NATIONAL ENRICHMENT FACILITY

10 CFR 30.6
10 CFR 40.5
10 CFR 70.5

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ATTN: Document Control Desk
Director
Office of Nuclear Material Safety and Safeguards
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

Louisiana Energy Services, L. P.
National Enrichment Facility
NRC Docket No. 70-3103

Subject: Integrated Safety Analysis Accident Sequences for Criticality Safe-By-Design Components

References:

1. Letter NEF#03-003 dated December 12, 2003, from E. J. Ferland (Louisiana Energy Services, L. P.) to Directors, Office of Nuclear Material Safety and Safeguards and the Division of Facilities and Security (NRC) regarding "Applications for a Material License Under 10 CFR 70, Domestic licensing of special nuclear material, 10 CFR 40, Domestic licensing of source material, and 10 CFR 30, Rules of general applicability to domestic licensing of byproduct material, and for a Facility Clearance Under 10 CFR 95, Facility security clearance and safeguarding of national security information and restricted data"

2. Letter NEF#04-002 dated February 27, 2004, from R. M. Krich (Louisiana Energy Services, L. P.) to Director, Office of Nuclear Material Safety and Safeguards (NRC) regarding "Revision 1 to Applications for a Material License Under 10 CFR 70, "Domestic licensing of special nuclear material," 10 CFR 40, "Domestic licensing of source material," and 10 CFR 30, "Rules of general applicability to domestic licensing of byproduct material"

3. Letter NEF#04-029 dated July 30, 2004, from R. M. Krich (Louisiana Energy Services, L. P.) to Director, Office of Nuclear Material Safety and Safeguards (NRC) regarding "Revision to Applications for a Material License Under 10 CFR 70, "Domestic licensing of special nuclear material," 10 CFR 40, "Domestic licensing of source material," and 10 CFR 30, "Rules of general applicability to domestic licensing of byproduct material"

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By letter dated December 12, 2003 (Reference 1), E. J. Ferland of Louisiana Energy Services (LES), L. P., submitted to the NRC applications for the licenses necessary to authorize construction and operation of a gas centrifuge uranium enrichment facility. Revision 1 to these applications was submitted to the NRC by letter dated February 27, 2004 (Reference 2). A subsequent revision (i.e., revision 2) to these applications was submitted to the NRC by letter dated July 30, 2004 (Reference 3).

In a July 26, 2004, conference call between LES and NRC representatives, discussions were held concerning modifications to accident sequences for criticality safety for the Integrated Safety Analysis (ISA). On September 9, 2004, LES and NRC representatives conducted an in-office meeting in the LES office in Washington, D.C. During this in-office meeting, modified ISA accident sequences and associated documentation for two criticality safe-by-design components were presented. Based on discussions during the conference call and subsequent meeting, the ISA accident sequences and associated documentation have been modified to address criticality safe-by-design components. Some of the associated information involves classified information (i.e., confidential national security information (CNSI)). This classified information has been separated from the unclassified information and is being submitted separately in accordance with 10 CFR 95.39, "External transmission of documents and material." The unclassified version of the information, in the form of revised ISA Summary pages, is included in the Enclosure, "Integrated Safety Analysis Accident Sequences for Criticality Safe-By-Design Components." This unclassified information will be formally incorporated into the ISA Summary in a future revision.

If you have any questions or need additional information, please contact me at 630-657-2813.

Respectfully,

Daniel G. Green for

R. M. Krich
Vice President – Licensing, Safety, and Nuclear Engineering

Enclosure:
Integrated Safety Analysis Accident Sequences for Criticality Safe-By-Design Components

cc: T.C. Johnson, NRC Project Manager

ENCLOSURE

Integrated Safety Analysis Accident Sequences for Criticality Safe-By-Design Components

Addition to Section 3.1.1.3.2

The definition of "highly unlikely" is taken from NUREG-1520 (NRC, 2002). Additionally, a qualitative determination of "highly unlikely" can apply to passive design component features (e.g., tanks, piping, cylinders, etc.) of the facility that do not rely on human interface to perform the criticality safety function (i.e., termed "safe-by-design"). For failure of passive safe-by-design components to be considered "highly unlikely," these components must also meet the criterion that the only potential means to effect a change that might result in a failure to function, would be to implement a design change (i.e., geometry deformation as a result of a credible process deviation or event does not adversely impact the performance of the safety function). The evaluation of the potential to adversely impact the safety function of these passive design features includes consideration of potential mechanisms to cause bulging, corrosion, and breach of confinement/leakage and subsequent accumulation of material. The evaluation further includes consideration of adequate controls to ensure that the double contingency principle is met. For each of these passive design components, it must be concluded, that there is no credible means to effect a geometry change that might result in a failure of the safety function and that significant margin exists between the normal operating conditions and design/analysis conditions assumed in the Criticality Safety Analysis. In addition, the configuration management system required by 10 CFR 70.72 (implemented by the NEF Configuration Management Program) ensures the maintenance of the safety function of these features and assures compliance with the double contingency principle, as well as the defense-in-depth criterion of 10 CFR 70.64(b).

Addition to Table 3.1-9

-5*	Initiating event with freq. < 10^{-5}/yr		For passive safe-by-design components or systems, failure is considered highly unlikely when no potential failure mode (e.g., bulging, corrosion, or leakage) exists, as discussed in Section 3.1.1.3.2, and these components and systems have been placed under configuration management.

Addition to Table 3.7-1

ccident Identifier	Initiating Event Index	Preventive Safety Parameter 1 or IROFS 1 Failure Index	Preventive Safety Parameter 2 or IROFS 2 Failure Index	Mitigation IROFS Failure Index	Likelihood Index T Uncontrolled (U) / Controlled (C)	Likelihood Category	Consequence Category (Type of Accident)	Risk Index (h= f x g) Uncontrolled (U) / Controlled (C)	Comments and Recommendations
	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	
LOSS OF SAFE-BY-DESIGN ATTRIBUTE	-5	N/A	N/A	N/A	-5(U)	1	3(CR)	3(U)	Acceptable Risk

Addition to Table 3.7-2

Accident Identifier: LOSS OF SAFE-BY-DESIGN ATTRIBUTE

The accident sequence is a criticality resulting from loss of a feature associated with safe-by-design components containing enriched Uranium material. The criticality event is assumed to have a high consequence to the worker and the public. The safe-by-design components addressed in this accident sequence are as follows.

Safe-by-design components in the following systems, Cascade, Product, Tails, Product Blending, Product Liquid Sampling, Contingency Dump, Centrifuge Test, Centrifuge Post Mortem, Liquid Effluent Collection and Treatment, Solid Waste, Decontamination Workshop, Fomblin Oil Recovery, Ventilated Room, Chemical Laboratory, Mass Spectrometry, and Cylinder Preparation Room Systems. These safe-by-design components are identified in Tables 3.7-6 through 3.7-21.

The passive, safe-by-design features of these components do not rely on human interface to perform the criticality safety function. These features also meet the criterion that the only potential means to effect a change that might result in a failure to function, would be to implement a design change (i.e., geometry deformation as a result of a credible process deviation or event does not adversely impact the performance of the safety function). The evaluation of the potential to adversely impact the safety function of the passive design features (which includes consideration of potential mechanisms to cause bulging, corrosion, and breach of confinement/leakage and subsequent accumulation of material) is presented in Tables 3.7-6 through 3.7-21, and includes consideration of adequate controls to ensure the double contingency principle is met. For the identified components, Tables 3.7-6 through 3.7-21 summarize the rationale for the conclusion that there is no credible means to effect a change to the safe-by-design feature that might result in a failure of the safety function. Tables 3.7-6 through 3.7-21 also support the conclusion that significant margin exists between the normal operating conditions and design/analysis conditions assumed in the Nuclear Criticality Safety Analysis. These passive, safe-by-design features are considered items which may affect IROFS. As a result, QA level 1 requirements apply to these features. In addition, the configuration management system required by 10 CFR 70.72 (implemented by the NEF Configuration Management Program) adequately ensures maintaining the safety function of the subject component features and assures compliance with the double contingency principle, as well as the defense-in-depth criterion required by 10 CFR 70.64(b).

Conclusion: Based on 1) the lack of credible means to effect an adverse change to the safe-by-design feature of these passive design components, 2) the large margins of safety that exist, 3) the application of the 10 CFR 70.72 configuration management system to preserve the safety design features, and 4) the relative low risk of a criticality event at low enriched uranium enrichment facilities, the frequency for the criticality initiating event was determined to be "highly unlikely." Therefore, an initiating event index of (-5) is appropriate, the risk of such an event is judged to be low and no IROFS are needed.

Table 3.7-6 Cascade System (Note 1)
Page 1 of 1

Criticality Assessment of Passive Safe-By-Design Components				
Component Description (A)	Sequence ID (B)	Critical Design Attribute (C)	Review of Up-Set Conditions to Change Geometry (Applicable HAZOP Guidewords) (D)	Notes/Comments (E)

Table 1 Notes:

1. The system is considered classified. As such, specific information regarding design of components has been intentionally excluded to protect the classified nature of the information.

Column Descriptions:

Column A: This column provides a brief description of each component.

Column B: This column identifies the accident sequence associated with the passive component.

Column C: This column identifies the critical design attribute under consideration along with the conservative values used in the criticality analysis.

Column D: This column identifies the applicable guidewords from the ISA HAZOP procedure that are used to assess the criticality design margin. Additional guidewords are addressed as applicable in the detailed assessment.

Column E: This column provides any notes, comments and concluding statements.

Criticality Assessment of Passive Safe-By-Design Components				
Component Description (A)	**Sequence ID (B)**	**Critical Design Attribute (C)**	**Review of Up-Set Conditions to Change Geometry (Applicable HAZOP Guidewords) (D)**	**Notes/Comments (E)**
Product Piping (largest pipe ID in system)	LOSS OF SAFE-BY-DESIGN ATTRIBUTE	**DIAMETER** 24.4 cm (ID) Keff = 1.0 @ 6 wt %		Based on qualitative assessment, there is margin between the parameter values at normal operating conditions of pipe diameter, amount of U^{235} and enrichment and the conservative design/analysis values for these parameters assumed for criticality.
			More Heat	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a more heat condition that would cause an approach to the critical safe diameter and to adversely affect the maintenance of margin to criticality associated with design and maximum operating parameter values for amount of U^{235} and enrichment.
			More Pressure	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a more pressure condition that would cause an approach to the critical safe diameter and to adversely affect the maintenance of margin to criticality associated with design and maximum operating parameter values for amount of U^{235} and enrichment.
			Corrosion/ Erosion	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a corrosion/erosion condition that would cause an approach to the critical safe diameter. Materials are corrosion/erosion resistant and postulated complete wall erosion would not exceed the critical safe diameter.
			Loss of Confinement or Leakage	Based on qualitative assessment, postulated loss of piping system confinement or leakage will not result in any appreciable accumulation of U^{235} material because of physical limitations of the process (sub-atmospheric). As a result, loss of confinement does not result in a potential for criticality and therefore its consequence is low.
			Fire	Components shall be protected from fire to ensure the critical design attribute of diameter is not adversely impacted.
			Maintenance	Configuration Management shall ensure that maintenance does not adversely impact the critical design attribute of diameter.
				Double Contingency Principle is satisfied as follows. The geometry is criticality safe and no single credible event or failure has been identified whereby the geometry could become unsafe. The enrichment is also controlled such that no single credible failure could result in loss of enrichment control.
Product Piping Arrangement	LOSS OF SAFE-BY-DESIGN ATTRIBUTE	**PHYSICAL ARRANGEMENT**		Based on qualitative assessment, there is margin between the normal operating conditions and the conservative design/analysis conditions assumed for criticality.
			More Heat	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a more heat condition that would adversely affect the maintenance of margin to criticality associated with design and maximum operating parameter values for amount of U^{235} and enrichment.

Criticality Assessment of Passive Safe-By-Design Components				
Component Description (A)	Sequence ID (B)	Critical Design Attribute (C)	Review of Up-Set Conditions to Change Geometry (Applicable HAZOP Guidewords) (D)	Notes/Comments (E)
			More Pressure	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a more pressure condition that would adversely affect the maintenance of margin to criticality associated with design and maximum operating parameter values for amount of U^{235} and enrichment.
			Corrosion/ Erosion	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a corrosion/erosion condition that would affect the maintenance of margin to criticality associated with design and maximum operating parameter values for physical arrangement.
			Loss of Confinement or Leakage	Based on qualitative assessment, postulated loss of piping system confinement or leakage will not result in any appreciable accumulation of U^{235} material because of physical limitations of the process (sub-atmospheric). As a result, loss of confinement does not result in a potential for criticality and therefore its consequence is low.
			Fire	Components shall be protected from fire to ensure the critical design attribute of physical arrangement is not adversely impacted.
			Maintenance	Configuration Management shall ensure that maintenance does not adversely impact the critical design attribute of physical arrangement.
			Impact/Drop	Components shall be protected from impact/drop to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Construction on Site)	Components shall be protected from construction on-Site to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Failure of Above-Ground Liquid Storage Tanks)	Components shall be protected from external flooding (Failure of Above-Ground Liquid Storage Tanks) to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Hurricane)	Components shall be protected from hurricane events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Seismic)	Components shall be protected from seismic events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Tornado)	Components shall be protected from tornado events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Local Intense Precipitation)	Components shall be protected from local intense precipitation events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (External Fire)	Components shall be protected from external fire events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Snow/Ice)	Components shall be protected from external ice/snow events to ensure the critical design attribute of physical arrangement is not adversely impacted.

Criticality Assessment of Passive Safe-By-Design Components				
Component Description (A)	**Sequence ID (B)**	**Critical Design Attribute (C)**	**Review of Up-Set Conditions to Change Geometry (Applicable HAZOP Guidewords) (D)**	**Notes/Comments (E)**
				Double Contingency Principle is satisfied as follows. The geometry is criticality safe and no single credible event or failure has been identified whereby the geometry could become unsafe. The enrichment is also controlled such that no single credible failure could result in loss of enrichment control.
Product Pump Set	LOSS OF SAFE-BY-DESIGN ATTRIBUTE	**PHYSICAL ARRANGEMENT**		Based on qualitative assessment, there is margin between the normal operating conditions and the conservative design/analysis conditions assumed for criticality.
			More Heat	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a more heat condition that would adversely affect the maintenance of margin to criticality associated with design and maximum operating parameter values for amount of U^{235} and enrichment.
			More Pressure	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a more pressure condition that would adversely affect the maintenance of margin to criticality associated with design and maximum operating parameter values for amount of U^{235} and enrichment.
			Corrosion/ Erosion	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a corrosion/erosion condition that would affect the maintenance of margin to criticality associated with design and maximum operating parameter values for physical arrangement.
			Loss of Confinement or Leakage	Based on qualitative assessment, postulated loss of Product Pump Set confinement or leakage will not result in any appreciable accumulation of U^{235} material because of physical limitations of the process (sub-atmospheric). As a result, loss of confinement does not result in a potential for criticality and therefore its consequence is low.
			Fire	Components shall be protected from fire to ensure the critical design attribute of physical arrangement is not adversely impacted.
			Maintenance	Configuration Management shall ensure that maintenance does not adversely impact the critical design attribute of physical arrangement.
			Impact/Drop	Components shall be protected from impact/drop to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Construction on Site)	Components shall be protected from construction on-site to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Failure of Above-Ground Liquid Storage Tanks)	Components shall be protected from external flooding (Failure of Above-Ground Liquid Storage Tanks) to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Hurricane)	Components shall be protected from hurricane events to ensure the critical design attribute of physical arrangement is not adversely impacted.

Criticality Assessment of Passive Safe-By-Design Components				
Component Description (A)	**Sequence ID (B)**	**Critical Design Attribute (C)**	**Review of Up-Set Conditions to Change Geometry (Applicable HAZOP Guidewords) (D)**	**Notes/Comments (E)**
			External Events (Seismic)	Components shall be protected from seismic events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Tornado)	Components shall be protected from tornado events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Local Intense Precipitation)	Components shall be protected from local intense precipitation events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (External Fire)	Components shall be protected from external fire events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Snow/Ice)	Components shall be protected from external ice/snow events to ensure the critical design attribute of physical arrangement is not adversely impacted.
				Double Contingency Principle is satisfied as follows. The geometry is criticality safe and no single credible event or failure has been identified whereby the geometry could become unsafe. The enrichment is also controlled such that no single credible failure could result in loss of enrichment control.
Product Evacuation Pump	LOSS OF SAFE-BY-DESIGN ATTRIBUTE	**VOLUME** 24 liters Keff = 1.0 @ 6 wt %		Based on qualitative assessment, there is margin between the parameter values at normal operating conditions of Product Evacuation Pump volume, amount of U^{235} and enrichment and the conservative design/analysis values for these parameters assumed for criticality.
			More Heat	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a more heat condition that would cause an approach to the critical safe volume and to adversely affect the maintenance of margin to criticality associated with design and maximum operating parameter values for amount of U^{235} and enrichment.
			More Pressure	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a more pressure condition that would cause an approach to the critical safe volume and to adversely affect the maintenance of margin to criticality associated with design and maximum operating parameter values for amount of U^{235} and enrichment.
			Corrosion / Erosion	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a corrosion/erosion condition that would cause an approach to the critical safe volume. Materials are corrosion/erosion resistant and postulated complete wall erosion would not exceed the critical safe volume.
			Loss of Confinement or Leakage	Based on qualitative assessment, postulated loss of Product Evacuation Pump confinement or leakage will not result in any appreciable accumulation of U^{235} material because of physical limitations of the process (sub-atmospheric). As a result, loss of confinement does not result in a potential for criticality and therefore its consequence is low.

Criticality Assessment of Passive Safe-By-Design Components				
Component Description (A)	**Sequence ID (B)**	**Critical Design Attribute (C)**	**Review of Up-Set Conditions to Change Geometry (Applicable HAZOP Guidewords) (D)**	**Notes/Comments (E)**
			Fire	Components shall be protected from fire to ensure the critical design attribute of volume is not adversely impacted.
			Maintenance	Configuration Management shall ensure that maintenance does not adversely impact the critical design attribute of volume.
				Double Contingency Principle is satisfied as follows. The geometry is criticality safe and no single credible event or failure has been identified whereby the geometry could become unsafe. The enrichment is also controlled such that no single credible failure could result in loss of enrichment control.
Product Cold Trap	LOSS OF SAFE-BY-DESIGN ATTRIBUTE	**DIAMETER** 24.4 cm (ID) Keff = 1.0 @ 6 wt %		Based on qualitative assessment, there is margin between the parameter values at normal operating conditions of component diameter, amount of U^{235} and enrichment and the conservative design/analysis values for these parameters assumed for criticality.
			More Heat	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a more heat condition that would cause an approach to the critical safe diameter and to adversely affect the maintenance of margin to criticality associated with design and maximum operating parameter values for amount of U^{235} and enrichment.
			More Pressure	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a more pressure condition that would cause an approach to the critical safe diameter and to adversely affect the maintenance of margin to criticality associated with design and maximum operating parameter values for amount of U^{235} and enrichment.
			Corrosion/ Erosion	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a corrosion/erosion condition that would cause an approach to the critical safe diameter. Materials are corrosion/erosion resistant and postulated complete wall erosion would not exceed the critical safe diameter.
			Loss of Confinement or Leakage	Based on qualitative assessment, postulated loss of cold trap confinement or leakage and will not result in any appreciable accumulation of material because of physical limitations of the process (sub-atmospheric). As a result, loss of confinement does not result in a potential for criticality and therefore its consequence is low.
			Fire	Components shall be protected from fire to ensure the critical design attribute of diameter is not adversely impacted.
			Maintenance	Configuration Management shall ensure that maintenance does not adversely impact the critical design attribute of diameter.
				Double Contingency Principle is satisfied as follows. The geometry is criticality safe and no single credible event or failure has been identified whereby the geometry could become unsafe. The enrichment is also controlled such that no single credible failure could result in loss of enrichment control.

Criticality Assessment of Passive Safe-By-Design Components				
Component Description (A)	**Sequence ID (B)**	**Critical Design Attribute (C)**	**Review of Up-Set Conditions to Change Geometry (Applicable HAZOP Guidewords) (D)**	**Notes/Comments (E)**
Carbon Trap (Product Evacuation)	LOSS OF SAFE-BY-DESIGN ATTRIBUTE	**DIAMETER** 24.4 cm (ID) Keff = 1.0 @ 6 wt %		Based on qualitative assessment, there is margin between the parameter values at normal operating conditions of Carbon Trap diameter, amount of U^{235} and enrichment and the conservative design/analysis values for these parameters assumed for criticality.
			More Heat	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a more heat condition that would cause an approach to the critical safe diameter and to adversely affect the maintenance of margin to criticality associated with design and maximum operating parameter values for amount of U^{235} and enrichment.
			More Pressure	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a more pressure condition that would cause an approach to the critical safe diameter and to adversely affect the maintenance of margin to criticality associated with design and maximum operating parameter values for amount of U^{235} and enrichment.
			Corrosion/ Erosion	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a corrosion/erosion condition that would cause an approach to the critical safe diameter. Materials are corrosion/erosion resistant and postulated complete wall erosion would not exceed the critical safe diameter.
			Loss of Confinement or Leakage	Based on qualitative assessment, postulated loss of Carbon Trap confinement or leakage will not result in any appreciable accumulation of U^{235} material because of physical limitations of the process (sub-atmospheric). As a result, loss of confinement does not result in a potential for criticality and therefore its consequence is low.
			Fire	Components shall be protected from fire to ensure the critical design attribute of diameter is not adversely impacted.
			Maintenance	Configuration Management shall ensure that maintenance does not adversely impact the critical design attribute of diameter.
				Double Contingency Principle is satisfied as follows. The geometry is criticality safe and no single credible event or failure has been identified whereby the geometry could become unsafe. The enrichment is also controlled such that no single credible failure could result in loss of enrichment control.
Aluminum Oxide Trap (Product Evacuation)	LOSS OF SAFE-BY-DESIGN ATTRIBUTE	**DIAMETER** 24.4 cm (ID) Keff = 1.0 @ 6 wt %		Based on qualitative assessment, there is margin between the parameter values at normal operating conditions of Aluminum Oxide Trap diameter, amount of U^{235} and enrichment and the conservative design/analysis values for these parameters assumed for criticality.
			More Heat	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a more heat condition that would cause an approach to the critical safe diameter and to adversely affect the maintenance of margin to criticality associated with design and maximum operating parameter values for amount of U^{235} and enrichment.

Criticality Assessment of Passive Safe-By-Design Components				
Component Description (A)	**Sequence ID (B)**	**Critical Design Attribute (C)**	**Review of Up-Set Conditions to Change Geometry (Applicable HAZOP Guidewords) (D)**	**Notes/Comments (E)**
			More Pressure	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a more pressure condition that would cause an approach to the critical safe diameter and to adversely affect the maintenance of margin to criticality associated with design and maximum operating parameter values for amount of U^{235} and enrichment.
			Corrosion/ Erosion	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a corrosion/erosion condition that would cause an approach to the critical safe diameter. Materials are corrosion/erosion resistant and postulated complete wall erosion would not exceed the critical safe diameter.
			Loss of Confinement or Leakage	Based on qualitative assessment, postulated loss of Aluminum Oxide Trap confinement or leakage will not result in any appreciable accumulation of U^{235} material because of physical limitations of the process (sub-atmospheric). As a result, loss of confinement does not result in a potential for criticality and therefore its consequence is low.
			Fire	Components shall be protected from fire to ensure the critical design attribute of diameter is not adversely impacted.
			Maintenance	Configuration Management shall ensure that maintenance does not adversely impact the critical design attribute of diameter.
				Double Contingency Principle is satisfied as follows. The geometry is criticality safe and no single credible event or failure has been identified whereby the geometry could become unsafe. The enrichment is also controlled such that no single credible failure could result in loss of enrichment control.
Chemical Absorber Oil Trap (Product Evacuation)	LOSS OF SAFE-BY-DESIGN ATTRIBUTE	**VOLUME** 24 liters Keff = 1.0 @ 6 wt %		Based on qualitative assessment, there is margin between the parameter values at normal operating conditions of Chemical Absorber Oil Trap volume, amount of U^{235} and enrichment and the conservative design/analysis values for these parameters assumed for criticality.
			More Heat	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a more heat condition that would cause an approach to the critical safe volume and to adversely affect the maintenance of margin to criticality associated with design and maximum operating parameter values for amount of U^{235} and enrichment.
			More Pressure	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a more pressure condition that would cause an approach to the critical safe volume and to adversely affect the maintenance of margin to criticality associated with design and maximum operating parameter values for amount of U^{235} and enrichment.
			Corrosion/ Erosion	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a corrosion/erosion condition that would cause an approach to the critical safe volume. Materials are corrosion/erosion resistant and postulated complete wall erosion would not exceed the critical safe volume.

Criticality Assessment of Passive Safe-By-Design Components				
Component Description (A)	**Sequence ID (B)**	**Critical Design Attribute (C)**	**Review of Up-Set Conditions to Change Geometry (Applicable HAZOP Guidewords) (D)**	**Notes/Comments (E)**
			Loss of Confinement or Leakage	Based on qualitative assessment, postulated loss of Chemical Absorber Oil Trap confinement or leakage will not result in any appreciable accumulation of U^{235} material because of physical limitations of the process (sub-atmospheric). As a result, loss of confinement does not result in a potential for criticality and therefore its consequence is low.
			Fire	Components shall be protected from fire to ensure the critical design attribute of volume is not adversely impacted.
			Maintenance	Configuration Management shall ensure that maintenance does not adversely impact the critical design attribute of volume.
				Double Contingency Principle is satisfied as follows. The geometry is criticality safe and no single credible event or failure has been identified whereby the geometry could become unsafe. The enrichment is also controlled such that no single credible failure could result in loss of enrichment control.
Oil Trap (Product Evacuation)	LOSS OF SAFE-BY-DESIGN ATTRIBUTE	**DIAMETER** 24.4 cm (ID) Keff = 1.0 @ 6 wt %		Based on qualitative assessment, there is margin between the parameter values at normal operating conditions of Oil Trap diameter, amount of U^{235} and enrichment and the conservative design/analysis values for these parameters assumed for criticality.
			More Heat	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a more heat condition that would cause an approach to the critical safe diameter and to adversely affect the maintenance of margin to criticality associated with design and maximum operating parameter values for amount of U^{235} and enrichment.
			More Pressure	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a more pressure condition that would cause an approach to the critical safe diameter and to adversely affect the maintenance of margin to criticality associated with design and maximum operating parameter values for amount of U^{235} and enrichment.
			Corrosion/ Erosion	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a corrosion/erosion condition that would cause an approach to the critical safe diameter. Materials are corrosion/erosion resistant and postulated complete wall erosion would not exceed the critical safe diameter.
			Loss of Confinement or Leakage	Based on qualitative assessment, postulated loss of Oil Trap confinement or leakage will not result in any appreciable accumulation of U^{235} material because of physical limitations of the process (sub-atmospheric). As a result, loss of confinement does not result in a potential for criticality and therefore its consequence is low.
			Fire	Components shall be protected from fire to ensure the critical design attribute of diameter is not adversely impacted.
			Maintenance	Configuration Management shall ensure that maintenance does not adversely impact the critical design attribute of diameter.

Criticality Assessment of Passive Safe-By-Design Components				
Component Description (A)	**Sequence ID (B)**	**Critical Design Attribute (C)**	**Review of Up-Set Conditions to Change Geometry (Applicable HAZOP Guidewords) (D)**	**Notes/Comments (E)**
				Double Contingency Principle is satisfied as follows. The geometry is criticality safe and no single credible event or failure has been identified whereby the geometry could become unsafe. The enrichment is also controlled such that no single credible failure could result in loss of enrichment control.
Vacuum Cleaner	LOSS OF SAFE-BY-DESIGN ATTRIBUTE	**DIAMETER** 24.4 cm (ID) Keff = 1.0 @ 6 wt %		Based on qualitative assessment, there is margin between the parameter value at normal operating conditions of Vacuum Cleaner diameter and the conservative design/analysis value for this parameter assumed for criticality.
			More Heat	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a more heat condition that would cause an approach to the critical safe diameter and to adversely affect the maintenance of margin to criticality associated with design and maximum operating parameter value.
			More Pressure	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a more pressure condition that would cause an approach to the critical safe diameter and to adversely affect the maintenance of margin to criticality associated with design and maximum operating parameter value.
			Corrosion/ Erosion	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a corrosion/erosion condition that would cause an approach to the critical safe diameter. Materials are corrosion/erosion resistant and postulated complete wall erosion would not exceed the critical safe diameter.
			Loss of Confinement or Leakage	Based on qualitative assessment, postulated loss of Vacuum Cleaner confinement or leakage will not result in any appreciable accumulation of U^{235}. As a result, loss of confinement does not result in a potential for criticality and therefore its consequence is low.
			Fire	Components shall be protected from fire to ensure the critical design attribute of diameter is not adversely impacted.
			Maintenance	Configuration Management shall ensure that maintenance does not adversely impact the critical design attribute of diameter.
			Impact/Drop	Components shall be protected from Impact/Drop to ensure the critical design attribute of diameter is not adversely impacted.
			External Events (Construction on Site)	Components shall be protected from Construction on Site to ensure the critical design attribute of diameter is not adversely impacted.
			External Events (Failure of Above-Ground Liquid Tanks)	Components shall be protected from Failure of Above-Ground Liquid Tanks to ensure the critical design attribute of diameter is not adversely impacted.
			External Events (Hurricane)	Components shall be protected from Hurricane events to ensure the critical design attribute of diameter is not adversely impacted.
			External Events (Seismic)	Components shall be protected from Seismic events to ensure the critical design attribute of diameter is not adversely impacted.

Criticality Assessment of Passive Safe-By-Design Components				
Component Description (A)	**Sequence ID (B)**	**Critical Design Attribute (C)**	**Review of Up-Set Conditions to Change Geometry (Applicable HAZOP Guidewords) (D)**	**Notes/Comments (E)**
			External Events (Tornado)	Components shall be protected from Tornado events to ensure the critical design attribute of diameter is not adversely impacted.
			External Events (Local Intense Precipitation)	Components shall be protected from Local Intense Precipitation events to ensure the critical design attribute of diameter is not adversely impacted.
			External Events (Snow/Ice)	Components shall be protected from Snow/Ice events to ensure the critical design attribute of diameter is not adversely impacted.
				Double Contingency Principle is satisfied as follows. The geometry is criticality safe and no single credible event or failure has been identified whereby the geometry could become unsafe. The enrichment is also controlled such that no single credible failure could result in loss of enrichment control.
Product Evacuation Pump/Chemical Trap Set	LOSS OF SAFE-BY-DESIGN ATTRIBUTE	**PHYSICAL ARRANGEMENT**		Based on qualitative assessment, there is margin between the normal operating conditions and the conservative design/analysis conditions assumed for criticality.
			More Heat	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a more heat condition that would adversely affect the maintenance of margin to criticality associated with design and maximum operating parameter values for amount of U^{235} and enrichment.
			More Pressure	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a more pressure condition that would adversely affect the maintenance of margin to criticality associated with design and maximum operating parameter values for amount of U^{235} and enrichment.
			Corrosion/ Erosion	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a corrosion/erosion condition that would affect the maintenance of margin to criticality associated with design and maximum operating parameter values for physical arrangement.
			Loss of Confinement or Leakage	Based on qualitative assessment, postulated loss of Product Evacuation Pump/Chemical Trap Set confinement or leakage will not result in any appreciable accumulation of U^{235} material because of physical limitations of the process (sub-atmospheric). As a result, loss of confinement does not result in a potential for criticality and therefore its consequence is low.
			Fire	Components shall be protected from fire to ensure the critical design attribute of physical arrangement is not adversely impacted.
			Maintenance	Configuration Management shall ensure that maintenance does not adversely impact the critical design attribute of physical arrangement.
			Impact/Drop	Components shall be protected from impact/drop to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Construction on Site)	Components shall be protected from construction on-Site to ensure the critical design attribute of physical arrangement is not adversely impacted.

Criticality Assessment of Passive Safe-By-Design Components				
Component Description (A)	**Sequence ID (B)**	**Critical Design Attribute (C)**	**Review of Up-Set Conditions to Change Geometry (Applicable HAZOP Guidewords) (D)**	**Notes/Comments (E)**
			External Events (Failure of Above-Ground Liquid Storage Tanks)	Components shall be protected from external flooding (Failure of Above-Ground Liquid Storage Tanks) to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Hurricane)	Components shall be protected from hurricane events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Seismic)	Components shall be protected from seismic events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Tornado)	Components shall be protected from tornado events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Local Intense Precipitation)	Components shall be protected from local intense precipitation events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (External Fire)	Components shall be protected from external fire events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Snow/Ice)	Components shall be protected from external ice/snow events to ensure the critical design attribute of physical arrangement is not adversely impacted.
				Double Contingency Principle is satisfied as follows. The geometry is criticality safe and no single credible event or failure has been identified whereby the geometry could become unsafe. The enrichment is also controlled such that no single credible failure could result in loss of enrichment control.
Pump Transport Device	LOSS OF SAFE-BY-DESIGN ATTRIBUTE	**PHYSICAL ARRANGEMENT**		Based on qualitative assessment, there is margin between the normal operating conditions and the conservative design/analysis conditions assumed for criticality.
			Corrosion/ Erosion	*Based on qualitative assessment, it is highly unlikely for a process* deviation to result in a corrosion/erosion condition that would affect the maintenance of margin to criticality associated with design and maximum operating parameter values for physical arrangement.
			Fire	Components shall be protected from fire to ensure the critical design attribute of physical arrangement is not adversely impacted.
			Maintenance	Configuration Management shall ensure that maintenance does not adversely impact the critical design attribute of physical arrangement.
			Impact/Drop	Components shall be protected from impact/drop to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Construction on Site)	Components shall be protected from construction on-Site to ensure the critical design attribute of physical arrangement is not adversely impacted.

Criticality Assessment of Passive Safe-By-Design Components				
Component Description (A)	**Sequence ID (B)**	**Critical Design Attribute (C)**	**Review of Up-Set Conditions to Change Geometry (Applicable HAZOP Guidewords) (D)**	**Notes/Comments (E)**
			External Events (Failure of Above-Ground Liquid Storage Tanks)	Components shall be protected from external flooding (Failure of Above-Ground Liquid Storage Tanks) to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Hurricane)	Components shall be protected from hurricane events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Seismic)	Components shall be protected from seismic events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Tornado)	Components shall be protected from tornado events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Local Intense Precipitation)	Components shall be protected from local intense precipitation events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (External Fire)	Components shall be protected from external fire events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Snow/Ice)	Components shall be protected from external ice/snow events to ensure the critical design attribute of physical arrangement is not adversely impacted.
				Double Contingency Principle is satisfied as follows. The geometry is criticality safe and no single credible event or failure has been identified whereby the geometry could become unsafe. The enrichment is also controlled such that no single credible failure could result in loss of enrichment control.
Chemical Trap Transport Device	LOSS OF SAFE-BY-DESIGN ATTRIBUTE	**PHYSICAL ARRANGEMENT**		Based on qualitative assessment, there is margin between the normal operating conditions and the conservative design/analysis conditions assumed for criticality.
			Corrosion/ Erosion	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a corrosion/erosion condition that would affect the maintenance of margin to criticality associated with design and maximum operating parameter values for physical arrangement.
			Fire	Components shall be protected from fire to ensure the critical design attribute of physical arrangement is not adversely impacted.
			Maintenance	Configuration Management shall ensure that maintenance does not adversely impact the critical design attribute of physical arrangement.
			Impact/Drop	Components shall be protected from impact/drop to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Construction on Site)	Components shall be protected from construction on-Site to ensure the critical design attribute of physical arrangement is not adversely impacted.

Criticality Assessment of Passive Safe-By-Design Components				
Component Description (A)	**Sequence ID (B)**	**Critical Design Attribute (C)**	**Review of Up-Set Conditions to Change Geometry (Applicable HAZOP Guidewords) (D)**	**Notes/Comments (E)**
			External Events (Failure of Above-Ground Liquid Storage Tanks)	Components shall be protected from external flooding (Failure of Above-Ground Liquid Storage Tanks) to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Hurricane)	Components shall be protected from hurricane events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Seismic)	Components shall be protected from seismic events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Tornado)	Components shall be protected from tornado events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Local Intense Precipitation)	Components shall be protected from local intense precipitation events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (External Fire)	Components shall be protected from external fire events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Snow/Ice)	Components shall be protected from external ice/snow events to ensure the critical design attribute of physical arrangement is not adversely impacted.
				Double Contingency Principle is satisfied as follows. The geometry is criticality safe and no single credible event or failure has been identified whereby the geometry could become unsafe. The enrichment is also controlled such that no single credible failure could result in loss of enrichment control.
Assay Sampling Evacuation Pump	LOSS OF SAFE-BY-DESIGN ATTRIBUTE	**VOLUME** 24 liters Keff = 1.0 @ 6 wt %		Based on qualitative assessment, there is margin between the parameter values at normal operating conditions of Assay Sampling Evacuation Pump volume, amount of U^{235} and enrichment and the conservative design/analysis values for these parameters assumed for criticality.
			More Heat	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a more heat condition that would cause an approach to the critical safe volume and to adversely affect the maintenance of margin to criticality associated with design and maximum operating parameter values for amount of U^{235} and enrichment.
			More Pressure	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a more pressure condition that would cause an approach to the critical safe volume and to adversely affect the maintenance of margin to criticality associated with design and maximum operating parameter values for amount of U^{235} and enrichment.

Criticality Assessment of Passive Safe-By-Design Components				
Component Description (A)	**Sequence ID (B)**	**Critical Design Attribute (C)**	**Review of Up-Set Conditions to Change Geometry (Applicable HAZOP Guidewords) (D)**	**Notes/Comments (E)**
			Corrosion/ Erosion	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a corrosion/erosion condition that would cause an approach to the critical safe volume. Materials are corrosion/erosion resistant and postulated complete wall erosion would not exceed the critical safe volume.
			Loss of Confinement or Leakage	Based on qualitative assessment, postulated loss of Assay Sampling Evacuation Pump confinement or leakage will not result in any appreciable accumulation of U^{235} material because of physical limitations of the process (sub-atmospheric). As a result, loss of confinement does not result in a potential for criticality and therefore its consequence is low.
			Fire	Components shall be protected from fire to ensure the critical design attribute of volume is not adversely impacted.
			Maintenance	Configuration Management shall ensure that maintenance does not adversely impact the critical design attribute of volume.
				Double Contingency Principle is satisfied as follows. The geometry is criticality safe and no single credible event or failure has been identified whereby the geometry could become unsafe. The enrichment is also controlled such that no single credible failure could result in loss of enrichment control.
Assay Sampling Rig	LOSS OF SAFE-BY-DESIGN ATTRIBUTE	**PHYSICAL ARRANGEMENT**		Based on qualitative assessment, there is margin between the normal operating conditions and the conservative design/analysis conditions assumed for criticality.
			More Heat	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a more heat condition that would adversely affect the maintenance of margin to criticality associated with design and maximum operating parameter values for amount of U^{235} and enrichment.
			More Pressure	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a more pressure condition that would adversely affect the maintenance of margin to criticality associated with design and maximum operating parameter values for amount of U^{235} and enrichment.
			Corrosion/ Erosion	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a corrosion/erosion condition that would affect the maintenance of margin to criticality associated with design and maximum operating parameter values for physical arrangement.
			Loss of Confinement or Leakage	Based on qualitative assessment, postulated loss of Assay Sampling Rig confinement or leakage will not result in any appreciable accumulation of U^{235} material because of physical limitations of the process (sub-atmospheric). As a result, loss of confinement does not result in a potential for criticality and therefore its consequence is low.
			Fire	Components shall be protected from fire to ensure the critical design attribute of physical arrangement is not adversely impacted.
			Maintenance	Configuration Management shall ensure that maintenance does not adversely impact the critical design attribute of physical arrangement.

Criticality Assessment of Passive Safe-By-Design Components				
Component Description (A)	**Sequence ID (B)**	**Critical Design Attribute (C)**	**Review of Up-Set Conditions to Change Geometry (Applicable HAZOP Guidewords) (D)**	**Notes/Comments (E)**
			Impact/Drop	Components shall be protected from impact/drop to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Construction on Site)	Components shall be protected from construction on-Site to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Failure of Above-Ground Liquid Storage Tanks)	Components shall be protected from external flooding (Failure of Above-Ground Liquid Storage Tanks) to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Hurricane)	Components shall be protected from hurricane events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Seismic)	Components shall be protected from seismic events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Tornado)	Components shall be protected from tornado events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Local Intense Precipitation)	Components shall be protected from local intense precipitation events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (External Fire)	Components shall be protected from external fire events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Snow/Ice)	Components shall be protected from external ice/snow events to ensure the critical design attribute of physical arrangement is not adversely impacted.
				Double Contingency Principle is satisfied as follows. The geometry is criticality safe and no single credible event or failure has been identified whereby the geometry could become unsafe. The enrichment is also controlled such that no single credible failure could result in loss of enrichment control.
Carbon Trap (Assay Sampling Rig)	LOSS OF SAFE-BY-DESIGN ATTRIBUTE	**DIAMETER** 24.4 cm (ID) Keff = 1.0 @ 6 wt %		Based on qualitative assessment, there is margin between the parameter values at normal operating conditions of Carbon Trap diameter, amount of U^{235} and enrichment and the conservative design/analysis values for these parameters assumed for criticality.
			More Heat	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a more heat condition that would cause an approach to the critical safe diameter and to adversely affect the maintenance of margin to criticality associated with design and maximum operating parameter values for amount of U^{235} and enrichment.

Criticality Assessment of Passive Safe-By-Design Components				
Component Description (A)	**Sequence ID (B)**	**Critical Design Attribute (C)**	**Review of Up-Set Conditions to Change Geometry (Applicable HAZOP Guidewords) (D)**	**Notes/Comments (E)**
			More Pressure	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a more pressure condition that would cause an approach to the critical safe diameter and to adversely affect the maintenance of margin to criticality associated with design and maximum operating parameter values for amount of U^{235} and enrichment.
			Corrosion/ Erosion	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a corrosion/erosion condition that would cause an approach to the critical safe diameter. Materials are corrosion/erosion resistant and postulated complete wall erosion would not exceed the critical safe diameter.
			Loss of Confinement or Leakage	Based on qualitative assessment, postulated loss of Carbon Trap confinement or leakage will not result in any appreciable accumulation of U^{235} material because of physical limitations of the process (sub-atmospheric). As a result, loss of confinement does not result in a potential for criticality and therefore its consequence is low.
			Fire	Components shall be protected from fire to ensure the critical design attribute of diameter is not adversely impacted.
			Maintenance	Configuration Management shall ensure that maintenance does not adversely impact the critical design attribute of diameter.
				Double Contingency Principle is satisfied as follows. The geometry is criticality safe and no single credible event or failure has been identified whereby the geometry could become unsafe. The enrichment is also controlled such that no single credible failure could result in loss of enrichment control.
Chemical Absorber Oil Trap (Assay Sampling Rig)	LOSS OF SAFE-BY-DESIGN ATTRIBUTE	**VOLUME** 24 liters Keff = 1.0 @ 6 wt %		Based on qualitative assessment, there is margin between the parameter values at normal operating conditions of Chemical Absorber Oil Trap volume, amount of U^{235} and enrichment and the conservative design/analysis values for these parameters assumed for criticality.
			More Heat	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a more heat condition that would cause an approach to the critical safe volume and to adversely affect the maintenance of margin to criticality associated with design and maximum operating parameter values for amount of U^{235} and enrichment.
			More Pressure	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a more pressure condition that would cause an approach to the critical safe volume and to adversely affect the maintenance of margin to criticality associated with design and maximum operating parameter values for amount of U^{235} and enrichment.
			Corrosion/ Erosion	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a corrosion/erosion condition that would cause an approach to the critical safe volume. Materials are corrosion/erosion resistant and postulated complete wall erosion would not exceed the critical safe volume.

Criticality Assessment of Passive Safe-By-Design Components				
Component Description (A)	**Sequence ID (B)**	**Critical Design Attribute (C)**	**Review of Up-Set Conditions to Change Geometry (Applicable HAZOP Guidewords) (D)**	**Notes/Comments (E)**
			Loss of Confinement or Leakage	Based on qualitative assessment, postulated loss of Chemical Absorber Oil Trap confinement or leakage will not result in any appreciable accumulation of U^{235} material because of physical limitations of the process (sub-atmospheric). As a result, loss of confinement does not result in a potential for criticality and therefore its consequence is low.
			Fire	Components shall be protected from fire to ensure the critical design attribute of volume is not adversely impacted.
			Maintenance	Configuration Management shall ensure that maintenance does not adversely impact the critical design attribute of volume.
				Double Contingency Principle is satisfied as follows. The geometry is criticality safe and no single credible event or failure has been identified whereby the geometry could become unsafe. The enrichment is also controlled such that no single credible failure could result in loss of enrichment control.
Oil Trap (Assay Sampling Rig)	LOSS OF SAFE-BY-DESIGN ATTRIBUTE	**DIAMETER** 24.4 cm (ID) Keff = 1.0 @ 6 wt %		Based on qualitative assessment, there is margin between the parameter values at normal operating conditions of Oil Trap diameter, amount of U^{235} and enrichment and the conservative design/analysis values for these parameters assumed for criticality.
			More Heat	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a more heat condition that would cause an approach to the critical safe diameter and to adversely affect the maintenance of margin to criticality associated with design and maximum operating parameter values for amount of U^{235} and enrichment.
			More Pressure	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a more pressure condition that would cause an approach to the critical safe diameter and to adversely affect the maintenance of margin to criticality associated with design and maximum operating parameter values for amount of U^{235} and enrichment.
			Corrosion/ Erosion	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a corrosion/erosion condition that would cause an approach to the critical safe diameter. Materials are corrosion/erosion resistant and postulated complete wall erosion would not exceed the critical safe diameter.
			Loss of Confinement or Leakage	Based on qualitative assessment, postulated loss of Oil Catch Pot confinement or leakage will not result in any appreciable accumulation of U^{235} material because of physical limitations of the process (sub-atmospheric). As a result, loss of confinement does not result in a potential for criticality and therefore its consequence is low.
			Fire	Components shall be protected from fire to ensure the critical design attribute of diameter is not adversely impacted.
			Maintenance	Configuration Management shall ensure that maintenance does not adversely impact the critical design attribute of diameter.

Criticality Assessment of Passive Safe-By-Design Components				
Component Description (A)	**Sequence ID (B)**	**Critical Design Attribute (C)**	**Review of Up-Set Conditions to Change Geometry (Applicable HAZOP Guidewords) (D)**	**Notes/Comments (E)**
				Double Contingency Principle is satisfied as follows. The geometry is criticality safe and no single credible event or failure has been identified whereby the geometry could become unsafe. The enrichment is also controlled such that no single credible failure could result in loss of enrichment control.
Assay Sampling Piping (largest pipe ID in system)	LOSS OF SAFE-BY-DESIGN ATTRIBUTE	**DIAMETER** 24.4 cm (ID) Keff = 1.0 @ 6 wt %		Based on qualitative assessment, there is margin between the parameter values at normal operating conditions of pipe diameter, amount of U^{235} and enrichment and the conservative design/analysis values for these parameters assumed for criticality.
			More Heat	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a more heat condition that would cause an approach to the critical safe diameter and to adversely affect the maintenance of margin to criticality associated with design and maximum operating parameter values for amount of U^{235} and enrichment.
			More Pressure	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a more pressure condition that would cause an approach to the critical safe diameter and to adversely affect the maintenance of margin to criticality associated with design and maximum operating parameter values for amount of U^{235} and enrichment.
			Corrosion/ Erosion	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a corrosion/erosion condition that would cause an approach to the critical safe diameter. Materials are corrosion/erosion resistant and postulated complete wall erosion would not exceed the critical safe diameter.
			Loss of Confinement or Leakage	Based on qualitative assessment, postulated loss of piping system confinement or leakage will not result in any appreciable accumulation of U^{235} material because of physical limitations of the process (sub-atmospheric). As a result, loss of confinement does not result in a potential for criticality and therefore its consequence is low.
			Fire	Components shall be protected from fire to ensure the critical design attribute of diameter is not adversely impacted.
			Maintenance	Configuration Management shall ensure that maintenance does not adversely impact the critical design attribute of diameter.
				Double Contingency Principle is satisfied as follows. The geometry is criticality safe and no single credible event or failure has been identified whereby the geometry could become unsafe. The enrichment is also controlled such that no single credible failure could result in loss of enrichment control.
Assay Sampling Piping Arrangement	LOSS OF SAFE-BY-DESIGN ATTRIBUTE	**PHYSICAL ARRANGEMENT**		Based on qualitative assessment, there is margin between the normal operating conditions and the conservative design/analysis conditions assumed for criticality.

Criticality Assessment of Passive Safe-By-Design Components				
Component Description (A)	**Sequence ID (B)**	**Critical Design Attribute (C)**	**Review of Up-Set Conditions to Change Geometry (Applicable HAZOP Guidewords) (D)**	**Notes/Comments (E)**
			More Heat	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a more heat condition that would adversely affect the maintenance of margin to criticality associated with design and maximum operating parameter values for amount of U^{235} and enrichment.
			More Pressure	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a more pressure condition that would adversely affect the maintenance of margin to criticality associated with design and maximum operating parameter values for amount of U^{235} and enrichment.
			Corrosion/ Erosion	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a corrosion/erosion condition that would affect the maintenance of margin to criticality associated with design and maximum operating parameter values for physical arrangement.
			Loss of Confinement or Leakage	Based on qualitative assessment, postulated loss of piping system confinement or leakage will not result in any appreciable accumulation of U^{235} material because of physical limitations of the process (sub-atmospheric). As a result, loss of confinement does not result in a potential for criticality and therefore its consequence is low.
			Fire	Components shall be protected from fire to ensure the critical design attribute of physical arrangement is not adversely impacted.
			Maintenance	Configuration Management shall ensure that maintenance does not adversely impact the critical design attribute of physical arrangement.
			Impact/Drop	Components shall be protected from impact/drop to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Construction on Site)	Components shall be protected from construction on-Site to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Failure of Above-Ground Liquid Storage Tanks)	Components shall be protected from external flooding (Failure of Above-Ground Liquid Storage Tanks) to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Hurricane)	Components shall be protected from hurricane events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Seismic)	Components shall be protected from seismic events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Tornado)	Components shall be protected from tornado events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Local Intense Precipitation)	Components shall be protected from local intense precipitation events to ensure the critical design attribute of physical arrangement is not adversely impacted.

Criticality Assessment of Passive Safe-By-Design Components				
Component Description (A)	**Sequence ID (B)**	**Critical Design Attribute (C)**	**Review of Up-Set Conditions to Change Geometry (Applicable HAZOP Guidewords) (D)**	**Notes/Comments (E)**
			External Events (External Fire)	Components shall be protected from external fire events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Snow/Ice)	Components shall be protected from external ice/snow events to ensure the critical design attribute of physical arrangement is not adversely impacted.
				Double Contingency Principle is satisfied as follows. The geometry is criticality safe and no single credible event or failure has been identified whereby the geometry could become unsafe. The enrichment is also controlled such that no single credible failure could result in loss of enrichment control.
Mobile UF_6 Rig	LOSS OF SAFE-BY-DESIGN ATTRIBUTE	**PHYSICAL ARRANGEMENT**		Based on qualitative assessment, there is margin between the normal operating conditions and the conservative design/analysis conditions assumed for criticality.
			More Heat	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a more heat condition that would adversely affect the maintenance of margin to criticality associated with design and maximum operating parameter values for amount of U^{235} and *enrichment.*
			More Pressure	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a more pressure condition that would adversely affect the maintenance of margin to criticality associated with design and maximum operating parameter values for amount of U^{235} and enrichment.
			Corrosion/ Erosion	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a corrosion/erosion condition that would affect the maintenance of margin to criticality associated with design and maximum operating parameter values for physical arrangement.
			Loss of Confinement or Leakage	Based on qualitative assessment, postulated loss of Mobile UF_6 Rig confinement or leakage will not result in any appreciable accumulation of U^{235} material because of physical limitations of the process (sub-atmospheric). As a result, loss of confinement does not result in a potential for criticality and therefore its consequence is low.
			Fire	Components shall be protected from fire to ensure the critical design attribute of physical arrangement is not adversely impacted.
			Maintenance	Configuration Management shall ensure that maintenance does not adversely impact the critical design attribute of physical arrangement.
			Impact/Drop	Components shall be protected from impact/drop to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Construction on Site)	Components shall be protected from construction on-Site to ensure the critical design attribute of physical arrangement is not adversely impacted.

Criticality Assessment of Passive Safe-By-Design Components				
Component Description (A)	**Sequence ID (B)**	**Critical Design Attribute (C)**	**Review of Up-Set Conditions to Change Geometry (Applicable HAZOP Guidewords) (D)**	**Notes/Comments (E)**
			External Events (Failure of Above-Ground Liquid Storage Tanks)	Components shall be protected from external flooding (Failure of Above-Ground Liquid Storage Tanks) to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Hurricane)	Components shall be protected from hurricane events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Seismic)	Components shall be protected from seismic events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Tornado)	Components shall be protected from tornado events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Local Intense Precipitation)	Components shall be protected from local intense precipitation events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (External Fire)	Components shall be protected from external fire events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Snow/Ice)	Components shall be protected from external ice/snow events to ensure the critical design attribute of physical arrangement is not adversely impacted.
				Double Contingency Principle is satisfied as follows. The geometry is criticality safe and no single credible event or failure has been identified whereby the geometry could become unsafe. The enrichment is also controlled such that no single credible failure could result in loss of enrichment control.
Finger Sample Bottle	LOSS OF SAFE-BY-DESIGN ATTRIBUTE	**DIAMETER** 24.4 cm (ID) Keff = 1.0 @ 6 wt %		Based on qualitative assessment, there is margin between the parameter values at normal operating conditions of Finger Sample Bottle diameter, amount of U^{235} and enrichment and the conservative design/analysis values for these parameters assumed for criticality.
			More Heat	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a more heat condition that would cause an approach to the critical safe diameter and to adversely affect the maintenance of margin to criticality associated with design and maximum operating parameter values for amount of U^{235} and enrichment.
			More Pressure	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a more pressure condition that would cause an approach to the critical safe diameter and to adversely affect the maintenance of margin to criticality associated with design and maximum operating parameter values for amount of U^{235} and enrichment.

Criticality Assessment of Passive Safe-By-Design Components				
Component Description (A)	Sequence ID (B)	Critical Design Attribute (C)	Review of Up-Set Conditions to Change Geometry (Applicable HAZOP Guidewords) (D)	Notes/Comments (E)
			Corrosion/ Erosion	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a corrosion/erosion condition that would cause an approach to the critical safe diameter. Materials are corrosion/erosion resistant and postulated complete wall erosion would not exceed the critical safe diameter.
			Loss of Confinement or Leakage	Based on qualitative assessment, postulated loss of Finger Sample Bottle confinement or leakage will not result in any appreciable accumulation of U^{235} material because of physical limitations of the process (sub-atmospheric). As a result, loss of confinement does not result in a potential for criticality and therefore its consequence is low.
			Fire	Components shall be protected from fire to ensure the critical design attribute of diameter is not adversely impacted.
			Maintenance	Configuration Management shall ensure that maintenance does not adversely impact the critical design attribute of diameter.
				Double Contingency Principle is satisfied as follows. The geometry is criticality safe and no single credible event or failure has been identified whereby the geometry could become unsafe. The enrichment is also controlled such that no single credible failure could result in loss of enrichment control.

Column Descriptions:

Column A: This column provides a brief description of each component.

Column B: This column identifies the accident sequence associated with the passive component.

Column C: This column identifies the critical design attribute under consideration along with the conservative values used in the criticality analysis.

Column D: This column identifies the applicable guidewords from the ISA HAZOP procedure that are used to assess the criticality design margin. Additional guidewords are addressed as applicable in the detailed assessment.

Column E: This column provides any notes, comments and concluding statements.

Table 3.7-8 Tails System
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Criticality Assessment of Passive Safe-By-Design Components				
Component Description (A)	**Sequence ID (B)**	**Critical Design Attribute C)**	**Review of Up-Set Conditions to Change Geometry (Applicable HAZOP Guidewords) (D)**	**Notes/Comments (E)**
Tails Piping (largest piping diameter in the system)	LOSS OF SAFE-BY-DESIGN ATTRIBUTE	**DIAMETER** 24.4 cm (ID) Keff = 1.0 @ 6 wt %		Based on qualitative assessment, there is margin between the parameter values at normal operating conditions of pipe diameter, amount of U^{235} and enrichment and the conservative design/analysis values for these parameters assumed for criticality.
			More Heat	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a more heat condition that would cause an approach to the critical safe diameter and to adversely affect the maintenance of margin to criticality associated with design and maximum operating parameter values for amount of U^{235} and enrichment.
			More Pressure	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a more pressure condition that would cause an approach to the critical safe diameter and to adversely affect the maintenance of margin to criticality associated with design and maximum operating parameter values for amount of U^{235} and enrichment.
			Corrosion/ Erosion	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a corrosion/erosion condition that would cause an approach to the critical safe diameter. Materials are corrosion/erosion resistant and postulated complete wall erosion would not exceed the critical safe diameter.
			Loss of Confinement or Leakage	Based on qualitative assessment, postulated loss of piping system confinement or leakage will not result in any appreciable accumulation of U^{235} material because of physical limitations of the process (sub-atmospheric). As a result, loss of confinement does not result in a potential for criticality and therefore its consequence is low.
			Fire	Components shall be protected from fire to ensure the critical design attribute of diameter is not adversely impacted.
			Maintenance	Configuration Management shall ensure that maintenance does not adversely impact the critical design attribute of diameter.
				Double Contingency Principle is satisfied as follows. The geometry is criticality safe and no single credible event or failure has been identified whereby the geometry could become unsafe. The enrichment is also controlled such that no single credible failure could result in loss of enrichment control.
Tails Piping Arrangement	LOSS OF SAFE-BY-DESIGN ATTRIBUTE	**PHYSICAL ARRANGEMENT**		Based on qualitative assessment, there is margin between the normal operating conditions and the conservative design/analysis conditions assumed for criticality.

Criticality Assessment of Passive Safe-By-Design Components				
Component Description (A)	**Sequence ID (B)**	**Critical Design Attribute C)**	**Review of Up-Set Conditions to Change Geometry (Applicable HAZOP Guidewords) (D)**	**Notes/Comments (E)**
			More Heat	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a more heat condition that would adversely affect the maintenance of margin to criticality associated with design and maximum operating parameter values for amount of U^{235} and enrichment.
			More Pressure	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a more pressure condition that would adversely affect the maintenance of margin to criticality associated with design and maximum operating parameter values for amount of U^{235} and enrichment.
			Corrosion/ Erosion	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a corrosion/erosion condition that would affect the maintenance of margin to criticality associated with design and maximum operating parameter values for physical arrangement.
			Loss of Confinement or Leakage	Based on qualitative assessment, postulated loss of piping system confinement or leakage will not result in any appreciable accumulation of U^{235} material because of physical limitations of the process (sub-atmospheric). As a result, loss of confinement does not result in a potential for criticality and therefore its consequence is low.
			Fire	Components shall be protected from fire to ensure the critical design attribute of physical arrangement is not adversely impacted.
			Maintenance	Configuration Management shall ensure that maintenance does not adversely impact the critical design attribute of physical arrangement.
			Impact/Drop	Components shall be protected from impact/drop to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Construction on Site)	Components shall be protected from construction on-Site to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Failure of Above-Ground Liquid Storage Tanks)	Components shall be protected from external flooding (Failure of Above-Ground Liquid Storage Tanks) to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Hurricane)	Components shall be protected from hurricane events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Seismic)	Components shall be protected from seismic events to ensure the critical design attribute of physical arrangement is not adversely impacted.

Criticality Assessment of Passive Safe-By-Design Components				
Component Description (A)	**Sequence ID (B)**	**Critical Design Attribute C)**	**Review of Up-Set Conditions to Change Geometry (Applicable HAZOP Guidewords) (D)**	**Notes/Comments (E)**
			External Events (Tornado)	Components shall be protected from tornado events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Local Intense Precipitation)	Components shall be protected from local intense precipitation events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (External Fire)	Components shall be protected from external fire events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Snow/Ice)	Components shall be protected from external ice/snow events to ensure the critical design attribute of physical arrangement is not adversely impacted.
				Double Contingency Principle is satisfied as follows. The geometry is criticality safe and no single credible event or failure has been identified whereby the geometry could become unsafe. The enrichment is also controlled such that no single credible failure could result in loss of enrichment control.
Tails Pump Set	LOSS OF SAFE-BY-DESIGN ATTRIBUTE	**PHYSICAL ARRANGEMENT**		Based on qualitative assessment, there is margin between the normal operating conditions and the conservative design/analysis conditions assumed for criticality.
			More Heat	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a more heat condition that would adversely affect the maintenance of margin to criticality associated with design and maximum operating parameter values for amount of U^{235} and enrichment.
			More Pressure	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a more pressure condition that would adversely affect the maintenance of margin to criticality associated with design and maximum operating parameter values for amount of U^{235} and enrichment.
			Corrosion/ Erosion	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a corrosion/erosion condition that would affect the maintenance of margin to criticality associated with design and maximum operating parameter values for physical arrangement.
			Loss of Confinement or Leakage	Based on qualitative assessment, postulated loss of Tails Pump Set confinement or leakage will not result in any appreciable accumulation of U^{235} material because of physical limitations of the process (sub-atmospheric). As a result, loss of confinement does not result in a potential for criticality and therefore its consequence is low.

Criticality Assessment of Passive Safe-By-Design Components				
Component Description (A)	**Sequence ID (B)**	**Critical Design Attribute C)**	**Review of Up-Set Conditions to Change Geometry (Applicable HAZOP Guidewords) (D)**	**Notes/Comments (E)**
			Fire	Components shall be protected from fire to ensure the critical design attribute of physical arrangement is not adversely impacted.
			Maintenance	Configuration Management shall ensure that maintenance does not adversely impact the critical design attribute of physical arrangement.
			Impact/Drop	Components shall be protected from impact/drop to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Construction on Site)	Components shall be protected from construction on-Site to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Failure of Above-Ground Liquid Storage Tanks)	Components shall be protected from external flooding (Failure of Above-Ground Liquid Storage Tanks) to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Hurricane)	Components shall be protected from hurricane events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Seismic)	Components shall be protected from seismic events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Tornado)	Components shall be protected from tornado events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Local Intense Precipitation)	Components shall be protected from local intense precipitation events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (External Fire)	Components shall be protected from external fire events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Snow/Ice)	Components shall be protected from external ice/snow events to ensure the critical design attribute of physical arrangement is not adversely impacted.
				Double Contingency Principle is satisfied as follows. The geometry is criticality safe and no single credible event or failure has been identified whereby the geometry could become unsafe. The enrichment is also controlled such that no single credible failure could result in loss of enrichment control.

Criticality Assessment of Passive Safe-By-Design Components				
Component Description (A)	**Sequence ID (B)**	**Critical Design Attribute C)**	**Review of Up-Set Conditions to Change Geometry (Applicable HAZOP Guidewords) (D)**	**Notes/Comments (E)**
Tails Evacuation Pump	LOSS OF SAFE-BY-DESIGN ATTRIBUTE	**VOLUME** 24 liters Keff = 1.0 @ 6 wt %		Based on qualitative assessment, there is margin between the parameter values at normal operating conditions of Tails Evacuation Pump volume, amount of U^{235} and enrichment and the conservative design/analysis values for these parameters assumed for criticality.
			More Heat	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a more heat condition that would cause an approach to the critical safe volume and to adversely affect the maintenance of margin to criticality associated with design and maximum operating parameter values for amount of U^{235} and enrichment.
			More Pressure	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a more pressure condition that would cause an approach to the critical safe volume and to adversely affect the maintenance of margin to criticality associated with design and maximum operating parameter values for amount of U^{235} and enrichment.
			Corrosion/ Erosion	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a corrosion/erosion condition that would cause an approach to the critical safe volume. Materials are corrosion/erosion resistant and postulated complete wall erosion would not exceed the critical safe volume.
			Loss of Confinement or Leakage	Based on qualitative assessment, postulated loss of Tails Evacuation Pump confinement or leakage will not result in any appreciable accumulation of U^{235} material because of physical limitations of the process (sub-atmospheric). As a result, loss of confinement does not result in a potential for criticality and therefore its consequence is low.
			Fire	Components shall be protected from fire to ensure the critical design attribute of volume is not adversely impacted.
			Maintenance	Configuration Management shall ensure that maintenance does not adversely impact the critical design attribute of volume.
				Double Contingency Principle is satisfied as follows. The geometry is criticality safe and no single credible event or failure has been identified whereby the geometry could become unsafe. The enrichment is also controlled such that no single credible failure could result in loss of enrichment control.
Carbon Trap (Tails Evacuation)	LOSS OF SAFE-BY-DESIGN ATTRIBUTE	**DIAMETER** 24.4 cm (ID) Keff = 1.0 @ 6 wt %		Based on qualitative assessment, there is margin between the parameter values at normal operating conditions of Carbon Trap diameter, amount of U^{235} and enrichment and the conservative design/analysis values for these parameters assumed for criticality.

Criticality Assessment of Passive Safe-By-Design Components				
Component Description (A)	**Sequence ID (B)**	**Critical Design Attribute C)**	**Review of Up-Set Conditions to Change Geometry (Applicable HAZOP Guidewords) (D)**	**Notes/Comments (E)**
			More Heat	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a more heat condition that would cause an approach to the critical safe diameter and to adversely affect the maintenance of margin to criticality associated with design and maximum operating parameter values for amount of U^{235} and enrichment.
			More Pressure	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a more pressure condition that would cause an approach to the critical safe diameter and to adversely affect the maintenance of margin to criticality associated with design and maximum operating parameter values for amount of U^{235} and enrichment.
			Corrosion/ Erosion	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a corrosion/erosion condition that would cause an approach to the critical safe diameter. Materials are corrosion/erosion resistant and postulated complete wall erosion would not exceed the critical safe diameter.
			Loss of Confinement or Leakage	Based on qualitative assessment, postulated loss of Carbon Trap confinement or leakage will not result in any appreciable accumulation of U^{235} material because of physical limitations of the process (sub-atmospheric). As a result, loss of confinement does not result in a potential for criticality and therefore its consequence is low.
			Fire	Components shall be protected from fire to ensure the critical design attribute of diameter is not adversely impacted.
			Maintenance	Configuration Management shall ensure that maintenance does not adversely impact the critical design attribute of diameter.
				Double Contingency Principle is satisfied as follows. The geometry is criticality safe and no single credible event or failure has been identified whereby the geometry could become unsafe. The enrichment is also controlled such that no single credible failure could result in loss of enrichment control.
Aluminum Oxide Trap (Tails Evacuation)	LOSS OF SAFE-BY-DESIGN ATTRIBUTE	**DIAMETER** 24.4 cm (ID) Keff = 1.0 @ 6 wt %		Based on qualitative assessment, there is margin between the parameter values at normal operating conditions of Aluminum Oxide Trap diameter, amount of U^{235} and enrichment and the conservative design/analysis values for these parameters assumed for criticality.
			More Heat	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a more heat condition that would cause an approach to the critical safe diameter and to adversely affect the maintenance of margin to criticality associated with design and maximum operating parameter values for amount of U^{235} and enrichment.

Criticality Assessment of Passive Safe-By-Design Components				
Component Description (A)	**Sequence ID (B)**	**Critical Design Attribute C)**	**Review of Up-Set Conditions to Change Geometry (Applicable HAZOP Guidewords) (D)**	**Notes/Comments (E)**
			More Pressure	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a more pressure condition that would cause an approach to the critical safe diameter and to adversely affect the maintenance of margin to criticality associated with design and maximum operating parameter values for amount of U^{235} and enrichment.
			Corrosion/ Erosion	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a corrosion/erosion condition that would cause an approach to the critical safe diameter. Materials are corrosion/erosion resistant and postulated complete wall erosion would not exceed the critical safe diameter.
			Loss of Confinement or Leakage	Based on qualitative assessment, postulated loss of Aluminum Oxide Trap confinement or leakage will not result in any appreciable accumulation of U^{235} material because of physical limitations of the process (sub-atmospheric). As a result, loss of confinement does not result in a potential for criticality and therefore its consequence is low.
			Fire	Components shall be protected from fire to ensure the critical design attribute of diameter is not adversely impacted.
			Maintenance	Configuration Management shall ensure that maintenance does not adversely impact the critical design attribute of diameter.
				Double Contingency Principle is satisfied as follows. The geometry is criticality safe and no single credible event or failure has been identified whereby the geometry could become unsafe. The enrichment is also controlled such that no single credible failure could result in loss of enrichment control.
Chemical Absorber Oil Trap (Tails Evacuation)	LOSS OF SAFE-BY-DESIGN ATTRIBUTE	**VOLUME** 24 liters Keff = 1.0 @ 6 wt %		Based on qualitative assessment, there is margin between the parameter values at normal operating conditions of Chemical Absorber Oil Trap volume, amount of U^{235} and enrichment and the conservative design/analysis values for these parameters assumed for criticality.
			More Heat	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a more heat condition that would cause an approach to the critical safe volume and to adversely affect the maintenance of margin to criticality associated with design and maximum operating parameter values for amount of U^{235} and enrichment.
			More Pressure	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a more pressure condition that would cause an approach to the critical safe volume and to adversely affect the maintenance of margin to criticality associated with design and maximum operating parameter values for amount of U^{235} and enrichment.

Criticality Assessment of Passive Safe-By-Design Components				
Component Description (A)	**Sequence ID (B)**	**Critical Design Attribute C)**	**Review of Up-Set Conditions to Change Geometry (Applicable HAZOP Guidewords) (D)**	**Notes/Comments (E)**
			Corrosion/ Erosion	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a corrosion/erosion condition that would cause an approach to the critical safe volume. Materials are corrosion/erosion resistant and postulated complete wall erosion would not exceed the critical safe volume.
			Loss of Confinement or Leakage	Based on qualitative assessment, postulated loss of Chemical Absorber Oil Trap confinement or leakage will not result in any appreciable accumulation of U^{235} material because of physical limitations of the process (sub-atmospheric). As a result, loss of confinement does not result in a potential for criticality and therefore its consequence is low.
			Fire	Components shall be protected from fire to ensure the critical design attribute of volume is not adversely impacted.
			Maintenance	Configuration Management shall ensure that maintenance does not adversely impact the critical design attribute of volume.
				Double Contingency Principle is satisfied as follows. The geometry is criticality safe and no single credible event or failure has been identified whereby the geometry could become unsafe. The enrichment is also controlled such that no single credible failure could result in loss of enrichment control.
Oil Trap (Tails Evacuation)	LOSS OF SAFE-BY-DESIGN ATTRIBUTE	**DIAMETER** 24.4 cm (ID) Keff = 1.0 @ 6 wt %		Based on qualitative assessment, there is margin between the parameter values at normal operating conditions of Oil Trap diameter, amount of U^{235} and enrichment and the conservative design/analysis values for these parameters assumed for criticality.
			More Heat	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a more heat condition that would cause an approach to the critical safe diameter and to adversely affect the maintenance of margin to criticality associated with design and maximum operating parameter values for amount of U^{235} and enrichment.
			More Pressure	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a more pressure condition that would cause an approach to the critical safe diameter and to adversely affect the maintenance of margin to criticality associated with design and maximum operating parameter values for amount of U^{235} and enrichment.
			Corrosion/ Erosion	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a corrosion/erosion condition that would cause an approach to the critical safe diameter. Materials are corrosion/erosion resistant and postulated complete wall erosion would not exceed the critical safe diameter.

Criticality Assessment of Passive Safe-By-Design Components				
Component Description (A)	**Sequence ID (B)**	**Critical Design Attribute C)**	**Review of Up-Set Conditions to Change Geometry (Applicable HAZOP Guidewords) (D)**	**Notes/Comments (E)**
			Loss of Confinement or Leakage	Based on qualitative assessment, postulated loss of Oil Trap confinement or leakage will not result in any appreciable accumulation of U^{235} material because of physical limitations of the process (sub-atmospheric). As a result, loss of confinement does not result in a potential for criticality and therefore its consequence is low.
			Fire	Components shall be protected from fire to ensure the critical design attribute of diameter is not adversely impacted.
			Maintenance	Configuration Management shall ensure that maintenance does not adversely impact the critical design attribute of diameter.
				Double Contingency Principle is satisfied as follows. The geometry is criticality safe and no single credible event or failure has been identified whereby the geometry could become unsafe. The enrichment is also controlled such that no single credible failure could result in loss of enrichment control.
Vacuum Cleaner	LOSS OF SAFE-BY-DESIGN ATTRIBUTE	**DIAMETER** 24.4 cm (ID) Keff = 1.0 @ 6 wt %		Based on qualitative assessment, there is margin between the parameter value at normal operating conditions of Vacuum Cleaner diameter and the conservative design/analysis value for this parameter assumed for criticality.
			More Heat	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a more heat condition that would cause an approach to the critical safe diameter and to adversely affect the maintenance of margin to criticality associated with design and maximum operating parameter value.
			More Pressure	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a more pressure condition that would cause an approach to the critical safe diameter and to adversely affect the maintenance of margin to criticality associated with design and maximum operating parameter value.
			Corrosion/ Erosion	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a corrosion/erosion condition that would cause an approach to the critical safe diameter. Materials are corrosion/erosion resistant and postulated complete wall erosion would not exceed the critical safe diameter.
			Loss of Confinement or Leakage	Based on qualitative assessment, postulated loss of Vacuum Cleaner confinement or leakage will not result in any appreciable accumulation of U^{235}. As a result, loss of confinement does not result in a potential for criticality and therefore its consequence is low.

Criticality Assessment of Passive Safe-By-Design Components				
Component Description (A)	**Sequence ID (B)**	**Critical Design Attribute C)**	**Review of Up-Set Conditions to Change Geometry (Applicable HAZOP Guidewords) (D)**	**Notes/Comments (E)**
			Fire	Components shall be protected from fire to ensure the critical design attribute of diameter is not adversely impacted.
			Maintenance	Configuration Management shall ensure that maintenance does not adversely impact the critical design attribute of diameter.
			Impact/Drop	Components shall be protected from Impact/Drop to ensure the critical design attribute of diameter is not adversely impacted.
			External Events (Construction on Site)	Components shall be protected from Construction on Site to ensure the critical design attribute of diameter is not adversely impacted.
			External Events (Failure of Above-Ground Liquid Tanks)	Components shall be protected from Failure of Above-Ground Liquid Tanks to ensure the critical design attribute of diameter is not adversely impacted.
			External Events (Hurricane)	Components shall be protected from Hurricane events to ensure the critical design attribute of diameter is not adversely impacted.
			External Events (Seismic)	Components shall be protected from Seismic events to ensure the critical design attribute of diameter is not adversely impacted.
			External Events (Tornado)	Components shall be protected from Tornado events to ensure the critical design attribute of diameter is not adversely impacted.
			External Events (Local Intense Precipitation)	Components shall be protected from Local Intense Precipitation events to ensure the critical design attribute of diameter is not adversely impacted.
			External Events (Snow/Ice)	Components shall be protected from Snow/Ice events to ensure the critical design attribute of diameter is not adversely impacted.
				Double Contingency Principle is satisfied as follows. The geometry is criticality safe and no single credible event or failure has been identified whereby the geometry could become unsafe. The enrichment is also controlled such that no single credible failure could result in loss of enrichment control.
Tails Evacuation Pump/Chemical Trap Set	LOSS OF SAFE-BY-DESIGN ATTRIBUTE	**PHYSICAL ARRANGEMENT**		Based on qualitative assessment, there is margin between the normal operating conditions and the conservative design/analysis conditions assumed for criticality.

Criticality Assessment of Passive Safe-By-Design Components				
Component Description (A)	Sequence ID (B)	Critical Design Attribute C)	Review of Up-Set Conditions to Change Geometry (Applicable HAZOP Guidewords) (D)	Notes/Comments (E)
			More Heat	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a more heat condition that would adversely affect the maintenance of margin to criticality associated with design and maximum operating parameter values for amount of U^{235} and enrichment.
			More Pressure	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a more pressure condition that would adversely affect the maintenance of margin to criticality associated with design and maximum operating parameter values for amount of U^{235} and enrichment.
			Corrosion/ Erosion	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a corrosion/erosion condition that would affect the maintenance of margin to criticality associated with design and maximum operating parameter values for physical arrangement.
			Loss of Confinement or Leakage	Based on qualitative assessment, postulated loss of Tails Evacuation Pump/Chemical Trap Set confinement or leakage will not result in any appreciable accumulation of U^{235} material because of physical limitations of the process (sub-atmospheric). As a result, loss of confinement does not result in a potential for criticality and therefore its consequence is low.
			Fire	Components shall be protected from fire to ensure the critical design attribute of physical arrangement is not adversely impacted.
			Maintenance	Configuration Management shall ensure that maintenance does not adversely impact the critical design attribute of physical arrangement.
			Impact/Drop	Components shall be protected from impact/drop to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Construction on Site)	Components shall be protected from construction on-Site to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Failure of Above-Ground Liquid Storage Tanks)	Components shall be protected from external flooding (Failure of Above-Ground Liquid Storage Tanks) to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Hurricane)	Components shall be protected from hurricane events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Seismic)	Components shall be protected from seismic events to ensure the critical design attribute of physical arrangement is not adversely impacted.

Criticality Assessment of Passive Safe-By-Design Components				
Component Description (A)	**Sequence ID (B)**	**Critical Design Attribute C)**	**Review of Up-Set Conditions to Change Geometry (Applicable HAZOP Guidewords) (D)**	**Notes/Comments (E)**
			External Events (Tornado)	Components shall be protected from tornado events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Local Intense Precipitation)	Components shall be protected from local intense precipitation events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (External Fire)	Components shall be protected from external fire events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Snow/Ice)	Components shall be protected from external ice/snow events to ensure the critical design attribute of physical arrangement is not adversely impacted.
				Double Contingency Principle is satisfied as follows. The geometry is criticality safe and no single credible event or failure has been identified whereby the geometry could become unsafe. The enrichment is also controlled such that no single credible failure could result in loss of enrichment control.
Pump Transport Device	LOSS OF SAFE-BY-DESIGN ATTRIBUTE	**PHYSICAL ARRANGEMENT**		Based on qualitative assessment, there is margin between the normal operating conditions and the conservative design/analysis conditions assumed for criticality.
			Corrosion/ Erosion	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a corrosion/erosion condition that would affect the maintenance of margin to criticality associated with design and maximum operating parameter values for physical arrangement.
			Fire	Components shall be protected from fire to ensure the critical design attribute of physical arrangement is not adversely impacted.
			Maintenance	Configuration Management shall ensure that maintenance does not adversely impact the critical design attribute of physical arrangement.
			Impact/Drop	Components shall be protected from impact/drop to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Construction on Site)	Components shall be protected from construction on-Site to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Failure of Above-Ground Liquid Storage Tanks)	Components shall be protected from external flooding (Failure of Above-Ground Liquid Storage Tanks) to ensure the critical design attribute of physical arrangement is not adversely impacted.

Criticality Assessment of Passive Safe-By-Design Components				
Component Description (A)	**Sequence ID (B)**	**Critical Design Attribute C)**	**Review of Up-Set Conditions to Change Geometry (Applicable HAZOP Guidewords) (D)**	**Notes/Comments (E)**
			External Events (Hurricane)	Components shall be protected from hurricane events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Seismic)	Components shall be protected from seismic events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Tornado)	Components shall be protected from tornado events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Local Intense Precipitation)	Components shall be protected from local intense precipitation events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (External Fire)	Components shall be protected from external fire events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Snow/Ice)	Components shall be protected from external ice/snow events to ensure the critical design attribute of physical arrangement is not adversely impacted.
				Double Contingency Principle is satisfied as follows. The geometry is criticality safe and no single credible event or failure has been identified whereby the geometry could become unsafe. The enrichment is also controlled such that no single credible failure could result in loss of enrichment control.
Chemical Trap Transport Device	LOSS OF SAFE-BY-DESIGN ATTRIBUTE	**PHYSICAL ARRANGEMENT**		Based on qualitative assessment, there is margin between the normal operating conditions and the conservative design/analysis conditions assumed for criticality.
			Corrosion/ Erosion	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a corrosion/erosion condition that would affect the maintenance of margin to criticality associated with design and maximum operating parameter values for physical arrangement.
			Fire	Components shall be protected from fire to ensure the critical design attribute of physical arrangement is not adversely impacted.
			Maintenance	Configuration Management shall ensure that maintenance does not adversely impact the critical design attribute of physical arrangement.
			Impact/Drop	Components shall be protected from impact/drop to ensure the critical design attribute of physical arrangement is not adversely impacted.

Criticality Assessment of Passive Safe-By-Design Components				
Component Description (A)	**Sequence ID (B)**	**Critical Design Attribute C)**	**Review of Up-Set Conditions to Change Geometry (Applicable HAZOP Guidewords) (D)**	**Notes/Comments (E)**
			External Events (Construction on Site)	Components shall be protected from construction on-Site to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Failure of Above-Ground Liquid Storage Tanks)	Components shall be protected from external flooding (Failure of Above-Ground Liquid Storage Tanks) to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Hurricane)	Components shall be protected from hurricane events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Seismic)	Components shall be protected from seismic events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Tornado)	Components shall be protected from tornado events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Local Intense Precipitation)	Components shall be protected from local intense precipitation events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (External Fire)	Components shall be protected from external fire events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Snow/Ice)	Components shall be protected from external ice/snow events to ensure the critical design attribute of physical arrangement is not adversely impacted.
				Double Contingency Principle is satisfied as follows. The geometry is criticality safe and no single credible event or failure has been identified whereby the geometry could become unsafe. The enrichment is also controlled such that no single credible failure could result in loss of enrichment control.
Mobile UF_6 Rig	LOSS OF SAFE-BY-DESIGN ATTRIBUTE	**PHYSICAL ARRANGEMENT**		Based on qualitative assessment, there is margin between the normal operating conditions and the conservative design/analysis conditions assumed for criticality.
			More Heat	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a more heat condition that would adversely affect the maintenance of margin to criticality associated with design and maximum operating parameter values for amount of U^{235} and enrichment.

Criticality Assessment of Passive Safe-By-Design Components				
Component Description (A)	Sequence ID (B)	Critical Design Attribute C)	Review of Up-Set Conditions to Change Geometry (Applicable HAZOP Guidewords) (D)	Notes/Comments (E)
			More Pressure	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a more pressure condition that would adversely affect the maintenance of margin to criticality associated with design and maximum operating parameter values for amount of U^{235} and enrichment.
			Corrosion/ Erosion	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a corrosion/erosion condition that would affect the maintenance of margin to criticality associated with design and maximum operating parameter values for physical arrangement.
			Loss of Confinement or Leakage	Based on qualitative assessment, postulated loss of Mobile UF_6 Rig confinement or leakage will not result in any appreciable accumulation of U^{235} material because of physical limitations of the process (sub-atmospheric). As a result, loss of confinement does not result in a potential for criticality and therefore its consequence is low.
			Fire	Components shall be protected from fire to ensure the critical design attribute of physical arrangement is not adversely impacted.
			Maintenance	Configuration Management shall ensure that maintenance does not adversely impact the critical design attribute of physical arrangement.
			Impact/Drop	Components shall be protected from impact/drop to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Construction on Site)	Components shall be protected from construction on-Site to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Failure of Above-Ground Liquid Storage Tanks)	Components shall be protected from external flooding (Failure of Above-Ground Liquid Storage Tanks) to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Hurricane)	Components shall be protected from hurricane events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Seismic)	Components shall be protected from seismic events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Tornado)	Components shall be protected from tornado events to ensure the critical design attribute of physical arrangement is not adversely impacted.

Criticality Assessment of Passive Safe-By-Design Components				
Component Description (A)	**Sequence ID (B)**	**Critical Design Attribute C)**	**Review of Up-Set Conditions to Change Geometry (Applicable HAZOP Guidewords) (D)**	**Notes/Comments (E)**
			External Events (Local Intense Precipitation)	Components shall be protected from local intense precipitation events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (External Fire)	Components shall be protected from external fire events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Snow/Ice)	Components shall be protected from external ice/snow events to ensure the critical design attribute of physical arrangement is not adversely impacted.
				Double Contingency Principle is satisfied as follows. The geometry is criticality safe and no single credible event or failure has been identified whereby the geometry could become unsafe. The enrichment is also controlled such that no single credible failure could result in loss of enrichment control.
Finger Sample Bottle	LOSS OF SAFE-BY-DESIGN ATTRIBUTE	**DIAMETER** 24.4 cm (ID) Keff = 1.0 @ 6 wt %		Based on qualitative assessment, there is margin between the parameter values at normal operating conditions of Finger Sample Bottle diameter, amount of U^{235} and enrichment and the conservative design/analysis values for these parameters assumed for criticality.
			More Heat	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a more heat condition that would cause an approach to the critical safe diameter and to adversely affect the maintenance of margin to criticality associated with design and maximum operating parameter values for amount of U^{235} and enrichment.
			More Pressure	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a more pressure condition that would cause an approach to the critical safe diameter and to adversely affect the maintenance of margin to criticality associated with design and maximum operating parameter values for amount of U^{235} and enrichment.
			Corrosion/ Erosion	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a corrosion/erosion condition that would cause an approach to the critical safe diameter. Materials are corrosion/erosion resistant and postulated complete wall erosion would not exceed the critical safe diameter.
			Loss of Confinement or Leakage	Based on qualitative assessment, postulated loss of Finger Sample Bottle confinement or leakage will not result in any appreciable accumulation of U^{235} material because of physical limitations of the process (sub-atmospheric). As a result, loss of confinement does not result in a potential for criticality and therefore its consequence is low.

Criticality Assessment of Passive Safe-By-Design Components				
Component Description (A)	Sequence ID (B)	Critical Design Attribute C)	Review of Up-Set Conditions to Change Geometry (Applicable HAZOP Guidewords) (D)	Notes/Comments (E)
			Fire	Components shall be protected from fire to ensure the critical design attribute of diameter is not adversely impacted.
			Maintenance	Configuration Management shall ensure that maintenance does not adversely impact the critical design attribute of diameter.
				Double Contingency Principle is satisfied as follows. The geometry is criticality safe and no single credible event or failure has been identified whereby the geometry could become unsafe. The enrichment is also controlled such that no single credible failure could result in loss of enrichment control.

Table 1 Column Descriptions:

Column A: This column provides a brief description of each component.

Column B: This column identifies the accident sequence associated with the passive component.

Column C: This column identifies the critical design attribute under consideration along with the conservative values used in the criticality analysis.

Column D: This column identifies the applicable guidewords from the ISA HAZOP procedure that are used to assess the criticality design margin. Additional guidewords are addressed as applicable in the detailed assessment.

Column E: This column provides any notes, comments and concluding statements.

Table 3.7-9 Product Blending System
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Criticality Assessment of Passive Safe By-Design Components				
Component Description (A)	**Sequence ID (B)**	**Critical Design Attribute (C)**	**Review of Up-Set Conditions to Change Geometry (Applicable HAZOP Guidewords) (D)**	**Notes/Comments (E)**
Product Blending Piping (largest pipe ID in the system)	LOSS OF SAFE-BY-DESIGN ATTRIBUTE	**DIAMETER** 24.4 cm (ID) Keff = 1.0 @ 6 wt %		Based on qualitative assessment, there is margin between the parameter values at normal operating conditions of pipe diameter, amount of U^{235} and enrichment and the conservative design/analysis values for these parameters assumed for criticality.
			More Heat	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a more heat condition that would cause an approach to the critical safe diameter and to adversely affect the maintenance of margin to criticality associated with design and maximum operating parameter values for amount of U^{235} and enrichment.
			More Pressure	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a more pressure condition that would cause an approach to the critical safe diameter and to adversely affect the maintenance of margin to criticality associated with design and maximum operating parameter values for amount of U^{235} and enrichment.
			Corrosion/ Erosion	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a corrosion/erosion condition that would cause an approach to the critical safe diameter. Materials are corrosion/erosion resistant and postulated complete wall erosion would not exceed the critical safe diameter.
			Loss of Confinement or Leakage	Based on qualitative assessment, postulated loss of piping system confinement or leakage will not result in any appreciable accumulation of U^{235} material because of physical limitations of the process (sub-atmospheric). As a result, loss of confinement does not result in a potential for criticality and therefore its consequence is low.
			Fire	Components shall be protected from fire to ensure the critical design attribute of diameter is not adversely impacted.
			Maintenance	Configuration Management shall ensure that maintenance does not adversely impact the critical design attribute of diameter.
				Double Contingency Principle is satisfied as follows. The geometry is criticality safe and no single credible event or failure has been identified whereby the geometry could become unsafe. The enrichment is also controlled such that no single credible failure could result in loss of enrichment control.

Criticality Assessment of Passive Safe By-Design Components				
Component Description (A)	**Sequence ID (B)**	**Critical Design Attribute (C)**	**Review of Up-Set Conditions to Change Geometry (Applicable HAZOP Guidewords) (D)**	**Notes/Comments (E)**
Product Blending Piping Arrangement	LOSS OF SAFE-BY-DESIGN ATTRIBUTE	**PHYSICAL ARRANGEMENT**		*Based on qualitative assessment, there is margin* between the normal operating conditions and the conservative design/analysis conditions assumed for criticality.
			More Heat	Based on qualitative assessment, it is highly unlikely *for a process deviation to result in a more heat* condition that would adversely affect the maintenance of margin to criticality associated with design and maximum operating parameter values for amount of U^{235} and enrichment.
			More Pressure	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a more pressure condition that would adversely affect the maintenance of margin to criticality associated with design and maximum operating parameter values for amount of U^{235} and enrichment.
			Corrosion/ Erosion	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a corrosion/erosion condition that would affect the maintenance of margin to criticality associated with design and maximum operating parameter values for physical arrangement.
			Loss of Confinement or Leakage	Based on qualitative assessment, postulated loss of piping system confinement or leakage will not result in any appreciable accumulation of U^{235} material because of physical limitations of the process (sub-atmospheric). As a result, loss of confinement does not result in a potential for criticality and therefore its consequence is low.
			Fire	Components shall be protected from fire to ensure the critical design attribute of physical arrangement is not adversely impacted.
			Maintenance	Configuration Management shall ensure that maintenance does not adversely impact the critical design attribute of physical arrangement.
			Impact/Drop	Components shall be protected from impact/drop to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Construction on Site)	Components shall be protected from construction on-Site to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Failure of Above-Ground Liquid Storage Tanks)	Components shall be protected from external flooding (Failure of Above-Ground Liquid Storage Tanks) to ensure the critical design attribute of physical arrangement is not adversely impacted.

Criticality Assessment of Passive Safe By-Design Components				
Component Description (A)	**Sequence ID (B)**	**Critical Design Attribute (C)**	**Review of Up-Set Conditions to Change Geometry (Applicable HAZOP Guidewords) (D)**	**Notes/Comments (E)**
			External Events (Hurricane)	Components shall be protected from hurricane events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Seismic)	Components shall be protected from seismic events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Tornado)	Components shall be protected from tornado events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Local Intense Precipitation)	Components shall be protected from local intense precipitation events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (External Fire)	Components shall be protected from external fire events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Snow/Ice)	Components shall be protected from external ice/snow events to ensure the critical design attribute of physical arrangement is not adversely impacted.
				Double Contingency Principle is satisfied as follows. The geometry is criticality safe and no single credible event or failure has been identified whereby the geometry could become unsafe. The enrichment is also controlled such that no single credible failure could result in loss of enrichment control.
Cold Trap (Product Blending Evacuation)	LOSS OF SAFE-BY-DESIGN ATTRIBUTE	**DIAMETER** 24.4 cm (ID) Keff = 1.0 @ 6 wt %		Based on qualitative assessment, there is margin between the parameter values at normal operating conditions of component diameter, amount of U^{235} and enrichment and the conservative design/analysis values for these parameters assumed for criticality.
			More Heat	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a more heat condition that would cause an approach to the critical safe diameter and to adversely affect the maintenance of margin to criticality associated with design and maximum operating parameter values for amount of U^{235} and enrichment.
			More Pressure	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a more pressure condition that would cause an approach to the critical safe diameter and to adversely affect the maintenance of margin to criticality associated with design and maximum operating parameter values for amount of U^{235} and enrichment.

Criticality Assessment of Passive Safe By-Design Components				
Component Description (A)	**Sequence ID (B)**	**Critical Design Attribute (C)**	**Review of Up-Set Conditions to Change Geometry (Applicable HAZOP Guidewords) (D)**	**Notes/Comments (E)**
			Corrosion/ Erosion	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a corrosion/erosion condition that would cause an approach to the critical safe diameter. Materials are corrosion/erosion resistant and postulated complete wall erosion would not exceed the critical safe diameter.
			Loss of Confinement or Leakage	Based on qualitative assessment, postulated loss of cold trap confinement or leakage and will not result in any appreciable accumulation of material because of physical limitations of the process (sub-atmospheric). As a result, loss of confinement does not result in a potential for criticality and therefore its consequence is low.
			Fire	Components shall be protected from fire to ensure the critical design attribute of diameter is not adversely impacted.
			Maintenance	Configuration Management shall ensure that maintenance does not adversely impact the critical design attribute of diameter.
				Double Contingency Principle is satisfied as follows. The geometry is criticality safe and no single credible event or failure has been identified whereby the geometry could become unsafe. The enrichment is also controlled such that no single credible failure could result in loss of enrichment control.
Product Blending Evacuation Pump	LOSS OF SAFE-BY-DESIGN ATTRIBUTE	**VOLUME** 24 liters Keff = 1.0 @ 6 wt %		Based on qualitative assessment, there is margin between the parameter values at normal operating conditions of Product Blending Evacuation Pump volume, amount of U^{235} and enrichment and the conservative design/analysis values for these parameters assumed for criticality.
			More Heat	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a more heat condition that would cause an approach to the critical safe volume and to adversely affect the maintenance of margin to criticality associated with design and maximum operating parameter values for amount of U^{235} and enrichment.
			More Pressure	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a more pressure condition that would cause an approach to the critical safe volume and to adversely affect the maintenance of margin to criticality associated with design and maximum operating parameter values for amount of U^{235} and enrichment.

Criticality Assessment of Passive Safe By-Design Components				
Component Description (A)	**Sequence ID (B)**	**Critical Design Attribute (C)**	**Review of Up-Set Conditions to Change Geometry (Applicable HAZOP Guidewords) (D)**	**Notes/Comments (E)**
			Corrosion/ Erosion	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a corrosion/erosion condition that would cause an approach to the critical safe volume. Materials are corrosion/erosion resistant and postulated complete wall erosion would not exceed the critical safe volume.
			Loss of Confinement or Leakage	Based on qualitative assessment, postulated loss of Product Blending Evacuation Pump confinement or leakage will not result in any appreciable accumulation of U^{235} material because of physical limitations of the process (sub-atmospheric). As a result, loss of confinement does not result in a potential for criticality and therefore its consequence is low.
			Fire	Components shall be protected from fire to ensure the critical design attribute of volume is not adversely impacted.
			Maintenance	Configuration Management shall ensure that maintenance does not adversely impact the critical design attribute of volume.
				Double Contingency Principle is satisfied as follows. The geometry is criticality safe and no single credible event or failure has been identified whereby the geometry could become unsafe. The enrichment is also controlled such that no single credible failure could result in loss of enrichment control.
Carbon Trap (Product Blending Evacuation)	LOSS OF SAFE-BY-DESIGN ATTRIBUTE	**DIAMETER** 24.4 cm (ID) Keff = 1.0 @ 6 wt %		Based on qualitative assessment, there is margin between the parameter values at normal operating conditions of Carbon Trap diameter, amount of U^{235} and enrichment and the conservative design/analysis values for these parameters assumed for criticality.
			More Heat	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a more heat condition that would cause an approach to the critical safe diameter and to adversely affect the maintenance of margin to criticality associated with design and maximum operating parameter values for amount of U^{235} and enrichment.
			More Pressure	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a more pressure condition that would cause an approach to the critical safe diameter and to adversely affect the maintenance of margin to criticality associated with design and maximum operating parameter values for amount of U^{235} and enrichment.

Criticality Assessment of Passive Safe By-Design Components				
Component Description (A)	**Sequence ID (B)**	**Critical Design Attribute (C)**	**Review of Up-Set Conditions to Change Geometry (Applicable HAZOP Guidewords) (D)**	**Notes/Comments (E)**
			Corrosion/ Erosion	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a corrosion/erosion condition that would cause an approach to the critical safe diameter. Materials are corrosion/erosion resistant and postulated complete wall erosion would not exceed the critical safe diameter.
			Loss of Confinement or Leakage	Based on qualitative assessment, postulated loss of Carbon Trap confinement or leakage will not result in any appreciable accumulation of U^{235} material because of physical limitations of the process (sub-atmospheric). As a result, loss of confinement does not result in a potential for criticality and therefore its consequence is low.
			Fire	Components shall be protected from fire to ensure the critical design attribute of diameter is not adversely impacted.
			Maintenance	Configuration Management shall ensure that maintenance does not adversely impact the critical design attribute of diameter.
				Double Contingency Principle is satisfied as follows. The geometry is criticality safe and no single credible event or failure has been identified whereby the geometry could become unsafe. The enrichment is also controlled such that no single credible failure could result in loss of enrichment control.
Aluminum Oxide Trap (Product Blending Evacuation)	LOSS OF SAFE-BY-DESIGN ATTRIBUTE	**DIAMETER** 24.4 cm (ID) *Keff = 1.0 @ 6 wt %*		Based on qualitative assessment, there is margin between the parameter values at normal operating conditions of Aluminum Oxide Trap diameter, amount of U^{235} and enrichment and the conservative design/analysis values for these parameters assumed for criticality.
			More Heat	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a more heat condition that would cause an approach to the critical safe diameter and to adversely affect the maintenance of margin to criticality associated with design and maximum operating parameter values for amount of U^{235} and enrichment.
			More Pressure	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a more pressure condition that would cause an approach to the critical safe diameter and to adversely affect the maintenance of margin to criticality associated with design and maximum operating parameter values for amount of U^{235} and enrichment.

Criticality Assessment of Passive Safe By-Design Components				
Component Description (A)	**Sequence ID (B)**	**Critical Design Attribute (C)**	**Review of Up-Set Conditions to Change Geometry (Applicable HAZOP Guidewords) (D)**	**Notes/Comments (E)**
			Corrosion/ Erosion	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a corrosion/erosion condition that would cause an approach to the critical safe diameter. Materials are corrosion/erosion resistant and postulated complete wall erosion would not exceed the critical safe diameter.
			Loss of Confinement or Leakage	Based on qualitative assessment, postulated loss of Aluminum Oxide Trap confinement or leakage will not result in any appreciable accumulation of U^{235} material because of physical limitations of the process (sub-atmospheric). As a result, loss of confinement does not result in a potential for criticality and therefore its consequence is low.
			Fire	Components shall be protected from fire to ensure the critical design attribute of diameter is not adversely impacted.
			Maintenance	Configuration Management shall ensure that maintenance does not adversely impact the critical design attribute of diameter.
				Double Contingency Principle is satisfied as follows. The geometry is criticality safe and no single credible event or failure has been identified whereby the geometry could become unsafe. The enrichment is also controlled such that no single credible failure could result in loss of enrichment control.
Chemical Absorber Oil Trap (Product Blending Evacuation)	LOSS OF SAFE-BY-DESIGN ATTRIBUTE	**VOLUME** 24 liters Keff = 1.0 @ 6 wt %		Based on qualitative assessment, there is margin between the parameter values at normal operating conditions of Chemical Absorber Oil Trap volume, amount of U^{235} and enrichment and the conservative design/analysis values for these parameters assumed for criticality.
			More Heat	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a more heat condition that would cause an approach to the critical safe volume and to adversely affect the maintenance of margin to criticality associated with design and maximum operating parameter values for amount of U^{235} and enrichment.
			More Pressure	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a more pressure condition that would cause an approach to the critical safe volume and to adversely affect the maintenance of margin to criticality associated with design and maximum operating parameter values for amount of U^{235} and enrichment.

Criticality Assessment of Passive Safe By-Design Components				
Component Description (A)	**Sequence ID (B)**	**Critical Design Attribute (C)**	**Review of Up-Set Conditions to Change Geometry (Applicable HAZOP Guidewords) (D)**	**Notes/Comments (E)**
			Corrosion/ Erosion	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a corrosion/erosion condition that would cause an approach to the critical safe volume. Materials are corrosion/erosion resistant and postulated complete wall erosion would not exceed the critical safe volume.
			Loss of Confinement or Leakage	Based on qualitative assessment, postulated loss of Chemical Absorber Oil Trap confinement or leakage will not result in any appreciable accumulation of U^{235} material because of physical limitations of the process (sub-atmospheric). As a result, loss of confinement does not result in a potential for criticality and therefore its consequence is low.
			Fire	Components shall be protected from fire to ensure the critical design attribute of volume is not adversely impacted.
			Maintenance	Configuration Management shall ensure that maintenance does not adversely impact the critical design attribute of volume.
				Double Contingency Principle is satisfied as follows. The geometry is criticality safe and no single credible event or failure has been identified whereby the geometry could become unsafe. The enrichment is also controlled such that no single credible failure could result in loss of enrichment control.
Oil Trap (Product Blending Evacuation)	LOSS OF SAFE-BY-DESIGN ATTRIBUTE	**DIAMETER** 24.4 cm (ID) Keff = 1.0 @ 6 wt %		Based on qualitative assessment, there is margin between the parameter values at normal operating conditions of Oil Trap diameter, amount of U^{235} and enrichment and the conservative design/analysis values for these parameters assumed for criticality.
			More Heat	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a more heat condition that would cause an approach to the critical safe diameter and to adversely affect the maintenance of margin to criticality associated with design and maximum operating parameter values for amount of U^{235} and enrichment.
			More Pressure	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a more pressure condition that would cause an approach to the critical safe diameter and to adversely affect the maintenance of margin to criticality associated with design and maximum operating parameter values for amount of U^{235} and enrichment.

Criticality Assessment of Passive Safe By-Design Components				
Component Description (A)	**Sequence ID (B)**	**Critical Design Attribute (C)**	**Review of Up-Set Conditions to Change Geometry (Applicable HAZOP Guidewords) (D)**	**Notes/Comments (E)**
			Corrosion/ Erosion	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a corrosion/erosion condition that would cause an approach to the critical safe diameter. Materials are corrosion/erosion resistant and postulated complete wall erosion would not exceed the critical safe diameter.
			Loss of Confinement or Leakage	Based on qualitative assessment, postulated loss of Oil Trap confinement or leakage will not result in any appreciable accumulation of U^{235} material because of physical limitations of the process (sub-atmospheric). As a result, loss of confinement does not result in a potential for criticality and therefore its consequence is low.
			Fire	Components shall be protected from fire to ensure the critical design attribute of diameter is not adversely impacted.
			Maintenance	Configuration Management shall ensure that maintenance does not adversely impact the critical design attribute of diameter.
				Double Contingency Principle is satisfied as follows. The geometry is criticality safe and no single credible event or failure has been identified whereby the geometry could become unsafe. The enrichment is also controlled such that no single credible failure could result in loss of enrichment control.
Vacuum Cleaner	LOSS OF SAFE-BY-DESIGN ATTRIBUTE	**DIAMETER** 24.4 cm (ID) Keff = 1.0 @ 6 wt %		Based on qualitative assessment, there is margin between the parameter value at normal operating conditions of Vacuum Cleaner diameter and the conservative design/analysis value for this parameter assumed for criticality.
			More Heat	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a more heat condition that would cause an approach to the critical safe diameter and to adversely affect the maintenance of margin to criticality associated with design and maximum operating parameter value.
			More Pressure	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a more pressure condition that would cause an approach to the critical safe diameter and to adversely affect the maintenance of margin to criticality associated with design and maximum operating parameter value.

Criticality Assessment of Passive Safe By-Design Components				
Component Description (A)	**Sequence ID (B)**	**Critical Design Attribute (C)**	**Review of Up-Set Conditions to Change Geometry (Applicable HAZOP Guidewords) (D)**	**Notes/Comments (E)**
			Corrosion/ Erosion	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a corrosion/erosion condition that would cause an approach to the critical safe diameter. Materials are corrosion/erosion resistant and postulated complete wall erosion would not exceed the critical safe diameter.
			Loss of Confinement or Leakage	Based on qualitative assessment, postulated loss of Vacuum Cleaner confinement or leakage will not result in any appreciable accumulation of U^{235}. As a result, loss of confinement does not result in a potential for criticality and therefore its consequence is low.
			Fire	Components shall be protected from fire to ensure the critical design attribute of diameter is not adversely impacted.
			Maintenance	Configuration Management shall ensure that maintenance does not adversely impact the critical design attribute of diameter.
			Impact/Drop	Components shall be protected from Impact/Drop to ensure the critical design attribute of diameter is not adversely impacted.
			External Events (Construction on Site)	Components shall be protected from Construction on Site to ensure the critical design attribute of diameter is not adversely impacted.
			External Events (Failure of Above-Ground Liquid Tanks)	Components shall be protected from Failure of Above-Ground Liquid Tanks to ensure the critical design attribute of diameter is not adversely impacted.
			External Events (Hurricane)	Components shall be protected from Hurricane events to ensure the critical design attribute of diameter is not adversely impacted.
			External Events (Seismic)	Components shall be protected from Seismic events to ensure the critical design attribute of diameter is not adversely impacted.
			External Events (Tornado)	Components shall be protected from Tornado events to ensure the critical design attribute of diameter is not adversely impacted.
			External Events (Local Intense Precipitation)	Components shall be protected from Local Intense Precipitation events to ensure the critical design attribute of diameter is not adversely impacted.
			External Events (Snow/Ice)	Components shall be protected from Snow/Ice events to ensure the critical design attribute of diameter is not adversely impacted.

Criticality Assessment of Passive Safe By-Design Components				
Component Description (A)	**Sequence ID (B)**	**Critical Design Attribute (C)**	**Review of Up-Set Conditions to Change Geometry (Applicable HAZOP Guidewords) (D)**	**Notes/Comments (E)**
				Double Contingency Principle is satisfied as follows. The geometry is criticality safe and no single credible event or failure has been identified whereby the geometry could become unsafe. The enrichment is also controlled such that no single credible failure could result in loss of enrichment control.
Product Blending Evacuation Pump/ Chemical Trap Set	LOSS OF SAFE-BY-DESIGN ATTRIBUTE	**PHYSICAL ARRANGEMENT**		Based on qualitative assessment, there is margin between the normal operating conditions and the conservative design/analysis conditions assumed for criticality.
			More Heat	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a more heat condition that would adversely affect the maintenance of margin to criticality associated with design and maximum operating parameter values for amount of U^{235} and enrichment.
			More Pressure	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a more pressure condition that would adversely affect the maintenance of margin to criticality associated with design and maximum operating parameter values for amount of U^{235} and enrichment.
			Corrosion/ Erosion	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a corrosion/erosion condition that would affect the maintenance of margin to criticality associated with design and maximum operating parameter values for physical arrangement.
			Loss of Confinement or Leakage	Based on qualitative assessment, postulated loss of Product Blending Evacuation Pump/ Chemical Trap Set confinement or leakage will not result in any appreciable accumulation of U^{235} material because of physical limitations of the process (sub-atmospheric). As a result, loss of confinement does not result in a potential for criticality and therefore its consequence is low.
			Fire	Components shall be protected from fire to ensure the critical design attribute of physical arrangement is not adversely impacted.
			Maintenance	Configuration Management shall ensure that maintenance does not adversely impact the critical design attribute of physical arrangement.
			Impact/Drop	Components shall be protected from impact/drop to ensure the critical design attribute of physical arrangement is not adversely impacted.

Criticality Assessment of Passive Safe By-Design Components				
Component Description (A)	**Sequence ID (B)**	**Critical Design Attribute (C)**	**Review of Up-Set Conditions to Change Geometry (Applicable HAZOP Guidewords) (D)**	**Notes/Comments (E)**
			External Events (Construction on Site)	Components shall be protected from construction on-Site to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Failure of Above-Ground Liquid Storage Tanks)	Components shall be protected from external flooding (Failure of Above-Ground Liquid Storage Tanks) to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Hurricane)	Components shall be protected from hurricane events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Seismic)	Components shall be protected from seismic events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Tornado)	Components shall be protected from tornado events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Local Intense Precipitation)	Components shall be protected from local intense precipitation events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (External Fire)	Components shall be protected from external fire events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Snow/Ice)	Components shall be protected from external ice/snow events to ensure the critical design attribute of physical arrangement is not adversely impacted.
				Double Contingency Principle is satisfied as follows. The geometry is criticality safe and no single credible event or failure has been identified whereby the geometry could become unsafe. The enrichment is also controlled such that no single credible failure could result in loss of enrichment control.
Pump Transport Device	LOSS OF SAFE-BY-DESIGN ATTRIBUTE	**PHYSICAL ARRANGEMENT**		Based on qualitative assessment, there is margin between the normal operating conditions and the conservative design/analysis conditions assumed for criticality.
			Corrosion/ Erosion	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a corrosion/erosion condition that would affect the maintenance of margin to criticality associated with design and maximum operating parameter values for physical arrangement.

Criticality Assessment of Passive Safe By-Design Components				
Component Description (A)	**Sequence ID (B)**	**Critical Design Attribute (C)**	**Review of Up-Set Conditions to Change Geometry (Applicable HAZOP Guidewords) (D)**	**Notes/Comments (E)**
			Fire	Components shall be protected from fire to ensure the critical design attribute of physical arrangement is not adversely impacted.
			Maintenance	Configuration Management shall ensure that maintenance does not adversely impact the critical design attribute of physical arrangement.
			Impact/Drop	Components shall be protected from impact/drop to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Construction on Site)	Components shall be protected from construction on-Site to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Failure of Above-Ground Liquid Storage Tanks)	Components shall be protected from external flooding (Failure of Above-Ground Liquid Storage Tanks) to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Hurricane)	Components shall be protected from hurricane events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Seismic)	Components shall be protected from seismic events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Tornado)	Components shall be protected from tornado events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Local Intense Precipitation)	Components shall be protected from local intense precipitation events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (External Fire)	Components shall be protected from external fire events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Snow/Ice)	Components shall be protected from external ice/snow events to ensure the critical design attribute of physical arrangement is not adversely impacted.
				Double Contingency Principle is satisfied as follows. The geometry is criticality safe and no single credible event or failure has been identified whereby the geometry could become unsafe. The enrichment is also controlled such that no single credible failure could result in loss of enrichment control.

Criticality Assessment of Passive Safe By-Design Components				
Component Description (A)	**Sequence ID (B)**	**Critical Design Attribute (C)**	**Review of Up-Set Conditions to Change Geometry (Applicable HAZOP Guidewords) (D)**	**Notes/Comments (E)**
Chemical Trap Transport Device	LOSS OF SAFE-BY-DESIGN ATTRIBUTE	**PHYSICAL ARRANGEMENT**		Based on qualitative assessment, there is margin between the normal operating conditions and the conservative design/analysis conditions assumed for criticality.
			Corrosion/ Erosion	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a corrosion/erosion condition that would affect the maintenance of margin to criticality associated with design and maximum operating parameter values for physical arrangement.
			Fire	Components shall be protected from fire to ensure the critical design attribute of physical arrangement is not adversely impacted.
			Maintenance	Configuration Management shall ensure that maintenance does not adversely impact the critical design attribute of physical arrangement.
			Impact/Drop	Components shall be protected from impact/drop to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Construction on Site)	Components shall be protected from construction on-Site to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Failure of Above-Ground Liquid Storage Tanks)	Components shall be protected from external flooding (Failure of Above-Ground Liquid Storage Tanks) to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Hurricane)	Components shall be protected from hurricane events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Seismic)	Components shall be protected from seismic events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Tornado)	Components shall be protected from tornado events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Local Intense Precipitation)	Components shall be protected from local intense precipitation events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (External Fire)	Components shall be protected from external fire events to ensure the critical design attribute of physical arrangement is not adversely impacted.

Criticality Assessment of Passive Safe By-Design Components				
Component Description (A)	**Sequence ID (B)**	**Critical Design Attribute (C)**	**Review of Up-Set Conditions to Change Geometry (Applicable HAZOP Guidewords) (D)**	**Notes/Comments (E)**
			External Events (Snow/Ice)	Components shall be protected from external ice/snow events to ensure the critical design attribute of physical arrangement is not adversely impacted.
				Double Contingency Principle is satisfied as follows. The geometry is criticality safe and no single credible event or failure has been identified whereby the geometry could become unsafe. The enrichment is also controlled such that no single credible failure could result in loss of enrichment control.
Mobile UF_6 Rig	LOSS OF SAFE-BY-DESIGN ATTRIBUTE	**PHYSICAL ARRANGEMENT**		Based on qualitative assessment, there is margin between the normal operating conditions and the conservative design/analysis conditions assumed for criticality.
			More Heat	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a more heat condition that would adversely affect the maintenance of margin to criticality associated with design and maximum operating parameter values for amount of U^{235} and enrichment.
			More Pressure	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a more pressure condition that would adversely affect the maintenance of margin to criticality associated with design and maximum operating parameter values for amount of U^{235} and enrichment.
			Corrosion/ Erosion	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a corrosion/erosion condition that would affect the maintenance of margin to criticality associated with design and maximum operating parameter values for physical arrangement.
			Loss of Confinement or Leakage	Based on qualitative assessment, postulated loss of Mobile UF_6 Rig confinement or leakage will not result in any appreciable accumulation of U^{235} material because of physical limitations of the process (sub-atmospheric). As a result, loss of confinement does not result in a potential for criticality and therefore its consequence is low.
			Fire	Components shall be protected from fire to ensure the critical design attribute of physical arrangement is not adversely impacted.
			Maintenance	Configuration Management shall ensure that maintenance does not adversely impact the critical design attribute of physical arrangement.

Criticality Assessment of Passive Safe By-Design Components				
Component Description (A)	**Sequence ID (B)**	**Critical Design Attribute (C)**	**Review of Up-Set Conditions to Change Geometry (Applicable HAZOP Guidewords) (D)**	**Notes/Comments (E)**
			Impact/Drop	Components shall be protected from impact/drop to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Construction on Site)	Components shall be protected from construction on-Site to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Failure of Above-Ground Liquid Storage Tanks)	Components shall be protected from external flooding (Failure of Above-Ground Liquid Storage Tanks) to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Hurricane)	Components shall be protected from hurricane events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Seismic)	Components shall be protected from seismic events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Tornado)	Components shall be protected from tornado events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Local Intense Precipitation)	Components shall be protected from local intense precipitation events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (External Fire)	Components shall be protected from external fire events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Snow/Ice)	Components shall be protected from external ice/snow events to ensure the critical design attribute of physical arrangement is not adversely impacted.
				Double Contingency Principle is satisfied as follows. The geometry is criticality safe and no single credible event or failure has been identified whereby the geometry could become unsafe. The enrichment is also controlled such that no single credible failure could result in loss of enrichment control.
1S Sample Bottle	LOSS OF SAFE-BY-DESIGN ATTRIBUTE	**DIAMETER** 24.4 cm (ID) Keff = 1.0 @ 6 wt %		Based on qualitative assessment, there is margin between the parameter values at normal operating conditions of 1S Sample Bottle diameter, amount of U^{235} and enrichment and the conservative design/analysis values for these parameters assumed for criticality.

Criticality Assessment of Passive Safe By-Design Components				
Component Description (A)	**Sequence ID (B)**	**Critical Design Attribute (C)**	**Review of Up-Set Conditions to Change Geometry (Applicable HAZOP Guidewords) (D)**	**Notes/Comments (E)**
			More Heat	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a more heat condition that would cause an approach to the critical safe diameter and to adversely affect the maintenance of margin to criticality associated with design and maximum operating parameter values for amount of U^{235} and enrichment.
			More Pressure	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a more pressure condition that would cause an approach to the critical safe diameter and to adversely affect the maintenance of margin to criticality associated with design and maximum operating parameter values for amount of U^{235} and enrichment.
			Corrosion/ Erosion	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a corrosion/erosion condition that would cause an approach to the critical safe diameter. Materials are corrosion/erosion resistant and postulated complete wall erosion would not exceed the critical safe diameter.
			Loss of Confinement or Leakage	Based on qualitative assessment, postulated loss of 1S Sample Bottle confinement or leakage will not result in any appreciable accumulation of U^{235} material because of physical limitations of the process (sub-atmospheric). As a result, loss of confinement does not result in a potential for criticality and therefore its consequence is low.
			Fire	Components shall be protected from fire to ensure the critical design attribute of diameter is not adversely impacted.
			Maintenance	Configuration Management shall ensure that maintenance does not adversely impact the critical design attribute of diameter.
				Double Contingency Principle is satisfied as follows. The geometry is criticality safe and no single credible event or failure has been identified whereby the geometry could become unsafe. The enrichment is also controlled such that no single credible failure could result in loss of enrichment control.

Column Descriptions:

Column A: This column provides a brief description of each component.

Column B: This column identifies the accident sequence associated with the passive component.

Column C: This column identifies the critical design attribute under consideration along with the conservative values used in the criticality analysis.

Column D: This column identifies the applicable guidewords from the ISA HAZOP procedure that are used to assess the criticality design margin. Additional guidewords are addressed as applicable in the detailed assessment.

Column E: This column provides any notes, comments and concluding statements.

Table 3.7-10 Product Liquid Sampling
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Criticality Assessment of Passive Safe-By-Design Components				
Component Description (A)	**Sequence ID (B)**	**Critical Design Attribute (C)**	**Review of Up-Set Conditions to Change Geometry (Applicable HAZOP Guidewords) (D)**	**Notes/Comments (E)**
Product Liquid Sampling Piping (largest pipe ID in the system)	LOSS OF SAFE-BY-DESIGN ATTRIBUTE	**DIAMETER** 24.4 cm (ID) Keff = 1.0 @ 6 wt %		Based on qualitative assessment, there is margin between the parameter values at normal operating conditions of pipe diameter, amount of U^{235} and enrichment and the conservative design/analysis values for these parameters assumed for criticality.
			More Heat	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a more heat condition that would cause an approach to the critical safe diameter and to adversely affect the maintenance of margin to criticality associated with design and maximum operating parameter values for amount of U^{235} and enrichment.
			More Pressure	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a more pressure condition that would cause an approach to the critical safe diameter and to adversely affect the maintenance of margin to criticality associated with design and maximum operating parameter values for amount of U^{235} and enrichment.
			Corrosion/ Erosion	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a corrosion/erosion condition that would cause an approach to the critical safe diameter. Materials are corrosion/erosion resistant and postulated complete wall erosion would not exceed the critical safe diameter.
			Loss of Confinement or Leakage	Based on qualitative assessment, postulated loss of piping system confinement or leakage will not result in any appreciable accumulation of U^{235} material because of physical limitations of the process (sub-atmospheric). As a result, loss of confinement does not result in a potential for criticality and therefore its consequence is low.
			Fire	Components shall be protected from fire to ensure the critical design attribute of diameter is not adversely impacted.
			Maintenance	Configuration Management shall ensure that maintenance does not adversely impact the critical design attribute of diameter.
				Double Contingency Principle is satisfied as follows. The geometry is criticality safe and no single credible event or failure has been identified whereby the geometry could become unsafe. The enrichment is also controlled such that no single credible failure could result in loss of enrichment control.

Criticality Assessment of Passive Safe-By-Design Components				
Component Description (A)	**Sequence ID (B)**	**Critical Design Attribute (C)**	**Review of Up-Set Conditions to Change Geometry (Applicable HAZOP Guidewords) (D)**	**Notes/Comments (E)**
Product Liquid Sampling Piping Arrangement	LOSS OF SAFE-BY-DESIGN ATTRIBUTE	**PHYSICAL ARRANGEMENT**		Based on qualitative assessment, there is margin between the normal operating conditions and the conservative design/analysis conditions assumed for criticality.
			More Heat	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a more heat condition that would adversely affect the maintenance of margin to criticality associated with design and maximum operating parameter values for amount of U^{235} and enrichment.
			More Pressure	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a more pressure condition that would adversely affect the maintenance of margin to criticality associated with design and maximum operating parameter values for amount of U^{235} and enrichment.
			Corrosion/ Erosion	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a corrosion/erosion condition that would affect the maintenance of margin to criticality associated with design and maximum operating parameter values for physical arrangement.
			Loss of Confinement or Leakage	Based on qualitative assessment, postulated loss of piping system confinement or leakage will not result in any appreciable accumulation of U^{235} material because of physical limitations of the process (sub-atmospheric). As a result, loss of confinement does not result in a potential for criticality and therefore its consequence is low.
			Fire	Components shall be protected from fire to ensure the critical design attribute of physical arrangement is not adversely impacted.
			Maintenance	Configuration Management shall ensure that maintenance does not adversely impact the critical design attribute of physical arrangement.
			Impact/Drop	Components shall be protected from impact/drop to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Construction on Site)	Components shall be protected from construction on-Site to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Failure of Above-Ground Liquid Storage Tanks)	Components shall be protected from external flooding (Failure of Above-Ground Liquid Storage Tanks) to ensure the critical design attribute of physical arrangement is not adversely impacted.

Criticality Assessment of Passive Safe-By-Design Components				
Component Description (A)	**Sequence ID (B)**	**Critical Design Attribute (C)**	**Review of Up-Set Conditions to Change Geometry (Applicable HAZOP Guidewords) (D)**	**Notes/Comments (E)**
			External Events (Hurricane)	Components shall be protected from hurricane events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Seismic)	Components shall be protected from seismic events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Tornado)	Components shall be protected from tornado events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Local Intense Precipitation)	Components shall be protected from local intense precipitation events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (External Fire)	Components shall be protected from external fire events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Snow/Ice)	Components shall be protected from external ice/snow events to ensure the critical design attribute of physical arrangement is not adversely impacted.
				Double Contingency Principle is satisfied as follows. The geometry is criticality safe and no single credible event or failure has been identified whereby the geometry could become unsafe. The enrichment is also controlled such that no single credible failure could result in loss of enrichment control.
Vacuum Cleaner	LOSS OF SAFE-BY-DESIGN ATTRIBUTE	**DIAMETER** 24.4 cm (ID) Keff = 1.0 @ 6 wt %		Based on qualitative assessment, there is margin between the parameter value at normal operating conditions of Vacuum Cleaner diameter and the conservative design/analysis value for this parameter assumed for criticality.
			More Heat	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a more heat condition that would cause an approach to the critical safe diameter and to adversely affect the maintenance of margin to criticality associated with design and maximum operating parameter value.
			More Pressure	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a more pressure condition that would cause an approach to the critical safe diameter and to adversely affect the maintenance of margin to criticality associated with design and maximum operating parameter value.

Criticality Assessment of Passive Safe-By-Design Components				
Component Description (A)	Sequence ID (B)	Critical Design Attribute (C)	Review of Up-Set Conditions to Change Geometry (Applicable HAZOP Guidewords) (D)	Notes/Comments (E)
			Corrosion/ Erosion	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a corrosion/erosion condition that would cause an approach to the critical safe diameter. Materials are corrosion/erosion resistant and postulated complete wall erosion would not exceed the critical safe diameter.
			Loss of Confinement or Leakage	Based on qualitative assessment, postulated loss of Vacuum Cleaner confinement or leakage will not result in any appreciable accumulation of U^{235}. As a result, loss of confinement does not result in a potential for criticality and therefore its consequence is low.
			Fire	Components shall be protected from fire to ensure the critical design attribute of diameter is not adversely impacted.
			Maintenance	Configuration Management shall ensure that maintenance does not adversely impact the critical design attribute of diameter.
			Impact/Drop	Components shall be protected from Impact/Drop to ensure the critical design attribute of diameter is not adversely impacted.
			External Events (Construction on Site)	Components shall be protected from Construction on Site to ensure the critical design attribute of diameter is not adversely impacted.
			External Events (Failure of Above-Ground Liquid Tanks)	Components shall be protected from Failure of Above-Ground Liquid Tanks to ensure the critical design attribute of diameter is not adversely impacted.
			External Events (Hurricane)	Components shall be protected from Hurricane events to ensure the critical design attribute of diameter is not adversely impacted.
			External Events (Seismic)	Components shall be protected from Seismic events to ensure the critical design attribute of diameter is not adversely impacted.
			External Events (Tornado)	Components shall be protected from Tornado events to ensure the critical design attribute of diameter is not adversely impacted.
			External Events (Local Intense Precipitation)	Components shall be protected from Local Intense Precipitation events to ensure the critical design attribute of diameter is not adversely impacted.
			External Events (Snow/Ice)	Components shall be protected from Snow/Ice events to ensure the critical design attribute of diameter is not adversely impacted.

Criticality Assessment of Passive Safe-By-Design Components				
Component Description (A)	**Sequence ID (B)**	**Critical Design Attribute (C)**	**Review of Up-Set Conditions to Change Geometry (Applicable HAZOP Guidewords) (D)**	**Notes/Comments (E)**
				Double Contingency Principle is satisfied as follows. The geometry is criticality safe and no single credible event or failure has been identified whereby the geometry could become unsafe. The enrichment is also controlled such that no single credible failure could result in loss of enrichment control.
Mobile UF_6 Rig	LOSS OF SAFE-BY-DESIGN ATTRIBUTE	**PHYSICAL ARRANGEMENT**		Based on qualitative assessment, there is margin between the normal operating conditions and the conservative design/analysis conditions assumed for criticality.
			More Heat	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a more heat condition that would adversely affect the maintenance of margin to criticality associated with design and maximum operating parameter values for amount of U^{235} and enrichment.
			More Pressure	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a more pressure condition that would adversely affect the maintenance of margin to criticality associated with design and maximum operating parameter values for amount of U^{235} and enrichment.
			Corrosion/ Erosion	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a corrosion/erosion condition that would affect the maintenance of margin to criticality associated with design and maximum operating parameter values for amount of U^{235} and enrichment.
			Loss of Confinement or Leakage	Based on qualitative assessment, postulated loss of Mobile UF_6 Rig confinement or leakage will not result in any appreciable accumulation of U^{235} material because of physical limitations of the process (sub-atmospheric). As a result, loss of confinement does not result in a potential for criticality and therefore its consequence is low.
			Fire	Components shall be protected from fire to ensure the critical design attribute of physical arrangement is not adversely impacted.
			Maintenance	Configuration Management shall ensure that maintenance does not adversely impact the critical design attribute of physical arrangement.
			Impact/Drop	Components shall be protected from impact/drop to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Construction on Site)	Components shall be protected from construction on-Site to ensure the critical design attribute of physical arrangement is not adversely impacted.

Criticality Assessment of Passive Safe-By-Design Components				
Component Description (A)	**Sequence ID (B)**	**Critical Design Attribute (C)**	**Review of Up-Set Conditions to Change Geometry (Applicable HAZOP Guidewords) (D)**	**Notes/Comments (E)**
			External Events (Failure of Above-Ground Liquid Storage Tanks)	Components shall be protected from external flooding (Failure of Above-Ground Liquid Storage Tanks) to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Hurricane)	Components shall be protected from hurricane events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Seismic)	Components shall be protected from seismic events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Tornado)	Components shall be protected from tornado events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Local Intense Precipitation)	Components shall be protected from local intense precipitation events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (External Fire)	Components shall be protected from external fire events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Snow/Ice)	Components shall be protected from external ice/snow events to ensure the critical design attribute of physical arrangement is not adversely impacted.
				Double Contingency Principle is satisfied as follows. The geometry is criticality safe and no single credible event or failure has been identified whereby the geometry could become unsafe. The enrichment is also controlled such that no single credible failure could result in loss of enrichment control.
1S Sample Bottle	LOSS OF SAFE-BY-DESIGN ATTRIBUTE	**DIAMETER** 24.4 cm (ID) Keff = 1.0 @ 6 wt %		Based on qualitative assessment, there is margin between the parameter values at normal operating conditions of pipe diameter, amount of U^{235} and enrichment and the conservative design/analysis values for these parameters assumed for criticality.
			More Heat	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a more heat condition that would cause an approach to the critical safe diameter and to adversely affect the maintenance of margin to criticality associated with design and maximum operating parameter values for amount of U^{235} and enrichment.

Table 3.7-10 Product Liquid Sampling
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Criticality Assessment of Passive Safe-By-Design Components				
Component Description (A)	**Sequence ID (B)**	**Critical Design Attribute (C)**	**Review of Up-Set Conditions to Change Geometry (Applicable HAZOP Guidewords) (D)**	**Notes/Comments (E)**
			More Pressure	*Based on qualitative assessment, it is highly unlikely* for a process deviation to result in a more pressure condition that would cause an approach to the critical safe diameter and to adversely affect the maintenance of margin to criticality associated with design and maximum operating parameter values for amount of U^{235} and enrichment.
			Corrosion/ Erosion	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a corrosion/erosion condition that would cause an approach to the critical safe diameter. Materials are corrosion/erosion resistant and postulated complete wall erosion would not exceed the critical safe diameter.
			Loss of Confinement or Leakage	Based on qualitative assessment, postulated loss of 1S Sample Bottle confinement or leakage will not result in any appreciable accumulation of U^{235} material because of physical limitations of the process (sub-atmospheric). As a result, loss of confinement does not result in a potential for criticality and therefore its consequence is low.
			Fire	Components shall be protected from fire to ensure the critical design attribute of diameter is not adversely impacted.
			Maintenance	Configuration Management shall ensure that maintenance does not adversely impact the critical design attribute of diameter.
				Double Contingency Principle is satisfied as follows. The geometry is criticality safe and no single credible event or failure has been identified whereby the geometry could become unsafe. The enrichment is also controlled such that no single credible failure could result in loss of enrichment control.

Table 3.7-10 Product Liquid Sampling
Page 8 of 8

Column Descriptions:

Column A: This column provides a brief description of each component.

Column B: This column identifies the accident sequence associated with the passive component.

Column C: This column identifies the critical design attribute under consideration along with the conservative values used in the criticality analysis.

Column D: This column identifies the applicable guidewords from the ISA HAZOP procedure that are used to assess the criticality design margin. Additional guidewords are addressed as applicable in the detailed assessment.

Column E: This column provides any notes, comments and concluding statements.

Table 3.7-11 Contingency Dump System (Note 1)
Page 1 of 1

Criticality Assessment of Passive Safe-By-Design Components				
Component Description (A)	Sequence ID (B)	Critical Design Attribute (C)	Review of Up-Set Conditions to Change Geometry (Applicable HAZOP Guidewords) (D)	Notes/Comments (E)

Table 1 Notes:

1. The system is considered classified. As such, specific information regarding design of components has been intentionally excluded to protect the classified nature of the information.

Column Descriptions:

Column A: This column provides a brief description of each component.

Column B: This column identifies the accident sequence associated with the passive component.

Column C: This column identifies the critical design attribute under consideration along with the conservative values used in the criticality analysis.

Column D: This column identifies the applicable guidewords from the ISA HAZOP procedure that are used to assess the criticality design margin. Additional guidewords are addressed as applicable in the detailed assessment.

Column E: This column provides any notes, comments and concluding statements.

Table 3.7-12 Centrifuge Test System (Note 1)
Page 1 of 1

Criticality Assessment of Passive Safe-By-Design Components				
Component Description (A)	Sequence ID (B)	Critical Design Attribute (C)	Review of Up-Set Conditions to Change Geometry (Applicable HAZOP Guidewords) (D)	Notes/Comments (E)

Table 1 Notes:

1. The system is considered classified. As such, specific information regarding design of components has been intentionally excluded to protect the classified nature of the information.

Column Descriptions:

Column A: This column provides a brief description of each component.

Column B: This column identifies the accident sequence associated with the passive component.

Column C: This column identifies the critical design attribute under consideration along with the conservative values used in the criticality analysis.

Column D: This column identifies the applicable guidewords from the ISA HAZOP procedure that are used to assess the criticality design margin. Additional guidewords are addressed as applicable in the detailed assessment.

Column E: This column provides any notes, comments and concluding statements.

Table 3.7-13 Centrifuge Post Mortem (Note 1)
Page 1 of 1

Criticality Assessment of Passive Safe-By-Design Components				
Component Description (A)	Sequence ID (B)	Critical Design Attribute (C)	Review of Up-Set Conditions to Change Geometry (Applicable HAZOP Guidewords) (D)	Notes/Comments (E)

Table 1 Notes:

1. The system is considered classified. As such, specific information regarding design of components has been intentionally excluded to protect the classified nature of the information.

Column Descriptions:

Column A: This column provides a brief description of each component.

Column B: This column identifies the accident sequence associated with the passive component.

Column C: This column identifies the critical design attribute under consideration along with the conservative values used in the criticality analysis.

Column D: This column identifies the applicable guidewords from the ISA HAZOP procedure that are used to assess the criticality design margin. Additional guidewords are addressed as applicable in the detailed assessment.

Column E: This column provides any notes, comments and concluding statements.

Table 3.7-14 Liquid Effluent Collection and Treatment System
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Criticality Assessment of Passive Safe-By-Design Components				
Component Description (A)	**Sequence ID (B)**	**Critical Design Attribute (C)**	**Review of Up-Set Conditions to Change Geometry (Applicable HAZOP Guidewords) (D)**	**Notes/Comments (E)**
Waste Container Transport Device	LOSS OF SAFE-BY-DESIGN ATTRIBUTE	**PHYSICAL ARRANGEMENT**		Based on qualitative assessment, there is margin between the normal operating conditions and the conservative design/analysis conditions assumed for criticality.
			Corrosion/ Erosion	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a corrosion/erosion condition that would affect the maintenance of margin to criticality associated with design and maximum operating parameter values for physical arrangement.
			Fire	Components shall be protected from fire to ensure the critical design attribute of physical arrangement is not adversely impacted.
			Maintenance	Configuration Management shall ensure that maintenance does not adversely impact the critical design attribute of physical arrangement.
			Impact/Drop	Components shall be protected from impact/drop to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Construction on Site)	Components shall be protected from construction on-Site to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Failure of Above-Ground Liquid Storage Tanks)	Components shall be protected from external flooding (Failure of Above-Ground Liquid Storage Tanks) to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Hurricane)	Components shall be protected from hurricane events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Seismic)	Components shall be protected from seismic events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Tornado)	Components shall be protected from tornado events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Local Intense Precipitation)	Components shall be protected from local intense precipitation events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (External Fire)	Components shall be protected from external fire events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Snow/Ice)	Components shall be protected from external ice/snow events to ensure the critical design attribute of physical arrangement is not adversely impacted.

Criticality Assessment of Passive Safe-By-Design Components				
Component Description (A)	**Sequence ID (B)**	**Critical Design Attribute (C)**	**Review of Up-Set Conditions to Change Geometry (Applicable HAZOP Guidewords) (D)**	**Notes/Comments (E)**
				Double Contingency Principle is satisfied as follows. The geometry is criticality safe and no single credible event or failure has been identified whereby the geometry could become unsafe. The enrichment is also controlled such that no single credible failure could result in loss of enrichment control.
Waste Container	LOSS OF SAFE-BY-DESIGN ATTRIBUTE	**VOLUME** 24 liters Keff = 1.0 @ 6 wt %		Based on qualitative assessment, there is margin between the parameter value at normal operating conditions of Waste Container volume and the conservative design/analysis value for this parameter assumed for criticality.
			Corrosion/ Erosion	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a corrosion/erosion condition that would cause an approach to the critical safe volume. Materials are corrosion/erosion resistant and postulated complete wall erosion would not exceed the critical safe volume.
			Loss of Confinement or Leakage	Based on qualitative assessment, postulated loss of Waste Container confinement or leakage will not result in any appreciable accumulation of U^{235} material. As a result, loss of confinement does not result in a potential for criticality and therefore its consequence is low.
			Fire	Components shall be protected from fire to ensure the critical design attribute of volume is not adversely impacted.
			Maintenance	Configuration Management shall ensure that maintenance does not adversely impact the critical design attribute of volume.
				Double Contingency Principle is satisfied as follows. The geometry is criticality safe and no single credible event or failure has been identified whereby the geometry could become unsafe. The enrichment is also controlled such that no single credible failure could result in loss of enrichment control.
Waste Container Storage Array	LOSS OF SAFE-BY-DESIGN ATTRIBUTE	**PHYSICAL ARRANGEMENT**		Based on qualitative assessment, there is margin between the normal operating conditions and the conservative design/analysis conditions assumed for criticality.
			Corrosion/ Erosion	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a corrosion/erosion condition that would affect the maintenance of margin to criticality associated with design and maximum operating parameter values.
			Fire	Components shall be protected from fire to ensure the critical design attribute of physical arrangement is not adversely impacted.

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Criticality Assessment of Passive Safe-By-Design Components				
Component Description (A)	**Sequence ID (B)**	**Critical Design Attribute (C)**	**Review of Up-Set Conditions to Change Geometry (Applicable HAZOP Guidewords) (D)**	**Notes/Comments (E)**
			Maintenance	Configuration Management shall ensure that maintenance does not adversely impact the critical design attribute of physical arrangement.
			Impact/Drop	Components shall be protected from impact/drop to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Construction on Site)	Components shall be protected from construction on-Site to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Failure of Above-Ground Liquid Storage Tanks)	Components shall be protected from external flooding (Failure of Above-Ground Liquid Storage Tanks) to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Hurricane)	Components shall be protected from hurricane events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Seismic)	Components shall be protected from seismic events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Tornado)	Components shall be protected from tornado events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Local Intense Precipitation)	Components shall be protected from local intense precipitation events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (External Fire)	Components shall be protected from external fire events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Snow/Ice)	Components shall be protected from external ice/snow events to ensure the critical design attribute of physical arrangement is not adversely impacted.
				Double Contingency Principle is satisfied as follows. The geometry is criticality safe and no single credible event or failure has been identified whereby the geometry could become unsafe. The enrichment is also controlled such that no single credible failure could result in loss of enrichment control.
Degreaser Water Centrifuge	LOSS OF SAFE-BY-DESIGN ATTRIBUTE	**VOLUME** 24 liters Keff = 1.0 @ 6 wt %		Based on qualitative assessment, there is margin between the parameter values at normal operating conditions of Degreaser Water Centrifuge volume, amount of U^{235} and enrichment and the conservative design/analysis values for these parameters assumed for criticality.

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Criticality Assessment of Passive Safe-By-Design Components				
Component Description (A)	**Sequence ID (B)**	**Critical Design Attribute (C)**	**Review of Up-Set Conditions to Change Geometry (Applicable HAZOP Guidewords) (D)**	**Notes/Comments (E)**
			More Heat	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a more heat condition that would cause an approach to the critical safe volume and to adversely affect the maintenance of margin to criticality associated with design and maximum operating parameter values for amount of U^{235} and enrichment.
			More Pressure	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a more pressure condition that would cause an approach to the critical safe volume and to adversely affect the maintenance of margin to criticality associated with design and maximum operating parameter values for amount of U^{235} and enrichment.
			Corrosion/ Erosion	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a corrosion/erosion condition that would cause an approach to the critical safe volume. Materials are corrosion/erosion resistant and postulated complete wall erosion would not exceed the critical safe volume.
			Loss of Confinement or Leakage	Degreaser Water Centrifuge shall be protected from loss of confinement or leakage with a curbed area to ensure subcriticality.
			Fire	Components shall be protected from fire to ensure the critical design attribute of volume is not adversely impacted.
			Maintenance	Configuration Management shall ensure that maintenance does not adversely impact the critical design attribute of volume.
			Impact/Drop	Components shall be protected from impact/drop to ensure the criticality design attribute of volume is not adversely impacted.
			External Events (Construction on Site)	Components shall be protected from construction on-Site to ensure the criticality design attribute of volume is not adversely impacted.
			External Events (Failure of Above-Ground Liquid Storage Tanks)	Components shall be protected from external flooding (Failure of Above-Ground Liquid Storage Tanks) to ensure the criticality design attribute of volume is not adversely impacted.
			External Events (Hurricane)	Components shall be protected from hurricane events to ensure the criticality design attribute of volume is not adversely impacted.
			External Events (Seismic)	Components shall be protected from seismic events to ensure the criticality design attribute of volume is not adversely impacted.

Criticality Assessment of Passive Safe-By-Design Components				
Component Description (A)	**Sequence ID (B)**	**Critical Design Attribute (C)**	**Review of Up-Set Conditions to Change Geometry (Applicable HAZOP Guidewords) (D)**	**Notes/Comments (E)**
			External Events (Tornado)	Components shall be protected from tornado events to ensure the criticality design attribute of volume is not adversely impacted.
			External Events (Local Intense Precipitation)	Components shall be protected from local intense precipitation events to ensure the criticality design attribute of volume is not adversely impacted.
			External Events (External Fire)	Components shall be protected from external fire events to ensure the criticality design attribute of volume is not adversely impacted.
			External Events (Snow/Ice)	Components shall be protected from external ice/snow events to ensure the criticality design attribute of volume is not adversely impacted.
				Double Contingency Principle is satisfied as follows. The geometry is criticality safe and no single credible event or failure has been identified whereby the geometry could become unsafe. The enrichment is also controlled such that no single credible failure could result in loss of enrichment control.
Degreaser Water Tank Unloading Pump	LOSS OF SAFE-BY-DESIGN ATTRIBUTE	**VOLUME** 24 liters Keff = 1.0 @ 6 wt %		Based on qualitative assessment, there is margin between the parameter values at normal operating conditions of Degreaser Water Unloading Pump volume, amount of U^{235} and enrichment and the conservative design/analysis values for these parameters assumed for criticality.
			More Heat	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a more heat condition that would cause an approach to the critical safe volume and to adversely affect the maintenance of margin to criticality associated with design and maximum operating parameter values for amount of U^{235} and enrichment.
			More Pressure	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a more pressure condition that would cause an approach to the critical safe volume and to adversely affect the maintenance of margin to criticality associated with design and maximum operating parameter values for amount of U^{235} and enrichment.
			Corrosion/ Erosion	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a corrosion/erosion condition that would cause an approach to the critical safe volume. Materials are corrosion/erosion resistant and postulated complete wall erosion would not exceed the critical safe volume.
			Loss of Confinement or Leakage	Degreaser Water Tank Unloading Pump shall be protected from loss of confinement or leakage with a curbed area to ensure subcriticality.

Criticality Assessment of Passive Safe-By-Design Components				
Component Description (A)	**Sequence ID (B)**	**Critical Design Attribute (C)**	**Review of Up-Set Conditions to Change Geometry (Applicable HAZOP Guidewords) (D)**	**Notes/Comments (E)**
			Fire	Components shall be protected from fire to ensure the critical design attribute of volume is not adversely impacted.
			Maintenance	Configuration Management shall ensure that maintenance does not adversely impact the critical design attribute of volume.
			Impact/Drop	Components shall be protected from impact/drop to ensure the criticality design attribute of volume is not adversely impacted.
			External Events (Construction on Site)	Components shall be protected from construction on-Site to ensure the criticality design attribute of volume is not adversely impacted.
			External Events (Failure of Above-Ground Liquid Storage Tanks)	Components shall be protected from external flooding (Failure of Above-Ground Liquid Storage Tanks) to ensure the criticality design attribute of volume is not adversely impacted.
			External Events (Hurricane)	Components shall be protected from hurricane events to ensure the criticality design attribute of volume is not adversely impacted.
			External Events (Seismic)	Components shall be protected from seismic events to ensure the criticality design attribute of volume is not adversely impacted.
			External Events (Tornado)	Components shall be protected from tornado events to ensure the criticality design attribute of volume is not adversely impacted.
			External Events (Local Intense Precipitation)	Components shall be protected from local intense precipitation events to ensure the criticality design attribute of volume is not adversely impacted.
			External Events (External Fire)	Components shall be protected from external fire events to ensure the criticality design attribute of volume is not adversely impacted.
			External Events (Snow/Ice)	Components shall be protected from external ice/snow events to ensure the criticality design attribute of volume is not adversely impacted.
				Double Contingency Principle is satisfied as follows. The geometry is criticality safe and no single credible event or failure has been identified whereby the geometry could become unsafe. The enrichment is also controlled such that no single credible failure could result in loss of enrichment control.

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Criticality Assessment of Passive Safe-By-Design Components				
Component Description (A)	**Sequence ID (B)**	**Critical Design Attribute (C)**	**Review of Up-Set Conditions to Change Geometry (Applicable HAZOP Guidewords) (D)**	**Notes/Comments (E)**
Degreaser Water Transfer Pump	LOSS OF SAFE-BY-DESIGN ATTRIBUTE	**VOLUME** 24 liters Keff = 1.0 @ 6 wt %		Based on qualitative assessment, there is margin between the parameter values at normal operating conditions of Degreaser Water Transfer Pump volume, amount of U^{235} and enrichment and the conservative design/analysis values for these parameters assumed for criticality.
			More Heat	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a more heat condition that would cause an approach to the critical safe volume and to adversely affect the maintenance of margin to criticality associated with design and maximum operating parameter values for amount of U^{235} and enrichment.
			More Pressure	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a more pressure condition that would cause an approach to the critical safe volume and to adversely affect the maintenance of margin to criticality associated with design and maximum operating parameter values for amount of U^{235} and enrichment.
			Corrosion/ Erosion	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a corrosion/erosion condition that would cause an approach to the critical safe volume. Materials are corrosion/erosion resistant and postulated complete wall erosion would not exceed the critical safe volume.
			Loss of Confinement or Leakage	Degreaser Water Transfer Pump shall be protected from loss of confinement or leakage with a curbed area to ensure subcriticality.
			Fire	Components shall be protected from fire to ensure the critical design attribute of volume is not adversely impacted.
			Maintenance	Configuration Management shall ensure that maintenance does not adversely impact the critical design attribute of volume.
			Impact/Drop	Components shall be protected from impact/drop to ensure the criticality design attribute of volume is not adversely impacted.
			External Events (Construction on Site)	Components shall be protected from construction on-Site to ensure the criticality design attribute of volume is not adversely impacted.
			External Events (Failure of Above-Ground Liquid Storage Tanks)	Components shall be protected from external flooding (Failure of Above-Ground Liquid Storage Tanks) to ensure the criticality design attribute of volume is not adversely impacted.
			External Events (Hurricane)	Components shall be protected from hurricane events to ensure the criticality design attribute of volume is not adversely impacted.

Criticality Assessment of Passive Safe-By-Design Components				
Component Description (A)	**Sequence ID (B)**	**Critical Design Attribute (C)**	**Review of Up-Set Conditions to Change Geometry (Applicable HAZOP Guidewords) (D)**	**Notes/Comments (E)**
			External Events (Seismic)	Components shall be protected from seismic events to ensure the criticality design attribute of volume is not adversely impacted.
			External Events (Tornado)	Components shall be protected from tornado events to ensure the criticality design attribute of volume is not adversely impacted.
			External Events (Local Intense Precipitation)	Components shall be protected from local intense precipitation events to ensure the criticality design attribute of volume is not adversely impacted.
			External Events (External Fire)	Components shall be protected from external fire events to ensure the criticality design attribute of volume is not adversely impacted.
			External Events (Snow/Ice)	Components shall be protected from external ice/snow events to ensure the criticality design attribute of volume is not adversely impacted.
				Double Contingency Principle is satisfied as follows. The geometry is criticality safe and no single credible event or failure has been identified whereby the geometry could become unsafe. The enrichment is also controlled such that no single credible failure could result in loss of enrichment control.
Degreaser Water Centrifuge Feed Pump	LOSS OF SAFE-BY-DESIGN ATTRIBUTE	**VOLUME** 24 liters Keff = 1.0 @ 6 wt %		Based on qualitative assessment, there is margin between the parameter values at normal operating conditions of *Degreaser Water Centrifuge Feed Pump volume, amount* of U^{235} and enrichment and the conservative design/analysis values for these parameters assumed for criticality.
			More Heat	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a more heat condition that would cause an approach to the critical safe volume and to adversely affect the maintenance of margin to criticality associated with design and maximum operating parameter values for amount of U^{235} and enrichment.
			More Pressure	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a more pressure condition that would cause an approach to the critical safe volume and to adversely affect the maintenance of margin to criticality associated with design and maximum operating parameter values for amount of U^{235} and enrichment.
			Corrosion/ Erosion	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a corrosion/erosion condition that would cause an approach to the critical safe volume. Materials are corrosion/erosion resistant and postulated complete wall erosion would not exceed the critical safe volume.

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Criticality Assessment of Passive Safe-By-Design Components				
Component Description (A)	**Sequence ID (B)**	**Critical Design Attribute (C)**	**Review of Up-Set Conditions to Change Geometry (Applicable HAZOP Guidewords) (D)**	**Notes/Comments (E)**
			Loss of Confinement or Leakage	Degreaser Water Centrifuge Feed Pump shall be protected from loss of confinement or leakage with a curbed area to ensure subcriticality.
			Fire	Components shall be protected from fire to ensure the critical design attribute of volume is not adversely impacted.
			Maintenance	Configuration Management shall ensure that maintenance does not adversely impact the critical design attribute of volume.
			Impact/Drop	Components shall be protected from impact/drop to ensure the criticality design attribute of volume is not adversely impacted.
			External Events (Construction on Site)	Components shall be protected from construction on-Site to ensure the criticality design attribute of volume is not adversely impacted.
			External Events (Failure of Above-Ground Liquid Storage Tanks)	Components shall be protected from external flooding (Failure of Above-Ground Liquid Storage Tanks) to ensure the criticality design attribute of volume is not adversely impacted.
			External Events (Hurricane)	Components shall be protected from hurricane events to ensure the criticality design attribute of volume is not adversely impacted.
			External Events (Seismic)	Components shall be protected from seismic events to ensure the criticality design attribute of volume is not adversely impacted.
			External Events (Tornado)	Components shall be protected from tornado events to ensure the criticality design attribute of volume is not adversely impacted.
			External Events (Local Intense Precipitation)	Components shall be protected from local intense precipitation events to ensure the criticality design attribute of volume is not adversely impacted.
			External Events (External Fire)	Components shall be protected from external fire events to ensure the criticality design attribute of volume is not adversely impacted.
			External Events (Snow/Ice)	Components shall be protected from external ice/snow events to ensure the criticality design attribute of volume is not adversely impacted.
				Double Contingency Principle is satisfied as follows. The geometry is criticality safe and no single credible event or failure has been identified whereby the geometry could become unsafe. The enrichment is also controlled such that no single credible failure could result in loss of enrichment control.

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Criticality Assessment of Passive Safe-By-Design Components				
Component Description (A)	**Sequence ID (B)**	**Critical Design Attribute (C)**	**Review of Up-Set Conditions to Change Geometry (Applicable HAZOP Guidewords) (D)**	**Notes/Comments (E)**
Degreaser Water Piping (largest pipe ID in subsystem)	LOSS OF SAFE-BY-DESIGN ATTRIBUTE	**DIAMETER** 24.4 cm (ID) Keff = 1.0 @ 6 wt %		Based on qualitative assessment, there is margin between the parameter values at normal operating conditions of pipe diameter, amount of U^{235} and enrichment and the conservative design/analysis values for these parameters assumed for criticality.
			More Heat	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a more heat condition that would cause an approach to the critical safe diameter and to adversely affect the maintenance of margin to criticality associated with design and maximum operating parameter values for amount of U^{235} and enrichment.
			More Pressure	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a more pressure condition that would cause an approach to the critical safe diameter and to adversely affect the maintenance of margin to criticality associated with design and maximum operating parameter values for amount of U^{235} and enrichment.
			Corrosion/ Erosion	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a corrosion/erosion condition that would cause an approach to the critical safe diameter. Materials are corrosion/erosion resistant and postulated complete wall erosion would not exceed the critical safe diameter.
			Loss of Confinement or Leakage	Piping system shall be protected from loss of confinement or leakage with a confinement area to ensure subcriticality.
			Fire	Components shall be protected from fire to ensure the critical design attribute of diameter is not adversely impacted.
			Maintenance	Configuration Management shall ensure that maintenance does not adversely impact the critical design attribute of diameter.
			Impact/Drop	Components shall be protected from impact/drop to ensure the criticality design attribute of diameter is not adversely impacted.
			External Events (Construction on Site)	Components shall be protected from construction on-Site to ensure the criticality design attribute of diameter is not adversely impacted.
			External Events (Failure of Above-Ground Liquid Storage Tanks)	Components shall be protected from external flooding (Failure of Above-Ground Liquid Storage Tanks) to ensure the criticality design attribute of diameter is not adversely impacted.
			External Events (Hurricane)	Components shall be protected from hurricane events to ensure the criticality design attribute of diameter is not adversely impacted.

Criticality Assessment of Passive Safe-By-Design Components				
Component Description (A)	**Sequence ID (B)**	**Critical Design Attribute (C)**	**Review of Up-Set Conditions to Change Geometry (Applicable HAZOP Guidewords) (D)**	**Notes/Comments (E)**
			External Events (Seismic)	Components shall be protected from seismic events to ensure the criticality design attribute of diameter is not adversely impacted.
			External Events (Tornado)	Components shall be protected from tornado events to ensure the criticality design attribute of diameter is not adversely impacted.
			External Events (Local Intense Precipitation)	Components shall be protected from local intense precipitation events to ensure the criticality design attribute of diameter is not adversely impacted.
			External Events (External Fire)	Components shall be protected from external fire events to ensure the criticality design attribute of diameter is not adversely impacted.
			External Events (Snow/Ice)	Components shall be protected from external ice/snow events to ensure the criticality design attribute of diameter is not adversely impacted.
				Double Contingency Principle is satisfied as follows. The geometry is criticality safe and no single credible event or failure has been identified whereby the geometry could become unsafe. The enrichment is also controlled such that no single credible failure could result in loss of enrichment control.
Degreaser Water Piping Arrangement	LOSS OF SAFE-BY-DESIGN ATTRIBUTE	**PHYSICAL ARRANGEMENT**		Based on qualitative assessment, there is margin between the normal operating conditions and the conservative *design/analysis conditions assumed for criticality.*
			More Heat	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a more heat condition that would adversely affect the maintenance of margin to criticality associated with design and maximum operating parameter values for amount of U^{235} and enrichment.
			More Pressure	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a more pressure condition that would adversely affect the maintenance of margin to criticality associated with design and maximum operating parameter values for amount of U^{235} and enrichment.
			Corrosion/ Erosion	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a corrosion/erosion condition that would affect the maintenance of margin to criticality associated with design and maximum operating parameter values for physical arrangement.
			Loss of Confinement or Leakage	Piping system shall be protected from loss of confinement or leakage with a confinement area to ensure subcriticality.

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Criticality Assessment of Passive Safe-By-Design Components				
Component Description (A)	**Sequence ID (B)**	**Critical Design Attribute (C)**	**Review of Up-Set Conditions to Change Geometry (Applicable HAZOP Guidewords) (D)**	**Notes/Comments (E)**
			Fire	Components shall be protected from fire to ensure the critical design attribute of physical arrangement is not adversely impacted.
			Maintenance	Configuration Management shall ensure that maintenance does not adversely impact the critical design attribute of physical arrangement.
			Impact/Drop	Components shall be protected from impact/drop to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Construction on Site)	Components shall be protected from construction on-Site to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Failure of Above-Ground Liquid Storage Tanks)	Components shall be protected from external flooding (Failure of Above-Ground Liquid Storage Tanks) to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Hurricane)	Components shall be protected from hurricane events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Seismic)	Components shall be protected from seismic events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Tornado)	Components shall be protected from tornado events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Local Intense Precipitation)	Components shall be protected from local intense precipitation events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (External Fire)	Components shall be protected from external fire events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Snow/Ice)	Components shall be protected from external ice/snow events to ensure the critical design attribute of physical arrangement is not adversely impacted.
				Double Contingency Principle is satisfied as follows. The geometry is criticality safe and no single credible event or failure has been identified whereby the geometry could become unsafe. The enrichment is also controlled such that no single credible failure could result in loss of enrichment control.

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Criticality Assessment of Passive Safe-By-Design Components				
Component Description (A)	**Sequence ID (B)**	**Critical Design Attribute (C)**	**Review of Up-Set Conditions to Change Geometry (Applicable HAZOP Guidewords) (D)**	**Notes/Comments (E)**
Spent Citric Acid Piping (largest pipe ID in subsystem)	LOSS OF SAFE-BY-DESIGN ATTRIBUTE	**DIAMETER** 24.4 cm (ID) Keff = 1.0 @ 6 wt %		Based on qualitative assessment, there is margin between the parameter values at normal operating conditions of pipe diameter, amount of U^{235} and enrichment and the conservative design/analysis values for these parameters assumed for criticality.
			More Heat	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a more heat condition that would cause an approach to the critical safe diameter and to adversely affect the maintenance of margin to criticality associated with design and maximum operating parameter values for amount of U^{235} and enrichment.
			More Pressure	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a more pressure condition that would cause an approach to the critical safe diameter and to adversely affect the maintenance of margin to criticality associated with design and maximum operating parameter values for amount of U^{235} and enrichment.
			Corrosion/ Erosion	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a corrosion/erosion condition that would cause an approach to the critical safe diameter. Materials are corrosion/erosion resistant and postulated complete wall erosion would not exceed the critical safe diameter.
			Loss of Confinement or Leakage	Piping system shall be protected from loss of confinement or leakage with a confinement area to ensure subcriticality.
			Fire	Components shall be protected from fire to ensure the critical design attribute of diameter is not adversely impacted.
			Maintenance	Configuration Management shall ensure that maintenance does not adversely impact the critical design attribute of diameter.
			Impact/Drop	Components shall be protected from impact/drop to ensure the criticality design attribute of diameter is not adversely impacted.
			External Events (Construction on Site)	Components shall be protected from construction on-Site to ensure the criticality design attribute of diameter is not adversely impacted.
			External Events (Failure of Above-Ground Liquid Storage Tanks)	Components shall be protected from external flooding (Failure of Above-Ground Liquid Storage Tanks) to ensure the criticality design attribute of diameter is not adversely impacted.
			External Events (Hurricane)	Components shall be protected from hurricane events to ensure the criticality design attribute of diameter is not adversely impacted.

Criticality Assessment of Passive Safe-By-Design Components				
Component Description (A)	**Sequence ID (B)**	**Critical Design Attribute (C)**	**Review of Up-Set Conditions to Change Geometry (Applicable HAZOP Guidewords) (D)**	**Notes/Comments (E)**
			External Events (Seismic)	Components shall be protected from seismic events to ensure the criticality design attribute of diameter is not adversely impacted.
			External Events (Tornado)	Components shall be protected from tornado events to ensure the criticality design attribute of diameter is not adversely impacted.
			External Events (Local Intense Precipitation)	Components shall be protected from local intense precipitation events to ensure the criticality design attribute of diameter is not adversely impacted.
			External Events (External Fire)	Components shall be protected from external fire events to ensure the criticality design attribute of diameter is not adversely impacted.
			External Events (Snow/Ice)	Components shall be protected from external ice/snow events to ensure the criticality design attribute of diameter is not adversely impacted.
				Double Contingency Principle is satisfied as follows. The geometry is criticality safe and no single credible event or failure has been identified whereby the geometry could become unsafe. The enrichment is also controlled such that no single credible failure could result in loss of enrichment control.
Spent Citric Acid Piping Arrangement	LOSS OF SAFE-BY-DESIGN ATTRIBUTE	**PHYSICAL ARRANGEMENT**		Based on qualitative assessment, there is margin between the normal operating conditions and the conservative design/analysis conditions assumed for criticality.
			More Heat	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a more heat condition that would adversely affect the maintenance of margin to criticality associated with design and maximum operating parameter values for amount of U^{235} and enrichment.
			More Pressure	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a more pressure condition that would adversely affect the maintenance of margin to criticality associated with design and maximum operating parameter values for amount of U^{235} and enrichment.
			Corrosion/ Erosion	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a corrosion/erosion condition that would affect the maintenance of margin to criticality associated with design and maximum operating parameter values for physical arrangement.
			Loss of Confinement or Leakage	Piping system shall be protected from loss of confinement or leakage with a confinement area to ensure subcriticality.

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Criticality Assessment of Passive Safe-By-Design Components				
Component Description (A)	**Sequence ID (B)**	**Critical Design Attribute (C)**	**Review of Up-Set Conditions to Change Geometry (Applicable HAZOP Guidewords) (D)**	**Notes/Comments (E)**
			Fire	Components shall be protected from fire to ensure the critical design attribute of physical arrangement is not adversely impacted.
			Maintenance	Configuration Management shall ensure that maintenance does not adversely impact the critical design attribute of physical arrangement.
			Impact/Drop	Components shall be protected from impact/drop to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Construction on Site)	Components shall be protected from construction on-Site to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Failure of Above-Ground Liquid Storage Tanks)	Components shall be protected from external flooding (Failure of Above-Ground Liquid Storage Tanks) to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Hurricane)	Components shall be protected from hurricane events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Seismic)	Components shall be protected from seismic events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Tornado)	Components shall be protected from tornado events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Local Intense Precipitation)	Components shall be protected from local intense precipitation events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (External Fire)	Components shall be protected from external fire events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Snow/Ice)	Components shall be protected from external ice/snow events to ensure the critical design attribute of physical arrangement is not adversely impacted.
				Double Contingency Principle is satisfied as follows. The geometry is criticality safe and no single credible event or failure has been identified whereby the geometry could become unsafe. The enrichment is also controlled such that no single credible failure could result in loss of enrichment control.

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Criticality Assessment of Passive Safe-By-Design Components				
Component Description (A)	**Sequence ID (B)**	**Critical Design Attribute (C)**	**Review of Up-Set Conditions to Change Geometry (Applicable HAZOP Guidewords) (D)**	**Notes/Comments (E)**
Spent Citric Acid Transfer Pump	LOSS OF SAFE-BY-DESIGN ATTRIBUTE	**VOLUME** 24. liters Keff = 1.0 @ 6 wt %		Based on qualitative assessment, there is margin between the parameter values at normal operating conditions of Spent Citric Acid Transfer Pump volume, amount of U^{235} and enrichment and the conservative design/analysis values for these parameters assumed for criticality.
			More Heat	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a more heat condition that would cause an approach to the critical safe volume and to adversely affect the maintenance of margin to criticality associated with design and maximum operating parameter values for amount of U^{235} and enrichment.
			More Pressure	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a more pressure condition that would cause an approach to the critical safe volume and to adversely affect the maintenance of margin to criticality associated with design and maximum operating parameter values for amount of U^{235} and enrichment.
			Corrosion/ Erosion	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a corrosion/erosion condition that would cause an approach to the critical safe volume. Materials are corrosion/erosion resistant and postulated complete wall erosion would not exceed the critical safe volume.
			Loss of Confinement or Leakage	Spent Citric Acid Transfer Pump shall be protected from loss of confinement or leakage with a confinement area to ensure subcriticality.
			Fire	Components shall be protected from fire to ensure the critical design attribute of volume is not adversely impacted.
			Maintenance	Configuration Management shall ensure that maintenance does not adversely impact the critical design attribute of volume.
			Impact/Drop	Components shall be protected from impact/drop to ensure the criticality design attribute of volume is not adversely impacted.
			External Events (Construction on Site)	Components shall be protected from construction on-Site to ensure the criticality design attribute of volume is not adversely impacted.
			External Events (Failure of Above-Ground Liquid Storage Tanks)	Components shall be protected from external flooding (Failure of Above-Ground Liquid Storage Tanks) to ensure the criticality design attribute of volume is not adversely impacted.
			External Events (Hurricane)	Components shall be protected from hurricane events to ensure the criticality design attribute of volume is not adversely impacted.

Criticality Assessment of Passive Safe-By-Design Components				
Component Description (A)	**Sequence ID (B)**	**Critical Design Attribute (C)**	**Review of Up-Set Conditions to Change Geometry (Applicable HAZOP Guidewords) (D)**	**Notes/Comments (E)**
			External Events (Seismic)	Components shall be protected from seismic events to ensure the criticality design attribute of volume is not adversely impacted.
			External Events (Tornado)	Components shall be protected from tornado events to ensure the criticality design attribute of volume is not adversely impacted.
			External Events (Local Intense Precipitation)	Components shall be protected from local intense precipitation events to ensure the criticality design attribute of volume is not adversely impacted.
			External Events (External Fire)	Components shall be protected from external fire events to ensure the criticality design attribute of volume is not adversely impacted.
			External Events (Snow/Ice)	Components shall be protected from external ice/snow events to ensure the criticality design attribute of volume is not adversely impacted.
				Double Contingency Principle is satisfied as follows. The geometry is criticality safe and no single credible event or failure has been identified whereby the geometry could become unsafe. The enrichment is also controlled such that no single credible failure could result in loss of enrichment control.
Spent Citric Acid Unloading Pump	LOSS OF SAFE-BY-DESIGN ATTRIBUTE	**VOLUME** 24 liters Keff = 1.0 @ 6 wt %		Based on qualitative assessment, there is margin between the parameter values at normal operating conditions of Spent Citric Acid Unloading Pump volume, amount of U^{235} and enrichment and the conservative design/analysis values for these parameters assumed for criticality.
			More Heat	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a more heat condition that would cause an approach to the critical safe volume and to adversely affect the maintenance of margin to criticality associated with design and maximum operating parameter values for amount of U^{235} and enrichment.
			More Pressure	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a more pressure condition that would cause an approach to the critical safe volume and to adversely affect the maintenance of margin to criticality associated with design and maximum operating parameter values for amount of U^{235} and enrichment.
			Corrosion/ Erosion	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a corrosion/erosion condition that would cause an approach to the critical safe volume. Materials are corrosion/erosion resistant and postulated complete wall erosion would not exceed the critical safe volume.

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Criticality Assessment of Passive Safe-By-Design Components				
Component Description (A)	**Sequence ID (B)**	**Critical Design Attribute (C)**	**Review of Up-Set Conditions to Change Geometry (Applicable HAZOP Guidewords) (D)**	**Notes/Comments (E)**
			Loss of Confinement or Leakage	Spent Citric Acid Unloading Pump shall be protected from loss of confinement or leakage with a confinement area to ensure subcriticality.
			Fire	Components shall be protected from fire to ensure the critical design attribute of volume is not adversely impacted.
			Maintenance	Configuration Management shall ensure that maintenance does not adversely impact the critical design attribute of volume.
			Impact/Drop	Components shall be protected from impact/drop to ensure the criticality design attribute of volume is not adversely impacted.
			External Events (Construction on Site)	Components shall be protected from construction on-Site to ensure the criticality design attribute of volume is not adversely impacted.
			External Events (Failure of Above-Ground Liquid Storage Tanks)	Components shall be protected from external flooding (Failure of Above-Ground Liquid Storage Tanks) to ensure the criticality design attribute of volume is not adversely impacted.
			External Events (Hurricane)	Components shall be protected from hurricane events to ensure the criticality design attribute of volume is not adversely impacted.
			External Events (Seismic)	Components shall be protected from seismic events to ensure the criticality design attribute of volume is not adversely impacted.
			External Events (Tornado)	Components shall be protected from tornado events to ensure the criticality design attribute of volume is not adversely impacted.
			External Events (Local Intense Precipitation)	Components shall be protected from local intense precipitation events to ensure the criticality design attribute of volume is not adversely impacted.
			External Events (External Fire)	Components shall be protected from external fire events to ensure the criticality design attribute of volume is not adversely impacted.
			External Events (Snow/Ice)	Components shall be protected from external ice/snow events to ensure the criticality design attribute of volume is not adversely impacted.
				Double Contingency Principle is satisfied as follows. The geometry is criticality safe and no single credible event or failure has been identified whereby the geometry could become unsafe. The enrichment is also controlled such that no single credible failure could result in loss of enrichment control.

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Criticality Assessment of Passive Safe-By-Design Components				
Component Description (A)	**Sequence ID (B)**	**Critical Design Attribute (C)**	**Review of Up-Set Conditions to Change Geometry (Applicable HAZOP Guidewords) (D)**	**Notes/Comments (E)**
Laboratory Waste Pump	LOSS OF SAFE-BY-DESIGN ATTRIBUTE	**VOLUME** 24 liters Keff = 1.0 @ 6 wt %		Based on qualitative assessment, there is margin between the parameter values at normal operating conditions of Laboratory Waste Pump volume, amount of U^{235} and enrichment and the conservative design/analysis values for these parameters assumed for criticality.
			More Heat	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a more heat condition that would cause an approach to the critical safe volume and to adversely affect the maintenance of margin to criticality associated with design and maximum operating parameter values for amount of U^{235} and enrichment.
			More Pressure	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a more pressure condition that would cause an approach to the critical safe volume and to adversely affect the maintenance of margin to criticality associated with design and maximum operating parameter values for amount of U^{235} and enrichment.
			Corrosion/ Erosion	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a corrosion/erosion condition that would cause an approach to the critical safe volume. Materials are corrosion/erosion resistant and postulated complete wall erosion would not exceed the critical safe volume.
			Loss of Confinement or Leakage	Laboratory Waste Pump shall be protected from loss of confinement or leakage with a confinement area to ensure subcriticality.
			Fire	Components shall be protected from fire to ensure the critical design attribute of volume is not adversely impacted.
			Maintenance	Configuration Management shall ensure that maintenance does not adversely impact the critical design attribute of volume.
			Impact/Drop	Components shall be protected from impact/drop to ensure the criticality design attribute of volume is not adversely impacted.
			External Events (Construction on Site)	Components shall be protected from construction on-Site to ensure the criticality design attribute of volume is not adversely impacted.
			External Events (Failure of Above-Ground Liquid Storage Tanks)	Components shall be protected from external flooding (Failure of Above-Ground Liquid Storage Tanks) to ensure the criticality design attribute of volume is not adversely impacted.
			External Events (Hurricane)	Components shall be protected from hurricane events to ensure the criticality design attribute of volume is not adversely impacted.

Criticality Assessment of Passive Safe-By-Design Components				
Component Description (A)	**Sequence ID (B)**	**Critical Design Attribute (C)**	**Review of Up-Set Conditions to Change Geometry (Applicable HAZOP Guidewords) (D)**	**Notes/Comments (E)**
			External Events (Seismic)	Components shall be protected from seismic events to ensure the criticality design attribute of volume is not adversely impacted.
			External Events (Tornado)	Components shall be protected from tornado events to ensure the criticality design attribute of volume is not adversely impacted.
			External Events (Local Intense Precipitation)	Components shall be protected from local intense precipitation events to ensure the criticality design attribute of volume is not adversely impacted.
			External Events (External Fire)	Components shall be protected from external fire events to ensure the criticality design attribute of volume is not adversely impacted.
			External Events (Snow/Ice)	Components shall be protected from external ice/snow events to ensure the criticality design attribute of volume is not adversely impacted.
				Double Contingency Principle is satisfied as follows. The geometry is criticality safe and no single credible event or failure has been identified whereby the geometry could become unsafe. The enrichment is also controlled such that no single credible failure could result in loss of enrichment control.
Miscellaneous Effluent *Transfer Pump*	LOSS OF SAFE-BY-DESIGN ATTRIBUTE	**VOLUME** 24 liters Keff = 1.0 @ 6 wt %		Based on qualitative assessment, there is margin between the parameter values at normal operating conditions of *Miscellaneous Effluent Transfer Pump volume, amount of* U^{235} and enrichment and the conservative design/analysis values for these parameters assumed for criticality.
			More Heat	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a more heat condition that would cause an approach to the critical safe volume and to adversely affect the maintenance of margin to criticality associated with design and maximum operating parameter values for amount of U^{235} and enrichment.
			More Pressure	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a more pressure condition that would cause an approach to the critical safe volume and to adversely affect the maintenance of margin to criticality associated with design and maximum operating parameter values for amount of U^{235} and enrichment.
			Corrosion/ Erosion	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a corrosion/erosion condition that would cause an approach to the critical safe volume. Materials are corrosion/erosion resistant and postulated complete wall erosion would not exceed the critical safe volume.

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Criticality Assessment of Passive Safe-By-Design Components				
Component Description (A)	Sequence ID (B)	Critical Design Attribute (C)	Review of Up-Set Conditions to Change Geometry (Applicable HAZOP Guidewords) (D)	Notes/Comments (E)
			Loss of Confinement or Leakage	Miscellaneous Effluent Transfer Pump shall be protected from loss of confinement or leakage with a confinement area to ensure subcriticality.
			Fire	Components shall be protected from fire to ensure the critical design attribute of volume is not adversely impacted.
			Maintenance	Configuration Management shall ensure that maintenance does not adversely impact the critical design attribute of volume.
			Impact/Drop	Components shall be protected from impact/drop to ensure the criticality design attribute of volume is not adversely impacted.
			External Events (Construction on Site)	Components shall be protected from construction on-Site to ensure the criticality design attribute of volume is not adversely impacted.
			External Events (Failure of Above-Ground Liquid Storage Tanks)	Components shall be protected from external flooding (Failure of Above-Ground Liquid Storage Tanks) to ensure the criticality design attribute of volume is not adversely impacted.
			External Events (Hurricane)	Components shall be protected from hurricane events to ensure the criticality design attribute of volume is not adversely impacted.
			External Events (Seismic)	Components shall be protected from seismic events to ensure the criticality design attribute of volume is not adversely impacted.
			External Events (Tornado)	Components shall be protected from tornado events to ensure the criticality design attribute of volume is not adversely impacted.
			External Events (Local Intense Precipitation)	Components shall be protected from local intense precipitation events to ensure the criticality design attribute of volume is not adversely impacted.
			External Events (External Fire)	Components shall be protected from external fire events to ensure the criticality design attribute of volume is not adversely impacted.
			External Events (Snow/Ice)	Components shall be protected from external ice/snow events to ensure the criticality design attribute of volume is not adversely impacted.
				Double Contingency Principle is satisfied as follows. The geometry is criticality safe and no single credible event or failure has been identified whereby the geometry could become unsafe. The enrichment is also controlled such that no single credible failure could result in loss of enrichment control.

Criticality Assessment of Passive Safe-By-Design Components				
Component Description (A)	**Sequence ID (B)**	**Critical Design Attribute (C)**	**Review of Up-Set Conditions to Change Geometry (Applicable HAZOP Guidewords) (D)**	**Notes/Comments (E)**
Miscellaneous Effluent Piping (largest pipe ID in system))	LOSS OF SAFE-BY-DESIGN ATTRIBUTE	**DIAMETER** 24.4 cm (ID) Keff = 1.0 @ 6 wt %		Based on qualitative assessment, there is margin between the parameter values at normal operating conditions of pipe diameter, amount of U^{235} and enrichment and the conservative design/analysis values for these parameters assumed for criticality.
			More Heat	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a more heat condition that would cause an approach to the critical safe diameter and to adversely affect the maintenance of margin to criticality associated with design and maximum operating parameter values for amount of U^{235} and enrichment.
			More Pressure	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a more pressure condition that would cause an approach to the critical safe diameter and to adversely affect the maintenance of margin to criticality associated with design and maximum operating parameter values for amount of U^{235} and enrichment.
			Corrosion/ Erosion	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a corrosion/erosion condition that would cause an approach to the critical safe diameter. Materials are corrosion/erosion resistant and postulated complete wall erosion would not exceed the critical safe diameter.
			Loss of Confinement or Leakage	Piping system shall be protected from loss of confinement or leakage with a confinement area to ensure subcriticality.
			Fire	Components shall be protected from fire to ensure the critical design attribute of diameter is not adversely impacted.
			Maintenance	Configuration Management shall ensure that maintenance does not adversely impact the critical design attribute of diameter.
			Impact/Drop	Components shall be protected from impact/drop to ensure the criticality design attribute of diameter is not adversely impacted.
			External Events (Construction on Site)	Components shall be protected from construction on-Site to ensure the criticality design attribute of diameter is not adversely impacted.
			External Events (Failure of Above-Ground Liquid Storage Tanks)	Components shall be protected from external flooding (Failure of Above-Ground Liquid Storage Tanks) to ensure the criticality design attribute of diameter is not adversely impacted.
			External Events (Hurricane)	Components shall be protected from hurricane events to ensure the criticality design attribute of diameter is not adversely impacted.

Criticality Assessment of Passive Safe-By-Design Components				
Component Description (A)	**Sequence ID (B)**	**Critical Design Attribute (C)**	**Review of Up-Set Conditions to Change Geometry (Applicable HAZOP Guidewords) (D)**	**Notes/Comments (E)**
			External Events (Seismic)	Components shall be protected from seismic events to ensure the criticality design attribute of diameter is not adversely impacted.
			External Events (Tornado)	Components shall be protected from tornado events to ensure the criticality design attribute of diameter is not adversely impacted.
			External Events (Local Intense Precipitation)	Components shall be protected from local intense precipitation events to ensure the criticality design attribute of diameter is not adversely impacted.
			External Events (External Fire)	Components shall be protected from external fire events to ensure the criticality design attribute of diameter is not adversely impacted.
			External Events (Snow/Ice)	Components shall be protected from external ice/snow events to ensure the criticality design attribute of diameter is not adversely impacted.
				Double Contingency Principle is satisfied as follows. The geometry is criticality safe and no single credible event or failure has been identified whereby the geometry could become unsafe. The enrichment is also controlled such that no single credible failure could result in loss of enrichment control.
Miscellaneous Effluent Piping Arrangement	LOSS OF SAFE-BY-DESIGN ATTRIBUTE	**PHYSICAL ARRANGEMENT**		Based on qualitative assessment, there is margin between the normal operating conditions and the conservative design/analysis conditions assumed for criticality.
			More Heat	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a more heat condition that would adversely affect the maintenance of margin to criticality associated with design and maximum operating parameter values for amount of U^{235} and enrichment.
			More Pressure	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a more pressure condition that would adversely affect the maintenance of margin to criticality associated with design and maximum operating parameter values for amount of U^{235} and enrichment.
			Corrosion/ Erosion	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a corrosion/erosion condition that would affect the maintenance of margin to criticality associated with design and maximum operating parameter values for physical arrangement.
			Loss of Confinement or Leakage	Piping system shall be protected from loss of confinement or leakage with a confinement area to ensure subcriticality.

Criticality Assessment of Passive Safe-By-Design Components				
Component Description (A)	Sequence ID (B)	Critical Design Attribute (C)	Review of Up-Set Conditions to Change Geometry (Applicable HAZOP Guidewords) (D)	Notes/Comments (E)
			Fire	Components shall be protected from fire to ensure the critical design attribute of physical arrangement is not adversely impacted.
			Maintenance	Configuration Management shall ensure that maintenance does not adversely impact the critical design attribute of physical arrangement.
			Impact/Drop	Components shall be protected from impact/drop to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Construction on Site)	Components shall be protected from construction on-Site to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Failure of Above-Ground Liquid Storage Tanks)	Components shall be protected from external flooding (Failure of Above-Ground Liquid Storage Tanks) to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Hurricane)	Components shall be protected from hurricane events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Seismic)	Components shall be protected from seismic events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Tornado)	Components shall be protected from tornado events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Local Intense Precipitation)	Components shall be protected from local intense precipitation events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (External Fire)	Components shall be protected from external fire events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Snow/Ice)	Components shall be protected from external ice/snow events to ensure the critical design attribute of physical arrangement is not adversely impacted.
				Double Contingency Principle is satisfied as follows. The geometry is criticality safe and no single credible event or failure has been identified whereby the geometry could become unsafe. The enrichment is also controlled such that no single credible failure could result in loss of enrichment control.

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Criticality Assessment of Passive Safe-By-Design Components				
Component Description (A)	**Sequence ID (B)**	**Critical Design Attribute (C)**	**Review of Up-Set Conditions to Change Geometry (Applicable HAZOP Guidewords) (D)**	**Notes/Comments (E)**
Precipitation Treatment Tank Filter Press Feed Pump	LOSS OF SAFE-BY-DESIGN ATTRIBUTE	**VOLUME** 24 liters Keff = 1.0 @ 6 wt %		Based on qualitative assessment, there is margin between the parameter values at normal operating conditions of Precipitation Treatment Tank Filter Press Feed Pump volume, amount of U^{235} and enrichment and the conservative design/analysis values for these parameters assumed for criticality.
			More Heat	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a more heat condition that would cause an approach to the critical safe volume and to adversely affect the maintenance of margin to criticality associated with design and maximum operating parameter values for amount of U^{235} and enrichment.
			More Pressure	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a more pressure condition that would cause an approach to the critical safe volume and to adversely affect the maintenance of margin to criticality associated with design and maximum operating parameter values for amount of U^{235} and enrichment.
			Corrosion/ Erosion	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a corrosion/erosion condition that would cause an approach to the critical safe volume. Materials are corrosion/erosion resistant and postulated complete wall erosion would not exceed the critical safe volume.
			Loss of Confinement or Leakage	Precipitation Treatment Tank Filter Press Feed Pump shall be protected from loss of confinement or leakage with a confinement area to ensure subcriticality.
			Fire	Components shall be protected from fire to ensure the critical design attribute of volume is not adversely impacted.
			Maintenance	Configuration Management shall ensure that maintenance does not adversely impact the critical design attribute of volume.
			Impact/Drop	Components shall be protected from impact/drop to ensure the criticality design attribute of volume is not adversely impacted.
			External Events (Construction on Site)	Components shall be protected from construction on-Site to ensure the criticality design attribute of volume is not adversely impacted.
			External Events (Failure of Above-Ground Liquid Storage Tanks)	Components shall be protected from external flooding (Failure of Above-Ground Liquid Storage Tanks) to ensure the criticality design attribute of volume is not adversely impacted.

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Criticality Assessment of Passive Safe-By-Design Components				
Component Description (A)	**Sequence ID (B)**	**Critical Design Attribute (C)**	**Review of Up-Set Conditions to Change Geometry (Applicable HAZOP Guidewords) (D)**	**Notes/Comments (E)**
			External Events (Hurricane)	Components shall be protected from hurricane events to ensure the criticality design attribute of volume is not adversely impacted.
			External Events (Seismic)	Components shall be protected from seismic events to ensure the criticality design attribute of volume is not adversely impacted.
			External Events (Tornado)	Components shall be protected from tornado events to ensure the criticality design attribute of volume is not adversely impacted.
			External Events (Local Intense Precipitation)	Components shall be protected from local intense precipitation events to ensure the criticality design attribute of volume is not adversely impacted.
			External Events (External Fire)	Components shall be protected from external fire events to ensure the criticality design attribute of volume is not adversely impacted.
			External Events (Snow/Ice)	Components shall be protected from external ice/snow events to ensure the criticality design attribute of volume is not adversely impacted.
				Double Contingency Principle is satisfied as follows. The geometry is criticality safe and no single credible event or failure has been identified whereby the geometry could become unsafe. The enrichment is also controlled such that no single credible failure could result in loss of enrichment control.
Precipitation Treatment Tank Transfer Pump	LOSS OF SAFE-BY-DESIGN ATTRIBUTE	**VOLUME** 24 liters Keff = 1.0 @ 6 wt %		Based on qualitative assessment, there is margin between the parameter values at normal operating conditions of Precipitation Treatment Tank Transfer Pump volume, amount of U^{235} and enrichment and the conservative design/analysis values for these parameters assumed for criticality.
			More Heat	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a more heat condition that would cause an approach to the critical safe volume and to adversely affect the maintenance of margin to criticality associated with design and maximum operating parameter values for amount of U^{235} and enrichment.
			More Pressure	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a more pressure condition that would cause an approach to the critical safe volume and to adversely affect the maintenance of margin to criticality associated with design and maximum operating parameter values for amount of U^{235} and enrichment.

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Criticality Assessment of Passive Safe-By-Design Components				
Component Description (A)	**Sequence ID (B)**	**Critical Design Attribute (C)**	**Review of Up-Set Conditions to Change Geometry (Applicable HAZOP Guidewords) (D)**	**Notes/Comments (E)**
			Corrosion/ Erosion	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a corrosion/erosion condition that would cause an approach to the critical safe volume. Materials are corrosion/erosion resistant and postulated complete wall erosion would not exceed the critical safe volume.
			Loss of Confinement or Leakage	Precipitation Treatment Tank Transfer Pump shall be protected from loss of confinement or leakage with a confinement area to ensure subcriticality.
			Fire	Components shall be protected from fire to ensure the critical design attribute of volume is not adversely impacted.
			Maintenance	Configuration Management shall ensure that maintenance does not adversely impact the critical design attribute of volume.
			Impact/Drop	Components shall be protected from impact/drop to ensure the criticality design attribute of volume is not adversely impacted.
			External Events (Construction on Site)	Components shall be protected from construction on-Site to ensure the criticality design attribute of volume is not adversely impacted.
			External Events (Failure of Above-Ground Liquid Storage Tanks)	Components shall be protected from external flooding (Failure of Above-Ground Liquid Storage Tanks) to ensure the criticality design attribute of volume is not adversely impacted.
			External Events (Hurricane)	Components shall be protected from hurricane events to ensure the criticality design attribute of volume is not adversely impacted.
			External Events (Seismic)	Components shall be protected from seismic events to ensure the criticality design attribute of volume is not adversely impacted.
			External Events (Tornado)	Components shall be protected from tornado events to ensure the criticality design attribute of volume is not adversely impacted.
			External Events (Local Intense Precipitation)	Components shall be protected from local intense precipitation events to ensure the criticality design attribute of volume is not adversely impacted.
			External Events (External Fire)	Components shall be protected from external fire events to ensure the Criticality Design is not adversely impacted.
			External Events (Snow/Ice)	Components shall be protected from external ice/snow events to ensure the criticality design attribute of volume is not adversely impacted.

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Criticality Assessment of Passive Safe-By-Design Components				
Component Description (A)	**Sequence ID (B)**	**Critical Design Attribute (C)**	**Review of Up-Set Conditions to Change Geometry (Applicable HAZOP Guidewords) (D)**	***Notes/Comments* (E)**
				Double Contingency Principle is satisfied as follows. The geometry is criticality safe and no single credible event or failure has been identified whereby the geometry could become unsafe. The enrichment is also controlled such that no single credible failure could result in loss of enrichment control.
Curbed Area, Liquid Effluent Collect and Treatment Room	LOSS OF SAFE-BY-DESIGN ATTRIBUTE	**Shape-Slab** 11.5 cm Keff = 1.0 @ 6 wt % (Ref. 11, Table 2)		Based on qualitative assessment, there is margin between the parameter values at normal operating conditions of the curb area shape, amount of U^{235} and enrichment and the conservative design/analysis values for these parameters assumed for criticality.
			More Heat	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a more heat condition that would cause an approach to the critical safe shape and to adversely affect the maintenance of margin to criticality associated with design and maximum operating parameter values for amount of U^{235} and enrichment.
			More Pressure	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a more pressure condition that would cause an approach to the critical safe shape and to adversely affect the maintenance of margin to criticality associated with design and maximum operating parameter values for amount of U^{235} and enrichment.
			Corrosion/ Erosion	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a corrosion/erosion condition that would cause an approach to the critical safe shape.
			Loss of Confinement or Leakage	Based on qualitative assessment, postulated loss of the curbed area confinement or leakage will not result in any appreciable accumulation of U^{235} material because of the robust construction of the curbed area.
			Fire	Components shall be protected from fire to ensure the critical design attribute of shape is not adversely impacted.
			Maintenance	Configuration Management shall ensure that maintenance does not adversely impact the critical design attribute of shape.
			Impact/Drop	Components shall be protected from impact/drop to ensure the criticality design attribute of shape is not adversely impacted.
			External Events (Construction on Site)	Components shall be protected from construction on-Site to ensure the criticality design attribute of shape is not adversely impacted.

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Criticality Assessment of Passive Safe-By-Design Components				
Component Description (A)	**Sequence ID (B)**	**Critical Design Attribute (C)**	**Review of Up-Set Conditions to Change Geometry (Applicable HAZOP Guidewords) (D)**	**Notes/Comments (E)**
			External Events (Failure of Above-Ground Liquid Storage Tanks)	Components shall be protected from external flooding (Failure of Above-Ground Liquid Storage Tanks) to ensure the criticality design attribute of shape is not adversely impacted.
			External Events (Hurricane)	Components shall be protected from hurricane events to ensure the criticality design attribute of shape is not adversely impacted.
			External Events (Seismic)	Components shall be protected from seismic events to ensure the criticality design attribute of shape is not adversely impacted.
			External Events (Tornado)	Components shall be protected from tornado events to ensure the criticality design attribute of shape is not adversely impacted.
			External Events (Local Intense Precipitation)	Components shall be protected from local intense precipitation events to ensure the criticality design attribute of shape is not adversely impacted.
			External Events (External Fire)	Components shall be protected from external fire events to ensure the criticality design attribute of shape is not adversely impacted.
			External Events (Snow/Ice)	Components shall be protected from external ice/snow events to ensure the criticality design attribute of shape is not adversely impacted.
				Double Contingency Principle is satisfied as follows. The geometry is criticality safe and no single credible event or failure has been identified whereby the geometry could become unsafe. The enrichment is also controlled such that no single credible failure could result in loss of enrichment control.

Column Descriptions:

Column A: This column provides a brief description of each component.

Column B: This column identifies the accident sequence associated with the passive component.

Column C: This column identifies the critical design attribute under consideration along with the conservative values used in the criticality analysis.

Column D: This column identifies the applicable guidewords from the ISA HAZOP procedure that are used to assess the criticality design margin. Additional guidewords are addressed as applicable in the detailed assessment.

Column E: This column provides any notes, comments and concluding statements.

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Criticality Assessment of Passive Safe-By-Design Components				
Component Description (A)	**Sequence ID (B)**	**Critical Design Attribute (C)**	**Review of Up-Set Conditions to Change Geometry (Applicable HAZOP Guidewords) (D)**	**Notes/Comments (E)**
12 Liter Container Storage Array	LOSS OF SAFE-BY-DESIGN ATTRIBUTE	**PHYSICAL ARRANGEMENT**		Based on qualitative assessment, there is margin between the normal operating conditions and the conservative design/analysis conditions assumed for criticality.
			Corrosion/ Erosion	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a corrosion/erosion condition that would affect the maintenance of margin to criticality associated with design and maximum operating parameter values.
			Fire	Components shall be protected from fire to ensure the critical design attribute of physical arrangement is not adversely impacted.
			Maintenance	Configuration Management shall ensure that maintenance does not adversely impact the critical design attribute of physical arrangement.
			Impact/Drop	Components shall be protected from impact/drop to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Construction on Site)	Components shall be protected from construction on-Site to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Failure of Above-Ground Liquid Storage Tanks)	Components shall be protected from external flooding (Failure of Above-Ground Liquid Storage Tanks) to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Hurricane)	Components shall be protected from hurricane events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Seismic)	Components shall be protected from seismic events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Tornado)	Components shall be protected from tornado events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Local Intense Precipitation)	Components shall be protected from local intense precipitation events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (External Fire)	Components shall be protected from external fire events to ensure the critical design attribute of physical arrangement is not adversely impacted.

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Criticality Assessment of Passive Safe-By-Design Components				
Component Description (A)	**Sequence ID (B)**	**Critical Design Attribute (C)**	**Review of Up-Set Conditions to Change Geometry (Applicable HAZOP Guidewords) (D)**	**Notes/Comments (E)**
			External Events (Snow/Ice)	Components shall be protected from external ice/snow events to ensure the critical design attribute of physical arrangement is not adversely impacted.
				Double Contingency Principle is satisfied as follows. The geometry is criticality safe and no single credible event or failure has been identified whereby the geometry could become unsafe. The enrichment is also controlled such that no single credible failure could result in loss of enrichment control.
12 Liter Canister	LOSS OF SAFE-BY-DESIGN ATTRIBUTE	**VOLUME** 24 liters Keff = 1.0 @ 6 wt %		Based on qualitative assessment, there is margin between the parameter value at normal operating conditions of 12 Liter Canister volume and the conservative design/analysis value for this parameter assumed for criticality.
			Corrosion/ Erosion	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a corrosion/erosion condition that would cause an approach to the critical safe volume. Materials are corrosion/erosion resistant and postulated complete wall erosion would not exceed the critical safe volume.
			Loss of Confinement or Leakage	Based on qualitative assessment, postulated loss of 12 Liter Canister confinement or leakage will not result in any appreciable accumulation of U^{235} material. As a result, loss of confinement does not result in a potential for criticality and therefore its consequence is low
			Fire	Components shall be protected from fire to ensure the critical design attribute of volume is not adversely impacted.
			Maintenance	Configuration Management shall ensure that maintenance does not adversely impact the critical design attribute of volume.
				Double Contingency Principle is satisfied as follows. The geometry is criticality safe and no single credible event or failure has been identified whereby the geometry could become unsafe. The enrichment is also controlled such that no single credible failure could result in loss of enrichment control.
12 Liter Container Transport Device	LOSS OF SAFE-BY-DESIGN ATTRIBUTE	**PHYSICAL ARRANGEMENT**		Based on qualitative assessment, there is margin between the normal operating conditions and the conservative design/analysis conditions assumed for criticality.
			Corrosion/ Erosion	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a corrosion/erosion condition that would affect the maintenance of margin to criticality associated with design and maximum operating parameter values for physical arrangement.
			Fire	Components shall be protected from fire to ensure the critical design attribute of physical arrangement is not adversely impacted.
			Maintenance	Configuration Management shall ensure that maintenance does not adversely impact the critical design attribute of physical arrangement.

Table 3.7-15 Solid Waste Collection System
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Criticality Assessment of Passive Safe-By-Design Components				
Component Description (A)	**Sequence ID (B)**	**Critical Design Attribute (C)**	**Review of Up-Set Conditions to Change Geometry (Applicable HAZOP Guidewords) (D)**	**Notes/Comments (E)**
			Impact/Drop	Components shall be protected from impact/drop to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Construction on Site)	Components shall be protected from construction on-Site to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Failure of Above-Ground Liquid Storage Tanks)	Components shall be protected from external flooding (Failure of Above-Ground Liquid Storage Tanks) to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Hurricane)	Components shall be protected from hurricane events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Seismic)	Components shall be protected from seismic events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Tornado)	Components shall be protected from tornado events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Local Intense Precipitation)	Components shall be protected from local intense precipitation events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (External Fire)	Components shall be protected from external fire events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Snow/Ice)	Components shall be protected from external ice/snow events to ensure the critical design attribute of physical arrangement is not adversely impacted.
				Double Contingency Principle is satisfied as follows. The geometry is criticality safe and no single credible event or failure has been identified whereby the geometry could become unsafe. The enrichment is also controlled such that no single credible failure could result in loss of enrichment control.

Column Descriptions:

Column A: This column provides a brief description of each component.

Column B: This column identifies the accident sequence associated with the passive component.

Column C: This column identifies the critical design attribute under consideration along with the conservative values used in the criticality analysis.

Column D: This column identifies the applicable guidewords from the ISA HAZOP procedure that are used to assess the criticality design margin. Additional guidewords are addressed as applicable in the detailed assessment.

Column E: This column provides any notes, comments and concluding statements.

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Criticality Assessment of Passive Safe-By-Design Components				
Component Description (A)	**Sequence ID (B)**	**Critical Design Attribute (C)**	**Review of Up-Set Conditions to Change Geometry (Applicable HAZOP Guidewords) (D)**	**Notes/Comments (E)**
Fomblin Oil Storage Array	LOSS OF SAFE-BY-DESIGN ATTRIBUTE	**PHYSICAL ARRANGEMENT**		Based on qualitative assessment, there is margin between the normal operating conditions and the conservative design/analysis conditions assumed for criticality.
			Corrosion/ Erosion	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a corrosion/erosion condition that would affect the maintenance of margin to criticality associated with design and maximum operating parameter values for physical arrangement.
			Fire	Components shall be protected from fire to ensure the critical design attribute of physical arrangement is not adversely impacted.
			Maintenance	Configuration Management shall ensure that maintenance does not adversely impact the critical design attribute of physical arrangement.
			Impact/Drop	Components shall be protected from impact/drop to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Construction on Site)	Components shall be protected from construction on-Site to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Failure of Above-Ground Liquid Storage Tanks)	Components shall be protected from external flooding (Failure of Above-Ground Liquid Storage Tanks) to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Hurricane)	Components shall be protected from hurricane events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Seismic)	Components shall be protected from seismic events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Tornado)	Components shall be protected from tornado events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Local Intense Precipitation)	Components shall be protected from local intense precipitation events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (External Fire)	Components shall be protected from external fire events to ensure the critical design attribute of physical arrangement is not adversely impacted.

Criticality Assessment of Passive Safe-By-Design Components				
Component Description (A)	**Sequence ID (B)**	**Critical Design Attribute (C)**	**Review of Up-Set Conditions to Change Geometry (Applicable HAZOP Guidewords) (D)**	**Notes/Comments (E)**
			External Events (Snow/Ice)	Components shall be protected from external ice/snow events to ensure the critical design attribute of physical arrangement is not adversely impacted.
				Double Contingency Principle is satisfied as follows. The geometry is criticality safe and no single credible event or failure has been identified whereby the geometry could become unsafe. The enrichment is also controlled such that no single credible failure could result in loss of enrichment control.
Product Pump Storage Array	LOSS OF SAFE-BY-DESIGN ATTRIBUTE	**PHYSICAL ARRANGEMENT**		Based on qualitative assessment, there is margin between the normal operating conditions and the conservative design/analysis conditions assumed for criticality.
			Corrosion/ Erosion	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a corrosion/erosion condition that would affect the maintenance of margin to criticality associated with design and maximum operating parameter values for physical arrangement.
			Fire	Components shall be protected from fire to ensure the critical design attribute of physical arrangement is not adversely impacted.
			Maintenance	Configuration Management shall ensure that maintenance does not adversely impact the critical design attribute of physical arrangement.
			Impact/Drop	Components shall be protected from impact/drop to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Construction on Site)	Components shall be protected from construction on-Site to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Failure of Above-Ground Liquid Storage Tanks)	Components shall be protected from external flooding (Failure of Above-Ground Liquid Storage Tanks) to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Hurricane)	Components shall be protected from hurricane events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Seismic)	Components shall be protected from seismic events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Tornado)	Components shall be protected from tornado events to ensure the critical design attribute of physical arrangement is not adversely impacted.

Criticality Assessment of Passive Safe-By-Design Components				
Component Description (A)	**Sequence ID (B)**	**Critical Design Attribute (C)**	**Review of Up-Set Conditions to Change Geometry (Applicable HAZOP Guidewords) (D)**	**Notes/Comments (E)**
			External Events (Local Intense Precipitation)	Components shall be protected from local intense precipitation events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (External Fire)	Components shall be protected from external fire events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Snow/Ice)	Components shall be protected from external ice/snow events to ensure the critical design attribute of physical arrangement is not adversely impacted.
				Double Contingency Principle is satisfied as follows. The geometry is criticality safe and no single credible event or failure has been identified whereby the geometry could become unsafe. The enrichment is also controlled such that no single credible failure could result in loss of enrichment control.
Oil Drip Tray	LOSS OF SAFE-BY-DESIGN ATTRIBUTE	**VOLUME** 24 liters Keff = 1.0 @ 6 wt %		Based on qualitative assessment, there is margin between the parameter value at normal operating conditions of Oil Drip Tray volume and the conservative design/analysis value for this parameter assumed for criticality.
			More Heat	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a more heat condition that would cause an approach to the critical safe volume and to adversely affect the maintenance of margin to criticality associated with design and maximum operating parameter value.
			More Pressure	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a more pressure condition that would cause an approach to the critical safe volume and to adversely affect the maintenance of margin to criticality associated with design and maximum operating parameter value.
			Corrosion/ Erosion	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a corrosion/erosion condition that would cause an approach to the critical safe volume. Materials are corrosion/erosion resistant and postulated complete wall erosion would not exceed the critical safe volume.
			Loss of Confinement or Leakage	Based on qualitative assessment, postulated loss of Oil Drip Tray confinement or leakage will not result in any appreciable accumulation of U^{235} material. As a result, loss of confinement does not result in a potential for criticality and therefore its consequence is low.
			Fire	Components shall be protected from fire to ensure the critical design attribute of volume is not adversely impacted.
			Maintenance	Configuration Management shall ensure that maintenance does not adversely impact the critical design attribute of volume.

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Criticality Assessment of Passive Safe-By-Design Components				
Component Description (A)	**Sequence ID (B)**	**Critical Design Attribute (C)**	**Review of Up-Set Conditions to Change Geometry (Applicable HAZOP Guidewords) (D)**	**Notes/Comments (E)**
				Double Contingency Principle is satisfied as follows. The geometry is criticality safe and no single credible event or failure has been identified whereby the geometry could become unsafe. The enrichment is also controlled such that no single credible failure could result in loss of enrichment control.
6 Liter Residue Container	LOSS OF SAFE-BY-DESIGN ATTRIBUTE	**VOLUME** 24 liters Keff = 1.0 @ 6 wt %		Based on qualitative assessment, there is margin between the parameter value at normal operating conditions of 6 Liter Residue Container volume and the conservative design/analysis value for this parameter assumed for criticality.
			Corrosion/ Erosion	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a corrosion/erosion condition that would cause an approach to the critical safe volume. Materials are corrosion/erosion resistant and postulated complete wall erosion would not exceed the critical safe volume.
			Loss of Confinement or Leakage	Based on qualitative assessment, postulated loss of 6 Liter Residue Container confinement or leakage will not result in any appreciable accumulation of U^{235} material. As a result, loss of confinement does not result in a potential for criticality and therefore its consequence is low.
			Fire	Components shall be protected from fire to ensure the critical design attribute of volume is not adversely impacted.
			Maintenance	Configuration Management shall ensure that maintenance does not adversely impact the critical design attribute of volume.
				Double Contingency Principle is satisfied as follows. The geometry is criticality safe and no single credible event or failure has been identified whereby the geometry could become unsafe. The enrichment is also controlled such that no single credible failure could result in loss of enrichment control.
6 Liter Residue Container Storage Array	LOSS OF SAFE-BY-DESIGN ATTRIBUTE	**PHYSICAL ARRANGEMENT**		Based on qualitative assessment, there is margin between the normal operating conditions and the conservative design/analysis conditions assumed for criticality.
			Corrosion/ Erosion	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a corrosion/erosion condition that would affect the maintenance of margin to criticality associated with design and maximum operating parameter values for physical arrangement.
			Fire	Components shall be protected from fire to ensure the critical design attribute of physical arrangement is not adversely impacted.
			Maintenance	Configuration Management shall ensure that maintenance does not adversely impact the critical design attribute of physical arrangement.
			Impact/Drop	Components shall be protected from impact/drop to ensure the critical design attribute of physical arrangement is not adversely impacted.

Criticality Assessment of Passive Safe-By-Design Components				
Component Description (A)	**Sequence ID (B)**	**Critical Design Attribute (C)**	**Review of Up-Set Conditions to Change Geometry (Applicable HAZOP Guidewords) (D)**	**Notes/Comments (E)**
			External Events (Construction on Site)	Components shall be protected from construction on-Site to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Failure of Above-Ground Liquid Storage Tanks)	Components shall be protected from external flooding (Failure of Above-Ground Liquid Storage Tanks) to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Hurricane)	Components shall be protected from hurricane events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Seismic)	Components shall be protected from seismic events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Tornado)	Components shall be protected from tornado events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Local Intense Precipitation)	Components shall be protected from local intense precipitation events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (External Fire)	Components shall be protected from external fire events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Snow/Ice)	Components shall be protected from external ice/snow events to ensure the critical design attribute of physical arrangement is not adversely impacted.
				Double Contingency Principle is satisfied as follows. The geometry is criticality safe and no single credible event or failure has been identified whereby the geometry could become unsafe. The enrichment is also controlled such that no single credible failure could result in loss of enrichment control.
Flexible Hoses Storage Array	LOSS OF SAFE-BY-DESIGN ATTRIBUTE	**PHYSICAL ARRANGEMENT**		Based on qualitative assessment, there is margin between the normal operating conditions and the conservative design/analysis conditions assumed for criticality.
			Corrosion/ Erosion	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a corrosion/erosion condition that would affect the maintenance of margin to criticality associated with design and maximum operating parameter values for physical arrangement.
			Fire	Components shall be protected from fire to ensure the critical design attribute of physical arrangement is not adversely impacted.

Criticality Assessment of Passive Safe-By-Design Components				
Component Description (A)	**Sequence ID (B)**	**Critical Design Attribute (C)**	**Review of Up-Set Conditions to Change Geometry (Applicable HAZOP Guidewords) (D)**	**Notes/Comments (E)**
			Maintenance	Configuration Management shall ensure that maintenance does not adversely impact the critical design attribute of physical arrangement.
			Impact/Drop	Components shall be protected from impact/drop to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Construction on Site)	Components shall be protected from construction on-Site to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Failure of Above-Ground Liquid Storage Tanks)	Components shall be protected from external flooding (Failure of Above-Ground Liquid Storage Tanks) to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Hurricane)	Components shall be protected from hurricane events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Seismic)	Components shall be protected from seismic events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Tornado)	Components shall be protected from tornado events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Local Intense Precipitation)	Components shall be protected from local intense precipitation events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (External Fire)	Components shall be protected from external fire events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Snow/Ice)	Components shall be protected from external ice/snow events to ensure the critical design attribute of physical arrangement is not adversely impacted.
				Double Contingency Principle is satisfied as follows. The geometry is criticality safe and no single credible event or failure has been identified whereby the geometry could become unsafe. The enrichment is also controlled such that no single credible failure could result in loss of enrichment control.
Citric Acid Holding Tank (Decon System for Flexibles)	LOSS OF SAFE-BY-DESIGN ATTRIBUTE	**Shape-Slab** 11.5 cm Keff = 1.0 @ 6 wt %		Based on qualitative assessment, there is margin between the parameter values at normal operating conditions of Citric Acid Holding Tank (Decontamination System for Flexibles) shape, amount of U^{235} and enrichment and the conservative design/analysis values for these parameters assumed for criticality.

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Criticality Assessment of Passive Safe-By-Design Components				
Component Description (A)	**Sequence ID (B)**	**Critical Design Attribute (C)**	**Review of Up-Set Conditions to Change Geometry (Applicable HAZOP Guidewords) (D)**	**Notes/Comments (E)**
			More Heat	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a more heat condition that would cause an approach to the critical safe shape and to adversely affect the maintenance of margin to criticality associated with design and maximum operating parameter values for amount of U^{235} and enrichment.
			More Pressure	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a more pressure condition that would cause an approach to the critical safe shape and to adversely affect the maintenance of margin to criticality associated with design and maximum operating parameter values for amount of U^{235} and enrichment.
			Corrosion/ Erosion	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a corrosion/erosion condition that would cause an approach to the critical safe shape. Materials are corrosion/erosion resistant.
			Loss of Confinement or Leakage	Citric Acid Holding Tank (Decontamination System for Flexibles) shall be protected from loss of confinement or leakage with a confinement area (Flexible Hose Decontamination Cabinet) to ensure the critical design.
			Fire	Components shall be protected from fire to ensure the critical design attribute of shape is not adversely impacted.
			Maintenance	Configuration Management shall ensure that maintenance does not adversely impact the critical design attribute of shape.
			Impact/Drop	Components shall be protected from impact/drop to ensure the criticality design attribute of shape is not adversely impacted.
			External Events (Construction on Site)	Components shall be protected from construction on-Site to ensure the criticality design attribute of shape is not adversely impacted.
			External Events (Failure of Above-Ground Liquid Storage Tanks)	Components shall be protected from external flooding (Failure of Above-Ground Liquid Storage Tanks) to ensure the criticality design attribute of shape is not adversely impacted.
			External Events (Hurricane)	Components shall be protected from hurricane events to ensure the criticality design attribute of shape is not adversely impacted.
			External Events (Seismic)	Components shall be protected from seismic events to ensure the criticality design attribute of shape is not adversely impacted.
			External Events (Tornado)	Components shall be protected from tornado events to ensure the criticality design attribute of shape is not adversely impacted.

Criticality Assessment of Passive Safe-By-Design Components				
Component Description (A)	**Sequence ID (B)**	**Critical Design Attribute (C)**	**Review of Up-Set Conditions to Change Geometry (Applicable HAZOP Guidewords) (D)**	**Notes/Comments (E)**
			External Events (Local Intense Precipitation)	Components shall be protected from local intense precipitation events to ensure the criticality design attribute of shape is not adversely impacted.
			External Events (External Fire)	Components shall be protected from external fire events to ensure the criticality design attribute of shape is not adversely impacted.
			External Events (Snow/Ice)	Components shall be protected from external ice/snow events to ensure the criticality design attribute of shape is not adversely impacted.
				Double Contingency Principle is satisfied as follows. The geometry is criticality safe and no single credible event or failure has been identified whereby the geometry could become unsafe. The enrichment is also controlled such that no single credible failure could result in loss of enrichment control.
Vacuum Cleaner	LOSS OF SAFE-BY-DESIGN ATTRIBUTE	DIAMETER 24.4 cm (ID) Keff = 1.0 @ 6 wt %		Based on qualitative assessment, there is margin between the parameter value at normal operating conditions of Vacuum Cleaner diameter and the conservative design/analysis value for this parameter assumed for criticality.
			More Heat	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a more heat condition that would cause an approach to the critical safe diameter and to adversely affect the maintenance of margin to criticality associated with design and maximum operating parameter value.
			More Pressure	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a more pressure condition that would cause an approach to the critical safe diameter and to adversely affect the maintenance of margin to criticality associated with design and maximum operating parameter value.
			Corrosion/ Erosion	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a corrosion/erosion condition that would cause an approach to the critical safe diameter. Materials are corrosion/erosion resistant and postulated complete wall erosion would not exceed the critical safe diameter.
			Loss of Confinement or Leakage	Based on qualitative assessment, postulated loss of Vacuum Cleaner confinement or leakage will not result in any appreciable accumulation of U^{235}. As a result, loss of confinement does not result in a potential for criticality and therefore its consequence is low.
			Fire	Components shall be protected from fire to ensure the critical design attribute of diameter is not adversely impacted.
			Maintenance	Configuration Management shall ensure that maintenance does not adversely impact the critical design attribute of diameter.
			Impact/Drop	Components shall be protected from Impact/Drop to ensure the critical design attribute of diameter is not adversely impacted.

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Criticality Assessment of Passive Safe-By-Design Components				
Component Description (A)	**Sequence ID (B)**	**Critical Design Attribute (C)**	**Review of Up-Set Conditions to Change Geometry (Applicable HAZOP Guidewords) (D)**	**Notes/Comments (E)**
			External Events (Construction on Site)	Components shall be protected from Construction on Site to ensure the critical design attribute of diameter is not adversely impacted.
			External Events (Failure of Above-Ground Liquid Tanks)	Components shall be protected from Failure of Above-Ground Liquid Tanks to ensure the critical design attribute of diameter is not adversely impacted.
			External Events (Hurricane)	Components shall be protected from Hurricane events to ensure the critical design attribute of diameter is not adversely impacted.
			External Events (Seismic)	Components shall be protected from Seismic events to ensure the critical design attribute of diameter is not adversely impacted.
			External Events (Tornado)	Components shall be protected from Tornado events to ensure the critical design attribute of diameter is not adversely impacted.
			External Events (Local Intense Precipitation)	Components shall be protected from Local Intense Precipitation events to ensure the critical design attribute of diameter is not adversely impacted.
			External Events (Snow/Ice)	Components shall be protected from Snow/Ice events to ensure the critical design attribute of diameter is not adversely impacted.
				Double Contingency Principle is satisfied as follows. The geometry is criticality safe and no single credible event or failure has been identified whereby the geometry could become unsafe. The enrichment is also controlled such that no single credible failure could result in loss of enrichment control.
Sample Bottle Wash Drip Tray	LOSS OF SAFE-BY-DESIGN ATTRIBUTE	**Shape-Slab 11.5 cm Keff = 1.0 @ 6 wt %**		Based on qualitative assessment, there is margin between the parameter values at normal operating conditions of Sample Bottle Wash Drip Tray shape, amount of U^{235} and enrichment and the conservative design/analysis values for these parameters assumed for criticality.
			More Heat	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a more heat condition that would cause an approach to the critical safe shape and to adversely affect the maintenance of margin to criticality associated with design and maximum operating parameter values for amount of U^{235} and enrichment.

Criticality Assessment of Passive Safe-By-Design Components				
Component Description (A)	**Sequence ID (B)**	**Critical Design Attribute (C)**	**Review of Up-Set Conditions to Change Geometry (Applicable HAZOP Guidewords) (D)**	**Notes/Comments (E)**
			More Pressure	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a more pressure condition that would cause an approach to the critical safe shape and to adversely affect the maintenance of margin to criticality associated with design and maximum operating parameter values for amount of U^{235} and enrichment.
			Corrosion/ Erosion	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a corrosion/erosion condition that would cause an approach to the critical safe shape. Materials are corrosion/erosion resistant.
			Loss of Confinement or Leakage	Sample Bottle Wash Drip Tray shall be protected from loss of confinement or leakage with a confinement area (Sample Bottle Decontamination Cabinet) to ensure subcriticality.
			Fire	Components shall be protected from fire to ensure the critical design attribute of shape is not adversely impacted.
			Maintenance	Configuration Management shall ensure that maintenance does not adversely impact the critical design attribute of shape.
			Impact/Drop	Components shall be protected from impact/drop to ensure the criticality design attribute of shape is not adversely impacted.
			External Events (Construction on Site)	Components shall be protected from construction on-Site to ensure the criticality design attribute of shape is not adversely impacted.
			External Events (Failure of Above-Ground Liquid Storage Tanks)	Components shall be protected from external flooding (Failure of Above-Ground Liquid Storage Tanks) to ensure the criticality design attribute of shape is not adversely impacted.
			External Events (Hurricane)	Components shall be protected from hurricane events to ensure the criticality design attribute of shape is not adversely impacted.
			External Events (Seismic)	Components shall be protected from seismic events to ensure the criticality design attribute of shape is not adversely impacted.
			External Events (Tornado)	Components shall be protected from tornado events to ensure the criticality design attribute of shape is not adversely impacted.
			External Events (Local Intense Precipitation)	Components shall be protected from local intense precipitation events to ensure the criticality design attribute of shape is not adversely impacted.
			External Events (External Fire)	Components shall be protected from external fire events to ensure the criticality design attribute of shape is not adversely impacted.

Criticality Assessment of Passive Safe-By-Design Components				
Component Description (A)	**Sequence ID (B)**	**Critical Design Attribute (C)**	**Review of Up-Set Conditions to Change Geometry (Applicable HAZOP Guidewords) (D)**	**Notes/Comments (E)**
			External Events (Snow/Ice)	Components shall be protected from external ice/snow events to ensure the criticality design attribute of shape is not adversely impacted.
				Double Contingency Principle is satisfied as follows. The geometry is criticality safe and no single credible event or failure has been identified whereby the geometry could become unsafe. The enrichment is also controlled such that no single credible failure could result in loss of enrichment control.
Fomblin Oil 6 Liter Container	LOSS OF SAFE-BY-DESIGN ATTRIBUTE	VOLUME 24 liters Keff = 1.0 @ 6 wt %		Based on qualitative assessment, there is margin between the parameter value at normal operating conditions of 6 Liter Residue Container volume and the conservative design/analysis value for this parameter assumed for criticality.
			Corrosion/ Erosion	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a corrosion/erosion condition that would cause an approach to the critical safe volume. Materials are corrosion/erosion resistant and postulated complete wall erosion would not exceed the critical safe volume.
			Loss of Confinement or Leakage	Based on qualitative assessment, postulated loss of 6 Liter Residue Container confinement or leakage will not result in any appreciable accumulation of U^{235} material. As a result, loss of confinement does not result in a potential for criticality and therefore its consequence is low.
			Fire	Components shall be protected from fire to ensure the critical design attribute of volume is not adversely impacted.
			Maintenance	Configuration Management shall ensure that maintenance does not adversely impact the critical design attribute of volume.
				Double Contingency Principle is satisfied as follows. The geometry is criticality safe and no single credible event or failure has been identified whereby the geometry could become unsafe. The enrichment is also controlled such that no single credible failure could result in loss of enrichment control.
Product Pump Transport Device	LOSS OF SAFE-BY-DESIGN ATTRIBUTE	**PHYSICAL ARRANGEMENT**		Based on qualitative assessment, there is margin between the normal operating conditions and the conservative design/analysis conditions assumed for criticality.
			Corrosion/ Erosion	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a corrosion/erosion condition that would affect the maintenance of margin to criticality associated with design and maximum operating parameter values for physical arrangement.
			Fire	Components shall be protected from fire to ensure the critical design attribute of physical arrangement is not adversely impacted.
			Maintenance	Configuration Management shall ensure that maintenance does not adversely impact the critical design attribute of physical arrangement.

Criticality Assessment of Passive Safe-By-Design Components				
Component Description (A)	**Sequence ID (B)**	**Critical Design Attribute (C)**	**Review of Up-Set Conditions to Change Geometry (Applicable HAZOP Guidewords) (D)**	**Notes/Comments (E)**
			Impact/Drop	Components shall be protected from impact/drop to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Construction on Site)	Components shall be protected from construction on-Site to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Failure of Above-Ground Liquid Storage Tanks)	Components shall be protected from external flooding (Failure of Above-Ground Liquid Storage Tanks) to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Hurricane)	Components shall be protected from hurricane events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Seismic)	Components shall be protected from seismic events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Tornado)	Components shall be protected from tornado events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Local Intense Precipitation)	Components shall be protected from local intense precipitation events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (External Fire)	Components shall be protected from external fire events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Snow/Ice)	Components shall be protected from external ice/snow events to ensure the critical design attribute of physical arrangement is not adversely impacted.
				Double Contingency Principle is satisfied as follows. The geometry is criticality safe and no single credible event or failure has been identified whereby the geometry could become unsafe. The enrichment is also controlled such that no single credible failure could result in loss of enrichment control.
Residue Container Transport Device	LOSS OF SAFE-BY-DESIGN ATTRIBUTE	**PHYSICAL ARRANGEMENT**		Based on qualitative assessment, there is margin between the normal operating conditions and the conservative design/analysis conditions assumed for criticality.
			Corrosion/ Erosion	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a corrosion/erosion condition that would affect the maintenance of margin to criticality associated with design and maximum operating parameter values for physical arrangement.

Criticality Assessment of Passive Safe-By-Design Components				
Component Description (A)	**Sequence ID (B)**	**Critical Design Attribute (C)**	**Review of Up-Set Conditions to Change Geometry (Applicable HAZOP Guidewords) (D)**	**Notes/Comments (E)**
			Fire	Components shall be protected from fire to ensure the critical design attribute of physical arrangement is not adversely impacted.
			Maintenance	Configuration Management shall ensure that maintenance does not adversely impact the critical design attribute of physical arrangement.
			Impact/Drop	Components shall be protected from impact/drop to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Construction on Site)	Components shall be protected from construction on-Site to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Failure of Above-Ground Liquid Storage Tanks)	Components shall be protected from external flooding (Failure of Above-Ground Liquid Storage Tanks) to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Hurricane)	Components shall be protected from hurricane events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Seismic)	Components shall be protected from seismic events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Tornado)	Components shall be protected from tornado events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Local Intense Precipitation)	Components shall be protected from local intense precipitation events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (External Fire)	Components shall be protected from external fire events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Snow/Ice)	Components shall be protected from external ice/snow events to ensure the critical design attribute of physical arrangement is not adversely impacted.
				Double Contingency Principle is satisfied as follows. The geometry is criticality safe and no single credible event or failure has been identified whereby the geometry could become unsafe. The enrichment is also controlled such that no single credible failure could result in loss of enrichment control.

Criticality Assessment of Passive Safe-By-Design Components				
Component Description (A)	**Sequence ID (B)**	**Critical Design Attribute (C)**	**Review of Up-Set Conditions to Change Geometry (Applicable HAZOP Guidewords) (D)**	**Notes/Comments (E)**
Flexible Hose Transport Device	LOSS OF SAFE-BY-DESIGN ATTRIBUTE	**PHYSICAL ARRANGEMENT**		Based on qualitative assessment, there is margin between the normal operating conditions and the conservative design/analysis conditions assumed for criticality.
			Corrosion/ Erosion	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a corrosion/erosion condition that would affect the maintenance of margin to criticality associated with design and maximum operating parameter values for physical arrangement.
			Fire	Components shall be protected from fire to ensure the critical design attribute of physical arrangement is not adversely impacted.
			Maintenance	Configuration Management shall ensure that maintenance does not adversely impact the critical design attribute of physical arrangement.
			Impact/Drop	Components shall be protected from impact/drop to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Construction on Site)	Components shall be protected from construction on-Site to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Failure of Above-Ground Liquid Storage Tanks)	Components shall be protected from external flooding (Failure of Above-Ground Liquid Storage Tanks) to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Hurricane)	Components shall be protected from hurricane events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Seismic)	Components shall be protected from seismic events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Tornado)	Components shall be protected from tornado events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Local Intense Precipitation)	Components shall be protected from local intense precipitation events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (External Fire)	Components shall be protected from external fire events to ensure the critical design attribute of physical arrangement is not adversely impacted.

Criticality Assessment of Passive Safe-By-Design Components				
Component Description (A)	**Sequence ID (B)**	**Critical Design Attribute (C)**	**Review of Up-Set Conditions to Change Geometry (Applicable HAZOP Guidewords) (D)**	**Notes/Comments (E)**
			External Events (Snow/Ice)	Components shall be protected from external ice/snow events to ensure the critical design attribute of physical arrangement is not adversely impacted.
				Double Contingency Principle is satisfied as follows. The geometry is criticality safe and no single credible event or failure has been identified whereby the geometry could become unsafe. The enrichment is also controlled such that no single credible failure could result in loss of enrichment control.
Flexible Hose Decontamination Cabinet	LOSS OF SAFE-BY-DESIGN ATTRIBUTE	**Shape-Slab** 11.5 cm Keff = 1.0 @ 6 wt %		Based on qualitative assessment, there is margin between the *parameter values at normal operating conditions of Flexible* Hose Decontamination Cabinet shape, amount of U^{235} and enrichment and the conservative design/analysis values for these parameters assumed for criticality.
			More Heat	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a more heat condition that would cause an approach to the critical safe shape and to adversely affect the maintenance of margin to criticality associated with design and maximum operating parameter values for amount of U^{235} and enrichment.
			More Pressure	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a more pressure condition that would cause an approach to the critical safe shape and to adversely affect the maintenance of margin to criticality associated with design and maximum operating parameter values for amount of U^{235} and enrichment.
			Corrosion/ Erosion	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a corrosion/erosion condition that would cause an approach to the critical safe shape. Materials are corrosion/erosion resistant.
			Loss of Confinement or Leakage	Based on qualitative assessment, postulated loss of the Flexible Hose Decontamination Cabinet or leakage will not result in any appreciable accumulation of U^{235} material because of the robust construction of the curbed area.
			Fire	Components shall be protected from fire to ensure the critical design attribute of shape is not adversely impacted.
			Maintenance	Configuration Management shall ensure that maintenance does not adversely impact the critical design attribute of shape.
			Impact/Drop	Components shall be protected from impact/drop to ensure the criticality design attribute of shape is not adversely impacted.
			External Events (Construction on Site)	Components shall be protected from construction on-Site to ensure the criticality design attribute of shape is not adversely impacted.

Criticality Assessment of Passive Safe-By-Design Components				
Component Description (A)	**Sequence ID (B)**	**Critical Design Attribute (C)**	**Review of Up-Set Conditions to Change Geometry (Applicable HAZOP Guidewords) (D)**	**Notes/Comments (E)**
			External Events (Failure of Above-Ground Liquid Storage Tanks)	Components shall be protected from external flooding (Failure of Above-Ground Liquid Storage Tanks) to ensure the criticality design attribute of shape is not adversely impacted.
			External Events (Hurricane)	Components shall be protected from hurricane events to ensure the criticality design attribute of shape is not adversely impacted.
			External Events (Seismic)	Components shall be protected from seismic events to ensure the criticality design attribute of shape is not adversely impacted.
			External Events (Tornado)	Components shall be protected from tornado events to ensure the criticality design attribute of shape is not adversely impacted.
			External Events (Local Intense Precipitation)	Components shall be protected from local intense precipitation events to ensure the criticality design attribute of shape is not adversely impacted.
			External Events (External Fire)	Components shall be protected from external fire events to ensure the criticality design attribute of shape is not adversely impacted.
			External Events (Snow/Ice)	Components shall be protected from external ice/snow events to ensure the criticality design attribute of shape is not adversely impacted.
				Double Contingency Principle is satisfied as follows. The geometry is criticality safe and no single credible event or failure has been identified whereby the geometry could become unsafe. The enrichment is also controlled such that no single credible failure could result in loss of enrichment control.
Sample Bottle Decontamination Cabinet	LOSS OF SAFE-BY-DESIGN ATTRIBUTE	**Shape-Slab** 11.5 cm Keff = 1.0 @ 6 wt %		Based on qualitative assessment, there is margin between the parameter values at normal operating conditions of Sample Bottle Decontamination Cabinet shape, amount of U^{235} and enrichment and the conservative design/analysis values for these parameters assumed for criticality.
			More Heat	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a more heat condition that would cause an approach to the critical safe shape and to adversely affect the maintenance of margin to criticality associated with design and maximum operating parameter values for amount of U^{235} and enrichment.

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Criticality Assessment of Passive Safe-By-Design Components				
Component Description (A)	**Sequence ID (B)**	**Critical Design Attribute (C)**	**Review of Up-Set Conditions to Change Geometry (Applicable HAZOP Guidewords) (D)**	**Notes/Comments (E)**
			More Pressure	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a more pressure condition that would cause an approach to the critical safe shape and to adversely affect the maintenance of margin to criticality associated with design and maximum operating parameter values for amount of U^{235} and enrichment.
			Corrosion/ Erosion	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a corrosion/erosion condition that would cause an approach to the critical safe shape. Materials are corrosion/erosion resistant.
			Loss of Confinement or Leakage	Based on qualitative assessment, postulated loss of the Sample Bottle Decontamination Cabinet or leakage will not result in any appreciable accumulation of U^{235} material because of the robust construction of the curbed area.
			Fire	Components shall be protected from fire to ensure the critical design attribute of shape is not adversely impacted.
			Maintenance	Configuration Management shall ensure that maintenance does not adversely impact the critical design attribute of shape.
			Impact/Drop	Components shall be protected from impact/drop to ensure the criticality design attribute of shape is not adversely impacted.
			External Events (Construction on Site)	Components shall be protected from construction on-Site to ensure the criticality design attribute of shape is not adversely impacted.
			External Events (Failure of Above-Ground Liquid Storage Tanks)	Components shall be protected from external flooding (Failure of Above-Ground Liquid Storage Tanks) to ensure the criticality design attribute of shape is not adversely impacted.
			External Events (Hurricane)	Components shall be protected from hurricane events to ensure the criticality design attribute of shape is not adversely impacted.
			External Events (Seismic)	Components shall be protected from seismic events to ensure the criticality design attribute of shape is not adversely impacted.
			External Events (Tornado)	Components shall be protected from tornado events to ensure the criticality design attribute of shape is not adversely impacted.
			External Events (Local Intense Precipitation)	Components shall be protected from local intense precipitation events to ensure the criticality design attribute of shape is not adversely impacted.
			External Events (External Fire)	Components shall be protected from external fire events to ensure the criticality design attribute of shape is not adversely impacted.

Criticality Assessment of Passive Safe-By-Design Components				
Component Description (A)	**Sequence ID (B)**	**Critical Design Attribute (C)**	**Review of Up-Set Conditions to Change Geometry (Applicable HAZOP Guidewords) (D)**	**Notes/Comments (E)**
			External Events (Snow/Ice)	Components shall be protected from external ice/snow events to ensure the criticality design attribute of shape is not adversely impacted.
				Double Contingency Principle is satisfied as follows. The geometry is criticality safe and no single credible event or failure has been identified whereby the geometry could become unsafe. The enrichment is also controlled such that no single credible failure could result in loss of enrichment control.
· Contaminated Components Hydraulic Bench	LOSS OF SAFE-BY-DESIGN ATTRIBUTE	PHYSICAL ARRANGEMENT		Based on qualitative assessment, there is margin between the normal operating conditions and the conservative design/analysis conditions assumed for criticality.
			Corrosion/ Erosion	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a corrosion/erosion condition that would affect the maintenance of margin to criticality associated with design and maximum operating parameter values for physical arrangement.
			Fire	Components shall be protected from fire to ensure the critical design attribute of physical arrangement is not adversely impacted.
			Maintenance	Configuration Management shall ensure that maintenance does not adversely impact the critical design attribute of physical arrangement.
			Impact/Drop	Components shall be protected from impact/drop to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Construction on Site)	Components shall be protected from construction on-Site to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Failure of Above-Ground Liquid Storage Tanks)	Components shall be protected from external flooding (Failure of Above-Ground Liquid Storage Tanks) to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Hurricane)	Components shall be protected from hurricane events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Seismic)	Components shall be protected from seismic events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Tornado)	Components shall be protected from tornado events to ensure the critical design attribute of physical arrangement is not adversely impacted.

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Criticality Assessment of Passive Safe-By-Design Components				
Component Description (A)	**Sequence ID (B)**	**Critical Design Attribute (C)**	**Review of Up-Set Conditions to Change Geometry (Applicable HAZOP Guidewords) (D)**	**Notes/Comments (E)**
			External Events (Local Intense Precipitation)	Components shall be protected from local intense precipitation events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (External Fire)	Components shall be protected from external fire events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Snow/Ice)	Components shall be protected from external ice/snow events to ensure the critical design attribute of physical arrangement is not adversely impacted.
				Double Contingency Principle is satisfied as follows. The geometry is criticality safe and no single credible event or failure has been identified whereby the geometry could become unsafe. The enrichment is also controlled such that no single credible failure could result in loss of enrichment control.

Column Descriptions:

Column A: This column provides a brief description of each component.

Column B: This column identifies the accident sequence associated with the passive component.

Column C: This column identifies the critical design attribute under consideration along with the conservative values used in the criticality analysis.

Column D: This column identifies the applicable guidewords from the ISA HAZOP procedure that are used to assess the criticality design margin. Additional guidewords are addressed as applicable in the detailed assessment.

Column E: This column provides any notes, comments and concluding statements.

Table 3.7-17 Fomblin Oil Recovery System
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Criticality Assessment of Passive Safe-By-Design Components				
Component Description (A)	**Sequence ID (B)**	**Critical Design Attribute (C)**	**Review of Up-Set Conditions to Change Geometry (Applicable HAZOP Guidewords) (D)**	**Notes/Comments (E)**
Fomblin Oil Recovery Rig	LOSS OF SAFE-BY-DESIGN ATTRIBUTE	**PHYSICAL ARRANGEMENT**		Based on qualitative assessment, there is margin between the normal operating conditions and the conservative design/analysis conditions assumed for criticality.
			More Heat	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a more heat condition that would adversely affect the maintenance of margin to criticality associated with design and maximum operating parameter.
			More Pressure	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a more pressure condition that would adversely affect the maintenance of margin to criticality associated with design and maximum operating parameter.
			Corrosion/ Erosion	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a corrosion/erosion condition that would affect the maintenance of margin to criticality associated with design and maximum operating parameter values for physical arrangement.
			Loss of Confinement or Leakage	Fomblin Oil Recovery Rig shall be protected from loss of confinement or leakage with a confinement area, the Fomblin Oil Recovery Rig Cabinet, to ensure the critical design.
			Fire	Components shall be protected from fire to ensure the critical design attribute of physical arrangement is not adversely impacted.
			Maintenance	Configuration Management shall ensure that maintenance does not adversely impact the critical design attribute of physical arrangement.
			Impact/Drop	Components shall be protected from impact/drop to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Construction on Site)	Components shall be protected from construction on-Site to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Failure of Above-Ground Liquid Storage Tanks)	Components shall be protected from external flooding (Failure of Above-Ground Liquid Storage Tanks) to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Hurricane)	Components shall be protected from hurricane events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Seismic)	Components shall be protected from seismic events to ensure the critical design attribute of physical arrangement is not adversely impacted.

Table 3.7-17 Fomblin Oil Recovery System
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Criticality Assessment of Passive Safe-By-Design Components				
Component Description (A)	**Sequence ID (B)**	**Critical Design Attribute (C)**	**Review of Up-Set Conditions to Change Geometry (Applicable HAZOP Guidewords) (D)**	**Notes/Comments (E)**
			External Events (Tornado)	Components shall be protected from tornado events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Local Intense Precipitation)	Components shall be protected from local intense precipitation events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (External Fire)	Components shall be protected from external fire events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Snow/Ice)	Components shall be protected from external ice/snow events to ensure the critical design attribute of physical arrangement is not adversely impacted.
				Double Contingency Principle is satisfied as follows. The geometry is criticality safe and no single credible event or failure has been identified whereby the geometry could become unsafe. The enrichment is also controlled such that no single credible failure could result in loss of enrichment control.
Fomblin Oil Recovery Rig Cabinet	LOSS OF SAFE-BY-DESIGN ATTRIBUTE	**Shape-Slab 11.5 cm Keff = 1.0 @ 6 wt %**		Based on qualitative assessment, there is margin between the parameter values at normal operating conditions of Fomblin Oil Recovery Rig Cabinet shape and the conservative design/analysis value for this parameter assumed for criticality.
			More Heat	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a more heat condition that would cause an approach to the critical safe shape and to adversely affect the maintenance of margin to criticality associated with design and maximum operating parameter .
			More Pressure	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a more pressure condition that would cause an approach to the critical safe shape and to adversely affect the maintenance of margin to criticality associated with design and maximum operating parameter.
			Corrosion/ Erosion	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a corrosion/erosion condition that would cause an approach to the critical safe shape. Materials are corrosion/erosion resistant.
			Loss of Confinement or Leakage	Based on qualitative assessment, postulated loss of the Fomblin Oil Recovery Rig Cabinet or leakage will not result in any appreciable accumulation of U^{235} material because of the robust construction of the Fomblin Oil Recovery Rig Cabinet.
			Fire	Components shall be protected from fire to ensure the critical design attribute of shape is not adversely impacted.
			Maintenance	Configuration Management shall ensure that maintenance does not adversely impact the critical design attribute of shape.

Table 3.7-17 Fomblin Oil Recovery System
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Criticality Assessment of Passive Safe-By-Design Components				
Component Description (A)	**Sequence ID (B)**	**Critical Design Attribute (C)**	**Review of Up-Set Conditions to Change Geometry (Applicable HAZOP Guidewords) (D)**	**Notes/Comments (E)**
			Impact/Drop	Components shall be protected from impact/drop to ensure the criticality design attribute of shape is not adversely impacted.
			External Events (Construction on Site)	Components shall be protected from construction on-Site to ensure the criticality design attribute of shape is not adversely impacted.
			External Events (Failure of Above-Ground Liquid Storage Tanks)	Components shall be protected from external flooding (Failure of Above-Ground Liquid Storage Tanks) to ensure the criticality design attribute of shape is not adversely impacted.
			External Events (Hurricane)	Components shall be protected from hurricane events to ensure the criticality design attribute of shape is not adversely impacted.
			External Events (Seismic)	Components shall be protected from seismic events to ensure the criticality design attribute of shape is not adversely impacted.
			External Events (Tornado)	Components shall be protected from tornado events to ensure the criticality design attribute of shape is not adversely impacted.
			External Events (Local Intense Precipitation)	Components shall be protected from local intense precipitation events to ensure the criticality design attribute of shape is not adversely impacted.
			External Events (External Fire)	Components shall be protected from external fire events to ensure the criticality design attribute of shape is not adversely impacted.
			External Events (Snow/Ice)	Components shall be protected from external ice/snow events to ensure the criticality design attribute of shape is not adversely impacted.
				Double Contingency Principle is satisfied as follows. The geometry is criticality safe and no single credible event or failure has been identified whereby the geometry could become unsafe. The enrichment is also controlled such that no single credible failure could result in loss of enrichment control.

Column Descriptions:

Column A: This column provides a brief description of each component.

Column B: This column identifies the accident sequence associated with the passive component.

Column C: This column identifies the critical design attribute under consideration along with the conservative values used in the criticality analysis.

Column D: This column identifies the applicable guidewords from the ISA HAZOP procedure that are used to assess the criticality design margin. Additional guidewords are addressed as applicable in the detailed assessment.

Column E: This column provides any notes, comments and concluding statements.

Table 3.7-18 Ventilated Room System
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Criticality Assessment of Passive Safe-By-Design Components				
Component Description (A)	**Sequence ID (B)**	**Critical Design Attribute (C)**	**Review of Up-Set Conditions to Change Geometry (Applicable HAZOP Guidewords) (D)**	**Notes/Comments (E)**
Cylinder Pressure Test & Pump Out Piping (largest pipe ID in the system)	LOSS OF SAFE-BY-DESIGN ATTRIBUTE	**DIAMETER** 24.4 cm (ID) Keff = 1.0 @ 6 wt %		Based on qualitative assessment, there is margin between the parameter values at normal operating conditions of pipe diameter, amount of U^{235} and enrichment and the conservative design/analysis values for these parameters assumed for criticality.
			More Heat	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a more heat condition that would cause an approach to the critical safe diameter and to adversely affect the maintenance of margin to criticality associated with design and maximum operating parameter values for amount of U^{235} and enrichment.
			More Pressure	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a more pressure condition that would cause an approach to the critical safe diameter and to adversely affect the maintenance of margin to criticality associated with design and maximum operating parameter values for amount of U^{235} and enrichment.
			Corrosion/ Erosion	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a corrosion/erosion condition that would cause an approach to the critical safe diameter. Materials are corrosion/erosion resistant and postulated complete wall erosion would not exceed the critical safe diameter.
			Loss of Confinement or Leakage	Based on qualitative assessment, postulated loss of piping system confinement or leakage will not result in any appreciable accumulation of U^{235} material. As a result, loss of confinement does not result in a potential for criticality and therefore its consequence is low.
			Fire	Components shall be protected from fire to ensure the critical design attribute of diameter is not adversely impacted.
			Maintenance	Configuration Management shall ensure that maintenance does not adversely impact the critical design attribute of diameter.
				Double Contingency Principle is satisfied as follows. The geometry is criticality safe and no single credible event or failure has been identified whereby the geometry could become unsafe. The enrichment is also controlled such that no single credible failure could result in loss of enrichment control.
Cylinder Pressure Test & Pump Out Piping Arrangement		**PHYSICAL ARRANGEMENT**		Based on qualitative assessment, there is margin between the normal operating conditions and the conservative design/analysis conditions assumed for criticality.

Criticality Assessment of Passive Safe-By-Design Components				
Component Description (A)	**Sequence ID (B)**	**Critical Design Attribute (C)**	**Review of Up-Set Conditions to Change Geometry (Applicable HAZOP Guidewords) (D)**	**Notes/Comments (E)**
			More Heat	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a more heat condition that would adversely affect the maintenance of margin to criticality associated with design and maximum operating parameter values for amount of U^{235} and enrichment.
			More Pressure	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a more pressure condition that would adversely affect the maintenance of margin to criticality associated with design and maximum operating parameter values for amount of U^{235} and enrichment.
			Corrosion/ Erosion	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a corrosion/erosion condition that would affect the maintenance of margin to criticality associated with design and maximum operating parameter values for physical arrangement.
			Loss of Confinement or Leakage	Based on qualitative assessment, postulated loss of piping system confinement or leakage will not result in any appreciable accumulation of U^{235} material. As a result, loss of confinement does not result in a potential for criticality and therefore its consequence is low.
			Fire	Components shall be protected from fire to ensure the critical design attribute of physical arrangement is not adversely impacted.
			Maintenance	Configuration Management shall ensure that maintenance does not adversely impact the critical design attribute of physical arrangement.
			Impact/Drop	Components shall be protected from impact/drop to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Construction on Site)	Components shall be protected from construction on-Site to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Failure of Above-Ground Liquid Storage Tanks)	Components shall be protected from external flooding (Failure of Above-Ground Liquid Storage Tanks) to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Hurricane)	Components shall be protected from hurricane events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Seismic)	Components shall be protected from seismic events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Tornado)	Components shall be protected from tornado events to ensure the critical design attribute of physical arrangement is not adversely impacted.

Criticality Assessment of Passive Safe-By-Design Components				
Component Description (A)	**Sequence ID (B)**	**Critical Design Attribute (C)**	**Review of Up-Set Conditions to Change Geometry (Applicable HAZOP Guidewords) (D)**	**Notes/Comments (E)**
			External Events (Local Intense Precipitation)	Components shall be protected from local intense precipitation events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (External Fire)	Components shall be protected from external fire events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Snow/Ice)	Components shall be protected from external ice/snow events to ensure the critical design attribute of physical arrangement is not adversely impacted.
				Double Contingency Principle is satisfied as follows. The geometry is criticality safe and no single credible event or failure has been identified whereby the geometry could become unsafe. The enrichment is also controlled such that no single credible failure could result in loss of enrichment control.
Cold Trap (Cylinder Pressure Test & Pump Out Evacuation)	LOSS OF SAFE-BY-DESIGN ATTRIBUTE	**DIAMETER** 24.4 cm (ID) Keff = 1.0 @ 6 wt %		Based on qualitative assessment, there is margin between the parameter values at normal operating conditions of component diameter, amount of U^{235} and enrichment and the conservative design/analysis values for these parameters assumed for criticality.
			More Heat	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a more heat condition that would cause an approach to the critical safe diameter and to adversely affect the maintenance of margin to criticality associated with design and maximum operating parameter values for amount of U^{235} and enrichment.
			More Pressure	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a more pressure condition that would cause an approach to the critical safe diameter and to adversely affect the maintenance of margin to criticality associated with design and maximum operating parameter values for amount of U^{235} and enrichment.
			Corrosion/ Erosion	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a corrosion/erosion condition that would cause an approach to the critical safe diameter. Materials are corrosion/erosion resistant and postulated complete wall erosion would not exceed the critical safe diameter.
			Loss of Confinement or Leakage	Based on qualitative assessment, postulated loss of cold trap confinement or leakage and will not result in any appreciable accumulation of material because of physical limitations of the process (sub-atmospheric). As a result, loss of confinement does not result in a potential for criticality and therefore its consequence is low.
			Fire	Components shall be protected from fire to ensure the critical design attribute of diameter is not adversely impacted.

Criticality Assessment of Passive Safe-By-Design Components				
Component Description (A)	**Sequence ID (B)**	**Critical Design Attribute (C)**	**Review of Up-Set Conditions to Change Geometry (Applicable HAZOP Guidewords) (D)**	**Notes/Comments (E)**
			Maintenance	Configuration Management shall ensure that maintenance does not adversely impact the critical design attribute of diameter.
				Double Contingency Principle is satisfied as follows. The geometry is criticality safe and no single credible event or failure has been identified whereby the geometry could become unsafe. The enrichment is also controlled such that no single credible failure could result in loss of enrichment control.
Cylinder Pressure Test & Pump Out Evacuation Pump	LOSS OF SAFE-BY-DESIGN ATTRIBUTE	**VOLUME** 24 liters Keff = 1.0 @ 6 wt %		Based on qualitative assessment, there is margin between the parameter values at normal operating conditions of Cylinder Pressure Test & Pump Out Evacuation Pump volume, amount of U^{235} and enrichment and the conservative design/analysis values for these parameters assumed for criticality.
			More Heat	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a more heat condition that would cause an approach to the critical safe volume and to adversely affect the maintenance of margin to criticality associated with design and maximum operating parameter values for amount of U^{235} and enrichment.
			More Pressure	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a more pressure condition that would cause an approach to the critical safe volume and to adversely affect the maintenance of margin to criticality associated with design and maximum operating parameter values for amount of U^{235} and enrichment.
			Corrosion/ Erosion	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a corrosion/erosion condition that would cause an approach to the critical safe volume. Materials are corrosion/erosion resistant and postulated complete wall erosion would not exceed the critical safe volume.
			Loss of Confinement or Leakage	Based on qualitative assessment, postulated loss of Cylinder Pressure Test & Pump Out Evacuation Pump confinement or leakage will not result in any appreciable accumulation of U^{235} material because of physical limitations of the process (sub-atmospheric). As a result, loss of confinement does not result in a potential for criticality and therefore its consequence is low.
			Fire	Components shall be protected from fire to ensure the critical design attribute of volume is not adversely impacted.
			Maintenance	Configuration Management shall ensure that maintenance does not adversely impact the critical design attribute of volume.

Criticality Assessment of Passive Safe-By-Design Components				
Component Description (A)	**Sequence ID (B)**	**Critical Design Attribute (C)**	**Review of Up-Set Conditions to Change Geometry (Applicable HAZOP Guidewords) (D)**	**Notes/Comments (E)**
				Double Contingency Principle is satisfied as follows. The geometry is criticality safe and no single credible event or failure has been identified whereby the geometry could become unsafe. The enrichment is also controlled such that no single credible failure could result in loss of enrichment control.
Carbon Trap (Cylinder Pressure Test & Pump Out Evacuation)	LOSS OF SAFE-BY-DESIGN ATTRIBUTE	**DIAMETER** 24.4 cm (ID) Keff = 1.0 @ 6 wt %		Based on qualitative assessment, there is margin between the parameter values at normal operating conditions of Carbon Trap diameter, amount of U^{235} and enrichment and the conservative design/analysis values for these parameters assumed for criticality.
			More Heat	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a more heat condition that would cause an approach to the critical safe diameter and to adversely affect the maintenance of margin to criticality associated with design and maximum operating parameter values for amount of U^{235} and enrichment.
			More Pressure	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a more pressure condition that would cause an approach to the critical safe diameter and to adversely affect the maintenance of margin to criticality associated with design and maximum operating parameter values for amount of U^{235} and enrichment.
			Corrosion/ Erosion	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a corrosion/erosion condition that would cause an approach to the critical safe diameter. Materials are corrosion/erosion resistant and postulated complete wall erosion would not exceed the critical safe diameter.
			Loss of Confinement or Leakage	Based on qualitative assessment, postulated loss of Carbon Trap confinement or leakage will not result in any appreciable accumulation of U^{235} material because of physical limitations of the process (sub-atmospheric). As a result, loss of confinement does not result in a potential for criticality and therefore its consequence is low.
			Fire	Components shall be protected from fire to ensure the critical design attribute of diameter is not adversely impacted.
			Maintenance	Configuration Management shall ensure that maintenance does not adversely impact the critical design attribute of diameter.
				Double Contingency Principle is satisfied as follows. The geometry is criticality safe and no single credible event or failure has been identified whereby the geometry could become unsafe. The enrichment is also controlled such that no single credible failure could result in loss of enrichment control.

Criticality Assessment of Passive Safe-By-Design Components				
Component Description (A)	**Sequence ID (B)**	**Critical Design Attribute (C)**	**Review of Up-Set Conditions to Change Geometry (Applicable HAZOP Guidewords) (D)**	**Notes/Comments (E)**
Aluminum Oxide Trap (Cylinder Pressure Test & Pump Out Evacuation)	LOSS OF SAFE-BY-DESIGN ATTRIBUTE	**DIAMETER** 24.4 cm (ID) Keff = 1.0 @ 6 wt %		Based on qualitative assessment, there is margin between the parameter values at normal operating conditions of Aluminum Oxide Trap diameter, amount of U^{235} and enrichment and the conservative design/analysis values for these parameters assumed for criticality.
			More Heat	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a more heat condition that would cause an approach to the critical safe diameter and to adversely affect the maintenance of margin to criticality associated with design and maximum operating parameter values for amount of U^{235} and enrichment.
			More Pressure	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a more pressure condition that would cause an approach to the critical safe diameter and to adversely affect the maintenance of margin to criticality associated with design and maximum operating parameter values for amount of U^{235} and enrichment.
			Corrosion/ Erosion	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a corrosion/erosion condition that would cause an approach to the critical safe diameter. Materials are corrosion/erosion resistant and postulated complete wall erosion would not exceed the critical safe diameter.
			Loss of Confinement or Leakage	Based on qualitative assessment, postulated loss of Aluminum Oxide Trap confinement or leakage will not result in any appreciable accumulation of U^{235} material because of physical limitations of the process (sub-atmospheric). As a result, loss of confinement does not result in a potential for criticality and therefore its consequence is low.
			Fire	Components shall be protected from fire to ensure the critical design attribute of diameter is not adversely impacted.
			Maintenance	Configuration Management shall ensure that maintenance does not adversely impact the critical design attribute of diameter.
				Double Contingency Principle is satisfied as follows. The geometry is criticality safe and no single credible event or failure has been identified whereby the geometry could become unsafe. The enrichment is also controlled such that no single credible failure could result in loss of enrichment control.
Chemical Absorber Oil Trap (Cylinder Pressure Test & Pump Out Evacuation)	LOSS OF SAFE-BY-DESIGN ATTRIBUTE	**VOLUME** 24 liters Keff = 1.0 @ 6 wt %		Based on qualitative assessment, there is margin between the parameter values at normal operating conditions of Chemical Absorber Oil Trap volume, amount of U^{235} and enrichment and the conservative design/analysis values for these parameters assumed for criticality.

Criticality Assessment of Passive Safe-By-Design Components				
Component Description (A)	**Sequence ID (B)**	**Critical Design Attribute (C)**	**Review of Up-Set Conditions to Change Geometry (Applicable HAZOP Guidewords) (D)**	**Notes/Comments (E)**
			More Heat	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a more heat condition that would cause an approach to the critical safe volume and to adversely affect the maintenance of margin to criticality associated with design and maximum operating parameter values for amount of U^{235} and enrichment.
			More Pressure	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a more pressure condition that would cause an approach to the critical safe volume and to adversely affect the maintenance of margin to criticality associated with design and maximum operating parameter values for amount of U^{235} and enrichment.
			Corrosion/ Erosion	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a corrosion/erosion condition that would cause an approach to the critical safe volume. Materials are corrosion/erosion resistant and postulated complete wall erosion would not exceed the critical safe volume.
			Loss of Confinement or Leakage	Based on qualitative assessment, postulated loss of Chemical Absorber Oil Trap confinement or leakage will not result in any appreciable accumulation of U^{235} material because of physical limitations of the process (sub-atmospheric). As a result, loss of confinement does not result in a potential for criticality and therefore its consequence is low.
			Fire	Components shall be protected from fire to ensure the critical design attribute of volume is not adversely impacted.
			Maintenance	Configuration Management shall ensure that maintenance does not adversely impact the critical design attribute of volume.
				Double Contingency Principle is satisfied as follows. The geometry is criticality safe and no single credible event or failure has been identified whereby the geometry could become unsafe. The enrichment is also controlled such that no single credible failure could result in loss of enrichment control.
Oil Trap (Cylinder Pressure Test & Pump Out Evacuation)	LOSS OF SAFE-BY-DESIGN ATTRIBUTE	**DIAMETER** 24.4 cm (ID) Keff = 1.0 @ 6 wt %		Based on qualitative assessment, there is margin between the parameter values at normal operating conditions of Oil Trap diameter, amount of U^{235} and enrichment and the conservative design/analysis values for these parameters assumed for criticality.
			More Heat	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a more heat condition that would cause an approach to the critical safe diameter and to adversely affect the maintenance of margin to criticality associated with design and maximum operating parameter values for amount of U^{235} and enrichment.

Criticality Assessment of Passive Safe-By-Design Components				
Component Description (A)	**Sequence ID (B)**	**Critical Design Attribute (C)**	**Review of Up-Set Conditions to Change Geometry (Applicable HAZOP Guidewords) (D)**	**Notes/Comments (E)**
			More Pressure	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a more pressure condition that would cause an approach to the critical safe diameter and to adversely affect the maintenance of margin to criticality associated with design and maximum operating parameter values for amount of U^{235} and enrichment.
			Corrosion/ Erosion	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a corrosion/erosion condition that would cause an approach to the critical safe diameter. Materials are corrosion/erosion resistant and postulated complete wall erosion would not exceed the critical safe diameter.
			Loss of Confinement or Leakage	Based on qualitative assessment, postulated loss of Oil Trap confinement or leakage will not result in any appreciable accumulation of U^{235} material because of physical limitations of the process (sub-atmospheric). As a result, loss of confinement does not result in a potential for criticality and therefore its consequence is low.
			Fire	Components shall be protected from fire to ensure the critical design attribute of diameter is not adversely impacted.
			Maintenance	Configuration Management shall ensure that maintenance does not adversely impact the critical design attribute of diameter.
				Double Contingency Principle is satisfied as follows. The geometry is criticality safe and no single credible event or failure has been identified whereby the geometry could become unsafe. The enrichment is also controlled such that no single credible failure could result in loss of enrichment control.
Vacuum Cleaner	LOSS OF SAFE-BY-DESIGN ATTRIBUTE	**DIAMETER** 24.4 cm (ID) Keff = 1.0 @ 6 wt %		Based on qualitative assessment, there is margin between the parameter value at normal operating conditions of Vacuum Cleaner diameter and the conservative design/analysis value for this parameter assumed for criticality.
			More Heat	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a more heat condition that would cause an approach to the critical safe diameter and to adversely affect the maintenance of margin to criticality associated with design and maximum operating parameter value.
			More Pressure	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a more pressure condition that would cause an approach to the critical safe diameter and to adversely affect the maintenance of margin to criticality associated with design and maximum operating parameter value.

Criticality Assessment of Passive Safe-By-Design Components				
Component Description (A)	Sequence ID (B)	Critical Design Attribute (C)	Review of Up-Set Conditions to Change Geometry (Applicable HAZOP Guidewords) (D)	Notes/Comments (E)
			Corrosion/ Erosion	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a corrosion/erosion condition that would cause an approach to the critical safe diameter. Materials are corrosion/erosion resistant and postulated complete wall erosion would not exceed the critical safe diameter.
			Loss of Confinement or Leakage	Based on qualitative assessment, postulated loss of Vacuum Cleaner confinement or leakage will not result in any appreciable accumulation of U^{235}. As a result, loss of confinement does not result in a potential for criticality and therefore its consequence is low.
			Fire	Components shall be protected from fire to ensure the critical design attribute of diameter is not adversely impacted.
			Maintenance	Configuration Management shall ensure that maintenance does not adversely impact the critical design attribute of diameter.
			Impact/Drop	Components shall be protected from Impact/Drop to ensure the critical design attribute of diameter is not adversely impacted.
			External Events (Construction on Site)	Components shall be protected from Construction on Site to ensure the critical design attribute of diameter is not adversely impacted.
			External Events (Failure of Above-Ground Liquid Tanks)	Components shall be protected from Failure of Above-Ground Liquid Tanks to ensure the critical design attribute of diameter is not adversely impacted.
			External Events (Hurricane)	Components shall be protected from Hurricane events to ensure the critical design attribute of diameter is not adversely impacted.
			External Events (Seismic)	Components shall be protected from Seismic events to ensure the critical design attribute of diameter is not adversely impacted.
			External Events (Tornado)	Components shall be protected from Tornado events to ensure the critical design attribute of diameter is not adversely impacted.
			External Events (Local Intense Precipitation)	Components shall be protected from Local Intense Precipitation events to ensure the critical design attribute of diameter is not adversely impacted.
			External Events (Snow/Ice)	Components shall be protected from Snow/Ice events to ensure the critical design attribute of diameter is not adversely impacted.

Criticality Assessment of Passive Safe-By-Design Components				
Component Description (A)	**Sequence ID (B)**	**Critical Design Attribute (C)**	**Review of Up-Set Conditions to Change Geometry (Applicable HAZOP Guidewords) (D)**	**Notes/Comments (E)**
				Double Contingency Principle is satisfied as follows. The geometry is criticality safe and no single credible event or failure has been identified whereby the geometry could become unsafe. The enrichment is also controlled such that no single credible failure could result in loss of enrichment control.
Cylinder Pressure Test & Pump Out Evacuation Pump/ Chemical Trap Set	LOSS OF SAFE-BY-DESIGN ATTRIBUTE	**PHYSICAL ARRANGEMENT**		Based on qualitative assessment, there is margin between the normal operating conditions and the conservative design/analysis conditions assumed for criticality.
			More Heat	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a more heat condition that would adversely affect the maintenance of margin to criticality associated with design and maximum operating parameter values for amount of U^{235} and enrichment.
			More Pressure	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a more pressure condition that would adversely affect the maintenance of margin to criticality associated with design and maximum operating parameter values for amount of U^{235} and enrichment.
			Corrosion/ Erosion	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a corrosion/erosion condition that would affect the maintenance of margin to criticality associated with design and maximum operating parameter values for physical arrangement.
			Loss of Confinement or Leakage	Based on qualitative assessment, postulated loss of Cylinder Pressure Test & Pump Out Evacuation Pump/ Chemical Trap Set confinement or leakage will not result in any appreciable accumulation of U^{235} material because of physical limitations of the process (sub-atmospheric). As a result, loss of confinement does not result in a potential for criticality and therefore its consequence is low.
			Fire	Components shall be protected from fire to ensure the critical design attribute of physical arrangement is not adversely impacted.
			Maintenance	Configuration Management shall ensure that maintenance does not adversely impact the critical design attribute of physical arrangement.
			Impact/Drop	Components shall be protected from impact/drop to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Construction on Site)	Components shall be protected from construction on-Site to ensure the critical design attribute of physical arrangement is not adversely impacted.

Criticality Assessment of Passive Safe-By-Design Components				
Component Description (A)	**Sequence ID (B)**	**Critical Design Attribute (C)**	**Review of Up-Set Conditions to Change Geometry (Applicable HAZOP Guidewords) (D)**	**Notes/Comments (E)**
			External Events (Failure of Above-Ground Liquid Storage Tanks)	Components shall be protected from external flooding (Failure of Above-Ground Liquid Storage Tanks) to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Hurricane)	Components shall be protected from hurricane events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Seismic)	Components shall be protected from seismic events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Tornado)	Components shall be protected from tornado events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Local Intense Precipitation)	Components shall be protected from local intense precipitation events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (External Fire)	Components shall be protected from external fire events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Snow/Ice)	Components shall be protected from external ice/snow events to ensure the critical design attribute of physical arrangement is not adversely impacted.
				Double Contingency Principle is satisfied as follows. The geometry is criticality safe and no single credible event or failure has been identified whereby the geometry could become unsafe. The enrichment is also controlled such that no single credible failure could result in loss of enrichment control.
Pump Transport Device	LOSS OF SAFE-BY-DESIGN ATTRIBUTE	**PHYSICAL ARRANGEMENT**		Based on qualitative assessment, there is margin between the normal operating conditions and the conservative design/analysis conditions assumed for criticality.
			Corrosion/ Erosion	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a corrosion/erosion condition that would affect the maintenance of margin to criticality associated with design and maximum operating parameter values for physical arrangement.
			Fire	Components shall be protected from fire to ensure the critical design attribute of physical arrangement is not adversely impacted.
			Maintenance	Configuration Management shall ensure that maintenance does not adversely impact the critical design attribute of physical arrangement.

Criticality Assessment of Passive Safe-By-Design Components				
Component Description (A)	**Sequence ID (B)**	**Critical Design Attribute (C)**	**Review of Up-Set Conditions to Change Geometry (Applicable HAZOP Guidewords) (D)**	**Notes/Comments (E)**
			Impact/Drop	Components shall be protected from impact/drop to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Construction on Site)	Components shall be protected from construction on-Site to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Failure of Above-Ground Liquid Storage Tanks)	Components shall be protected from external flooding (Failure of Above-Ground Liquid Storage Tanks) to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Hurricane)	Components shall be protected from hurricane events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Seismic)	Components shall be protected from seismic events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Tornado)	Components shall be protected from tornado events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Local Intense Precipitation)	Components shall be protected from local intense precipitation events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (External Fire)	Components shall be protected from external fire events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Snow/Ice)	Components shall be protected from external ice/snow events to ensure the critical design attribute of physical arrangement is not adversely impacted.
				Double Contingency Principle is satisfied as follows. The geometry is criticality safe and no single credible event or failure has been identified whereby the geometry could become unsafe. The enrichment is also controlled such that no single credible failure could result in loss of enrichment control.
Chemical Trap Transport Device	LOSS OF SAFE-BY-DESIGN ATTRIBUTE	**PHYSICAL ARRANGEMENT**		Based on qualitative assessment, there is margin between the normal operating conditions and the conservative design/analysis conditions assumed for criticality.
			Corrosion/ Erosion	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a corrosion/erosion condition that would affect the maintenance of margin to criticality associated with design and maximum operating parameter values for physical arrangement.

Criticality Assessment of Passive Safe-By-Design Components				
Component Description (A)	**Sequence ID (B)**	**Critical Design Attribute (C)**	**Review of Up-Set Conditions to Change Geometry (Applicable HAZOP Guidewords) (D)**	**Notes/Comments (E)**
			Fire	Components shall be protected from fire to ensure the critical design attribute of physical arrangement is not adversely impacted.
			Maintenance	Configuration Management shall ensure that maintenance does not adversely impact the critical design attribute of physical arrangement.
			Impact/Drop	Components shall be protected from impact/drop to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Construction on Site)	Components shall be protected from construction on-Site to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Failure of Above-Ground Liquid Storage Tanks)	Components shall be protected from external flooding (Failure of Above-Ground Liquid Storage Tanks) to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Hurricane)	Components shall be protected from hurricane events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Seismic)	Components shall be protected from seismic events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Tornado)	Components shall be protected from tornado events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Local Intense Precipitation)	Components shall be protected from local intense precipitation events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (External Fire)	Components shall be protected from external fire events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Snow/Ice)	Components shall be protected from external ice/snow events to ensure the critical design attribute of physical arrangement is not adversely impacted.
				Double Contingency Principle is satisfied as follows. The geometry is criticality safe and no single credible event or failure has been identified whereby the geometry could become unsafe. The enrichment is also controlled such that no single credible failure could result in loss of enrichment control.
1S Sample Bottle	LOSS OF SAFE-BY-DESIGN ATTRIBUTE	**DIAMETER** 24.4 cm (ID) Keff = 1.0 @ 6 wt %		Based on qualitative assessment, there is margin between the parameter values at normal operating conditions of 1S Sample Bottle diameter, amount of U^{235} and enrichment and the conservative design/analysis values for these parameters assumed for criticality.

Criticality Assessment of Passive Safe-By-Design Components				
Component Description (A)	**Sequence ID (B)**	**Critical Design Attribute (C)**	**Review of Up-Set Conditions to Change Geometry (Applicable HAZOP Guidewords) (D)**	**Notes/Comments (E)**
			More Heat	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a more heat condition that would cause an approach to the critical safe diameter and to adversely affect the maintenance of margin to criticality associated with design and maximum operating parameter values for amount of U^{235} and enrichment.
			More Pressure	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a more pressure condition that would cause an approach to the critical safe diameter and to adversely affect the maintenance of margin to criticality associated with design and maximum operating parameter values for amount of U^{235} and enrichment.
			Corrosion/ Erosion	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a corrosion/erosion condition that would cause an approach to the critical safe diameter. Materials are corrosion/erosion resistant and postulated complete wall erosion would not exceed the critical safe diameter.
			Loss of Confinement or Leakage	Based on qualitative assessment, postulated loss of 1S Sample Bottle confinement or leakage will not result in any appreciable accumulation of U^{235} material because of physical limitations of the process (sub-atmospheric). As a result, loss of confinement does not result in a potential for criticality and therefore its consequence is low.
			Fire	Components shall be protected from fire to ensure the critical design attribute of diameter is not adversely impacted.
			Maintenance	Configuration Management shall ensure that maintenance does not adversely impact the critical design attribute of diameter.
				Double Contingency Principle is satisfied as follows. The geometry is criticality safe and no single credible event or failure has been identified whereby the geometry could become unsafe. The enrichment is also controlled such that no single credible failure could result in loss of enrichment control.
Chemical Trap Storage Array	LOSS OF SAFE-BY-DESIGN ATTRIBUTE	**PHYSICAL ARRANGEMENT**		Based on qualitative assessment, there is margin between the normal operating conditions and the conservative design/analysis conditions assumed for criticality.
			Corrosion/ Erosion	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a corrosion/erosion condition that would affect the maintenance of margin to criticality associated with design and maximum operating parameter values for physical arrangement.
			Fire	Components shall be protected from fire to ensure the critical design attribute of physical arrangement is not adversely impacted.

Criticality Assessment of Passive Safe-By-Design Components				
Component Description (A)	**Sequence ID (B)**	**Critical Design Attribute (C)**	**Review of Up-Set Conditions to Change Geometry (Applicable HAZOP Guidewords) (D)**	**Notes/Comments (E)**
			Maintenance	Configuration Management shall ensure that maintenance does not adversely impact the critical design attribute of physical arrangement.
			Impact/Drop	Components shall be protected from impact/drop to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Construction on Site)	Components shall be protected from construction on-Site to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Failure of Above-Ground Liquid Storage Tanks)	Components shall be protected from external flooding (Failure of Above-Ground Liquid Storage Tanks) to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Hurricane)	Components shall be protected from hurricane events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Seismic)	Components shall be protected from seismic events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Tornado)	Components shall be protected from tornado events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Local Intense Precipitation)	Components shall be protected from local intense precipitation events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (External Fire)	Components shall be protected from external fire events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Snow/Ice)	Components shall be protected from external ice/snow events to ensure the critical design attribute of physical arrangement is not adversely impacted.
				Double Contingency Principle is satisfied as follows. The geometry is criticality safe and no single credible event or failure has been identified whereby the geometry could become unsafe. The enrichment is also controlled such that no single credible failure could result in loss of enrichment control.
Dump Trap Storage Array	LOSS OF SAFE-BY-DESIGN ATTRIBUTE	**PHYSICAL ARRANGEMENT**		Based on qualitative assessment, there is margin between the normal operating conditions and the conservative design/analysis conditions assumed for criticality.

Criticality Assessment of Passive Safe-By-Design Components				
Component Description (A)	**Sequence ID (B)**	**Critical Design Attribute (C)**	**Review of Up-Set Conditions to Change Geometry (Applicable HAZOP Guidewords) (D)**	**Notes/Comments (E)**
			Corrosion/ Erosion	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a corrosion/erosion condition that would affect the maintenance of margin to criticality associated with design and maximum operating parameter values for physical arrangement.
			Fire	Components shall be protected from fire to ensure the critical design attribute of physical arrangement is not adversely impacted.
			Maintenance	Configuration Management shall ensure that maintenance does not adversely impact the critical design attribute of physical arrangement.
			Impact/Drop	Components shall be protected from impact/drop to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Construction on Site)	Components shall be protected from construction on-Site to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Failure of Above-Ground Liquid Storage Tanks)	Components shall be protected from external flooding (Failure of Above-Ground Liquid Storage Tanks) to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Hurricane)	Components shall be protected from hurricane events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Seismic)	Components shall be protected from seismic events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Tornado)	Components shall be protected from tornado events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Local Intense Precipitation)	Components shall be protected from local intense precipitation events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (External Fire)	Components shall be protected from external fire events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Snow/Ice)	Components shall be protected from external ice/snow events to ensure the critical design attribute of physical arrangement is not adversely impacted.
				Double Contingency Principle is satisfied as follows. The geometry is criticality safe and no single credible event or failure has been identified whereby the geometry could become unsafe. The enrichment is also controlled such that no single credible failure could result in loss of enrichment control.

Criticality Assessment of Passive Safe-By-Design Components				
Component Description (A)	**Sequence ID (B)**	**Critical Design Attribute (C)**	**Review of Up-Set Conditions to Change Geometry (Applicable HAZOP Guidewords) (D)**	**Notes/Comments (E)**
Dump Trap Interals	LOSS OF SAFE-BY-DESIGN ATTRIBUTE	**PHYSICAL ARRANGEMENT**		Based on qualitative assessment, there is margin between the normal operating conditions and the conservative design/analysis conditions assumed for criticality.
			More Heat	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a more heat condition that would adversely affect the maintenance of margin to criticality associated with design and maximum operating parameter values for amount of U^{235} and enrichment.
			More Pressure	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a more pressure condition that would adversely affect the maintenance of margin to criticality associated with design and maximum operating parameter values for amount of U^{235} and enrichment.
			Corrosion/ Erosion	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a corrosion/erosion condition that would affect the maintenance of margin to criticality associated with design and maximum operating parameter values for physical arrangement.
			Loss of Confinement or Leakage	Based on qualitative assessment, postulated loss of Dump Trap confinement or leakage will not result in any appreciable accumulation of U^{235} material because of physical limitations of the process (sub-atmospheric). As a result, loss of confinement does not result in a potential for criticality and therefore its consequence is low.
			Fire	Components shall be protected from fire to ensure the critical design attribute of physical arrangement is not adversely impacted.
			Maintenance	Configuration Management shall ensure that maintenance does not adversely impact the critical design attribute of physical arrangement.
			Impact/Drop	Components shall be protected from impact/drop to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Construction on Site)	Components shall be protected from construction on-Site to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Failure of Above-Ground Liquid Storage Tanks)	Components shall be protected from external flooding (Failure of Above-Ground Liquid Storage Tanks) to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Hurricane)	Components shall be protected from hurricane events to ensure the critical design attribute of physical arrangement is not adversely impacted.

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Criticality Assessment of Passive Safe-By-Design Components				
Component Description (A)	**Sequence ID (B)**	**Critical Design Attribute (C)**	**Review of Up-Set Conditions to Change Geometry (Applicable HAZOP Guidewords) (D)**	**Notes/Comments (E)**
			External Events (Seismic)	Components shall be protected from seismic events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Tornado)	Components shall be protected from tornado events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Local Intense Precipitation)	Components shall be protected from local intense precipitation events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (External Fire)	Components shall be protected from external fire events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Snow/Ice)	Components shall be protected from external ice/snow events to ensure the critical design attribute of physical arrangement is not adversely impacted.
				Double Contingency Principle is satisfied as follows. The geometry is criticality safe and no single credible event or failure has been identified whereby the geometry could become unsafe. The enrichment is also controlled such that no single credible failure could result in loss of enrichment control.
12 Liter Canister Storage Array	LOSS OF SAFE-BY-DESIGN ATTRIBUTE	**PHYSICAL ARRANGEMENT**		Based on qualitative assessment, there is margin between the normal operating conditions and the conservative design/analysis conditions assumed for criticality.
			Corrosion/ Erosion	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a corrosion/erosion condition that would affect the maintenance of margin to criticality associated with design and maximum operating parameter values for physical arrangement.
			Fire	Components shall be protected from fire to ensure the critical design attribute of physical arrangement is not adversely impacted.
			Maintenance	Configuration Management shall ensure that maintenance does not adversely impact the critical design attribute of physical arrangement.
			Impact/Drop	Components shall be protected from impact/drop to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Construction on Site)	Components shall be protected from construction on-Site to ensure the critical design attribute of physical arrangement is not adversely impacted.

Criticality Assessment of Passive Safe-By-Design Components				
Component Description (A)	**Sequence ID (B)**	**Critical Design Attribute (C)**	**Review of Up-Set Conditions to Change Geometry (Applicable HAZOP Guidewords) (D)**	**Notes/Comments (E)**
			External Events (Failure of Above-Ground Liquid Storage Tanks)	Components shall be protected from external flooding (Failure of Above-Ground Liquid Storage Tanks) to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Hurricane)	Components shall be protected from hurricane events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Seismic)	Components shall be protected from seismic events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Tornado)	Components shall be protected from tornado events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Local Intense Precipitation)	Components shall be protected from local intense precipitation events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (External Fire)	Components shall be protected from external fire events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Snow/Ice)	Components shall be protected from external ice/snow events to ensure the critical design attribute of physical arrangement is not adversely impacted.
				Double Contingency Principle is satisfied as follows. The geometry is criticality safe and no single credible event or failure has been identified whereby the geometry could become unsafe. The enrichment is also controlled such that no single credible failure could result in loss of enrichment control.
12 Liter Canister	LOSS OF SAFE-BY-DESIGN ATTRIBUTE	**VOLUME** 24 liters Keff = 1.0 @ 6 wt %		Based on qualitative assessment, there is margin between the parameter value at normal operating conditions of 12 Liter Canister volume and the conservative design/analysis value for this parameter assumed for criticality.
			Corrosion/ Erosion	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a corrosion/erosion condition that would cause an approach to the critical safe volume. Materials are corrosion/erosion resistant and postulated complete wall erosion would not exceed the critical safe volume.
			Loss of Confinement or Leakage	Based on qualitative assessment, postulated loss of 12 liter canister confinement or leakage will not result in any appreciable accumulation of U^{235} material. As a result, loss of confinement does not result in a potential for criticality and therefore its consequence is low.
			Fire	Components shall be protected from fire to ensure the critical design attribute of volume is not adversely impacted.

Criticality Assessment of Passive Safe-By-Design Components				
Component Description (A)	**Sequence ID (B)**	**Critical Design Attribute (C)**	**Review of Up-Set Conditions to Change Geometry (Applicable HAZOP Guidewords) (D)**	**Notes/Comments (E)**
			Maintenance	Configuration Management shall ensure that maintenance does not adversely impact the critical design attribute of volume.
				Double Contingency Principle is satisfied as follows. The geometry is criticality safe and no single credible event or failure has been identified whereby the geometry could become unsafe. The enrichment is also controlled such that no single credible failure could result in loss of enrichment control.
12 Liter Canister Transport Device	LOSS OF SAFE-BY-DESIGN ATTRIBUTE	PHYSICAL ARRANGEMENT		Based on qualitative assessment, there is margin between the normal operating conditions and the conservative design/analysis conditions assumed for criticality.
			Corrosion/ Erosion	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a corrosion/erosion condition that would affect the maintenance of margin to criticality associated with design and maximum operating parameter values for physical arrangement.
			Fire	Components shall be protected from fire to ensure the critical design attribute of physical arrangement is not adversely impacted.
			Maintenance	Configuration Management shall ensure that maintenance does not adversely impact the critical design attribute of physical arrangement.
			Impact/Drop	Components shall be protected from impact/drop to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Construction on Site)	Components shall be protected from construction on-Site to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Failure of Above-Ground Liquid Storage Tanks)	Components shall be protected from external flooding (Failure of Above-Ground Liquid Storage Tanks) to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Hurricane)	Components shall be protected from hurricane events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Seismic)	Components shall be protected from seismic events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Tornado)	Components shall be protected from tornado events to ensure the critical design attribute of physical arrangement is not adversely impacted.

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Criticality Assessment of Passive Safe-By-Design Components				
Component Description (A)	**Sequence ID (B)**	**Critical Design Attribute (C)**	**Review of Up-Set Conditions to Change Geometry (Applicable HAZOP Guidewords) (D)**	**Notes/Comments (E)**
			External Events (Local Intense Precipitation)	Components shall be protected from local intense precipitation events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (External Fire)	Components shall be protected from external fire events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Snow/Ice)	Components shall be protected from external ice/snow events to ensure the critical design attribute of physical arrangement is not adversely impacted.
				Double Contingency Principle is satisfied as follows. The geometry is criticality safe and no single credible event or failure has been identified whereby the geometry could become unsafe. The enrichment is also controlled such that no single credible failure could result in loss of enrichment control.

Column Descriptions:

Column A: This column provides a brief description of each component.

Column B: This column identifies the accident sequence associated with the passive component.

Column C: This column identifies the critical design attribute under consideration along with the conservative values used in the criticality analysis.

Column D: This column identifies the applicable guidewords from the ISA HAZOP procedure that are used to assess the criticality design margin. Additional guidewords are addressed as applicable in the detailed assessment.

Column E: This column provides any notes, comments and concluding statements.

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Criticality Assessment of Passive Safe-By-Design Components				
Component Description (A)	**Sequence ID (B)**	**Critical Design Attribute (C)**	**Review of Up-Set Conditions to Change Geometry (Applicable HAZOP Guidewords) (D)**	**Notes/Comments (E)**
1S Sample Bottle	LOSS OF SAFE-BY-DESIGN ATTRIBUTE	**DIAMETER** 24.4 cm (ID) *Keff* = 1.0 @ 6 wt %		Based on qualitative assessment, there is margin between the parameter values at normal operating conditions of 1S Sample Bottle diameter, amount of U^{235} and enrichment and the conservative design/analysis values for these parameters assumed for criticality.
			More Heat	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a more heat condition that would cause an approach to the critical safe diameter and to adversely affect the maintenance of margin to criticality associated with design and maximum operating parameter values for amount of U^{235} and enrichment.
			More Pressure	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a more pressure condition that would cause an approach to the critical safe diameter and to adversely affect the maintenance of margin to criticality associated with design and maximum operating parameter values for amount of U^{235} and enrichment.
			Corrosion/ Erosion	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a corrosion/erosion condition that would cause an approach to the critical safe diameter. Materials are corrosion/erosion resistant and postulated complete wall erosion would not exceed the critical safe diameter.
			Loss of Confinement or Leakage	Based on qualitative assessment, postulated loss of 1S Sample Bottle confinement or leakage will not result in any appreciable accumulation of U^{235} material because of physical limitations of the process (sub-atmospheric). As a result, loss of confinement does not result in a potential for criticality and therefore its consequence is low.
			Fire	Components shall be protected from fire to ensure the critical design attribute of diameter is not adversely impacted.
			Maintenance	Configuration Management shall ensure that maintenance does not adversely impact the critical design attribute of diameter.
				Double Contingency Principle is satisfied as follows. The geometry is criticality safe and no single credible event or failure has been identified whereby the geometry could become unsafe. The enrichment is also controlled such that no single credible failure could result in loss of enrichment control.
1S Sample Bottle Storage Array	LOSS OF SAFE-BY-DESIGN ATTRIBUTE	**PHYSICAL ARRANGEMENT**		Based on qualitative assessment, there is margin between the normal operating conditions and the conservative design/analysis conditions assumed for criticality.

Criticality Assessment of Passive Safe-By-Design Components				
Component Description (A)	**Sequence ID (B)**	**Critical Design Attribute (C)**	**Review of Up-Set Conditions to Change Geometry (Applicable HAZOP Guidewords) (D)**	**Notes/Comments (E)**
			Corrosion/ Erosion	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a corrosion/erosion condition that would affect the maintenance of margin to criticality associated with design and maximum operating parameter values for physical arrangement.
			Fire	Components shall be protected from fire to ensure the critical design attribute of physical arrangement is not adversely impacted.
			Maintenance	Configuration Management shall ensure that maintenance does not adversely impact the critical design attribute of physical arrangement.
			Impact/Drop	Components shall be protected from impact/drop to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Construction on Site)	Components shall be protected from construction on-Site to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Failure of Above-Ground Liquid Storage Tanks)	Components shall be protected from external flooding (Failure of Above-Ground Liquid Storage Tanks) to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Hurricane)	Components shall be protected from hurricane events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Seismic)	Components shall be protected from seismic events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Tornado)	Components shall be protected from tornado events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Local Intense Precipitation)	Components shall be protected from local intense precipitation events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (External Fire)	Components shall be protected from external fire events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Snow/Ice)	Components shall be protected from external ice/snow events to ensure the critical design attribute of physical arrangement is not adversely impacted.
				Double Contingency Principle is satisfied as follows. The geometry is criticality safe and no single credible event or failure has been identified whereby the geometry could become unsafe. The enrichment is also controlled such that no single credible failure could result in loss of enrichment control.

Criticality Assessment of Passive Safe-By-Design Components				
Component Description (A)	**Sequence ID (B)**	**Critical Design Attribute (C)**	**Review of Up-Set Conditions to Change Geometry (Applicable HAZOP Guidewords) (D)**	**Notes/Comments (E)**
Cold Trap	LOSS OF SAFE-BY-DESIGN ATTRIBUTE	**DIAMETER** 24.4 cm (ID) Keff = 1.0 @ 6 wt %		Based on qualitative assessment, there is margin between the parameter values at normal operating conditions of component diameter, amount of U^{235} and enrichment and the conservative design/analysis values for these parameters assumed for criticality.
			More Heat	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a more heat condition that would cause an approach to the critical safe diameter and to adversely affect the maintenance of margin to criticality associated with design and maximum operating parameter values for amount of U^{235} and enrichment.
			More Pressure	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a more pressure condition that would cause an approach to the critical safe diameter and to adversely affect the maintenance of margin to criticality associated with design and maximum operating parameter values for amount of U^{235} and enrichment.
			Corrosion/ Erosion	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a corrosion/erosion condition that would cause an approach to the critical safe diameter. Materials are corrosion/erosion resistant and postulated complete wall erosion would not exceed the critical safe diameter.
			Loss of Confinement or Leakage	Based on qualitative assessment, postulated loss of cold trap confinement or leakage and will not result in any appreciable accumulation of material because of physical limitations of the process (sub-atmospheric). As a result, loss of confinement does not result in a potential for criticality and therefore its consequence is low.
			Fire	Components shall be protected from fire to ensure the critical design attribute of diameter is not adversely impacted.
			Maintenance	Configuration Management shall ensure that maintenance does not adversely impact the critical design attribute of diameter.
				Double Contingency Principle is satisfied as follows. The geometry is criticality safe and no single credible event or failure has been identified whereby the geometry could become unsafe. The enrichment is also controlled such that no single credible failure could result in loss of enrichment control.
UF_6 Sampling System Pump	LOSS OF SAFE-BY-DESIGN ATTRIBUTE	**VOLUME** 24 liters Keff = 1.0 @ 6 wt %		Based on qualitative assessment, there is margin between the parameter values at normal operating conditions of UF_6 Sampling System Pump volume, amount of U^{235} and enrichment and the conservative design/analysis values for these parameters assumed for criticality.

Criticality Assessment of Passive Safe-By-Design Components				
Component Description (A)	**Sequence ID (B)**	**Critical Design Attribute (C)**	**Review of Up-Set Conditions to Change Geometry (Applicable HAZOP Guidewords) (D)**	**Notes/Comments (E)**
			More Heat	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a more heat condition that would cause an approach to the critical safe volume and to adversely affect the maintenance of margin to criticality associated with design and maximum operating parameter values for amount of U^{235} and enrichment.
			More Pressure	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a more pressure condition that would cause an approach to the critical safe volume and to adversely affect the maintenance of margin to criticality associated with design and maximum operating parameter values for amount of U^{235} and enrichment.
			Corrosion/ Erosion	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a corrosion/erosion condition that would cause an approach to the critical safe volume. Materials are corrosion/erosion resistant and postulated complete wall erosion would not exceed the critical safe volume.
			Loss of Confinement or Leakage	Based on qualitative assessment, postulated loss of UF_6 Sampling System Pump confinement or leakage will not result in any appreciable accumulation of U^{235} material because of physical limitations of the process (sub-atmospheric). As a result, loss of confinement does not result in a potential for criticality and therefore its consequence is low.
			Fire	Components shall be protected from fire to ensure the critical design attribute of volume is not adversely impacted.
			Maintenance	Configuration Management shall ensure that maintenance does not adversely impact the critical design attribute of volume.
				Double Contingency Principle is satisfied as follows. The geometry is criticality safe and no single credible event or failure has been identified whereby the geometry could become unsafe. The enrichment is also controlled such that no single credible failure could result in loss of enrichment control.
P10 Sample Bottle	LOSS OF SAFE-BY-DESIGN ATTRIBUTE	**DIAMETER** 24.4 cm (ID) Keff = 1.0 @ 6 wt %		Based on qualitative assessment, there is margin between the parameter values at normal operating conditions of P10 Sample Bottle diameter, amount of U^{235} and enrichment and the conservative design/analysis values for these parameters assumed for criticality.
			More Heat	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a more heat condition that would cause an approach to the critical safe diameter and to adversely affect the maintenance of margin to criticality associated with design and maximum operating parameter values for amount of U^{235} and enrichment.

Criticality Assessment of Passive Safe-By-Design Components				
Component Description (A)	**Sequence ID (B)**	**Critical Design Attribute (C)**	**Review of Up-Set Conditions to Change Geometry (Applicable HAZOP Guidewords) (D)**	**Notes/Comments (E)**
			More Pressure	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a more pressure condition that would cause an approach to the critical safe diameter and to adversely affect the maintenance of margin to criticality associated with design and maximum operating parameter values for amount of U^{235} and enrichment.
			Corrosion/ Erosion	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a corrosion/erosion condition that would cause an approach to the critical safe diameter. Materials are corrosion/erosion resistant and postulated complete wall erosion would not exceed the critical safe diameter.
			Loss of Confinement or Leakage	Based on qualitative assessment, postulated loss of P10 Sample Bottle confinement or leakage will not result in any appreciable accumulation of U^{235} material because of physical limitations of the process (sub-atmospheric). As a result, loss of confinement does not result in a potential for criticality and therefore its consequence is low.
			Fire	Components shall be protected from fire to ensure the critical design attribute of diameter is not adversely impacted.
			Maintenance	Configuration Management shall ensure that maintenance does not adversely impact the critical design attribute of diameter.
				Double Contingency Principle is satisfied as follows. The geometry is criticality safe and no single credible event or failure has been identified whereby the geometry could become unsafe. The enrichment is also controlled such that no single credible failure could result in loss of enrichment control.

Column Descriptions:

Column A: This column provides a brief description of each component.

Column B: This column identifies the accident sequence associated with the passive component.

Column C: This column identifies the critical design attribute under consideration along with the conservative values used in the criticality analysis.

Column D: This column identifies the applicable guidewords from the ISA HAZOP procedure that are used to assess the criticality design margin. Additional guidewords are addressed as applicable in the detailed assessment.

Column E: This column provides any notes, comments and concluding statements.

Table 3.7-20 Mass Spectrometry
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Criticality Assessment of Passive Safe-By-Design Components				
Component Description (A)	**Sequence ID (B)**	**Critical Design Attribute (C)**	**Review of Up-Set Conditions to Change Geometry (Applicable HAZOP Guidewords) (D)**	**Notes/Comments (E)**
Mass Spectrometry	LOSS OF SAFE-BY-DESIGN ATTRIBUTE	**VOLUME** 24 liters Keff = 1.0 @ 6 wt %		Based on qualitative assessment, there is margin between the parameter values at normal operating conditions of Mass Spectrometry volume, amount of U^{235} and enrichment and the conservative design/analysis values for these parameters assumed for criticality.
			More Heat	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a more heat condition that would cause an approach to the critical safe volume and to adversely affect the maintenance of margin to criticality associated with design and maximum operating parameter values for amount of U^{235} and enrichment.
			More Pressure	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a more pressure condition that would cause an approach to the critical safe volume and to adversely affect the maintenance of margin to criticality associated with design and maximum operating parameter values for amount of U^{235} and enrichment.
			Corrosion/ Erosion	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a corrosion/erosion condition that would cause an approach to the critical safe volume. Materials are corrosion/erosion resistant and postulated complete wall erosion would not exceed the critical safe volume.
			Loss of Confinement or Leakage	Based on qualitative assessment, postulated loss of Mass Spectrometry confinement or leakage will not result in any appreciable accumulation of U^{235} material because of physical limitations of the process (sub-atmospheric). As a result, loss of confinement does not result in a potential for criticality and therefore its consequence is low.
			Fire	*Components shall be protected from fire to ensure the critical* design attribute of volume is not adversely impacted.
			Maintenance	Configuration Management shall ensure that maintenance does not adversely impact the critical design attribute of volume.
				Double Contingency Principle is satisfied as follows. The geometry is criticality safe and no single credible event or failure has been identified whereby the geometry could become unsafe. The enrichment is also controlled such that no single credible failure could result in loss of enrichment control.
Finger Sample Bottle	LOSS OF SAFE-BY-DESIGN ATTRIBUTE	**DIAMETER** 24.4 cm (ID) Keff = 1.0 @ 6 wt %		Based on qualitative assessment, there is margin between the parameter values at normal operating conditions of Finger Sample Bottle diameter, amount of U^{235} and enrichment and the conservative design/analysis values for these parameters assumed for criticality.

Table 3.7-20 Mass Spectrometry
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Criticality Assessment of Passive Safe-By-Design Components				
Component Description (A)	**Sequence ID (B)**	**Critical Design Attribute (C)**	**Review of Up-Set Conditions to Change Geometry (Applicable HAZOP Guidewords) (D)**	**Notes/Comments (E)**
			More Heat	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a more heat condition that would cause an approach to the critical safe diameter and to adversely affect the maintenance of margin to criticality associated with design and maximum operating parameter values for amount of U^{235} and *enrichment.*
			More Pressure	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a more pressure condition that would cause an approach to the critical safe diameter and to adversely affect the maintenance of margin to criticality associated with design and maximum operating parameter values for amount of U^{235} and enrichment.
			Corrosion/ Erosion	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a corrosion/erosion condition that would cause an approach to the critical safe diameter. Materials are corrosion/erosion resistant and postulated complete wall erosion would not exceed the critical safe diameter.
			Loss of Confinement or Leakage	Based on qualitative assessment, postulated loss of Finger Sample Bottle confinement or leakage will not result in any appreciable accumulation of U^{235} material because of physical limitations of the process (sub-atmospheric). As a result, loss of confinement does not result in a potential for criticality and therefore its consequence is low.
			Fire	Components shall be protected from fire to ensure the critical design attribute of diameter is not adversely impacted.
			Maintenance	Configuration Management shall ensure that maintenance does not adversely impact the critical design attribute of diameter.
				Double Contingency Principle is satisfied as follows. The geometry is criticality safe and no single credible event or failure has been identified whereby the geometry could become unsafe. The enrichment is also controlled such that no single credible failure could result in loss of enrichment control.

Column Descriptions:

Column A: This column provides a brief description of each component.

Column B: This column identifies the accident sequence associated with the passive component.

Column C: This column identifies the critical design attribute under consideration along with the conservative values used in the criticality analysis.

Column D: This column identifies the applicable guidewords from the ISA HAZOP procedure that are used to assess the criticality design margin. Additional guidewords are addressed as applicable in the detailed assessment.

Column E: This column provides any notes, comments and concluding statements.

Table 3.7-21 Cylinder Preparation System
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Criticality Assessment of Passive Safe-By-Design Components				
Component Description (A)	**Sequence ID (B)**	**Critical Design Attribute (C)**	**Review of Up-Set Conditions to Change Geometry (Applicable HAZOP Guidewords) (D)**	**Notes/Comments (E)**
Cylinder Preparation Test & Pump Out Piping (largest pipe ID in system)	LOSS OF SAFE-BY-DESIGN ATTRIBUTE	**DIAMETER** 24.4 cm (ID) Keff = 1.0 @ 6 wt %		Based on qualitative assessment, there is margin between the parameter values at normal operating conditions of pipe diameter, amount of U^{235} and enrichment and the conservative design/analysis values for these parameters assumed for criticality.
			More Heat	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a more heat condition that would cause an approach to the critical safe diameter and to adversely affect the maintenance of margin to criticality associated with design and maximum operating parameter values for amount of U^{235} and enrichment.
			More Pressure	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a more pressure condition that would cause an approach to the critical safe diameter and to adversely affect the maintenance of margin to criticality associated with design and maximum operating parameter values for amount of U^{235} and enrichment.
			Corrosion/ Erosion	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a corrosion/erosion condition that would cause an approach to the critical safe diameter. Materials are corrosion/erosion resistant and postulated complete wall erosion would not exceed the critical safe diameter.
			Loss of Confinement or Leakage	Based on qualitative assessment, postulated loss of piping system confinement or leakage will not result in any appreciable accumulation of U^{235} material. As a result, loss of confinement does not result in a potential for criticality and therefore its consequence is low.
			Fire	Components shall be protected from fire to ensure the critical design attribute of diameter is not adversely impacted.
			Maintenance	Configuration Management shall ensure that maintenance does not adversely impact the critical design attribute of diameter.
				Double Contingency Principle is satisfied as follows. The geometry is criticality safe and no single credible event or failure has been identified whereby the geometry could become unsafe. The enrichment is also controlled such that no single credible failure could result in loss of enrichment control.
Cylinder Preparation Test & Pump Out Piping Arrangement	LOSS OF SAFE-BY-DESIGN ATTRIBUTE	**PHYSICAL ARRANGEMENT**		Based on qualitative assessment, there is margin between the normal operating conditions and the conservative design/analysis conditions assumed for criticality.

Criticality Assessment of Passive Safe-By-Design Components				
Component Description (A)	**Sequence ID (B)**	**Critical Design Attribute (C)**	**Review of Up-Set Conditions to Change Geometry (Applicable HAZOP Guidewords) (D)**	**Notes/Comments (E)**
			More Heat	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a more heat condition that would adversely affect the maintenance of margin to criticality associated with design and maximum operating parameter values for amount of U^{235} and enrichment.
			More Pressure	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a more pressure condition that would adversely affect the maintenance of margin to criticality associated with design and maximum operating parameter values for amount of U^{235} and enrichment.
			Corrosion/ Erosion	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a corrosion/erosion condition that would affect the maintenance of margin to criticality associated with design and maximum operating parameter values for physical arrangement.
			Loss of Confinement or Leakage	Based on qualitative assessment, postulated loss of piping system confinement or leakage will not result in any appreciable accumulation of U^{235} material. As a result, loss of confinement does not result in a potential for criticality and therefore its consequence is low.
			Fire	Components shall be protected from fire to ensure the critical design attribute of physical arrangement is not adversely impacted.
			Maintenance	Configuration Management shall ensure that maintenance does not adversely impact the critical design attribute of physical arrangement.
			Impact/Drop	Components shall be protected from impact/drop to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Construction on Site)	Components shall be protected from construction on-Site to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Failure of Above-Ground Liquid Storage Tanks)	Components shall be protected from external flooding (Failure of Above-Ground Liquid Storage Tanks) to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Hurricane)	Components shall be protected from hurricane events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Seismic)	Components shall be protected from seismic events to ensure the critical design attribute of physical arrangement is not adversely impacted.

Criticality Assessment of Passive Safe-By-Design Components				
Component Description (A)	**Sequence ID (B)**	**Critical Design Attribute (C)**	**Review of Up-Set Conditions to Change Geometry (Applicable HAZOP Guidewords) (D)**	**Notes/Comments (E)**
			External Events (Tornado)	Components shall be protected from tornado events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Local Intense Precipitation)	Components shall be protected from local intense precipitation events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (External Fire)	Components shall be protected from external fire events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Snow/Ice)	Components shall be protected from external ice/snow events to ensure the critical design attribute of physical arrangement is not adversely impacted.
				Double Contingency Principle is satisfied as follows. The geometry is criticality safe and no single credible event or failure has been identified whereby the geometry could become unsafe. The enrichment is also controlled such that no single credible failure could result in loss of enrichment control.
Cylinder Preparation Test & Pump Out Evacuation Pump	LOSS OF SAFE-BY-DESIGN ATTRIBUTE	**VOLUME** 24 liters Keff = 1.0 @ 6 wt %		Based on qualitative assessment, there is margin between the parameter values at normal operating conditions of Cylinder Pressure Test & Pump Out Evacuation Pump volume, amount of U^{235} and enrichment and the conservative design/analysis values for these parameters assumed for criticality.
			More Heat	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a more heat condition that would cause an approach to the critical safe volume and to adversely affect the maintenance of margin to criticality associated with design and maximum operating parameter values for amount of U^{235} and enrichment.
			More Pressure	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a more pressure condition that would cause an approach to the critical safe volume and to adversely affect the maintenance of margin to criticality associated with design and maximum operating parameter values for amount of U^{235} and enrichment.
			Corrosion/ Erosion	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a corrosion/erosion condition that would cause an approach to the critical safe volume. Materials are corrosion/erosion resistant and postulated complete wall erosion would not exceed the critical safe volume.

Criticality Assessment of Passive Safe-By-Design Components				
Component Description (A)	**Sequence ID (B)**	**Critical Design Attribute (C)**	**Review of Up-Set Conditions to Change Geometry (Applicable HAZOP Guidewords) (D)**	**Notes/Comments (E)**
			Loss of Confinement or Leakage	Based on qualitative assessment, postulated loss of Cylinder Pressure Test & Pump Out Evacuation Pump confinement or leakage will not result in any appreciable accumulation of U^{235} material because of physical limitations of the process (sub-atmospheric). As a result, loss of confinement does not result in a potential for criticality and therefore its consequence is low.
			Fire	Components shall be protected from fire to ensure the critical design attribute of volume is not adversely impacted.
			Maintenance	Configuration Management shall ensure that maintenance does not adversely impact the critical design attribute of volume.
				Double Contingency Principle is satisfied as follows. The geometry is criticality safe and no single credible event or failure has been identified whereby the geometry could become unsafe. The enrichment is also controlled such that no single credible failure could result in loss of enrichment control.
Carbon Trap (Cylinder Preparation Test & Pump Out Evacuation)	LOSS OF SAFE-BY-DESIGN ATTRIBUTE	**DIAMETER** 24.4 cm (ID) Keff = 1.0 @ 6 wt %		Based on qualitative assessment, there is margin between the parameter values at normal operating conditions of Carbon Trap diameter, amount of U^{235} and enrichment and the conservative design/analysis values for these parameters assumed for criticality.
			More Heat	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a more heat condition that would cause an approach to the critical safe diameter and to adversely affect the maintenance of margin to criticality associated with design and maximum operating parameter values for amount of U^{235} and enrichment.
			More Pressure	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a more pressure condition that would cause an approach to the critical safe diameter and to adversely affect the maintenance of margin to criticality associated with design and maximum operating parameter values for amount of U^{235} and enrichment.
			Corrosion/ Erosion	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a corrosion/erosion condition that would cause an approach to the critical safe diameter. Materials are corrosion/erosion resistant and postulated complete wall erosion would not exceed the critical safe diameter.
			Loss of Confinement or Leakage	Based on qualitative assessment, postulated loss of Carbon Trap confinement or leakage will not result in any appreciable accumulation of U^{235} material because of physical limitations of the process (sub-atmospheric). As a result, loss of confinement does not result in a potential for criticality and therefore its consequence is low.

Criticality Assessment of Passive Safe-By-Design Components				
Component Description (A)	**Sequence ID (B)**	**Critical Design Attribute (C)**	**Review of Up-Set Conditions to Change Geometry (Applicable HAZOP Guidewords) (D)**	**Notes/Comments (E)**
			Fire	Components shall be protected from fire to ensure the critical design attribute of diameter is not adversely impacted.
			Maintenance	Configuration Management shall ensure that maintenance does not adversely impact the critical design attribute of diameter.
				Double Contingency Principle is satisfied as follows. The geometry is criticality safe and no single credible event or failure has been identified whereby the geometry could become unsafe. The enrichment is also controlled such that no single credible failure could result in loss of enrichment control.
Aluminum Oxide Trap (Cylinder Preparation Test & Pump Out Evacuation)	LOSS OF SAFE-BY-DESIGN ATTRIBUTE	**DIAMETER** 24.4 cm (ID) Keff = 1.0 @ 6 wt %		Based on qualitative assessment, there is margin between the parameter values at normal operating conditions of Aluminum Oxide Trap diameter, amount of U^{235} and enrichment and the conservative design/analysis values for these parameters assumed for criticality.
			More Heat	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a more heat condition that would cause an approach to the critical safe diameter and to adversely affect the maintenance of margin to criticality associated with design and maximum operating parameter values for amount of U^{235} and enrichment.
			More Pressure	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a more pressure condition that would cause an approach to the critical safe diameter and to adversely affect the maintenance of margin to criticality associated with design and maximum operating parameter values for amount of U^{235} and enrichment.
			Corrosion/ Erosion	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a corrosion/erosion condition that would cause an approach to the critical safe diameter. Materials are corrosion/erosion resistant and postulated complete wall erosion would not exceed the critical safe diameter.
			Loss of Confinement or Leakage	Based on qualitative assessment, postulated loss of Aluminum Oxide Trap confinement or leakage will not result in any appreciable accumulation of U^{235} material because of physical limitations of the process (sub-atmospheric). As a result, loss of confinement does not result in a potential for criticality and therefore its consequence is low.
			Fire	Components shall be protected from fire to ensure the critical design attribute of diameter is not adversely impacted.
			Maintenance	Configuration Management shall ensure that maintenance does not adversely impact the critical design attribute of diameter.

Criticality Assessment of Passive Safe-By-Design Components				
Component Description (A)	**Sequence ID (B)**	**Critical Design Attribute (C)**	**Review of Up-Set Conditions to Change Geometry (Applicable HAZOP Guidewords) (D)**	**Notes/Comments (E)**
				Double Contingency Principle is satisfied as follows. The geometry is criticality safe and no single credible event or failure has been identified whereby the geometry could become unsafe. The enrichment is also controlled such that no single credible failure could result in loss of enrichment control.
Chemical Absorber Oil Trap (Cylinder Preparation Test & Pump Out Evacuation)	LOSS OF SAFE-BY-DESIGN ATTRIBUTE	**VOLUME** 24 liters Keff = 1.0 @ 6 wt %		Based on qualitative assessment, there is margin between the parameter values at normal operating conditions of Chemical Absorber Oil Trap volume, amount of U^{235} and enrichment and the conservative design/analysis values for these parameters assumed for criticality.
			More Heat	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a more heat condition that would cause an approach to the critical safe volume and to adversely affect the maintenance of margin to criticality associated with design and maximum operating parameter values for amount of U^{235} and enrichment.
			More Pressure	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a more pressure condition that would cause an approach to the critical safe volume and to adversely affect the maintenance of margin to criticality associated with design and maximum operating parameter values for amount of U^{235} and enrichment.
			Corrosion/ Erosion	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a corrosion/erosion condition that would cause an approach to the critical safe volume. Materials are corrosion/erosion resistant and postulated complete wall erosion would not exceed the critical safe volume.
			Loss of Confinement or Leakage	Based on qualitative assessment, postulated loss of Chemical Absorber Oil Trap confinement or leakage will not result in any appreciable accumulation of U^{235} material because of physical limitations of the process (sub-atmospheric). As a result, loss of confinement does not result in a potential for criticality and therefore its consequence is low.
			Fire	Components shall be protected from fire to ensure the critical design attribute of volume is not adversely impacted.
			Maintenance	Configuration Management shall ensure that maintenance does not adversely impact the critical design attribute of volume.
				Double Contingency Principle is satisfied as follows. The geometry is criticality safe and no single credible event or failure has been identified whereby the geometry could become unsafe. The enrichment is also controlled such that no single credible failure could result in loss of enrichment control.

Criticality Assessment of Passive Safe-By-Design Components				
Component Description (A)	**Sequence ID (B)**	**Critical Design Attribute (C)**	**Review of Up-Set Conditions to Change Geometry (Applicable HAZOP Guidewords) (D)**	**Notes/Comments (E)**
Oil Trap (Cylinder Preparation Test & Pump Out Evacuation)	LOSS OF SAFE-BY-DESIGN ATTRIBUTE	**DIAMETER** 24.4 cm (ID) Keff = 1.0 @ 6 wt %		Based on qualitative assessment, there is margin between the parameter values at normal operating conditions of Oil Trap diameter, amount of U^{235} and enrichment and the conservative design/analysis values for these parameters assumed for criticality.
			More Heat	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a more heat condition that would cause an approach to the critical safe diameter and to adversely affect the maintenance of margin to criticality associated with design and maximum operating parameter values for amount of U^{235} and enrichment.
			More Pressure	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a more pressure condition that would cause an approach to the critical safe diameter and to adversely affect the maintenance of margin to criticality associated with design and maximum operating parameter values for amount of U^{235} and enrichment.
			Corrosion/ Erosion	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a corrosion/erosion condition that would cause an approach to the critical safe diameter. Materials are corrosion/erosion resistant and postulated complete wall erosion would not exceed the critical safe diameter.
			Loss of Confinement or Leakage	Based on qualitative assessment, postulated loss of Oil Trap confinement or leakage will not result in any appreciable accumulation of U^{235} material because of physical limitations of the process (sub-atmospheric). As a result, loss of confinement does not result in a potential for criticality and therefore its consequence is low.
			Fire	Components shall be protected from fire to ensure the critical design attribute of diameter is not adversely impacted.
			Maintenance	Configuration Management shall ensure that maintenance does not adversely impact the critical design attribute of diameter.
				Double Contingency Principle is satisfied as follows. The geometry is criticality safe and no single credible event or failure has been identified whereby the geometry could become unsafe. The enrichment is also controlled such that no single credible failure could result in loss of enrichment control.
Vacuum Cleaner	LOSS OF SAFE-BY-DESIGN ATTRIBUTE	**DIAMETER** 24.4 cm (ID) Keff = 1.0 @ 6 wt %		Based on qualitative assessment, there is margin between the parameter value at normal operating conditions of Vacuum Cleaner diameter and the conservative design/analysis value for this parameter assumed for criticality.

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Criticality Assessment of Passive Safe-By-Design Components				
Component Description (A)	**Sequence ID (B)**	**Critical Design Attribute (C)**	**Review of Up-Set Conditions to Change Geometry (Applicable HAZOP Guidewords) (D)**	**Notes/Comments (E)**
			More Heat	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a more heat condition that would cause an approach to the critical safe diameter and to adversely affect the maintenance of margin to criticality associated with design and maximum operating parameter value.
			More Pressure	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a more pressure condition that would cause an approach to the critical safe diameter and to adversely affect the maintenance of margin to criticality associated with design and maximum operating parameter value.
			Corrosion/ Erosion	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a corrosion/erosion condition that would cause an approach to the critical safe diameter. Materials are corrosion/erosion resistant and postulated complete wall erosion would not exceed the critical safe diameter.
			Loss of Confinement or Leakage	Based on qualitative assessment, postulated loss of Vacuum Cleaner confinement or leakage will not result in any appreciable accumulation of U^{235}. As a result, loss of confinement does not result in a potential for criticality and therefore its consequence is low.
			Fire	Components shall be protected from fire to ensure the critical design attribute of diameter is not adversely impacted.
			Maintenance	Configuration Management shall ensure that maintenance does not adversely impact the critical design attribute of diameter.
			Impact/Drop	Components shall be protected from Impact/Drop to ensure the critical design attribute of diameter is not adversely impacted.
			External Events (Construction on Site)	Components shall be protected from Construction on Site to ensure the critical design attribute of diameter is not adversely impacted.
			External Events (Failure of Above-Ground Liquid Tanks)	Components shall be protected from Failure of Above-Ground Liquid Tanks to ensure the critical design attribute of diameter is not adversely impacted.
			External Events (Hurricane)	Components shall be protected from Hurricane events to ensure the critical design attribute of diameter is not adversely impacted.
			External Events (Seismic)	Components shall be protected from Seismic events to ensure the critical design attribute of diameter is not adversely impacted.

Criticality Assessment of Passive Safe-By-Design Components				
Component Description (A)	**Sequence ID (B)**	**Critical Design Attribute (C)**	**Review of Up-Set Conditions to Change Geometry (Applicable HAZOP Guidewords) (D)**	**Notes/Comments (E)**
			External Events (Tornado)	Components shall be protected from Tornado events to ensure the critical design attribute of diameter is not adversely impacted.
			External Events (Local Intense Precipitation)	Components shall be protected from Local Intense Precipitation events to ensure the critical design attribute of diameter is not adversely impacted.
			External Events (Snow/Ice)	Components shall be protected from Snow/Ice events to ensure the critical design attribute of diameter is not adversely impacted.
				Double Contingency Principle is satisfied as follows. The geometry is criticality safe and no single credible event or failure has been identified whereby the geometry could become unsafe. The enrichment is also controlled such that no single credible failure could result in loss of enrichment control.
Cylinder Preparation Test & Pump Out Evacuation Pump/ Chemical Trap Set	LOSS OF SAFE-BY-DESIGN ATTRIBUTE	**PHYSICAL ARRANGEMENT**		Based on qualitative assessment, there is margin between the normal operating conditions and the conservative design/analysis conditions assumed for criticality.
			More Heat	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a more heat condition that would adversely affect the maintenance of margin to criticality associated with design and maximum operating parameter values for amount of U^{235} and enrichment.
			More Pressure	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a more pressure condition that would adversely affect the maintenance of margin to criticality associated with design and maximum operating parameter values for amount of U^{235} and enrichment.
			Corrosion/ Erosion	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a corrosion/erosion condition that would affect the maintenance of margin to criticality associated with design and maximum operating parameter values for physical arrangement.
			Loss of Confinement or Leakage	Based on qualitative assessment, postulated loss of Cylinder Pressure Test & Pump Out Evacuation Pump/ Chemical Trap Set confinement or leakage will not result in any appreciable accumulation of U^{235} material because of physical limitations of the process (sub-atmospheric). As a result, loss of confinement does not result in a potential for criticality and therefore its consequence is low.

Criticality Assessment of Passive Safe-By-Design Components				
Component Description (A)	Sequence ID (B)	Critical Design Attribute (C)	Review of Up-Set Conditions to Change Geometry (Applicable HAZOP Guidewords) (D)	Notes/Comments (E)
			Fire	Components shall be protected from fire to ensure the critical design attribute of physical arrangement is not adversely impacted.
			Maintenance	Configuration Management shall ensure that maintenance does not adversely impact the critical design attribute of physical arrangement.
			Impact/Drop	Components shall be protected from impact/drop to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Construction on Site)	Components shall be protected from construction on-Site to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Failure of Above-Ground Liquid Storage Tanks)	Components shall be protected from external flooding (Failure of Above-Ground Liquid Storage Tanks) to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Hurricane)	Components shall be protected from hurricane events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Seismic)	Components shall be protected from seismic events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Tornado)	Components shall be protected from tornado events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Local Intense Precipitation)	Components shall be protected from local intense precipitation events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (External Fire)	Components shall be protected from external fire events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Snow/Ice)	Components shall be protected from external ice/snow events to ensure the critical design attribute of physical arrangement is not adversely impacted.
				Double Contingency Principle is satisfied as follows. The geometry is criticality safe and no single credible event or failure has been identified whereby the geometry could become unsafe. The enrichment is also controlled such that no single credible failure could result in loss of enrichment control.

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Criticality Assessment of Passive Safe-By-Design Components				
Component Description (A)	**Sequence ID (B)**	**Critical Design Attribute (C)**	**Review of Up-Set Conditions to Change Geometry (Applicable HAZOP Guidewords) (D)**	**Notes/Comments (E)**
Pump Transport Device	LOSS OF SAFE-BY-DESIGN ATTRIBUTE	**PHYSICAL ARRANGEMENT**		Based on qualitative assessment, there is margin between the normal operating conditions and the conservative design/analysis conditions assumed for criticality.
			Corrosion/ Erosion	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a corrosion/erosion condition that would affect the maintenance of margin to criticality associated with design and maximum operating parameter values for physical arrangement.
			Fire	Components shall be protected from fire to ensure the critical design attribute of physical arrangement is not adversely impacted.
			Maintenance	Configuration Management shall ensure that maintenance does not adversely impact the critical design attribute of physical arrangement.
			Impact/Drop	Components shall be protected from impact/drop to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Construction on Site)	Components shall be protected from construction on-Site to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Failure of Above-Ground Liquid Storage Tanks)	Components shall be protected from external flooding (Failure of Above-Ground Liquid Storage Tanks) to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Hurricane)	Components shall be protected from hurricane events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Seismic)	Components shall be protected from seismic events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Tornado)	Components shall be protected from tornado events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Local Intense Precipitation)	Components shall be protected from local intense precipitation events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (External Fire)	Components shall be protected from external fire events to ensure the critical design attribute of physical arrangement is not adversely impacted.

Criticality Assessment of Passive Safe-By-Design Components				
Component Description (A)	**Sequence ID (B)**	**Critical Design Attribute (C)**	**Review of Up-Set Conditions to Change Geometry (Applicable HAZOP Guidewords) (D)**	**Notes/Comments (E)**
			External Events (Snow/Ice)	Components shall be protected from external ice/snow events to ensure the critical design attribute of physical arrangement is not adversely impacted.
				Double Contingency Principle is satisfied as follows. The geometry is criticality safe and no single credible event or failure has been identified whereby the geometry could become unsafe. The enrichment is also controlled such that no single credible failure could result in loss of enrichment control.
Chemical Trap Transport Device	LOSS OF SAFE-BY-DESIGN ATTRIBUTE	PHYSICAL ARRANGEMENT		Based on qualitative assessment, there is margin between the normal operating conditions and the conservative design/analysis conditions assumed for criticality.
			Corrosion/ Erosion	Based on qualitative assessment, it is highly unlikely for a process deviation to result in a corrosion/erosion condition that would affect the maintenance of margin to criticality associated with design and maximum operating parameter values for physical arrangement.
			Fire	Components shall be protected from fire to ensure the critical design attribute of physical arrangement is not adversely impacted.
			Maintenance	Configuration Management shall ensure that maintenance does not adversely impact the critical design attribute of physical arrangement.
			Impact/Drop	Components shall be protected from impact/drop to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Construction on Site)	Components shall be protected from construction on-Site to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Failure of Above-Ground Liquid Storage Tanks)	Components shall be protected from external flooding (Failure of Above-Ground Liquid Storage Tanks) to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Hurricane)	Components shall be protected from hurricane events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Seismic)	Components shall be protected from seismic events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Tornado)	Components shall be protected from tornado events to ensure the critical design attribute of physical arrangement is not adversely impacted.

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Criticality Assessment of Passive Safe-By-Design Components				
Component Description (A)	**Sequence ID (B)**	**Critical Design Attribute (C)**	**Review of Up-Set Conditions to Change Geometry (Applicable HAZOP Guidewords) (D)**	**Notes/Comments (E)**
			External Events (Local Intense Precipitation)	Components shall be protected from local intense precipitation events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (External Fire)	Components shall be protected from external fire events to ensure the critical design attribute of physical arrangement is not adversely impacted.
			External Events (Snow/Ice)	Components shall be protected from external ice/snow events to ensure the critical design attribute of physical arrangement is not adversely impacted.
				Double Contingency Principle is satisfied as follows. The geometry is criticality safe and no single credible event or failure has been identified whereby the geometry could become unsafe. The enrichment is also controlled such that no single credible failure could result in loss of enrichment control.

Column Descriptions:

Column A: This column provides a brief description of each component.

Column B: This column identifies the accident sequence associated with the passive component.

Column C: This column identifies the critical design attribute under consideration along with the conservative values used in the criticality analysis.

Column D: This column identifies the applicable guidewords from the ISA HAZOP procedure that are used to assess the criticality design margin. Additional guidewords are addressed as applicable in the detailed assessment.

Column E: This column provides any notes, comments and concluding statements.