Atlantic Richfield Hanford Company
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CRITICALITY PREVENTION SPECIFICATIONS
THORIUM-URANIUM-233 SEPARATIONS IN THE PUREX PLANT

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CRITICALITY PREVENTION SPECIFICATIONS
THORIUM-URANIUM-233 SEPARATIONS IN THE PUREX PLANT1.0 Introduction

The specifications in this document define the limits or restrictions required to maintain an acceptably low probability of the occurrence of a nuclear chain reaction in the Purex Plant while processing irradiated thorium targets. They were developed within the requirements, policies, responsibilities, and criteria defined by:

- (a) AEC Manual RL-Chapter 05R4, "Non-Reactor Nuclear Criticality Safety;"

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- (c) Policy Guide 1.6.6, "Criticality Prevention";
 - (d) Operating Instruction 1.6.6.1, "Criticality Prevention During the Storing and Transporting of Fissile Materials";
 - (e) Operating Instruction 1.6.6.2, "Criticality Prevention in Process Facilities", and
 - (f) ARH-468 (unclassified), April 2, 1968, R. E. Tomlinson, "Technical Criteria for the Prevention of Criticality - Chemical Processing Division."

These criticality prevention specifications do not stipulate the system, procedures, or mechanisms to permit operation within the limits or restrictions. An administrative system composed of written procedures, calculated material balances, stipulated sampling sequence and frequency, and other measurement and control techniques shall be used to augment available in-line monitors and direct reading instruments.

1.1 Related Criticality Prevention Documentation*

- a. This document supersedes RL-SEP-650, July 26, 1965, Separations Process Engineering, "Process Bases and Specifications - Thorium U-233 Separations at the Purex Plant" and ISO-319, June 3, 1966, H. C. Rathvon and R. E. Van der Cook, "Supplemental Criticality and Chemical Hazards Control Specifications; Transportation and Storage of Uranium-233 Solutions Outside the Purex Plant"
- b. Criticality prevention specifications applicable to the processing of fissile materials other than that defined in Paragraph 1.3 are as follows:

*Criticality prevention specifications relating to Purex wastes in the underground waste storage tanks are issued by the Manager - Waste Management Process Engineering.

1.2 Administration and Responsibility

- a. The term "Manager - Separations Process Engineering" as used in these specifications is the Manager himself, is a delegate in accordance with Atlantic Richfield Hanford Company Policy Guide 1.1.3, or is the Manager's designated (in writing) representative for criticality safety, except that a representative for criticality safety is not authorized to issue or to revise criticality specifications.
- b. Deviations from specifications shall be promptly called to the attention of the Manager - Separations Process Engineering. Plans for corrective action shall be developed promptly and shall be acted upon accordingly. The plans and procedures required for the corrective action shall be subject to approval for criticality considerations by the Manager - Separations Process Engineering.
- c. The Manager - Separations Process Engineering shall revise or supplement these specifications as required to permit justified changes in the process or equipment. Supplements or revisions of these specifications require the same level of review, approval, and acceptance as the specifications themselves.

1.3 Application

- a. The specifications shall apply to the operations and to the facilities of the Hanford Purex Plant, Building 202-A. They also apply to any other associated operations and facilities within the 202-A Exclusion Area that are administered and controlled by the Manager - Purex Section and the 221-U Building area for storing and handling U-233 and WR Vault and 204-S areas for storing and handling thorium nitrate. For purposes of these specifications, these facilities shall be referred to as the Purex Plant. Operations covered by these specifications shall include all those directly or indirectly associated with the processing of fissile materials defined under b. below, including plant flushing operations.

Equipment systems or other spaces in the Purex Plant which are suspected to contain fissile materials and for which controls are not defined by these specifications shall be referred to the Manager - Separations Process Engineering for limit specifications.

- b. These specifications apply to the processing of the following types of fissile materials:
- (1) Aluminum-clad irradiated thoria targets with a maximum U-233 content of 5,000 grams per ton.
 - (2) Solutions containing fissile materials originating from the processing of above-defined targets.
- c. Revised or supplementary specifications shall be required prior to processing fissile materials not covered by 1.3 b. above.

1.4 General Limits and Requirements

- a. Quantities of U-233 greater than 250 grams shall not be introduced into any part of the Purex Plant for which a criticality safety limit has not been established. The introduction of trace amounts of U-233 expected during thorium processing operations into such spaces, including off-gas and ventilation ducts, or the inadvertent introduction of U-233 into such spaces as a result of failure of or leakage from equipment shall not be considered a violation of this specification. However, see Paragraph d. below.
- b. purposes of applying specifications any U-233 or Pa-233 in the vessels shall be considered to be Pu-239.
- c. For the purpose of these specifications, unless otherwise specified, any plutonium present shall be considered to be U-233 gram per gram.
- d. The addition of U-233 or Pa-233 to any process vessel not covered by these specifications shall require the approval of the Manager - Separations Process Engineering.
- e. The transfer or collection of U-233 into temporary containers, such as buckets or catch pans, shall be governed by the requirements for process samples, Paragraph 1.19.
- f. Precipitation of a gross mass (>500 grams) total of U-233 from a nitrate solution by the addition of a precipitating agent or by denitration shall be avoided.**
- g. Any indications of uncontrolled accumulation or precipitation of U-233 in the Purex Plant shall be referred promptly to the Manager - Separations Process Engineering. In the event that uncontrolled accumulation or precipitation of U-233 is confirmed, the introduction of U-233 in any form to the Purex Plant processing system shall be stopped and corrective action shall be taken in accordance with Paragraph 1.2.
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**This restriction is not intended to prevent the chemical flushing of vessels with precipitating agents. Rather, it implies that the chemical flushing must be preceded by flushing with nitric acid solution until the quantity of contained U-233 is known with reasonable certainty to be less than 500 grams.

- h. Any indication of uncontrolled accumulation of Pa-233, U-233, and/or Pu-239 in a solvent phase shall be referred immediately to the Manager - Separations Process Engineering.
- i. The maximum tributyl phosphate concentration of the 100 stream shall be 32 volume percent.
- j. Unless otherwise specified, the total plutonium, Pa, and U-233 concentration in solution shall not exceed 23 grams per gallon (6 g/l).
- k. During thorium-U-233 processing operations in the Purex Plant, the essential material (chemical) components of all process streams shall be restricted to those defined by [REDACTED] flowsheets or flowsheet changes that are issued or approved by the Manager - Separations Process Engineering.
- l. A minimum routine sample schedule, issued by the Manager - Purex Operations shall be approved by the Manager - Separations Process Engineering, for criticality prevention considerations. Any revisions to the routine sample schedule which would reduce the specified minimum sampling frequency are also subject to approval for criticality prevention considerations. It is the intent of the specifications of this paragraph to require a schedule of sampling and analyses that will insure adequate criticality prevention, as judged by the Manager - Separations Process Engineering.
- m. Transfer of fissile materials between the Purex Plant and any agency not a part of the Chemical Processing Division shall be governed by the following:**
 - (1) Transfers of 15 grams of fissile material (including plutonium, Pa-233, and/or U-233), maximum, are not restricted by criticality safety considerations.
 - (2) Transfers of greater than 15 grams of fissile material (including plutonium, Pa-233, and/or U-233) shall require special criticality prevention specifications to be issued by the Manager - Separations Process Engineering. Irradiated thoria targets are excepted in Paragraph 1.6 below.

[REDACTED]

**The above requirements are based on Operating Instruction 1.6.6.1, "Criticality Prevention During the Storing and Transporting of Fissile Materials"

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- (3) Off-site shipment of product material is regulated by
Facilities Engineering Department

[REDACTED]

1.5 Equipment Modifications and Replacement*

- a. Physical changes to the Purex Plant processing system required for thorium-U-233 processing, as defined by detailed design drawings, shall be approved by the Manager - Separations Process Engineering, or his designated representative, prior to the introduction of U-233 into the processing system. Following such approval, no changes shall be made to any of the following systems that would invalidate as-built drawings or other accepted descriptive material without the prior review and approval of the Manager - Separations Process Engineering.

(1) Equipment Pieces

1CU Concentrator E-H4
2AF Tank TK-J21
3AF Tank TK-J5
U-233 Product Containers and Carriers

(2) Cells, Rooms, and Process Areas

J Cell Package
L Cell
N Cell
PR Room
Sampler Pits in U-233 Service (J1, J21, J22, J23, J5A, L1, L2, L3)

- b. New or replacement Purex canyon vessels, excluding jumpers, which are of different design than existing vessels, shall be reviewed and approved, for criticality prevention considerations, by the Manager - Separations Process Engineering prior to installation.
- c. No equipment piece shall be moved from its normally installed position without the approval of the Manager - Separations Process Engineering, unless it is known beyond reasonable doubt to satisfy at least one of the following requirements:**
- (1) The equipment piece contains less than 2 pounds of thorium and 1,000 grams total of U-233 and has been drained; or
 - (2) The equipment piece contains less than 350 grams of U-233; or
 - (3) The equipment piece contains U-233 and thorium at a ratio less than 1,900 grams per ton and less than 1,000 grams of U-233.

*The requirements of this section are intended to supplement the criticality safety requirements of Operating Instruction 4.9.1.3, "The Facilities Change Notice System."

**This restriction is not intended to prevent the movement of approved carriers of fissile or other materials.

1.6 Receipt, Handling, and Transfer of Irradiated Thoria Targets

a. General

Purex Section personnel shall use every reasonable precaution to avoid accepting any fissile material not defined by Paragraph 1.3 unless covered by a separate specification.

b. Aluminum-Clad Thoria Targets

Aside from the limitations of Paragraphs 1.3 and 1.6 a. above, the receipt and handling of aluminum-clad irradiated thoria targets shall not be restricted by criticality considerations. Further, the transfer of this material from the Purex Plant to any other on-site (Hanford) location shall not be restricted by criticality considerations.

1.7 Dissolver System

- a. Vessels: Annular Dissolvers - TK-A3, B3, and C3
Aluminum Coating Waste Tank - TK-D2
Ammonia Scrubber-Water - TK-A3-4, TK-B3-4, and TK-C3-4
Receiver Tanks

b. Aluminum-Clad Irradiated Thoria Targets

- (1) For any one of the above vessels, the cumulative maximum allowable mass of U-233, introduced as a solution from outside the dissolver system, shall be 500 grams in each dissolver cut solution.
- (2) The transfer of solutions, containing thorium and U-233, between any two vessels of the dissolver system shall not be restricted for criticality reasons.

1.8 Headend Centrifuge System

- a. Vessels: Tanks - TK-E1, TK-E3, TK-E5
Centrifuges - G-E2 and G-E4
Ammonia Scrubber-Water Receiver - TK-E3-2
- b. When the above vessels are used for thorium decladding waste processing:
 - (1) The maximum allowable mass of U-233 received from any vessel except TK-D2 or the annular dissolvers (A3, B3, and C3) shall be limited to 500 grams.
 - (2) The receipt of fissile materials from TK-D2, or the annular dissolvers (A3, B3, and C3) shall not be restricted by criticality considerations.

1.9 Thorium Solution Storage, Boil-Off, and Feed

- a. Vessels: Storage Tanks - TK-D1, D3, D4, D5
E-F11 Acid Boil-Off
TK-F12 Storage Tank
HAF Makeup Tank- TK-E6
HAF Pump Tank - TK-H1
- b. The maximum allowable U-233 concentration in the above tanks shall be in accordance with the following tabulation:

Maximum Allowable U-233/Th Ratio, g/T

<u>Vessel</u>	
TK-D1 TK-D3, D4, D5, E-F11 TK-F12 TK-E6	5,000
TK-H1*	2,000

c. Other Restrictions:

Additional restrictions for the addition of U-233 rework solution to TK-E6 include:

- (1) TK-E6 must be at least half full (2,000 gallons) of thorium solution containing at least one pound of thorium per gallon of solution.
- (2) The tank contents shall be agitated.
- (3) Prior to or during transfer to the headend tank, TK-E6, the rework solution shall be diluted with cadmium nitrate and/or nitric acid solution to an equivalent reactivity of less than 6 grams per liter U-233.

*The values tabulated for TK-H1 (feed to HA Column) are specified to permit operation within the required LCU-2AF stream limitations (Paragraph 1.12). Dilution with "cold" thorium nitrate tetrahydrate in TK-E6 is required for irradiated fuels containing higher U-233/Th ratios and may be necessary in the event of high U-233 recycle.

1.10 First Decontamination and Partition Cycle

- a. Vessels: HAF Pump Tank - TK-H1
HA Column - T-H2
1BXF Tank - TK-J3
- b. The maximum allowable U-233 concentration in the above vessels shall be in accordance with the following tabulation:

Maximum Allowable U-233, g/TVessel

TK-H1*	2,000
T-H2 (HAP)**	2,500

- c. The maximum concentration of U-233 in TK-J3 shall be less than 0.45 gram per gallon (0.12 g/l) or 3000 grams U-233 per ton of thorium.
- d. Vessels: 1BX Column T-J6
1BS Column T-J7
- (1) The maximum U-233 concentration in the 1BX and 1BS Columns shall be 0.45 grams per gallon (0.12 g/l)**, limited as follows:
- (a) The HNO_3 concentration in the 1BX stream should not be less than 0.12M. This limit shall also apply to any aqueous phase introduced to T-J6 in connection with the startup of processing.
- (b) The T-J6 aqueous-to-organic flow ratio should not exceed 0.7.
- (c) The maximum temperatures of the 1BX and 1BXF streams should be 35°C.

*The values tabulated for TK-H1 (feed to HA Column) are specified to permit operation within the required 1UC-2AF stream limitations and the current flowsheet. Dilution with "cold" TNT in TK-E6 is required for irradiated fuels containing higher U-233/Th ratios and may be necessary in the event of excessive U-233 recycle.

**These stream values are specified to permit operation within the required 1UC-2AF stream limitations, assuming a total U-233 recycle of 25 percent via the 1BSU, 2BW, and 3BW streams.

e. Vessel: 1BSU Sampler Tank - TK-J2

- (1) The maximum concentration of U-233 shall be 9.5 grams per gallon.
- (2) The maximum allowable mass of U-233 in the 1BSU sampler tank (TK-J2) shall be 3,000 grams.

f. Vessel: 1C Column T-H3

The maximum U-233 concentration in the 1C Column shall be limited to 0.75 grams per gallon (0.2 g/l), limited as follows.

- (a) The aqueous-to-organic flow ratio should be in excess of 0.45.
- (b) 1CX nitric acid concentration should be between 0.005 and 0.02M.

g. Blanks shall be installed in all unused process lines from the P&O Gallery and the Sample Gallery to vessels listed in a., b., c., d., e., and f. above during thorium-U-233 processing, except steam cooling water, electrical and air lines, and pulser water.

1.11 Final Thorium Cycle and TNT Loadout

Vessels: 1BT Concentrator - E-J8
2DF Pump Tank - TK-K1
2D Column - T-K2
2E Column - T-K3
2EU Concentrator - E-K4
2UC Receiver Tank - TK-K5
TNT Sample Tank - TK-K6
TNT Storage Tanks - TK's P1, P2, P3, and P4
Waste Sample Tank - TK-P5
Waste Rework Tank - TK-P6
TNT Trailer
WR Vault Tanks - TK's 006, 007, 008, 009
204-S Tanks - TK's 204-1, 2, and 3

The maximum allowable concentration of U-233 in the above vessels and equipment shall be 3,000 grams per ton of thorium.*

* This limit will permit recycle of solution to the HAF makeup tank (TK-E6) in the event of a partition failure. The U-233 content of TNT shipped in the TNT trailer from the Purex Plant is limited to a much lower concentration by the TNT Product Specifications.

1.12 Second Uranium Cycle

- a. Vessels: 1CU Concentrator - E-H⁴
1CU Receiver - TK-J1
2AF Feed Tank - TK-J21

- (1) The maximum allowable masses of U-233 in the H⁴, J1, and J21 vessels shall be 8.2, 8.2, and 3.5 kg, respectively.
- (2) The maximum allowable aqueous U-233 concentration in the above vessels shall be 3.6 grams per gallon (0.95 g/l).
- (3) The maximum allowable nitric acid concentration shall be 0.19 pounds per gallon (0.36M).

- b. Vessel: 2A Column - T-J22

- (1) The maximum allowable U-233 concentration shall be maintained at less than 13 grams per gallon (3.5 g/l) limited as follows:
 - (a) The HNO₃ concentration in the 2AS stream should be not less than 0.1M. This limit shall also apply to any aqueous phase introduced to T-J22 in connection with the startup of processing.
 - (b) The maximum 2AF to 2AX flow ratio should be 4.1.

- c. Vessel: 2B Column - T-J23

The maximum allowable U-233 concentration shall be maintained at less than 23 grams per gallon (6 g/l) with a minimum 2B Column aqueous-to-organic flow ratio of 0.65.

- d. Blanks shall be installed in all unused process lines from the P&O Gallery and the Sample Gallery to vessels listed in a., b, and c. above during U-233 processing, except steam, cooling water, electrical, air, the seal pot water to E-H⁴, and pulser water.

1.13 Third Uranium Cycle

A. Vessel: 3AF Tank - TK-J5

The maximum allowable concentration in the annular 3AF tank (TK-J5) shall be 23 grams per gallon (6 g/l).*

b. Vessels: 3A Column - T-L1
3B Column - T-L2

The maximum U-233 concentration in the 3BU stream shall be 154 grams per gallon (40 g/liter), limited as follows:

- (1) The maximum 3AF-to-3AX flow ratio should be 3.7.
- (2) The minimum 3AS HNO₃ concentration should be 0.08M.
- (3) The minimum 3B aqueous-to-organic flow ratio should be 0.55.

c. Vessel: 3BU Receiver Tank - TK-N1

The maximum U-233 concentration in the 3BU tank, TK-N1, shall be 154 grams per gallon (40 g/l).**

d. Vessels: Thorium Absorption Column - T-N50
3CU Concentrator - E-N6
3UC Receiver Tank - TK-N7
Vessel Vent Drain Tank - TK-N20

The maximum U-233 concentration in the above vessels shall be 1,700 grams per gallon (450 g/l).

- e. All unused process lines from the P&O Gallery, Sample Gallery, and N Cell AMU to the vessels listed in a., b., c., and d. above shall be blanked during U-233 processing except the steam, cooling water, electrical, and air lines, and pulser water.
- f. Entry of personnel into N Cell hoods, except for hands and arms, shall require prior approval by the Manager - Separations Process Engineering.

*This limit is required for SJ sump safety. The tank itself is safe for 190 g/gal. (50 g/l) U-233 solution.

**This limit is required for SNA sump safety. The tank itself is safe for 940 g/gal. (250 g/l) U-233 solution.

g. N Cell Sump Limits

- (1) The maximum concentration of U-233 in the SNA sump shall be 154 grams per gallon (40 g/l) with the exception noted below:

Exception: Solution containing up to 1,700 grams per gallon (450 g/l) may be drained from TK-N20 into the SNA sump for immediate transfer to TK-L11 provided TK-N1 is either empty of solution or known with reasonable certainty* to contain less than 500 grams of U-233.

- (2) The maximum depth of solution in the SNA sump shall be 0.9 inches.
- (3) The filler bar (Drawing H-2-63445) shall not be removed from the SN sump trough, and SNA shall be separate from SN.
- (4) The maximum concentration of U-233 in solution in the SN sump shall be 1,700 grams per gallon (450 g/l).
- (5) The maximum depth of solution (of any concentration of U-233) in the SN sump shall not exceed 1.0 inches. No foreign solid material shall be allowed to accumulate in the hoods in a manner that would artificially increase (such as by displacement or damming) the normal depth of a volume of solution in the sumps.
- (6) The maximum depth of solution in the cation column hood shall not exceed 1.0 inches. The drain from this hood to the SN sump shall be maintained in a free flowing condition.

*By analysis of at least two successive dilute (0.25M) nitric acid flush solutions.

1.14 Product Handling - PR Rooma. General Restrictions

The number of personnel inside a vessel enclosure shall be restricted to one man at a time when the U-233 holdup in the vessel may be greater than 500 grams. At any other time, the number shall not be limited. (Activities in the spaces outside of the vessel enclosures or through the glove ports in the PR Room are not restricted with respect to the number of personnel.)

b. Vessel Limits

- (1) The maximum allowable concentration of U-233 in the PR Room vessels (L9, L11, and L13) shall be 1,700 grams per gallon (450 g/l).
- (2) The maximum combined volume in TK-L11 and Sump SLD shall be 7.2 gallons unless the combined mass of U-233 in TK-L11 and Sump SLD is less than 3 kg, in which case the maximum volume shall be 23.2 gallons.

c. U-233 Rework to TK-E6*

Prior to or during transfer to the headend tank, TK-E6, U-233 rework solution shall be diluted with cadmium nitrate and/or nitric acid solution to an equivalent reactivity of less than 6 grams per liter U-233 and Pu-239.**

The U-233 solution shall be transferred to TK-E6 from TK-L11 via the existing Group 11 jet (2.7:1 minimum dilution) with the following motive fluid:

1.	< 60 g/gal.
(< 16 g/l)	$\text{HNO}_3 > 0.25\text{M}$
(Cadmium use is optional)
2.	> 60 g/gal. to < 760 g/gal.
(200 g/l)	$\text{HNO}_3 > 0.25\text{M}$ and
$\text{Cd} > 0.23\text{M}^{***}$
3.	> 760 g/gal.
(> 200 g/l)	Must be diluted in TK-L11 to the
concentration shown in Item 1. or
2. prior to transfer.

* The restrictions for operation of TK-E6 (Paragraph 1.9) shall apply for all transfers of rework U-233 solutions.

** The use of cadmium nitrate as a motive fluid for the transfer jet permits the rework of U-233 without the excessive volume which would result from acid dilution alone.

*** When a 200 g/l U-233 solution is transferred with 0.23M cadmium solution via this jet, the resultant solution contains maximum U-233 and minimum cadmium concentrations of 75 g/l and 0.14M, respectively. A solution of 75 g/l U-233 and 0.14M cadmium has a reactivity equivalent to 6 g/l U-233 and Pu-239 solution.

d. Sump Limits

- (1) The maximum allowable concentration of U-233 in the PR Room sumps (SLB, SLC, SLD, SLE, and SLF) shall be 1,700 grams per gallon (450 g/l).
- (2) The maximum depth of solution measured from the lowest points in the PR Room sumps shall be 1.7 inches.*
- (3) The drain lines from the PR Room sumps to the Canyon Sump SLA shall be maintained in a free-flowing condition.
- (4) The maximum combined volume in TK-L11 and Sump SLD shall be 7.2 gallons unless the combined mass of U-233 in TK-L11 and Sump SLD is less than 3 kg, in which case the maximum volume shall be 23.2 gallons.

e. L Cell Package, L10 Sample Tank

- (1) The maximum U-233 concentration in T-L3, E-L4, TK-L6, horizontal sample tank, TK-L10, shall be 280 grams per gallon (75 g/l).
- (2) T-L3 and E-L4 vessels shall not be used for concentrating U-233 solutions.
- (3) Existing horizontal sample tank, TK-L10, shall not be used for U-233 product sampling.

f. Personnel Entry Restrictions

- (1) Whenever the U-233 holdup in each L Cell vessel (excluding the 3A Column, L1) is known to be 500 grams or less (as determined by successive "deep flushes"**), entry of personnel into L Cell shall not be restricted by criticality safety considerations.
- (2) Entry of personnel into L Cell whenever the U-233 holdup in any L Cell vessel (excluding the 2A Column, T-L1) may be greater than 500 grams shall be made in accordance with the following provisions:

*The depth of solution in Sump SLC shall be measured from the floor and not the bottom of the jet-out cup.

**An L Cell "deep flush" is defined as one which covers the tower packing of the stripper and concentrator. A minimum nitric acid concentration of 0.25M shall be used due to possible presence of plutonium.

- (a) Entry within the inner double doors of L Cell shall be limited to four men.
 - (b) Within L Cell, personnel shall not climb above the floor level and shall not enter the spaces bounded by the principal structural supporting members (dunnage) of an equipment piece or an assembly of equipment pieces, except to the extent described under Item (c) below.
 - (c) Only one man at a time may reach within the spaces bounded by the equipment supporting members and no portions of his body, other than his hands and arms, shall enter these spaces.
- (3) Entry of personnel into L Cell under any other than the conditions of (1) and (2) above shall be in accordance with special instructions issued by the Manager - Separations Process Engineering.

1.15 Product Handling - Containers and Carriersa. Definitions

- (1) As used in these specifications, product containers and carriers approved for storage and transport of U-233 solutions are defined as follows:

Container: Polyethylene bottle, nominal 3-liter capacity (actual 3.3 to 3.7 liters); defined by Drawing H-2-32973.

Carrier: On-site storage (Type 1)*, 30-gallon steel drum provided with a stainless steel insert for secondary containment. The annular space (about 7 inches thick) is concrete filled. Details are defined by Drawing H-2-32920.

Carrier: Off-site shipping (Type 2), Westinghouse; 55-gallon steel drum with a stainless steel insert for secondary containment. The annular space is filled with Vermiculite. Details are defined by Drawing No. 966 D873, Westinghouse Electric Corporation, Bettis Atomic Power Laboratory.

Carrier: Off-site shipping (Type 3), ORNL; 55-gallon steel drum with a 5-inch, Schedule 80 stainless steel pipe insert for secondary containment. The void space is filled with foamed glass. Details are defined by Drawing M-12165-CD-011-D, Union Carbide Nuclear Company.

- (2) As used in these specifications, an array is a single-tier horizontal arrangement of any number of containers within Type 1, 2, or 3 carriers (including any in transit) in which the spacing between any two adjacent carriers is less than 12 feet, edge-to-edge, and in which the neutron shielding equivalent of any material separating any two adjacent carriers is less than 12 inches of concrete.**

*The number designations (Type 1, 2, 3) were adopted for convenience in defining the carriers described herein. They have no other significance.

**The transport of up to four loaded U-233 containers in their carriers between two arrays is permitted provided their presence does not cause either array to exceed its numerical limit.

b. Container Limits

<u>Max. Concentration</u>	<u>Max. Mass</u>
<u>g U-233/l</u>	<u>g U-233/Container</u>
450*	1,400*

- (1) Only one loaded container shall be outside its carrier at a time. Exception: Paragraph 1.23.
- (2) At any time during which operations require the removal of a container from its carrier, the distance between a bare container and a loaded carrier shall be limited by design or operation of handling facilities to a minimum of 10 inches, edge-to-edge. These containers shall not be passed over any carrier.
- (3) No limit is imposed on the number of container-carriers stored in a single or double-line array.
- (4) Containers may be stored in Type 1 carriers without limit as to the number of containers in the array.
- (5) Arrays of containers in Type 2 or 3 carriers, other than single or double-line arrays, shall be limited to 124 containers.**
- (6) If U-233 container-carriers of different types are stored in a mixed common array, the array limits for the most restrictive case shall apply to the entire array.
- (7) The secondary containment vessel of each shipping or storage carrier shall not be vented while in transit when the carrier contains U-233 solutions.

c. Identification of Product Containers

Immediately following the addition of material to a product container, the material shall be identified by attaching a tag or label to the container and to the carrier.

* Shipping requirements are 375 g/l maximum and 3 liters maximum.

** This specification pertains only to on-site product handling under CPD supervision.

d. Lids on Carriers

Lids shall be securely fastened on all loaded carriers, except that one loaded carrier may be opened, at one time, for loading, unloading, transfer or inspection.

1.16 Waste Treatment, 3WB and Acid Recovery Systemsa. Vessels: Tanks - F7, F10, F15, F26, and Concentrator - E-F6

- (1) For solutions that are not neutralized, the maximum allowable U-233 in the above waste treatment vessels shall be in accordance with the following tabulation:

<u>Vessel</u>	<u>U-233, Grams</u>
E-F6	4,500
TK-F7	7,000
TK-F10	7,000
TK-F15	7,000
TK-F26	7,000

- (2) For solutions to be neutralized, the maximum allowable U-233 mass shall be 500 grams.

b. Vessels: Tanks - F16, F18

- (1) For solutions to be neutralized, the maximum allowable U-233 mass shall be 500 grams each.
- (2) For solutions that are not to be neutralized, the maximum U-233 mass shall be 7,000 grams each.

c. Vessels: Tank - TK-F3
Absorber - T-F5
U Cell Vessels

For the above Acid Recovery System vessels, the maximum allowable U-233 shall be 500 grams each.

1.17 Solvent Treatment (G and R Cells)

Vessels: Tanks - G1, G2, G5, G6, G7, G8, and T-G2
Tanks - R1, R2, R5, R6, R7, R8, and T-R2
Centrifuges - G-R3 and G-R4

For the above Solvent Treatment vessels, the maximum allowable U-233 mass limit shall be 500 grams each.

1.18 Canyon Sumps

a. Sumps: SA, SB, SC, SD, SE*, SFA, SFB, SH2, SJ, SJ2, and SK

Limit: 23 grams U-233 per gallon (6 g/l) or its equivalent reactivity, maximum concentration.

b. Sump: SLA

- (1) The maximum total mass of U-233 and plutonium shall be 50 kg.
- (2) The maximum concentration of U-233 shall be 1,700 grams per gallon (450 g/l).
- (3) The maximum total depth of solution shall be one inch, measured at the edge of the trough, unless analyses of two successive floor flushes indicate the U-233 concentration to be less than 23 grams per gallon (6 g/l) and no U-233 is added subsequently.
- (4) The steam supply to the SLA sump to TK-F18 jet shall be blanked unless the U-233 concentration in SLA is less than 23 grams per gallon (6 g/l).

c. Sumps: SG, SM, and SR

The maximum total mass of U-233 shall be 500 grams in each sump.

* The SE sump U-233 concentration may be greater than 6 g/l provided adequate cadmium is present to reduce the reactivity below that of 6 g/l U-233 solution (see Paragraph 1.14).

1.19 Storage and Transportation of Samples and Laboratory Solutions

a. Definitions

(1) Process Samples

For purposes of this section, a process sample may be a single sample or a composite of liquid and/or solid materials.

(2) Disposal Bottle

For purposes of this section, a disposal bottle shall have a maximum diameter of 4.8 inches and a maximum volume of 3.7 liters. The bottle defined by Drawing H-2-32973 meets these requirements. Other bottles that meet these requirements may be used.

(3) Work Station

For purposes of this section, a work station is any hood, group of hoods, cabinet, or other identifiable zone that contains more than 500 grams of U-233.

(4) Laboratory Solution

For purposes of this section, laboratory solutions are considered to consist of the solution in a sample disposal bottle with a U-233 concentration in excess of 5.5 grams per liter.

(5) For purposes of this section, the Purex Plant is considered to consist of two locations: the Purex Analytical Laboratory and the rest of the plant.

(6) Sample Storage Station

For purposes of this section, the Sample Storage Station is a single cabinet in the Purex Analytical Laboratory used for storing sample and laboratory process materials.

b. Limits: Process Samples

(1) Any single process sample shall be limited to a maximum volume of 500 milliliters unless the U-233 concentration in the sample is less than 23 grams per gallon (6 grams per liter) as determined by analysis. In this case, the maximum volume shall be 4 liters.

(2) No single process sample shall contain greater than 250 grams of U-233.

c. Limits: Disposal Bottles

The maximum concentration of U-233 in a disposal bottle shall be 450 grams per liter.

The maximum mass of U-233 in a disposal bottle shall be 1,400 grams.

d. Limits: Purex Analytical Laboratory*

(1) Work Station

The maximum number of disposal bottles within a work station shall be one.

The maximum total volume of all solutions other than the disposal bottle in the work station shall be 3.0 liters and the U-233 content other than the disposal bottle shall not exceed 250 grams.

Work stations shall be separated from each other and from the Sample Storage Station by 12 feet, edge-to-edge, or the neutron shielding equivalent of 12 inches of concrete.

(2) Process Samples Outside Work Stations

The maximum total mass of all process samples outside the work stations within the Purex Analytical Laboratory shall be 250 grams plus the mass in one sample. These may be stored and transported without restriction.

(3) Transport of Disposal Bottle

Only one disposal bottle shall be in transit at one time.

The distance between the disposal bottle and any other quantity of U-233 in excess of 250 grams shall exceed 20 inches center-to-center.

(4) Sample Storage Station

The cabinet shall be anchored to the wall to prevent tipping.

The shelves used for storing U-233 solutions (including process samples) shall be spaced at least 23 inches apart.

* Includes the dumb-waiter between the Purex Analytical Laboratory and the Sample Gallery.

The maximum number of shelves utilized for storing U-233 solutions shall be three (3).

The maximum total volume of all solutions stored on each shelf shall be two (2) liters.

The maximum total mass of U-233 in all solutions (including process samples) on each shelf shall be 500 grams.

The Sample Storage Station shall be separated from any work station by 12 feet distance, edge-to-edge, or by the neutron shielding equivalent of 12 inches of concrete.

e. Limits: The Rest of the Purex Plant

(1) Process Samples

The maximum total mass of U-233 in all process samples in the rest of the Purex Plant shall be 250 grams plus the mass in one additional sample. These may be stored or transported without restriction.

(2) Disposal Bottles

During the storage and/or transportation in the rest of the Purex Plant, disposal bottles shall be considered to be product containers. Specifications for storage and transportation of product containers are given in Section 1.15.

f. Limits: Transfer of Solutions to Process Vessels

Process samples or laboratory solutions shall not be transferred to a process vessel unless it is known that the quantity of U-233 in the solution and the tank combined is less than the quantity specified for the tank.

g. Transportation of Process Samples

(1) Transportation of process samples between the Purex Plant and any other part of the Chemical Processing Division shall be limited to 500 grams of U-233 in a single vehicle.

(2) Transportation of process samples that contain less than 15 grams of U-233 (total for the shipment) between the Purex Plant and other Hanford contractors are not restricted by criticality safety considerations. Transportation of larger amounts requires the prior issuance of a nuclear safety specification.*

*Operating Instruction 1.6.6.1

1.20 Accumulation and Transportation of Wastes and Failed Equipment

The accumulation and transport of wastes and used equipment pieces to or from the Purex Plant shall be governed by the following restrictions:

a. Miscellaneous Scrap Wastes

Miscellaneous U-233-bearing (buryable, incinerable, or leachable) wastes shall be accumulated, confined, and transported in accordance with the following restrictions.

- (1) Wastes (such as wiping rags used for decontamination, rubber gloves, and nonabsorbent materials) known beyond a reasonable doubt to contain only small quantities of U-233 shall be accumulated, confined, and transported in paperboard boxes, barrels, etc. The maximum allowable U-233 mass shall be 250 grams per container and the maximum average U-233 concentration per container shall be 190 grams per cubic foot. The containers shall be maintained less than three tiers high with a maximum cumulative areal concentration of 190 grams per square foot.
- (2) Disposal of wastes which contain potentially large quantities of U-233 (such as ion exchange resin or materials used to clean up gross spills) shall be governed by the following considerations:
 - (a) The waste shall be accumulated, stored, and transported in sealed containers having a maximum diameter of five inches and a maximum height of 12 inches and which are not capable of self-sustaining combustion.
 - (b) The containers shall be restricted by physical barriers to a center-to-center distance of at least 18 inches until the total U-233 content in a single container has been determined, by neutron measurement, to be less than 250 grams.
 - (c) Waste containers, containing 250 grams of U-233, maximum, shall be handled in accordance with the restrictions of Paragraph 1.20 a (1) above.
 - (d) No waste containers containing greater than 400 grams of U-233 shall be transported from or stored at the Purex Plant.

- (3) Waste cartons shall not be transported on the same vehicles with containers of U-233 product solutions.*
- (4) Burial of individual containers containing more than 250 grams of U-233 shall require prior approval of the Manager - Waste Management Process Engineering.**
- (5) The shipment of more than 250 grams of U-233 to the burial ground shall require the prior notification of the Manager - Tank Farms Management.**

b. Miscellaneous Failed Equipment - Burial Boxes

- (1) Any hydrogenous material (other than the hydrogenous material used in the construction of the equipment), to be placed in the equipment burial box, shall be physically segregated from the equipment pieces, and shall be essentially free of fissile material (less than 15 g).
- (2) Only those materials known to contain minimal quantities of U-233 (based either upon flushing or prior service) shall be added to burial boxes that contain failed tube bundles which may (based upon prior service) contain U-233.
- (3) Jumpers with sections larger than four-inch pipe which by prior use may contain significant quantities of U-233 shall be flushed prior to placement in the burial box.
- (4) The total U-233 content of a burial box shall be known beyond a reasonable doubt (as determined by the best estimating methods) to be less than 1,000 grams. In addition, each equipment piece placed in the box shall satisfy at least one of the following requirements:
 - (a) The equipment piece contains less than 2 pounds of thorium;
or
 - (b) The equipment piece contains less than 350 grams of U-233;
or

*The transport of product solutions, in approved containers on the regular PR truck, is subject to the control of the Manager - Plutonium Finishing Section and governed by the restrictions in Paragraph 1.24.

- (c) The equipment piece contains U-233 and thorium at a ratio less than 1,900 grams per ton.
- (5) At least three feet edge-to-edge spacing shall be maintained between a loaded burial box and all other boxes which contain 350 or more grams of U-233.

c. Burial Tunnel

The total U-233 content of equipment placed on a rail car to enter the burial tunnel shall be restricted to the same limits imposed upon a burial box in Paragraph b (4) above.

1.21 Fire Protection

The use of high-expansion chemical foam, with an expansion ratio (foam-to-solution) greater than 400 to 1 is not restricted in the Purex Plant. The use of water to control fires in the Purex Plant is governed by the following restrictions:

a. Category A Areas*:

(Includes all areas of the Purex Plant not designated as Category B or Category C areas.)

No restrictions are placed on the use of water to fight fires in these areas.

b. Category B Areas*:

(Includes the Canyon and Canyon Lobby, all process cells except those listed in Category C, the Analytical Laboratory, the PR Can Storage Room and Corridor, N Cell, Hot Shop and H.S. Lobby, N Cell Hood Room, N Cell AMU, Q Cell, Railroad Tunnel, and Sample Gallery.)

- (1) The possibility of fissile materials accumulating because of fire-fighting efforts (e.g., collapsing structures, gushing water, etc.) shall be brought to the attention of fire-fighting personnel.
- (2) No other restrictions are placed on the use of water to fight fires in these areas.

c. Category C Areas*:

(Includes N Cell Hood, L Cell, the PR Room, Motor Truck, and 221-U Plant Storage Area.)

(1) N Cell Hood

If the quantity of U-233 in the SN sump is unknown, the use of a fog nozzle(s) is permitted provided the liquid level on the hood floor does not increase beyond 1.0 inches.

*For a more complete definition of the categories, refer to the following reference:

If the quantity of U-233 in the SN sump is known to be less than 14.1 kg, the use of fog nozzle(s) is unrestricted.

(2) L Cell

The use of the water fog system in L Cell is limited to ten minutes at a maximum water pressure of 150 psig.*

(3) PR Room

The use of water in the PR Room hoods is restricted. The maximum water volume contained in the L9, L10, L11 or L13 hoods at any time shall be 20 gallons. The rate of water addition to the hoods shall be restricted to prevent the accumulation of water in excess of the above limit.

(4) Outside Purex (See Paragraph 1.24)

The motor truck and portion of 221-U Building used for storage of U-233 product are not restricted in water fog volume.

* These conditions will yield a total volume in L Cell of 3,000 gallons, which corresponds to a depth on the floor of less than six inches, measured at the wall.

1.22 Flushing Operation

Chemical flushing of process vessels, prior, during or after the thorium campaign, including the removal of necessary nuclear blanks, is permissible provided the following conditions are met:

- a. The maximum mass of U-233 within a vessel shall be 500 grams, or
- b. The maximum mass ratio of U-233 to thorium shall be 1,900 grams per ton.

1.23 Product Transfer - U-233 Transloading Station

Transfer of U-233 product solution between bottles defined in Paragraph 1.15 within the U-233 transloading station shall be permitted under the following restrictions:

<u>Item</u>	<u>Limit</u>
1. Number of product bottles in station at one time	Two (2), maximum
2. Total volume of product solution in station at one time	3.5 liters, maximum
3. Number of rinse bottles in station at one time	One (1), maximum
4. Total volume of rinse solution (in water bottle and/or rinse bottle)	3.5 liters, maximum
5. Uranium-233 concentration	1,700 g/gal., maximum (450 g/l)

1.24 Transportation and Storage of U-233 Solutions Outside the Purex Planta. Definitions

As used in this paragraph, product container and carriers and arrays approved for the storage and transport of U-233 solutions are defined in Paragraph 1.15.

b. Limits(1) Transport via motor truck within and between the 200 East and 200 West Areas.*

Containers shall be inside a Type 1 storage or Type 2 or 3 shipping carrier while in transit.

The maximum number of Type 1, 2, or 3 carriers transported on a single motor truck shall be 124.

The Type 1, 2, or 3 carriers shall be positioned in the truck in a single tier and their secondary containment vessels shall not be vented during transport.

(2) Type 1 Storage Carrier Array

The maximum number of Type 1 storage carriers in a single-tiered arrangement of Type 1 storage carriers is not restricted.

(3) Type 2 or 3 Shipping Carrier Array

The maximum number of Type 2 or 3 shipping carriers in a single-row or a single-tier, double-row array is not restricted.

The maximum number of Type 2 or 3 shipping carriers in any other single-tier array shall be 124.

(4) Mixed Arrays

In an array where containers are within both Type 1 and Type 2 or Type 3 carriers, the array limits for Type 2 and Type 3 carriers shall apply unless the array is less than 15 feet wide. In this case, a maximum of four Type 2 or 3 carriers may be included in the Type 1 carrier array limit.

(5) Transport Within the 271-U and 221-U Buildings

(a) Transport and storage in the 221-U Building pipe gallery of U-233 product carriers shall be restricted only by

* This specification does not apply to off-site shipments.

array limits stated in (2), (3) and (4) above.

(b) There shall be no simultaneous transport of U-233 and plutonium on the same floor of the 271-U Building.

(c) There shall be no storage of U-233 in the 271-U Building.

c. Transfer of Containers Between Type 1 Storage and Type 2 or 3 Shipping Carriers

- (1) The maximum number of containers that are outside a Type 1 storage or Type 2 or 3 shipping carrier at one time shall be one.
- (2) A container that is not in a Type 1, 2, or 3 carrier shall be at least 10 inches, edge-to-edge, from a loaded carrier and shall not be passed over any carrier.

d. Carrier Lids

- (1) Lids shall be securely fastened on Type 1 loaded carriers when the carriers are unattended by operating personnel.
- (2) Lids shall be securely fastened on Type 2 and 3 loaded carriers at all times, except that one loaded carrier may be opened for loading, unloading, transfer or inspection.

e. Venting

The containers and the secondary containment vessels of the Type 1, 2 or 3 carriers shall be vented during storage.*

f. Identification of Carriers

Immediately following the addition of a loaded container to a Type 1, 2, or 3 carrier, the carrier shall be identified as loaded by attaching a tag or label. A tagged or labelled carrier shall be handled at all times as though it is loaded until the contents have been removed and the tag or label is detached.

* Either continuous or intermittent venting is acceptable. Intermittent venting should be scheduled at a minimum frequency of one week. The special vent cap provided for containers is considered to continuously vent the container.

1.25 Nuclear Blanking Schedule

- a. The need for nuclear blanks has been indicated previously under the individual sections. Presented in Appendix 2.2 in summary form is a listing of all nuclear blanks that shall be installed. The tabulation lists the related vessel, the nozzle number and line description, the size of the blank, and the required action. A nuclear blank is defined as the physical removal of a section of the pipe line to prevent transfer of a fluid.
- b. Alterations to the status of any of the routings shown in Appendix 2.1 shall require the prior approval of the Manager - Separations Process Engineering.

1.26 Authorizations for Criticality Prevention Specifications

Prepared by: W.E. Matheson 6-5-70
Engineer - Separations Process
Engineering Date

Issued by: G. L. Ritter 6-5-70
Manager - Separations Process
Engineering Date

Reviewed by: W.E. Matheson 6-5-70
R.D. Carter
Criticality Prevention Engineer -
Advance Process Development Date

Approved by: R.E. Tomlinson 6-24-70
Manager - Research and Development Date

Approved by: L.J. Beach 6-24-70
Manager - Operations Support
Engineering Date

Accepted by: B.M. 6/24/70
C.W. Malody
Manager - Purex Section Date

Accepted by: W.E. 7/1/70
Paul W. Smith
Manager - Technical Services
Section Date

Accepted by: L.J. Beach 7/6/70
Manager - Plutonium Finishing
Section Date

Revision Approvals

(CRITICALITY PREVENTION SPECIFICATIONS)

Issued By: Manager Separations Process Eng.	Approved By: Manager Research & Development	Approved By: Manager Operations Support Eng.	Accepted by: Manager Responsible Section	Pages Revised
<i>L. L. Ritter</i> Date: 7-30-70 <small>FOR L. L. RITTER</small>	<i>R. E. Tomlinson</i> Date: 7-31-70	<i>L. J. Beard</i> Date: 8-3-70	<i>W. J. Maloney</i> Purex Date: 8-12-70	1.23-1 1.26-2 Date: 7/30/70
<i>L. L. Ritter</i> Date: 10-8-70	<i>R. E. Tomlinson</i> Date: 10 8 70	<i>L. J. Beard</i> Date: 10-16-70	<i>W. J. Maloney</i> Date: 10-19-70	1.10-1 1.11-1 1.26-2 Date: 9/30/70
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Appendix 2.1

NUCLEAR BLANKING SCHEDULE
(1970 Thorium Campaign)

<u>Item No.</u>	<u>Vessel Or Cell</u>	<u>Nozzle and Line Description</u>	<u>Size Blank</u>	<u>Action Required</u>
1.	D5	D-G14: Steam to Jet D5 to F8	1 1/2"	Blank in P&O Gallery
2.	F8	F-G159: Steam to Jet F8 to D5	1 1/2"	Blank in P&O Gallery
3.	F8	F-G154: Steam to Jet F8 to F16	1 1/2"	Blank in P&O Gallery
4.	F8	F-G148: Steam to Jet F8 to E6	1 1/2"	Blank in P&O Gallery
5.	F10	F-G119: Steam to Jet F10 to H4	1 1/2"	Blank in P&O Gallery
6.	F12	F-G83: Steam to Jet F12 to F15	1 1/2"	Blank in P&O Gallery
7.	F13	F-G72: Steam to Jet F13 to J3	1 1/2"	Blank in P&O Gallery
8.	F14	F-G60: Steam to Jet F14 to F16	1"	Blank in P&O Gallery
9.	G1	G-G170: 7003 Header	1/2"	Audit for blank in P&O Gallery
10.	G5	G-G63: TBP Header	2"	Blank in P&O Gallery
11.	G5A	G149-2"-MP-9: 7003 Header	2"	Audit for blank in P&O Gallery
12.	G5A	G143-2"-MP-9: 7006 Header	2"	Audit for blank in P&O Gallery
13.	G7	G-G26: TBP Header	2"	Blank in P&O Gallery

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NUCLEAR BLANKING SCHEDULE Contd.

<u>Item No.</u>	<u>Vessel Or Cell</u>	<u>Nozzle and Line Description</u>	<u>Size Blank</u>	<u>Action Required</u>
14.	H1	H-G91: 7007 Header	2"	Audit for blank in P&O Gallery
15.	H2	H-G59: 7007 Header	1"	Blank in P&O Gallery
16.	H2	H-T40: J1 to H2	3"	Blank in Canyon
17.	H3	H-G37: 7007 Header	1"	Blank in P&O Gallery
18.	H3	Column Nozzles: B,P,A		Audit for blanks in Canyon
19.	H4	H-G17: 7007 Header	2"	Blank in P&O Gallery
20.	H4	Vessel Nozzles: HH, CC, JJ, LL, PP, KK, GA, E, D, U		Audit for blanks in Canyon
21.	J1	J-G175: Steam to Jet J1 to H1	1 1/2"	Blank in P&O Gallery
22.	J1	J-G184: Steam to Jet J1 to H4	2"	Blank in P&O Gallery
23.	J1	J-G174: Steam to Jet J1 to F10	1"	Blank in P&O Gallery
24.	J1	J-G173: HNO ₃ to J1	1"	Blank in Sample Gallery
25.	J1	Vessel Nozzles: G, Y		Audit for blanks in Canyon
26.	J2	J-G167: 7007 Header	1"	Audit for blank in P&O Gallery
27.	J2	Vessel Nozzles: P, M, S, DB		Audit for blanks in Canyon
28.	J2	Nozzle AR on J Cell Pkg.		Audit for blanks in Canyon
29.	J3	J-G136: 7007 Header	1"	Audit for blank in P&O Gallery
30.	J4	J-G89: HNO ₃ to J4	1"	Blank in Sample Gallery

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NUCLEAR BLANKING SCHEDULE Contd.

<u>Item No.</u>	<u>Vessel Or Cell</u>	<u>Nozzle and Line Description</u>	<u>Size Blank</u>	<u>Action Required</u>
31.	J5	J-G95: HNO ₃ to J5	1/2"	Blank in P&O Gallery
32.	J5	J-G94: NaNO ₂ and 1BX Header to J5	1"	Blank in P&O Gallery
33.	J5	J-G76: Steam to Jet J5 to J1	1"	Blank in P&O Gallery
34.	J5	Vessel Nozzles: S,U,H,P		Audit for blanks in Canyon
35.	J6	J-T48: J6 to J4 (MT out)		Blank in Canyon
36.	J7	J-T20: Piston Leakage J7 to J1	2"	Blank in Canyon
37.	J7	J-T15: J7 to G1	3"	Blank in Canyon
38.	J21	J-G140(A&C): Chemical Addition	1"	Blank in P&O Gallery
39.	J21	J-G140: 7003 Header	1"	Blank in P&O Gallery
40.	J21	J-G138: Steam to Jet J21 to F10	1 1/2"	Blank in P&O Gallery
41.	J21	Vessel Nozzles: F,J,K		Audit for blanks in Canyon
42.	J22	Nozzle CW		Audit for blanks in Canyon
43.	J23	J-T56: Route to Q1	3"	Blank in Canyon
44.	K6	K-G1: Steam to Jet K6 to J1	1 1/2"	Blank in White Room
45.	L1	Column Nozzles: 4" at top		Audit for blank in Canyon
46.	L2	L-G47-C	1/2"	Audit for blank in White Room

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NUCLEAR BLANKING SCHEDULE Contd.

<u>Item No.</u>	<u>Vessel Or Cell</u>	<u>Nozzle and Line Description</u>	<u>Size Blank</u>	<u>Action Required</u>
47.	L2	L-G45A: Organic to L2	Tubing	Disconnect and blank in White Room
48.	L2	L-G44: HNO ₃ to L2	1/2"	Blank in White Room
49.	L2	Column Nozzle: J	3"	Audit for blank in Canyon
50.	L3	L-G29: Steam to L3	2"	Blank in White Room
51.	L4	L-G15: Steam to L4	1"	Blank in White Room
52.	L9A	7007 Header	1"	Audit for blank in White Room
53.	Q Cell	Q5 to J1 Jet	2"	Blank in Q Cell
54.	N Cell	Chem. Add. to N1 (HNO ₃ , ANN, F)	1/2"	Blank in N Cell AMU
55.	N Cell	XAF to N1	1/2"	Blank in N Cell hood
56.	N Cell	XAF Line	1/2"	Blank in N Cell hood
57.	N Cell	XCP to N6	1/2"	Blank in N Cell hood
58.	N Cell	Transfer line from N7 to L9 and L10	1/2"	Blank in N Cell hood
59.	N Cell	N8 Condensate to N1	1/2"	Blank in N Cell hood
60.	N Cell	N2 to Vent Header	1/2"	Audit for blank in N Cell hood
61.	N Cell	N3 to Vent Header	1/2"	Audit for blank in N Cell hood
62.	N Cell	XAW Pot to Vent Header	1/2"	Blank in N Cell hood
63.	N Cell	XAW and XSW Waste to L8	1/2"	Blank in N Cell hood
64.	N Cell	N4 Resin Receiver to Vent Hdr.	1/2"	Audit for blank in N Cell hood

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NUCLEAR BLANKING SCHEDULE Contd.

<u>Item No.</u>	<u>Vessel Or Cell</u>	<u>Nozzle and Line Description</u>	<u>Size Blank</u>	<u>Action Required</u>
65.	N Cell	N4 and N5 Overflow Vent	1/2"	Blank in N Cell hood
66.	R Cell	R-1 and 2: TBP Header to R5 and R7	2"	Blank in White Room
67.	J7	J-G18: 1CX (U-Pu) to to Splp-J8	2"	Blank in P&O Gallery

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