>24590-PTF-MVD-CXP-00023, Rev. 1, Mechanical Systems Data Sheet: Vessel, CXP-VSL-00026C;<br>24590-PTF-MXD-CXP-00011, Rev. A, Mechanical Systems Data Sheet: Process Bulge, CXP-BULGE-00004;<br>24590-PTF-N1D-CXP-P0001, Rev. 0, Plant Item Material Selection Data Sheet, CXP-VSL-00001, Cesium Ion Exchange Feed Vessel;<br>24590-PTF-N1D-CXP-P0003, Rev. 0, Plant Item Material Selection Data Sheet, CXP-VSL-00026A/B/C, IX Treated LAW Collection Vessel;<br>24590-PTF-N1D-CXP-P0007, Rev. 0, Plant Item Material Selection Data Sheet, CXP-VSL-00004, Cs IX Caustic Rinse Collection Vessel;<br>24590-PTF-N1D-CXP-P0008, Rev. 0, Plant Item Material Selection Data Sheet, CXP-VSL-00005, Cs IX Reagent Vessel |

**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.

| Information Assessed | | Source of Information | Assessment |
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| **Design** | Ancillary equipment design standards are appropriate and adequate for the equipment's intended use. | System Description, drawings, and material selection sheets listed above under References; 24590-WTP-DC-PS-01-001, Rev 2, Pipe Stress Design Criteria including "Pipe Stress Criteria" and "Span Method Criteria"; ASME B31.3 Code, Process Piping, 1996 Edition, American Society of Mechanical Engineers; 24590-WTP-PER-M-02-002, Rev 1, Materials for Ancillary Equipment; 24590-WTP-PSAR-ESH-01-002-02, Rev. 1A, Preliminary Safety Analysis Report (PSAR) to Support Construction Authorization; PT Facility Specific Information; 24590-WTP-MX00-TP001, Rev. 1, Process Bulge Design and Fabrication | The Pipe Stress Design Criteria document identifies ASME B31.3 as the design code for piping systems of the WTP. Seismic Categories and Quality Levels vary among the ancillary equipment components. While each of the vessels, ion exchange columns, ion exchange feed pumps and feed heat exchangers are Seismic Category I (SC-I) and Quality Level 1 (QL-1), the other ancillary equipment is predominantly SC-II/QL-2 or SC-III/Commercial Material grade (CM). Guiding characteristics of these assignments are that black cell equipment and ion exchange feed, discharge, and emergency elution are classed as SC-I/Q-1 while the lower design standards are applied to decreasingly radioactive or non-radioactive service and readily replaceable equipment within the hot cell. RFDs and PJMs are SC-II/QL-2. The hydrogen mitigation portions of the ancillary equipment, including RFD/PJM ejector nozzles and air piping crossing into the C3 area are SDC and will be SC-I/QL-1, including the purge supply and discharge as are the piping and fittings for delivery of emergency elution reagents from CXP-VSL-00005 as shown on P&ID 24590-PTF-M6-CXP-P0001. Implicit hydrogen mitigation portions of the ancillary equipment include breakpots which allow gas liquid separations as shown for the ion exchange effluents in Zone A4 of P&ID 24590-PTF-M6-CXP-P0002. Break pots are ancillary equipment and must comply with established material standards and service. Some transfer routes apply the vessels as breakpots. The Seismic Categories are explained in detail in the Pipe Stress Design Criteria document. Bulge design and fabrication standards for SC I & II equipment are addressed in 24590-WTP-MX00-TP001. Quality Levels are discussed in the PSAR. These codes and standards are acceptable and adequate for the design of the ancillary equipment and secondary containment (bulge) for the intended service. |

| Information Assessed | | Source of Information | Assessment |
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| | If the ancillary equipment to be used is not built to a design standard, the design calculations demonstrate sound engineering principles of construction. | 24590-WTP-DC-PS-01-001, Rev 2, Pipe Stress Design Criteria including "Pipe Stress Criteria" and "Span Method Criteria"; 24590-WTP-MX00-TP001, Rev. 1, Process Bulge Design and Fabrication; 24590-WTP-3PS-PF00-T0001, Rev. 1, Engineering Specification for Process Jumper Fabrication for PT and HLW; 24590-PTF-M6-CXP-P0003, Rev 0, P&ID - PTF Cesium Ion Exchange Columns System; 24590-PTF-MXD-CXP-00011, Rev. A, Mechanical Systems Data Sheet: Process Bulge, CXP-BULGE-00004. | The ancillary equipment is built to design and fabrication standards. The Pipe Stress Design Criteria document specifies that piping is to be designed in accordance with ASME B31.3. Jumpers are to be designed and fabricated in accord with ASME B31.3 as well as structural welding codes of AWS D1.1 and D1.6 subject to ASME B&PV Code Section IX welding and brazing certification and Section V non-destructive examination. The Bulge Mechanical Systems Data sheet and P&ID 24590-PTF-M6- CXP-P0003 indicate bulge construction is to QL-2 and SC-II of 0.25" 316L Stainless Steel with washdown nozzles and demineralized water supply for decontamination and a 316L drain line to the C5 Drain Collection Header; 24590-WTP-MX00-TP001, the P&ID, and the mechanical data sheet demonstrate sound engineering principles in the design intent of the bulges. |

| Information Assessed | | Source of Information | Assessment |
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| Design | 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. | Drawings listed above under References; 24590-WTP-DC-PS-01-001, Rev 2, Pipe Stress Design Criteria including "Pipe Stress Criteria" and "Span Method Criteria"; Uniform Building Code (UBC), 1997 Edition, International Conference of Building Officials; ASME Boiler and Pressure Vessel Code, Section III, Rules for Construction of Nuclear Facility Components, Division 1, Subsection NC, Appendix N and Appendix F, 1995; 24590-WTP-VV-PS-01-001, Rev. 2, Verification and Validation Report for ME101, Linear Elastic Analysis of Piping, Version N8 | 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 many loadings including operating pressure, operating temperature, thermal expansion/contraction, settlement, vibration, and corrosion allowance in the design of piping. Elements of the ASME B&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. ASME B&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 for this ancillary equipment regarding portions of the plant wash racks PWD-RK-00007, and -00009, and treated LAW feed pump subsystems of the P&IDs as these components are designed as commercial grade SC-III. Details of the seismic design methods are discussed in the Pipe Stress Design Criteria document. Design is by hand calculations and computer codes that have been tested and approved as discussed in the Verification and Validation Report for ME101, Linear Elastic Analysis of Piping, Version N8. These are adequate and appropriate codes and standards to ensure that the ancillary equipment will have adequate strength at end of design life to withstand all anticipated loadings. |

| Information Assessed | | Source of Information | Assessment |
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| Supports | Ancillary equipment supports are adequately designed. | Drawings - see references above; 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; ASME B31.3 Code, Process Piping, 1996 Edition, American Society of Mechanical Engineers; ASME Boiler and Pressure Vessel Code, Section III, Rules for Construction of Nuclear Facility Components, Division 1, Subsection NF and Appendix F, 1995; 24590-WTP-PL-PS-01-001, Rev 1, Verification and Validation Test Plan for Bechtel's ME150 Pipe Support Family of Programs (PCFAPPS) | The Pipe Support Design Criteria considers all load types 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-I/II and SC-III/IV pipe supports. Bounding load cases are passed to the pipe support designers from the results of the ancillary equipment piping stress analyses. Details of the seismic design methodology are discussed in the Pipe Support Design Criteria document. Analysis is by manual calculation and computer programs that have been tested and approved as discussed in the Verification and Validation Test Plan for Bechtel's ME150 Pipe Support Family of Programs (PCFAPPS). The Ancillary Equipment Pipe Support Design document shows examples of typical equipment supports. These are appropriate codes and standards for design of the CXP system ancillary equipment supports. 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 °F for concrete and 200 °F for steel).<br>Design standards for vessel internal equipment supports are discussed in the integrity assessment for the CXP system vessels. |

| Information Assessed | | Source of Information | Assessment |
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| **Connections** | Seams and connections are adequately designed. | 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 V, Nondestructive Examination; ASME Boiler and Pressure Vessel Code, Section IX, Welding and Brazing Qualifications; ASME/ANSI B16.5, 1988 Edition, Piping Flanges and Flanged Fittings; 24590-WTP-PER-PL-02-001, Rev. 5, Piping Material Class Description; 24590-WTP-3PS-PS02-T00001, Rev. 2, Shop Fabrication of Piping; 24590-WTP-MX00-TP001, Rev. 1, Process Bulge Design and Fabrication | The Basis of Design states that in-cell piping that is non-maintainable will be fully welded. The Pipe Stress Design Criteria document 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&PV Code, Section IX. Flange connections are to be designed in accordance with ANSI B16.5 as called out by piping material class. Process piping within bulges is designed and fabricated in accord with *Shop Fabrication of Piping* which requires welding to standards of ASME B&PV Section IX, and inspected in accord with visual, liquid penetrant, and radiographic test methods of ASME B&PV Section V as appropriate. Bulges are required to be welded to standards of ASME B&PV Section IX, and inspected in accord with visual, liquid penetrant, and radiographic test methods of ASME B&PV Section V as appropriate. These are appropriate codes and standards for design and fabrication of the CXP system ancillary equipment and bulge as secondary containment. |
| **Supports** | The system will withstand the effects of frost heave. | System Description and SDCN listed above under References; 24590-WTP-DC-ST-01-001, Rev. 2, Structural Design Criteria | The ancillary equipment associated with the CXP system considered in this assessment is located in above grade bulges, hot cells and black cells inside the Pretreatment Facility. The Structural Design Criteria requires that all structural foundations shall extend into the surrounding soil below the frost line to preclude frost heave. The frost line is 30 in. below grade. The PTF building foundations are not subject to frost heave; therefore, the ancillary equipment located inside the building is not subject to frost heave. |

| Information Assessed | | Source of Information | Assessment |
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| Waste Characteristics | Characteristics of the waste to be stored or treated have been identified (ignitable, reactive, toxic, specific gravity, vapor pressure, flash point, temperature) | 24590-WTP-PSAR-ESH-01-002-02, Rev. 1A, Preliminary Safety Analysis Report (PSAR) to Support Construction Authorization; PT Facility Specific Information; System Description and SDCN and Process Flow Diagrams and material selection data sheets listed above under References | The PSAR provides a summary of potential hazardous conditions associated with each CXP vessel and the associated ancillary equipment. Design provisions for control of these hazards are listed in the PSAR and the individual System Descriptions. The CXP System Description identifies the safety functions for ancillary equipment to include providing primary confinement of the wastes during normal operations, upset conditions and during and after a SC-II Design Basis Seismic Event, providing sufficient agitation and/or ventilation to prevent hydrogen accumulation/storage in the waste or ion exchange columns, and providing secondary confinement elements (including ventilation) to SC-I. Ancillary equipment associated with the Cesium Ion Exchange Vessels (CXP-VSL-00001, -00004, -00005, and -00026A/B/C) and IX columns (CXP-IXC-00001/2/3/4) handle caustic and acidic liquors, resin slurries, and vessel ventilation gases. The primary function of the ancillary equipment associated with the CXP System is to provide a primary pressure and fluid boundary to protect facility workers from the hazardous materials in the vessel transfer and treatment streams and vessel ventilation stream and to provide for hydrogen mitigation. |

| Information Assessed | | Source of Information | Assessment |
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| **Waste Characteristics** | Ancillary equipment is designed to handle the wastes with the characteristics defined above and any treatment reagents. | System Description and SDCN, and material selection data sheets listed above under References; 24590-WTP-PER-M-02-002, Rev 1, Materials for Ancillary Equipment; 24590-WTP-PER-PL-02-001, Rev. 5, Piping Material Class Description; 24590-PTF-M6-CXP-P0003, Rev 0, P&ID - PTF Cesium Ion Exchange Columns System; 24590-PTF-MXD-CXP-00011, Rev. A, Mechanical Systems Data Sheet: Process Bulge, CXP-BULGE-00004 | The System Description indicates that the CXP system Cesium Ion Exchange (IX) vessels and IX columns process and store caustic waste and slurries of organic resin, demineralized water, sodium hydroxide solutions, and nitric acid solutions. No other reagents are added to this system during normal operations although the piping provides recirculatory sampling capability following each ion exchange column. 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 vessels except as noted therein. The CXP vessels and nozzles are fabricated of 316L stainless steel with the exception of CXP-VSL-00004 & -00005 which are fabricated of 304L stainless steel. The Piping Material Class Description lists 316L stainless steel as the material selection for the CXP system ancillary equipment. The Bulge Mechanical Systems Data sheet indicates bulge construction is to QL-2 /SC-II of 0.25" 316L Stainless Steel and the P&ID specifies the drain line of 316L; the P&ID and the mechanical data sheet demonstrate sound engineering principles in the design intent of the bulge to handle the waste and reagent characteristics for which it is intended. |

| Information Assessed | | Source of Information | Assessment |
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| Compatibility | 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. | System Description, SDCN, and material selection data sheets listed above under References; 24590-WTP-DB-ENG-01-001, Rev 1A, Basis of Design; 24590-WTP-PER-M-02-002, Rev 1, Materials for Ancillary Equipment; 24590-WTP-3PS-NN00-T0001, Rev 0, Engineering Specification for Hot and Anti-Sweat Thermal Insulation; 24590-WTP-3PS-PF00-T0001, Rev. 1, Engineering Specification for Process Jumper Fabrication for PT and HLW | 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. Detailed material selection (corrosion) analyses were conducted for the Cesium Ion Exchange Process vessels and Ion exchange columns in the PT facility process design. The Materials for Ancillary Equipment document requires that the material selection and corrosion/erosion allowances for ancillary equipment (including jumpers) in contact with the waste will be equal to or better than the material and corrosion allowance of the waste source vessels except as noted therein. 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. Corrosion allowances are considered for all ancillary equipment, therefore, the ancillary equipment will provide the expected design service life. |

| Information Assessed | | Source of Information | Assessment |
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| Corrosion Allowance | Corrosion allowance is adequate for the intended service life of the ancillary equipment. | Drawings listed above under References; 24590-WTP-DC-PS-01-001, Rev. 2, Pipe Stress Design Criteria including "Pipe Stress Criteria" and "Span Method Criteria"; 24590-WTP-DB-ENG-01-001, Rev 1A, Basis of Design; 24590-WTP-PER-M-02-002, Rev 1, Materials for Ancillary Equipment; 24590-WTP-PER-PL-02-001, Rev. 5, Piping Material Class Description | The Pipe Stress Design Criteria document 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 design life of 40 years is identified in the Basis of Design for ancillary equipment located in inaccessible process cells. Detailed material selection (corrosion) analyses are conducted for each vessel and major components in the CXP system in the PT Facility during process design. 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 except as noted therein. Bounding corrosion allowances are listed for each piping material class in the Piping Material Class Description document. The corrosion/erosion allowance for the 316L stainless steel CXP system ancillary equipment piping specifications is 0.040 in. and is appropriate for the intended service. |
| Strength | Pressure controls (vents and relief valves) are adequately designed to ensure pressure relief if normal operating pressures in the vessels are exceeded. | Drawings listed above under References; 24590-WTP-DC-PS-01-001, Rev. 2, Pipe Stress Design Criteria including "Pipe Stress Criteria" and "Span Method Criteria"; 24590-WTP-PER-PL-02-001, Rev. 5, Piping Material Class Description | The Pipe Stress Design Criteria document specifies use of 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 reliving device must be designed for at least the highest pressure that can be developed. Bounding pressure and temperature limits are listed for each of the piping material classes in the Piping Material Class Description document. Ion exchange columns, operated with pressurized air purge systems are also mounted with SC-I/QL-1 rupture disks. |

| Information Assessed | | Source of Information | Assessment |
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| | Maximum flows and any unusual operating stresses are identified | Drawings listed above under References; 24590-WTP-DC-PS-01-001, Rev 2, Pipe Stress Design Criteria including "Pipe Stress Criteria" and "Span Method Criteria"; 24590-WTP-PER-PL-02-001, Rev. 5, Piping Material Class Description | The expected flow paths for the ancillary equipment are identified on the P&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. The Piping Material Class Description document lists the bounding pressure and temperature limits for each piping material class. |
| **Secondary Containment** | 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. | Drawings, System Description and SDCN listed above under References; 24590-WTP-MX00-TP001, Rev. 1, Process Bulge Design and Fabrication; 24590-PTF-MXD-CXP-00011, Rev. A, Mechanical Systems Data Sheet: Process Bulge, CXP-BULGE-00004 | The ancillary equipment considered in this assessment is located in above grade process (black and hot) cells and a bulge. The Cesium Ion Exchange Process system vessels are housed at EL 0' (CXP-VSL-00005, due to service, is elevated to support gravity feed for emergency elution) in the black cells P-0111 and P-0114 in the north-west and north-central zones of the PT Facility with IX feed and Treated LAW feed pumps, heat exchangers, primary jumpers, and piping adjacent to the black cell within the hot cell P-0123. The Process bulge CXP-BULGE-00004, which houses pipe valving outside of the hot and black cells for the feed and elution streams is present in Room P-0317 on Elevation 56' 0", and constitutes secondary containment for the piping, valves, and fittings. The bulge is to be fabricated of 0.25" 316L SS, compatible with the waste materials, and a 316L SS floor drain and line which routes liquids into the C5 (black and hot cell) collection header. The air supply bulge for hydrogen mitigation is present on EL 77', but is not present on the P&IDs, is not reviewed within the scope of this assessment, and is not intended to be a regulated portion of the plant. Secondary containment for ancillary equipment within the cells is provided by the liners and sumps as appropriate and is outside the scope of this integrity assessment. |