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DOCUMENT INFORMATION

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Project Information (Check Applicable Box)

☐ Balance of Facilities ☐ HLW Vitrification ☐ Analytical Laboratory ☒ Across all areas

☐ Pretreatment ☐ LAW Vitrification ☐ External Interfaces

Document is applicable to ALARA (as determined by the originator)? ☐ Yes ☒ No

Applicability to ALARA means that the item has the potential to affect doses, contamination levels, or releases to the environment. (See 24590-WTP-GPP-SRAD-002, *Application of ALARA in the Design Process*, sections 4.1 and 4.2 for more information.)

Subject code(s): _____ (for correspondence only)

ACTION ITEM INFORMATION (for correspondence other than meeting minutes)

Commitments: ☐ Yes ☒ No (if yes, brief description below)

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Special Instructions for PDC

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Notice

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History Sheet

Rev	Date	Reason for revision	Revised by
0	10/01/02	Issued for Permitting Use	SW Vail
1	8/05/03	Revision includes addition of the AEA statement and the inclusion of the Analytical Laboratory. Reissued for Permitting Use	Sharok Khabir

Contents

1 Introduction

The Dangerous Waste Permit Condition III.10.E.9.b.ix requires, prior to construction of each secondary containment and leak detection system for the WTP Tank Systems, "a detailed description of how tank system design provides access for conducting future tank integrity assessments".

The purpose of this document is to define the access provided for future tank integrity assessments.

2 Applicable Documents

2.1 24590-PTF-PER-M-02-003, *Underground Pipe Protection*

3 Description

3.1 Access Provisions

3.1.1 Black Cells

Tank systems located in black cells are not physically accessible. These tank systems have been designed for a 40 year life so access is not required. In order to ensure tank systems last for 40 years, corrosion resistant materials based on expected chemistries have been specified; sufficient corrosion allowances have been specified; and robust design codes (such as ASME *Boiler and Pressure Vessel Code,* Section VIII, Division 1, ASME B31.3, *Process Piping*) have been used.

Where there is a potential for erosion due to entrained solids exceeding 2 weight percent and velocities in excess of 10 feet per second, additional allowance or hardfacing is provided. Positive material identification is performed by vendors for spool pieces and vessels and by field inspectors for welds susceptible to corrosion. Welds of the confinement boundary of the vessels are radiographed and field pipe welds are radiographed or ultrasonically inspected. Vessels and piping are analyzed for fatigue, and vessel piping is designed to be flushed to remove deposits.

Each of the black cells have stainless steel liners with sumps and level detection capable of detecting liquids collecting in the sump within 24 hours. Access ports are provided to allow camera inspection of the sumps.

3.1.2 Hot Cells

Tank systems in hot cells are remotely accessible for limited inspection. Many of the design considerations for tank systems in black cells apply to tank systems in hot cells. Most components in these tank systems have been designed so access is not required and have been designed for a 40 year life. Where components (i.e. melters, ultrafilters, silver mordenite cartridges, etc.) have been designed for a shorter life, the capability to replace the component has been provided. In order to ensure that vessels and piping last for 40 years, corrosion resistant materials based on expected chemistries have been specified; sufficient corrosion allowances have been specified; and robust design codes (such as ASME *Boiler and Pressure Vessel Code,* Section VIII, Division 1, ASME B31.3, *Process Piping,* and ASME AG-1, *Code*

on Nuclear Air and Gas Treatment) have been used. Where there is a potential for erosion due to entrained solids exceeding 2 weight percent and velocities in excess of 10 feet per second, additional allowance or hardfacing is provided. Positive material identification is performed by vendors for spool pieces and vessels. The vessels and piping are analyzed for fatigue and designed to be flushed to remove deposits.

Jumpers may be installed in selected tank systems, which would allow for measurement of piping wall thickness and inspection for corrosion or erosion of piping systems. A selected portion of the tank system components in hot cells will be remotely accessible for repair or replacement.

The pretreatment facility (PTF) and high level waste (HLW) vitrification facility and the analytical laboratory (Lab) contain highly radioactive wastes and hazardous materials that come into contact with various systems, structures, and equipment. As a result of this contact, these systems, structures, and equipment require special design considerations for access, handling, and maintenance. In general, process systems and equipment within cells or caves that could fail during operations will be designed for safe recovery, replacement, and/or redundancy.

In the pretreatment facility, remotely replaceable equipment (pumps, ultrafilters, ion exchange columns, reboilers, etc.) will be placed in a centrally located hot cell and serviced by a dedicated facility crane. Small equipment (pumps, valves and instruments), in less radioactive systems, will be located in bulges outside hot cells and serviced manually using temporary confinement and shielding and using portable cranes as appropriate.

In the HLW vitrification facility, in-cave, hot cell equipment will generally be remotely maintainable and replaceable. In-cave equipment disassembly, maintenance, and replacement will be accomplished via local remote handling equipment or by remote handling equipment in dedicated maintenance areas or caves.

In the PTF and HLW vitrification facility hot cells where there is potential for equipment failure within a high radiation area, means will be provided for recovery of that equipment. Recovery will be accomplished by either using dedicated remote recovery facilities, by placing pumps and other ancillary equipment in bulges or other accessible area or, where permissible, operator intervention. Operator intervention will not be an acceptable means for routine maintenance, but the capability will be designed into the facility for off-normal recovery operations. Operator intervention means of recovery will normally be accomplished via strategically located plugs in cave or cell walls and roofs with special lifting and handling equipment, specially designed systems and equipment connections and a means of isolation in the cell or cave. Sufficient space will be provided for removal and replacement of these plugs and the associated recovery operation.

In hot cells, a process and mechanical handling monitoring closed circuit television (CCTV) system is provided for remote viewing of equipment and operations within cave areas and where the radiation levels are too high for personnel access. Cameras will be located to give optimum viewing angles and distance to suit the process where required. Cameras used to monitor process functions can be used to evaluate tank systems, but the capability may be limited by their location.

3.1.3 Accessible Areas

Tank systems in accessible areas can be visually and physically inspected. The same design considerations exist for accessible tank systems that apply for hot cell tank systems. Tank system components in accessible areas will be accessible for repair or replacement.

Where maintenance, repair or replacement activities are deemed necessary, the design will provide good access to the component, operator visibility, appropriate lifting and handling devices, and adequate provisions for transfer of equipment.

Positioning of equipment will be optimized to avoid unnecessary dismantling to gain access.

3.1.4 Underground Piping

Waste is received from the Hanford tanks through one of three co-axial (pipe-in-pipe) transfer pipes. Treated waste is transferred between the PTF and the Lab, LAW, and HLW facilities through coaxial pipelines. This underground piping is not accessible for assessment without excavation; however co-axial pipelines have the provision to pneumatically test both primary and secondary pipes for leakage by pressurizing the annular space between the pipes. They also have on-line primary containment leak detection capability. Protection of underground piping is addressed in 24590-PTF-PER-M-02-003, *Underground Pipe Protection*.

3.1.5 External Tanks

External tanks are accessible for inspection and integrity assessment.

3.2 Assessment Approach

An initial integrity assessment is not required because these are new tank systems and miscellaneous units. The tank systems will be designed, installed, and assessed in accordance with WAC 173-303-640(3). Baseline measurements will be taken in predetermined locations to allow comparison with future measurements.

3.2.1 Periodic Assessments

Periodic integrity assessments for tank systems in black cells, hot cells, and accessible cells will be performed. The periodic integrity assessments of tank systems will include, as a minimum, the review of applicable process chemistry and operating conditions over the period to ensure that they have stayed within the specified ranges and the determination of the effect on corrosion or erosion of any deviations from the specified ranges.

In hot cells and accessible areas, where consistent with keeping the radiation exposure as low as reasonably achievable (ALARA), the periodic integrity assessments of tank systems may include non-destructive examination (NDE) of welds or determination of wall thickness in order to detect potential degradation in selected accessible systems. Identifying and evaluating potential degradation mechanisms will help identify areas where additional inspection may be required. Adjustments to inspection strategy will also account for consequences of a failure. Other factors include material of construction, design conditions, operating conditions, design codes and standards used, effectiveness of corrosion monitoring programs, and maintenance program elements.

3.2.2 Vessels with High Erosion Potential

Vessels with high erosion potential are identified based on the solids contents, the expected velocity, and the viscosity of the fluid. Where erosion has the potential to be high, additional wear allowance is provided or the surfaces are hardfaced or an erosion resistant material is used. Some of the vessels in the hot cells can be accessed to see if there is evidence of erosion.

3.3 Characterization

Sampling and analysis will be performed as required to support process control, environmental compliance, regulatory compliance, and waste form qualification. Sample points and sample requirements will be specified.

3.4 Process Monitoring

Dangerous waste tank systems have spill prevention controls and overfill prevention controls. As required for process purposes, tanks or vessels are provided with level, temperature, and pressure indicators to monitor the physical parameters.

3.5 Leakage Assessment

A check of the mass transferred during operation by comparing the tank or vessel level changes will determine if there are any gross leakage or misrouting of fluids. The sump levels in these areas will be monitored, and if leakage is detected, assessment will be made (by isolating tanks or vessels and watching for level changes or by emptying vessels to see if the source of the leak stops) to determine the source of the leakage. This may involve draining the contents from a vessel to see if the leak can be stopped or may involve isolating and filling a vessel to determine if there is an appreciable loss of inventory. Leak tests to determine the loss of inventory will be made periodically.

MASTER DISTRIBUTION SCHEDULE

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Approver Mark Hoffmann *Print Name* — *Signature* — 8/5/03 *Date*