PUREX Connector Spare Inventory Quality Level Upgrade Plan

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Washington River Protection Solutions, LLC

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Office of River Protection

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LIST OF TERMS

3
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<table>
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<th>Description</th>
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<tr>
<td>ASTM</td>
<td>American Society for Testing and Materials</td>
</tr>
<tr>
<td>ANSI</td>
<td>American National Standards Institute</td>
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<tr>
<td>ASME</td>
<td>American Society of Mechanical Engineers</td>
</tr>
<tr>
<td>EPRI</td>
<td>Electric Power Research Institute</td>
</tr>
<tr>
<td>CGD</td>
<td>Commercial Grade Dedication</td>
</tr>
<tr>
<td>CMM</td>
<td>Coordinate Measurement Machine</td>
</tr>
<tr>
<td>Critical Elements</td>
<td>Attributes that can be tested or verified (dimensional, material, hardness, etc.) to acceptance criteria</td>
</tr>
<tr>
<td>DI</td>
<td>Dimensional Inspection</td>
</tr>
<tr>
<td>Lot</td>
<td>The term Lot shall mean “inspection lot,” that is, a collection of units of product from which a sample is to be drawn and inspected (i.e.: PO, S/N, line item, etc.).</td>
</tr>
<tr>
<td>MT</td>
<td>Magnetic Particle Testing</td>
</tr>
<tr>
<td>M&amp;TE</td>
<td>Measurement and Test Equipment</td>
</tr>
<tr>
<td>PUREX</td>
<td>Plutonium Uranium Redox Extraction</td>
</tr>
<tr>
<td>PO</td>
<td>Purchase Order</td>
</tr>
<tr>
<td>PT</td>
<td>Liquid Penetrant Testing</td>
</tr>
<tr>
<td>RT</td>
<td>Radiographic Testing</td>
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<tr>
<td>SS</td>
<td>Safety Significant</td>
</tr>
<tr>
<td>SSC</td>
<td>System, Structure and Component</td>
</tr>
<tr>
<td>TE</td>
<td>Technical Evaluation</td>
</tr>
<tr>
<td>QL</td>
<td>Quality Level</td>
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<tr>
<td>TOC</td>
<td>Tank Operations Contract</td>
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### Units

<table>
<thead>
<tr>
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<th>Description</th>
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</thead>
<tbody>
<tr>
<td>°F</td>
<td>Degrees Fahrenheit</td>
</tr>
<tr>
<td>PSIG</td>
<td>Pounds per Square Inch Gauge</td>
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</tbody>
</table>
1.0 OVERVIEW AND SCOPE:

1.1 Overview

PUREX connectors are used to make remote connections in tank operations contractor (TOC) waste transfer primary piping system and are typically disposed of with the jumper when piping configurations are changed. Prior to October 1, 2008 the waste transfer system was considered general service therefore the majority of the spare parts were ordered/fabricated to that same quality level. The current Tank Farms Document Safety Analysis, RPP-13033, Rev. 7-L, Tank Farms Documented Safety Analysis, defines the waste transfer primary piping system as safety significant (SS) Quality Level-2. The safety function is further described below.

The safety function of all primary components of the waste transfer primary piping system are defined in RPP-13033, Section 4.4.1.1:

The safety function of waste transfer primary piping systems is to provide confinement of waste. Providing confinement of waste decreases the frequency of a fine spray leak. Providing confinement of waste also decreases the frequency of a waste release during pneumatic testing of waste transfer primary piping system encasements. In addition, providing confinement of waste protects the facility worker from a wetting spray/jet/stream leak, from a flammable gas deflagration in a DST annulus due to a misroute, and from a flammable gas deflagration in a waste transfer-associated structure due to a waste transfer leak.

RPP-RPT-42297, Safety-Significant Waste Transfer Primary Piping Systems-Functions and Requirements Evaluation Document, further delineates the critical characteristics that must be satisfied by each component of the waste transfer primary piping system. The four critical characteristics are provided below:

1. Max. Operating Temperature (Design Temperature)
2. Min. Operating Temperature (Design Temperature, including Ambient)
3. Max. Operating Pressure (Design Pressure)
4. Connector/Nozzle Material (Waste Compatibility)

Critical Characteristics are a subset of key design attributes that, once verified, provides reasonable assurance that the primary piping (i.e.: PUREX connector) will meet its intended safety function.

The PUREX connector is comprised of several components; Figure 1-1 provides a cutaway view of the connector and identifies each of the parts required for operation. The 1-inch, 2-inch, and 3-inch connectors look essentially the same except that the 2-inch connector is smaller in size than the 3-inch, and the 1-inch connector is smaller in size than the 2-inch. None of the parts are interchangeable between the sizes of connectors.
The general service spare parts stock which existed prior to the waste transfer system becoming safety significant are upgraded via the Commercial Grade Dedication (CGD) process as identified in TFC-ENG-DESIGN-C-15, *Commercial Grade Dedication*. The CGD demonstrates how the four critical characteristics are verified to provide reasonable assurance that the safety function of the component will be met. Currently, parts are upgraded on a task on demand basis which is not cost effective nor does it eliminate schedule risk associated with needing replacement PUREX parts for emergent work.
1.2 Scope

Maintaining spare parts inventory availability for assembling Quality Level-2 (safety significant) PUREX connectors is an on-going process. Legacy casting are generally the only components that are upgraded via CGD. Non-cast components are fabricated from new QL-2 material and would not utilize this plan. The scope of this plan is to define the methodology and acceptance criteria to be used to allow the upgrade of the components from their current quality level to QL-2 in large quantities. Currently parts are upgraded on a batch on demand basis (batch castings) which has proven to be cost effective. Any of the parts listed in this plan can be upgraded from existing stock to support mission needs. The methodology for upgrade is provided for the following parts:

- Hooks
- Hook Pins
- Hook Guides
- Operating Nuts
- Operating Screws
- Connector Blocks (horizontal and vertical)
- Skirts (horizontal and vertical)
- Split Washers
- Gasket Retainer Rings
- Nozzles

The following activities are required to be performed to execute this plan:

1. Identify the PUREX connector parts that are required to be upgraded via the material database and walk-downs of the spare part storage warehouses.
2. Identify the level of part readiness (e.g. cast only with final machining required prior to use)
3. Identify parts to be upgraded and initiate the CGD process and tag the selected components as conditional accept or in-process.
4. Perform Non-Destructive Evaluation (NDE) on the parts as required following the sampling criteria contained in this plan.
5. Perform final machining as required and follow-on NDE, as applicable.
6. Develop and process supporting documentation in accordance with TFC-ENG-DESIGN-C-15, Commercial Grade Dedication, thus providing traceability from the applicable item to the testing performed which provides the basis for the upgrade. Tag parts with appropriate quality level and disposition non-conforming parts.

NDE requirements are driven by a combination of the individual part fabrication drawing notes and selected testing to provide reasonable assurance that the parts can perform their safety function.

1.3 Approach

The dedication of upgrade of multiple components via a sampling size is a recognized and acceptable methodology within the nuclear industry. Sampling sizes will be used per the guidance prescribed in TR-017218-R1, Guideline for Sampling in the Commercial-Grade Item Acceptance Process, as allowed by TFC-ENG-DESIGN-C-15, Commercial Grade Dedication. This guideline provides the methodology for determining sample size based on significance to safety function, lot homogeneity, and existing documentation.

The term Lot is defined as “inspection lot,” that is, a collection of units of product from which a sample is to be drawn and inspected. The PUREX parts being upgraded consist of a variety of purchase orders (PO), lot numbers, heat numbers and varying drawing revisions. Generally most spare parts can be linked
to a PO by an etched or stamped number on each part. When practical, this PO number should be used to form Lots. Parts that do not have a PO or number unique to an assortment of parts (other than part number) should be considered for tightened sampling. Lots may be assembled for sampling by grouping like items together with no PO numbers or maintaining complete segregation of like components (same part number, same PO). Engineering judgment should be used for lot development. Initially a normal sampling plan method will be selected when performing NDE. In the event that discordances are found against the identified acceptance criteria, sampling will be expanded to the requirements of a tightened sampling plan if the defect cannot be accepted as-is. Additional discordances identified during tightened sampling that cannot be accepted as-is will result in 100% inspection.

TFC-ENG-DESIGN-C-15 references TR-017218-R1 as a basis for establishing sampling rates. The recommended set of sampling plans from TR-017218-R1 for nondestructive tests and inspections Normal, Reduced, and Tightened Sampling are contained in Table 1-1. The Normal Sampling Plan should be considered initially. When more discrimination is warranted, the Tightened Sampling Plan may be appropriate. Those persons involved in the upgrade approval should be involved in making this decision.

### Table 1-1. Recommended Test and Inspection Sampling Plan

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1.4 Acceptance Criteria

Acceptance criteria for the elements being evaluated by this plan have been selected to provide reasonable assurance that the parts can satisfy their safety function. Acceptance criteria have been derived from the individual part drawings, procurement specifications and testing & material standards. Testing and inspection requirements for each part type is described below in Section 2.0, acceptance criteria (criteria) is provided for each. The scrutiny of tests and inspections will use a graded approach based on how each part impacts the ability to maintain the safety function.

In the event that discordances are found through testing and inspection, an assessment shall be made to disposition the parts with the following:

- Use-As-Is – The defect does not impact the safety function (must be justified in NCR). This disposition will also be used for parts that meet the acceptance criteria.
- Reject Item – Non-repairable, of no value, not cost effective to repair.
- Retain item for jig/test fixture – Although not suitable for use within the facility, the item may still be capable of being used for other activities.
- Repair – Expensive to replace, critical item, capable and cost effective to repair.

1.5 Control Procedures

TFC-ENG-DESIGN-C-15, Commercial Grade Dedication
TR-017218-R1, Guideline for Sampling in the Commercial-Grade Item Acceptance Process
TFC-OPS-MAINT-C-07, Control and Calibration of Measuring and Test Equipment
TFC-ESHQ-Q_INSP-C-01, Control of Inspections
TFC-ESHQ-Q_INSP-P-03, Positive Material Identification Processes for QA Inspections
TFC-ENG-FACSUP-C-02, Operability/Technical Evaluations

1.6 Test Fixtures and Support Equipment

All inspections and measurements shall be completed by qualified personnel using calibrated equipment per controlling procedures. Refer to the section above for controlling procedures. To facilitate inspections described below, the following measurement and test equipment (M&TE) may be utilized. Testing and inspections that cannot be performed by TOC personnel should be included in contracted work scope to a qualified vendor.

- Thread gauge for skirts (tie rod hole)
- Digital calipers
- Optical comparator
- Coordinate Measurement Machine (CMM)
- Hydrostatic pressure test equipment
- Hardness testing equipment
- Telescoping gauges
- Micrometers
- Gauge pins
- Positive Material Identification gun (or equivalent)
- Liquid Penetrant testing equipment
- Magnetic Particle testing equipment
2.0 TESTING

In order to assert reasonable assurance that the parts are capable of meeting their intended safety function and that they conform to the drawings and specifications, various NDE shall be completed per the guidelines delineated in this plan. Table 2-1 contains an overview of the testing and inspections that each part will be subjected to. The table also provides guidance on whether sampling will be used or 100% of the items will need to be evaluated. This plan shall be used as guidance; the design documentation, material standards, and procurement specification requirements shall take precedence over this document outside of what has been evaluated as important in the upgrade process. The bases of whether sampling will be used or every part receives inspection depends on the complexity of the inspection/test and/or the importance to supporting the safety function. For example, 100% visual inspection of each part is simple to perform yet allows each part to be inspected for obvious defects. Conversely, identifying the presence of surfaces cracks within a Lot (liquid penetrant testing) can be accomplished by sampling and provides reasonable certainty for the Lot, 100% inspection would be very expensive and is not necessary. Additionally, nozzles are receiving 100% hydrostatic pressure testing based on significance to ensuring the parts satisfy the operating pressure critical characteristic.

Table 2-1. NDE Requirements and Sampling Plans

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<td>Sampling</td>
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<td>Sampling</td>
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<tr>
<td>Skirt Vert. and Horz. (Cast), Machined</td>
<td>100%</td>
<td>Sampling</td>
<td></td>
<td>100%</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gasket Retainer</td>
<td>100%</td>
<td>100%</td>
<td>Sampling</td>
<td>100%</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Split Washer</td>
<td>100%</td>
<td></td>
<td>Sampling</td>
<td>100%</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nozzle (Cast), Machined</td>
<td>100%</td>
<td>100%</td>
<td>Sampling</td>
<td>100%</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Parts that are not associated with existing Lots (e.g.: disassembled connector parts) should be grouped with like items for sample selection. Select NDE is listed in the sections below for each part type that will provide adequate reasonable assurance to support the upgrade process.

Critical elements are being defined in this plan as attributes that can be tested or verified (i.e.: dimensional, material, hardness, etc.) to acceptance criteria and validates the critical characteristics. RPP-RPT-42297 states that critical characteristics are a subset of design attributes that once verified, provides reasonable assurance that the item will meet the intended safety function. Defining critical elements up front and how they validate the critical characteristics ensures a consistent approach to upgrading.

Critical elements verified through testing and inspection shall be in accordance with the latest drawing revision (to include outstanding Engineering Change Notifications). Cast or machined parts that cannot conform to the most current requirements will be dispositioned on an individual case basis based on the ability of the part to support the safety function. This determination should be recorded within the CGD. Drawing revisions are being omitted from this plan as the most current approved drawing shall be consulted for the part that is applicable to each part/lot. Parts critical to maintaining the safety function
that do not have any identifying markings except for hook pins, gasket retainers and split washers should not be upgraded without additional testing verifying additional critical elements above what is listed within this plan and determined by those approving the upgrade.

Critical dimensions for dimensional inspection have been identified in the figures below by red boxes. These boxes represent what dimensions need to be verified; however the value within the box is for reference only. The current drawings should be used to determine the appropriate value and tolerance for the part. Positive Material Identification equipment provides a chemical/elemental breakdown of the material tested within the tolerance of the equipment. Differentiating between extremely similar metals can be difficult, but this test does provide a greater level of assurance than no test at all. In the event that the PMI test does not match the chemical/elemental requirements specified below, disposition the results within the CGD and Technical Evaluation (if required). An example being: PMI cannot read carbon content, so differentiating between 304 and 304L is difficult; this should be discussed within the supporting upgrade documentation.

2.1 PUREX Hooks

PUREX hooks are connected to the operating nut and clamp into the backside of the nozzle compressing the gasket between the block and nozzle. This clamping force contributes to maintaining a pressure and waste confinement boundary. Critical elements that support the critical characteristics are hook strength and hook length (center of pin hole to lip contact area and angle of contact area relative to the datum plane). Differing hook length can result in uneven hook loading. An additional important dimension is the hook guide interface surface on the back of the hook. This surface interacts with the hook guide to ensure the hooks are properly engaged with the back face of the nozzle. The hole diameter also needs to be verified to ensure a proper fit with the hook pin. Critical areas of the hook are the region surrounding the lip contact area and angle of contact area.

In the past, hooks have been fabricated by three methods, cast, forged or machined from plate. Forged hooks are no longer specified by the current hook or connector drawings so they will not be evaluated for upgrade by this plan. Plate hooks are precipitation hardening heat treated using 1075°F (H1075) process and shall have a hardness minimum/maximum of Rockwell C29/C38 (Brinell 293/375) to meet mechanical requirements as specified in HS-V-P-0031, Rev. 1, Hook Machined, Remote Connector – PUREX Type. Cast hooks must conform to the requirements of HS-BP-0071, Rev. 2, Hook, Casting, Remote Connector, and have a minimum hardness of 277HB(29HRC). Verifying material hardness provides evidence that the hooks have been heat treated within specification contributing to proper material strength.

Cast parts are more susceptible to material flaws and voids within the material as compared to plate which can lead to component failure, however past operating experience has not yielded a trend of documented hook failures. If a lot of cast hooks are suspected to have internal defects based on cast surface finish or excessive voids (voids marginally within the acceptance criteria below) as determined during visual inspection by a qualified quality assurance technician, radiographic testing (RT) sampling can be used to provide reasonable assurance that the castings are free from defects which could impact the safety function. If RT is used, the acceptance criteria should be per ASME B31.3, Table 302.3.3D, Class 1, Grade B. To determine if surface cracks are present within the Lot, a sampling of castings will receive liquid penetrant testing (PT).

Positive material identification (PMI) will be used to determine if the material chemical/elemental composition is within specification. Critical dimensions will be taken to ensure the parts have been machined according to the drawing. Non-machined hooks will not be dimensionally verified as they will
be subject to the dimensional requirements of the applicable drawing and will need to be machined by a qualified fabricator.

Verifying material composition, critical dimensions and material soundness produces reasonable assurance that the parts/lots meet the critical elements of hook strength and hook length.

The following NDE is required for hooks:

1. Visual Inspection:
   a. Quantity: 100% of Lot
   b. Criteria: There shall be no positive or negative discontinuities whose measureable dimensions exceeds the following visual acceptance standard.

<table>
<thead>
<tr>
<th>GATE HEIGHT&lt;sup&gt;(a)&lt;/sup&gt;</th>
<th>POSITIVE</th>
<th>NEGATIVE&lt;sup&gt;(b)&lt;/sup&gt;</th>
<th>MINIMUM SPACING</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>HEIGHT</td>
<td>DIA.</td>
<td>DEPTH</td>
</tr>
<tr>
<td>0.045&quot;</td>
<td>0.045&quot;</td>
<td>0.060&quot;</td>
<td>0.045&quot;</td>
</tr>
</tbody>
</table>

   (a) Gate height is not applicable to plate hooks. Although gate height may not impact the safety function, verifying this dimension provides evidence that the part was cast correctly.
   (b) Small defects may be present at random but shall not be in areas that interfere with the function of the part.
   Note: Table from HS-BP-0071.

2. Penetrant Inspection:
   a. Quantity: Sampling of Lot.
   b. Criteria: There shall be no linear cold shuts, visual cracks, or visual shrinkage defects whose measurable dimensions exceed the following acceptance standard.

<table>
<thead>
<tr>
<th>INDIVIDUAL INDICATION</th>
<th>POROSITY</th>
<th>BLEEDING LIMITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>SIZE</td>
<td>SPACING</td>
<td>SIZE</td>
</tr>
<tr>
<td>0.060&quot;</td>
<td>0.375&quot;</td>
<td>0.045&quot;</td>
</tr>
</tbody>
</table>

   Critical inspection areas are the hole and lip contact areas.
   Note: Note: Table from HS-BP-0071. Consult HS-BP-0071 Section 3.4 for additional soundness requirements if needed.

3. Positive Material Identification:
   a. Quantity: Sampling of Lot.
   b. Cast Criteria: Precipitation hardening, stainless steel alloy casting shall meet chemical/elemental requirements specified for Grades CB7Cu-1 (Type 17-4) or CB7Cu-2 (Type 15-5) in Table 2 of ASTM A747.
   c. Plate Criteria: Precipitation hardening, stainless steel alloy shall meet the chemical/elemental requirements specified for Type XM-12, Table 1 of ASTM A-693 or ASTM A-564.

4. Hardness Testing:
   a. Quantity: Sampling of Lot.
   b. Cast Criteria: Minimum hardness of 277 HB (29 HRC)
   c. Plate Criteria: Minimum/Maximum hardness Rockwell C29/C38 (Brinell 293/375)

5. Part Number Identification:
a. Quantity: 100% of Lot.
b. Criteria: Verify part number is present on part. Cast shall have cast part numbers and machined (cast and plate) shall have stamped/etched numbers.

2.1.1 3-Inch Hooks

The following NDE is required for 3-inch machined (cast and plate) hooks:

1. Dimensional Inspection:
   a. Quantity: Sampling of Lot.
   b. Criteria: At a minimum, verify the selected dimensions denoted by red boxes. Actual dimensions and tolerance shall be per H-2-90175 (latest revision).

![Figure 2-1. 3-Inch Hook Critical Dimensions](image-url)
2.1.2 2-Inch Hooks

The following NDE is required for 2-inch machined (cast and plate) hooks:

1. Dimensional Inspection:
   a. Quantity: Sampling of Lot.
   b. Criteria: At a minimum, verify the selected dimensions denoted by red boxes. Actual dimensions and tolerance shall be per H-2-90174 (latest revision).

Figure 2-2. 2-Inch Hook Critical Dimensions

2.1.3 1-Inch Hooks

The following NDE is required for 1-inch machined (cast and plate) hooks:

1. Dimensional Inspection:
   a. Quantity: Sampling of Lot.
   b. Criteria: At a minimum, verify the selected dimensions denoted by red boxes. Actual dimensions and tolerance shall be per H-2-90173 (latest revision).
2.2 **Hook Pin**

Hook pins connect the hooks to the operating nut and transmit the load from each hook through double shear. Critical elements for the hook pin are material strength and diameter. Proper fit between the hook, pin and operating nut impact the forces that can be transmitted through the pin. The hook pins are made of carbon steel and are heated treated to a hardness of 32-37 Rockwell C. Hook pin failure could result in a leak during transfer operations. Verifying the pin diameter and material hardness provide reasonable assurance that the safety function can be maintained. Hook pins are typically packaged in threes; pin lot size quantity shall be per sets of three when packaged and individually when loose. Maintain pins in sets when possible.

The following NDE is required for Hook Pins:

1. Visual Inspection:
a. Quantity: 100% of Lot
b. Criteria: Part shall be free of visible defect, pitting and damage.

2. Material Identification:
   a. Quantity: Sampling of Lot (each pin in set if packaged).
   b. Criteria: Verify material is carbon steel by testing with a magnet.

3. Hardness Testing:
   a. Quantity: Sampling of Lot (1 pin per set if packaged).
   b. Criteria: 32-37 HRC (or per drawing).

4. Part Number Identification:
   a. Quantity: 100% of Lot.
   b. Criteria: Verify part number is present on part (or packaging).

2.2.1 3-Inch Hook Pin

The following NDE is required for 3-inch Hook Pins:

1. Dimensional Inspection:
   a. Quantity: Sampling of Lot (each pin in set if packaged).
   b. Criteria: At a minimum, verify the selected dimension denoted by the red box. Actual dimensions and tolerance shall be per H-2-32431 (latest revision).

![3-Inch Hook Pin Critical Dimensions](image)

**Figure 2-4. 3-Inch Hook Pin Critical Dimensions**

2.2.2 2-Inch Hook Pin

The following NDE is required for 2-inch Hook Pins:

1. Dimensional Inspection:
   a. Quantity: Sampling of Lot.
   b. Criteria: At a minimum, verify the selected dimension denoted by red box. Actual dimensions and tolerance shall be per H-2-32421 (latest revision).
2.2.3 1-Inch Hook Pin

The following NDE is required for 1-inch Hook Pins:

1. Dimensional Inspection:
   a. Quantity: Sampling of Lot.
   b. Criteria: At a minimum, verify the selected dimension denoted by red box.
      Actual dimensions and tolerance shall be per H-2-32411 (latest revision).

2.3 PUREX Hook Guide

The hook guide pilots the hooks into position as the connector is tightened ensuring that the hook tips are fully seated against the back face of the nozzle. The hook guide is held in place to the top of the block by tie rods fastened to the skirt. The hook guide also ensures that the operating screw is centered on the block.
and provides a cavity for the split washers to support the screw when the connector is loosened. The hook guide supports the safety function by ensuring the hooks remain engaged with the back face of the nozzle when tightening. A failure of the hook guide would likely be during the tightening process and would be readily identified. Failure during transfer operations would have little to no impact on the ability to support the safety function after the connector is tightened. The critical elements for the hook guide are select dimensions to ensure hook positioning and clearances for the split washer and operating screw. The hook guide is heat treated to develop proper strength for the material; since the hook guide is not subjected to large forces (as compared to hooks) hardness testing is not necessary for upgrade purposes. Material composition will be verified to add additional assurance. Verifying select dimensions and material composition provides reasonable assurance that the hook guide is capable of supporting the safety function.

The following NDE is required for Hook Guides:

1. Visual Inspection:
   a. Quantity: 100% of Lot
   b. Criteria: There shall be no positive or negative discontinuities whose measureable dimensions exceeds the following visual acceptance standard.

<table>
<thead>
<tr>
<th>GATE HEIGHT</th>
<th>POSITIVE</th>
<th>NEGATIVE(^{(a)})</th>
<th>MINIMUM SPACING</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>HEIGHT</td>
<td>DIA.</td>
<td>DEPTH</td>
</tr>
<tr>
<td>0.045&quot;</td>
<td>0.045&quot;</td>
<td>0.060&quot;</td>
<td>0.045&quot;</td>
</tr>
</tbody>
</table>

\(^{(a)}\) Small defects may be present at random but shall not be in areas that interfere with the function of the part.

Note: Table from HS-BP-0072.

2. Positive Material Identification:
   a. Quantity: Sampling of Lot.
   b. Criteria: Corrosion-resistant stainless steel alloy casting shall meet the Chemical/Elemental requirements specified for Grade CF8 in Table 2 of ASTM A743.

3. Part Number Identification:
   a. Quantity: 100% of Lot.
   b. Criteria: Verify part number is present on the part.

2.3.1 3-Inch Machined Hook Guide

The following NDE is required for post-machined cast Hook Guide:

1. Dimensional Inspection:
   a. Quantity: Sampling of Lot.
   b. Criteria: At a minimum, verify the selected dimensions denoted by red boxes. Actual dimensions and tolerance shall be per H-2-68206 (latest revision).
2.3.2 2-Inch Machined Hook Guide

The following NDE is required for post-machined cast Hook Guide:

1. Dimensional Inspection:
   a. Quantity: Sampling of Lot.
   b. Criteria: At a minimum, verify the selected dimensions denoted by red boxes. Actual dimensions and tolerance shall be per H-2-68205 (latest revision).
2.3.3 1-Inch Machined Hook Guide

The following NDE is required for post-machined cast Hook Guide:

1. Dimensional Inspection:
   a. Quantity: Sampling of Lot.
   b. Criteria: At a minimum, verify the selected dimensions denoted by red boxes. Actual dimensions and tolerance shall be per H-2-68204 (latest revision).

![Hook Guide Critical Dimensions](image)

**Figure 2-9. 1-Inch Hook Guide Critical Dimensions**

2.4 PUREX Operating Nut

The operating nut travels up and down the threads of the operating screw; the hooks are connected to the operating nut with hook pins and transmit screw rotation into a linear clamping force. This clamping force maintains the seal between the block, gasket and nozzle. Much like the hooks, the operating nut is subjected to continual loads once the connector is tightened and occasional loads during transfer operations. The hook pin holes must be within specification to ensure even hook loading occurs. The clamping force is transmitted through the threads of the operating nut to the operating screw, therefore these threads must be machined properly to ensure proper strength. Poor thread quality and strength could prevent the connector from tightening properly not establishing a seal. Thread galling can result from improperly mated threads or lack of lubrication, which can lead to an undetected failure during installation. Machining quality threads and correct material hardness ensures the connector will function as designed. Failure of the operating nut could result in a leak during transfer operations. The critical elements of an operating nut are material strength and select dimensions. Verifying the material by magnetic testing and hardness testing provides evidence that the part is capable of supporting the safety function in conjunction with dimensional verification.

The following NDE is required for all Operating Nuts:

1. Visual Inspection:
   a. Quantity: 100% of Lot
   b. Criteria: There shall be no positive or negative discontinuities whose measureable dimensions exceeds the following visual acceptance standard.
2. Material Identification:
   a. Quantity: Sampling of Lot.
   b. Criteria: Verify material is carbon steel by testing with a magnet.

3. Hardness Testing:
   a. Quantity: Sampling of Lot.
   b. Criteria: 181-211 HB.

4. Part Number Identification:
   a. Quantity: 100% of Lot.
   b. Criteria: Verify part number is present on part.

5. Magnetic Particle Testing:
   a. Quantity: Sampling of Lot.
   b. Criteria: Per Section 3.3.2 of HS-BP-0073 (latest revision)

2.4.1 3-Inch Operating Nut

The following NDE is required for post-machined cast Operating Nuts:

1. Dimensional Inspection:
   a. Quantity: Sampling of Lot.
   b. Criteria: At a minimum, verify the selected dimensions denoted by red boxes. Actual dimensions and tolerance shall be per H-2-68210 (latest revision). Verify the minor diameter and thread per inch (TPI) are within specification.
2.4.2 2-Inch Operating Nut

The following NDE is required for post-machined cast operating nut:

1. Dimensional Inspection:
   a. Quantity: Sampling of Lot.
   b. Criteria: At a minimum, verify the selected dimensions denoted by red boxes. Actual dimensions and tolerance shall be per H-2-68209 (latest revision). Verify minor diameter and TPI are within specification.
Figure 2-11. 2-Inch Operating Nut Critical Dimensions
2.4.3 1-Inch Operating Nut

The following NDE is required for post-machined cast operating nut:

1. Dimensional Inspection:
   a. Quantity: Sampling of Lot.
   b. Criteria: At a minimum, verify the selected dimensions denoted by red boxes. Actual dimensions and tolerance shall be per H-2-68208 (latest revision). Verify minor diameter and TPI are within specification.

Figure 2-12. 1-Inch Operating Nut Critical Dimensions
2.5 **PUREX Operating Screw**

The operating screw is centered on the connector by the hook guide and interfaces with the operating nut. When the screw is tightened the operating nut moves up the screw, pulling the hooks, tightening against the back face of the nozzle. The reaction forces are transmitted into the top of the block with the screw in compression. This clamping force compresses the gasket between the block and the nozzle establishing the pressure boundary. The operating screw supports the safety function by ensuring adequate clamping force can be applied and maintained to provide a pressure containment boundary. The operating screw is located by the hook guide and prevented from withdrawal by the split washer. As with the operating nut, the threads on the operating screw are equally important to ensure proper force transmittal and smooth operation during connector tightening. Failure of the operating screw in some circumstances could be undetectable during connector tightening if the part is not machined properly or the material is out of specification. Operating screw failure could result in a leak during transfer operations. The critical elements for the operating screw are material strength and select dimensions. The operating screw is carbon steel so PMI cannot be used to determine material content. The operating screw is heat treated so hardness testing will provide evidence that the part have been heat treated within specification.

The following NDE is required for Operating Screws:

1. **Visual Inspection:**
   a. Quantity: 100% of Lot
   b. Criteria: Part shall be free of visible defect, pitting and damage.
2. **Material Identification:**
   a. Quantity: Sampling of Lot.
   b. Criteria: Verify material is carbon steel by testing with a magnet.
3. **Part Number Identification:**
   a. Quantity: 100% of Lot.
   b. Criteria: Verify part number is present on part.
4. **Hardness Testing:**
   a. Quantity: Sampling of Lot.
   b. Criteria: 24-34 HRC.

### 2.5.1 3-Inch Operating Screw

The following NDE is required for 3-inch operating screws:

1. **Dimensional Inspection:**
   a. Quantity: Sampling of Lot.
   b. Criteria: At a minimum, verify the selected dimensions denoted by red boxes. Actual dimensions and tolerance shall be per H-2-32431 (latest revision).
2.5.2 2-Inch Operating Screw

The following NDE is required for 2-inch operating screws:

2. Dimensional Inspection:
   a. Quantity: Sampling of Lot.
   b. Criteria: At a minimum, verify the selected dimensions denoted by red boxes. Actual dimensions and tolerance shall be per H-2-32421 (latest revision).
2.5.3 1-Inch Operating Screw

The following NDE is required for 1-inch operating screws:

1. Dimensional Inspection:
   a. Quantity: Sampling of Lot.
   b. Criteria: At a minimum, verify the selected dimensions denoted by red boxes. Actual dimensions and tolerance shall be per H-2-32411 (latest revision).
The block is one of the primary components of the connector. Piping is welded to the block (for jumpers) or provides isolation and serves as the primary pressure boundary. The block is machined out of solid billet 304L stainless steel. Blocks come in a variety of configurations and varying port sizes. The block is compressed between the gasket, gasket retainer, skirt and the hook guide and operating screw. Connector block failure could result in a leak during transfer operations. Proper block machining ensures that the gasket, gasket retainer and skirt can mate as designed. Poor fit-up of these components could impact the gaskets sealing ability. The critical elements for the block are dimensions and material composition which enable the safety function to be maintained. The block is very robust in design so material verification
ensures that the part conforms to the specified material. The dimensions of the block must be verified to ensure proper fit-up with mating parts.

The following NDE is required for Blocks:

1. Visual Inspection:
   a. Quantity: 100% of Lot
   b. Criteria: Part shall be free of visible defect, pitting and damage.

2. Positive Material Identification:
   a. Quantity: 100% of Lot.
   b. Criteria: Stainless steel alloy shall meet the chemical requirements specified ASTM A276 304L. PMI may not detect carbon content, and results may indicate material as 304 which is acceptable.

3. Part Number Identification:
   a. Quantity: 100% of Lot.
   b. Criteria: Verify part number is present on part.

2.6.1 3-Inch Block

The following NDE is required for 3-inch Blocks:

1. Dimensional Inspection:
   a. Quantity: Sampling of Lot.
   b. Criteria: At a minimum, verify the selected dimensions denoted by red boxes. Actual dimensions and tolerance shall be per H-2-32433 (latest revision) for the applicable part number.
   i. Refer to drawing to verify inlet and outlet diameters.
Figure 2-16. 3-Inch Horizontal Block Blank Critical Dimensions
2.6.2  2-Inch Block

The following NDE is required for 2-inch Blocks:

1. Dimensional Inspection:
   a. Quantity: Sampling of Lot.
   b. Criteria: At a minimum, verify the selected dimensions denoted by red boxes. Actual dimensions and tolerance shall be per H-2-32423 (latest revision) for the applicable part number.
      i. Refer to drawing for varying inlet and outlet diameters.
At a minimum, verify the selected dimensions denoted by red boxes. Actual dimensions and tolerances shall be per.

Figure 2-18. 2-Inch Horizontal Block Blank Critical Dimensions

Figure 2-19. 2 Inch Horizontal Block Critical Dimensions
2.6.3 1-Inch Block

The following NDE is required for 1-inch Blocks:

1. Dimensional Inspection:
   a. Quantity: Sampling of Lot.
   b. Criteria: At a minimum, verify the selected dimensions denoted by red boxes. Actual dimensions and tolerance shall be per H-2-32413 (latest revision) for the applicable part number.
      i. Refer to drawing for varying inlet and outlet diameters.

Figure 2-20. 1-Inch Horizontal Block Blank Critical Dimensions
2.7 PUREX Skirts

The skirt holds and centers the gasket and gasket retainer in place against the block. The skirt is bolted to the hook guide with tie rods and places the block in compression. The skirt provides a means to guide the jumper or process blank into position facilitating installation. Skirts come in two configurations, vertical and horizontal. The pressure boundary is established by the gasket and gasket retainer between the nozzle and the block. The skirt supports the safety function by ensuring the gasket, gasket retainer and hook guide stays in place. The skirt also helps maintain radial hook alignment. Improper skirt machining could prevent the gasket retainer from seating correctly during connector head assembly or gasket change out resulting in a poor seal. This failure would be discovered during a leak check. Skirt failure during transfer operations would have minimal impact to the safety function as the pressure boundary is maintained by the gasket retainer. Critical elements for the skirt are verification of select dimensions and material composition for waste compatibility. The skirt is cast to the same specifications as the hook guides, HS-BP-0072.

The following NDE is required for skirts:

1. Visual Inspection:
   a. Quantity: 100% of Lot
   b. Criteria: There shall be no positive or negative discontinuities whose measureable dimensions exceed the following visual acceptance standard.
RPP-PLAN-57325, Rev. 1

<table>
<thead>
<tr>
<th></th>
<th>HEIGHT</th>
<th>DIA.</th>
<th>DEPTH</th>
<th>DIA.</th>
<th>ONE PER SQ. IN</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.045&quot;</td>
<td>0.045&quot;</td>
<td>0.060&quot;</td>
<td>0.045&quot;</td>
<td>0.060&quot;</td>
<td></td>
</tr>
</tbody>
</table>

(a) Small defects may be present at random but shall not be in areas that interfere with the function of the part.
Note: Table from HS-BP-0072.

2. Positive Material Identification:
   a. Quantity: Sampling of Lot.
   b. Criteria: Corrosion-resistant stainless steel alloy casting shall meet the Chemical/Elemental requirements specified for Grade CF8 in Table 2 of ASTM A743.

3. Part Number Identification:
   a. Quantity: 100% of Lot.
   b. Criteria: Verify part number is present on part.

2.7.1 3-Inch Machined Skirts

The following NDE is required for machined cast skirts:

1. Dimensional Inspection:
   a. Quantity: Sampling of Lot.
   b. Criteria: At a minimum, verify the selected dimensions denoted below. Actual dimensions and tolerance shall be per H-2-68218 (Horizontal) and H-2-68219 (Vertical), latest revision.
      i. Test threaded tie rod holes with 5/8"-11 UNC-2B Go/No Go gauge. Blind holes shall be threaded a minimum of 1” deep.
      ii. Verify hook gap clearances are within tolerance per applicable drawing.
      iii. Verify the large inside diameter of the skirt is within tolerance per applicable drawing.

2. Functional Inspection:
   a. Quantity: 100%
   b. Criteria: Smooth operation – Go, binding operation – No Go.
      i. Test fit a dimensionally verified 3-inch gasket retainer into the skirt as would be installed to verify proper thread operation.

2.7.2 2-Inch Machined Skirts

The following NDE is required for machined cast skirts:

1. Dimensional Inspection:
   a. Quantity: Sampling of Lot.
   b. Criteria: At a minimum, verify the selected dimensions denoted below. Actual dimensions and tolerance shall be per H-2-68214 (Horizontal) and H-2-68215 (Vertical), latest revision.
      i. Test threaded tie rod holes with 1/2"-13 UNC-2B Go/No Go gauge. Blind holes shall be threaded a minimum of 0.81” deep.
      ii. Verify hook gap clearances are within tolerance per applicable drawing.
      iii. Verify the large inside diameter of the skirt is within tolerance per applicable drawing.

2. Functionality Inspection:
   a. Quantity: 100%
   b. Criteria: Smooth operation – Go, binding operation – No Go.
      i. Test fit a dimensionally verified 2-inch gasket retainer into the skirt as would be installed to verify proper thread operation.
2.7.3 1-Inch Machined Skirts

The following NDE is required for machined cast skirts:

1. Dimensional Inspection:
   a. Quantity: Sampling of Lot.
   b. Criteria: At a minimum, verify the selected dimensions denoted below. Actual dimensions and tolerance shall be per H-2-68212 (Horizontal) and H-2-68213 (Vertical), latest revision.
      i. Test threaded tie rod holes with 3/8”-16 UNC-2B Go/No Go gauge. Blind holes shall be threaded a minimum of 0.65” deep.
      ii. Verify hook gap clearances are within tolerance per applicable drawing.
      iii. Verify the large inside diameter of the skirt is within tolerance per applicable drawing.

2. Functionality Inspection:
   a. Quantity: 100%
   b. Criteria: Smooth operation – Go, binding operation – No Go.
      i. Test fit a dimensionally verified 1-inch gasket retainer into the skirt as would be installed to verify proper thread operation.

2.8 Gasket Retainer

The gasket retainer holds the gasket in place within the skirt and against the block creating a seal when the connector is tightened. The gasket retainer must conform dimensionally to the drawing to ensure it does not interfere with the sealing process. The gasket retainer provides a boundary to contain the gasket when elastically or plastically deformed against the nozzle sealing surface during the tightening process. The gasket retainer must be capable of withstanding the hoop stresses associated with fluid pressure and gasket compression. A gasket is pressed into the gasket retainer which is then threaded into the bottom of the skirt. Improper gasket retainer fit-up could prevent the gasket from being compressed uniformly against the sealing surface of the connector block. Gasket retainer failure could result in a potential leak during transfer operations. The critical elements for the gasket retainer are dimensional and material strength. The gasket retainer may be machined from several different materials: 304 SST, 316L SST, Hastelloy and Inconel. Verifying material composition and critical dimensions ensures the part is capable of maintaining the safety function. Part numbers are rarely found on gasket retainers so dimensional inspection will be 100% of Lot.

The following NDE is required for Gasket Retainers:

1. Visual Inspection:
   a. Quantity: 100% of Lot
   b. Criteria: Part shall be free of visible defect, pitting and damage.

2. Positive Material Identification:
   a. Quantity: Sampling of Lot.
   b. Criteria: Chemical/Elemental requirement per ASTM A276 304 SST/316L, ASTM B574 Hastelloy C22 (N06022), or ASTM B166 Inconel 690.

2.8.1 3-Inch Gasket Retainer

The following NDE is required for 3-inch Gasket Retainers:
1. Dimensional Inspection:
   a. Quantity: 100% of Lot
   b. Criteria: At a minimum, verify the selected dimensions denoted by red boxes. Actual dimensions and tolerance shall be per H-2-32431 (latest revision).

![Diagram](image)

**Figure 2-22. 3-Inch Gasket Retainer Critical Dimensions**

### 2.8.2 2-Inch Gasket Retainer

The following NDE is required for 2-inch Gasket Retainers:

2. Dimensional Inspection:
   a. Quantity: 100% of Lot
   b. Criteria: At a minimum, verify the selected dimensions denoted by red boxes. Actual dimensions and tolerance shall be per H-2-32421 (latest revision).
2.8.3 1-Inch Gasket Retainer

The following NDE is required for 1-inch Gasket Retainers:

1. Dimensional Inspection:
   a. Quantity: 100% of Lot
   b. Criteria: At a minimum, verify the selected dimensions denoted by red boxes. Actual dimensions and tolerance shall be per H-2-32411 (latest revision).
2.9 Split Washer

The split washer locks the operating screw into the hook guide and facilitates opening the hooks during connector loosening and helps hold the hooks open for installation. When the connector is tightened the split washer sits idle beneath the hook guide. Split washer material hardness is important in regards to component longevity when subjected to high cyclic rates, but does not impact the ability to support the safety function. Dimensionally, the split washer must not interfere with the tightening process to ensure a proper seal is established. Split washer failure does not impact the safety function. The split washer is machined from 416 SST bar stock and is heat treated to a hardness of 38-43 Rockwell C. The critical elements for the split washer are dimensions. Verifying these elements ensures the washer does not inhibit proper connector sealing.

The following NDE is required for Split Washers:

1. Visual Inspection:
   a. Quantity: 100% of Lot
   b. Criteria: Part shall be free of visible defect, pitting and damage.

2.9.1 3-Inch Split Washer

The following NDE is required for 3-inch split washers:

1. Dimensional Inspection:
   a. Quantity: Sampling of Lot.
   b. Criteria: At a minimum, verify the selected dimensions denoted by red boxes. Actual dimensions and tolerance shall be per H-2-32431 (latest revision).
2.9.2 2-Inch Split Washer

The following NDE is required for 2-inch split washers:

1. Dimensional Inspection:
   a. Quantity: Sampling of Lot.
   b. Criteria: At a minimum, verify the selected dimensions denoted by red boxes. Actual dimensions and tolerance shall be per H-2-32421 (latest revision).
2.9.3 1-Inch Split Washer

The following NDE is required for 1-inch split washers:

1. Dimensional Inspection:
   a. Quantity: Sampling of Lot.
   b. Criteria: At a minimum, verify the selected dimensions denoted by red boxes. Actual dimensions and tolerance shall be per H-2-32411 (latest revision).
2.10 PUREX Nozzles

The nozzle is another primary component to the pressure boundary. The nozzle is clamped against the gasket by the hooks which are in contact with the back face of the nozzle. Nozzles are machined from a cast alloy and are welded to piping/kick-plates. The nozzle sealing surface is convex to allow for minor misalignment, dimensional control of this surface is paramount. The nozzle must be capable of withstanding all of the forces transmitted through the connector so material strength must be verified. Defects within the casting and on the surface of the nozzle may jeopardize its strength. Care should be taken when visually inspecting the nozzles to ensure that the sealing surface is not damaged (scratched or abraded). The nozzle is subjected to the following forces: operation hydrostatic pressure forces, occasional loading forces (thermal, pressure transients, etc.) and forces from jumper misalignment (the connector tries to center itself on the nozzle when tightened). Any nozzle failure could result in a leak during transfer operations. In-service leak checks prior to use are performed to verify the seal against the nozzle. The critical elements for a nozzle are dimensions, material strength and material composition. Verifying these elements provide reasonable assurance that the nozzle can satisfy the safety function. Due to the significance of the nozzle in maintaining the pressure boundary, 100% sampling should be used to ensure complete confidence in the parts ability to maintain the safety function.

The following NDE is required for Nozzles:

1. Visual Inspection:
   a. Quantity: 100% of Lot
   b. Criteria: There shall be no discontinuities or defects that could impact the sealing surface of the nozzle. RPP-11596 does not specify inspection criteria. The hydrostatic test fixture will utilize a PUREX gasket enabling the sealing capability to be evaluated.

2. Hydrostatic Pressure Test:
   a. Quantity: 100% of Lot.
   b. Criteria: Verify no leakage occurs within the nozzle body, leakage from the jig is acceptable.
      i. Hydrostatically pressure test the nozzle to a pressure no less than 1000 psig (+10-0psig). Perform the test in accordance with ASME B31.3, Section 345 other than the test pressure (unspecified design pressure). Clamp the nozzle between two flanges at a maximum force 1.5 times the hydraulic force from the test pressure against the cross sectional area of the nozzle. A test pressure of 1000 psig is based on the pressure used in the RPP-RPT-28320 analysis. The test fixture shall use a PUREX gasket on the sealing face.

3. Positive Material Identification:
   a. Quantity: 100% of Lot.
   b. Criteria: Stainless steel alloy casting shall meet the chemical/elemental requirements specified for Grade B1 of ASTM A995.

4. Part Number Identification:
   a. Quantity: 100% of Lot.
   b. Criteria: Verify part number is present on part.

2.10.1 3-Inch Nozzle

The following NDE is required for 3-inch machined Nozzles:

1. Dimensional Inspection:
   a. Quantity: Sampling of Lot.
   b. Criteria: At a minimum, verify the selected dimensions denoted by red boxes. Actual dimensions and tolerance shall be per H-2-90186 or H-2-32446 (latest revision).
2.10.2 2-Inch Nozzle

The following NDE is required for 2-inch machined Nozzles:

2. Dimensional Inspection:
   c. Quantity: Sampling of Lot.
   d. Criteria: At a minimum, verify the selected dimensions denoted by red boxes. Actual dimensions and tolerance shall be per H-2-90185 (latest revision).
Figure 2-29. 2-Inch Nozzle Critical Dimensions
2.10.3 1-Inch Nozzle

The following NDE is required for 1-inch machined Nozzles:

1. Dimensional Inspection:
   a. Quantity: Sampling of Lot.
   b. Criteria: At a minimum, verify the selected dimensions denoted by red boxes. Actual dimensions and tolerance shall be per H-2-90184 (latest revision).

![Figure 2-30. 1-Inch Nozzle Critical Dimensions](image)

3.0 SUMMARY

The components being upgraded come from a variety of purchase orders, varying part number revisions and quality levels. Verifying the critical elements for each group of components provides reasonable assurance that they are capable of performing their safety function by satisfying the critical characteristics.
1. Max. Operating Temperature (Design Temperature)

2. Min. Operating Temperature (Design Temperature, including Ambient)

3. Max. Operating Pressure (Design Pressure)

4. Connector/Nozzle Material (Waste Compatibility)

Each critical characteristic will be examined to show how verifying the critical elements enables the safety function to be satisfied under those conditions and events for which the safety function is required.

By verifying the components’ material of construction conforms to the specified material within the PUREX drawings and procurement specifications, maximum and minimum temperatures and material waste compatibility characteristics are satisfied. Each part’s material type was selected for its ability to function as designed within the intended environment. Although materials have changed over the years due to availability issues, the currently specified materials have years of successful operational history and material strength is suitable within the design temperature range. The maximum and minimum process temperatures for waste transfer components are defined in RPP-RPT-42297 as 200°F and approximately 32°F respectively (Ambient -25°F). TFC-ENG-STD-22, Piping, Jumpers and Valves, defines the design temperature as ≥200°F. HNF-SD-WM-TSR-006, Tank Farms Technical Safety Requirements, Specific Administrative Control 5.8.8, states that the lowest temperature shall be verified to be >32°F. From these two sources, the design temperature range is defined as:

- Maximum Operating Temperature: ≥200°F
- Minimum Operating Temperature: >32°F

All of the materials specified in the design media have been selected to perform within the intended environment. Although material strength is derived from material chemical composition (verified by PMI), additional testing is required to ensure the components are capable of supporting the intended operating pressures.

Waste transfer piping and components (PUREX connectors) have a design operating pressure of ≥ 400psig for double shell tanks (DST) as defined in TFC-ENG-STD-22. PUREX connectors have been evaluated by RPP-RPT-29063, Qualification of 3-In. PUREX Connector to ASME B31.3, and RPP-RPT-36800, Qualification of 2-in. PUREX connector to ASME B31.3, for unlisted component evaluation requirements to qualify the 3-inch and 2-inch connectors to ASME B3 1.3 standards. These documents use A finite element analysis is used to determine that allowable stress values in the connectors and nozzles meet the current ASME B3 1.3 requirements and are substantiated by proof testing (3-inch) and extensive, successful service experience (1 and 2-inch). The analysis clearly demonstrates that the PUREX components are suitable for operation at 400 psig, 200°F. In addition of 2-inch and 3-inch connectors, the use of 1-inch and 4-inch connectors have been used within the facility with successful service experience. Until recently, there have not been any applications requiring safety significant 1-inch connectors, however verification of the critical elements depicted in this plan provide reasonable assurance that the parts can satisfy their safety function. Additional evaluation may be required for the 1-inch connectors to be used for ASME B31.3 Normal Fluid Service. This plan does not address the upgrade of 4-inch connectors at this time.

To provide additional reasonable assurance, testing like hardness, liquid penetrant, etc. will be completed on a sampling of parts to verify component soundness, proper hardness, and overall ability to support the safety function. Verifying the critical elements provide evidence that the critical characteristics are
satisfied, but to ensure the safety function can be maintained additional assurance is needed. The pressure boundary performance (ability to maintain a seal) of the PUREX connector depends on how well the connector can clamp to a nozzle and maintain clamping force during operation. Verifying select dimensions of each component allows a greater level confidence that the connector can perform its safety function in the intended environment. Although there are many dimensions that can be measured or verified, this plan has selected dimensions that are thought to be more critical than others based on interactions with other components. Parts being machined by a qualified vendor shall follow the requirements established by the design media as this plan is for supporting component upgrading only.

All safety significant PUREX components used within the waste transfer system are fabricated and tested to the requirements of RPP-14541, *Jumper Fabrication and Testing Specification for Tank Farms*. One of the requirements of RPP-14541 is the successful completion of the ASME B31.3 hydrostatic pressure test which serves as a method for verifying soundness and (pressure boundary) tightness. All of the parts being upgraded by this plan are subject to this testing during fabrication which provides additional proof that the PUREX components are capable of supporting the safety function. The consequences of failure for a PUREX component during operation is mitigated by the administrative control key element (TSR 5.9.3) requiring a waste transfer associated structure to be have a cover installed or door closed when physically connected to an active waste transfer pump.

Following the requirements of TFC-ENG-DESIGN-C-15 and the supporting documentation, this plan should be referenced as an element of the basis and justification for upgrade. Depending on the condition and/or homogeneity of the parts being upgraded, additional testing and inspections may be needed. Completing the requirements established in section 2.0 of this plan is sufficient at providing reasonable assurance that the upgraded parts are capable of functioning as designed.

4.0 REFERENCES


