SEP 18 1996 Sta. 37 20 ENGINEERING DATA TRANSMITTAL	Page 1 of 1 1. EDT 605972
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1	1	Design Authority	R.J. Bettenus	8/29/96	4035	1	1	tech Review	R.J. Bettenus
		Design Agent				1	1	WRAP ENG, R.J. Bettenus	
1	1	Cog. Eng. RH Ruben	RH Ruben	8/29/96	4035				
1	1	Cog. Mgr. JS Greenberg	JS Greenberg	8/29/96					
		QA N/A							
1	1	Safety MF Hackworth	MF Hackworth	8/29/96					
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18. Signature of EDT Originator <i>Rubén H. Ruben</i> 8/29/96	19. Authorized Representative Date for Receiving Organization <i>CGO</i> 9/10/96	20. Design Authority/ Cognizant Manager <i>J. Greenberg</i> 8/29/96	21. DOE APPROVAL (if required) Ctrl. No. ☐ Approved ☐ Approved w/comments ☐ Disapproved w/comments
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Designation of the Waste Receipt, Storage, Assay and Shipping Portions of the WRAP I Facility as a Limited Control Facility

RH Ruben

Westinghouse Hanford Company, Richland, WA 99352
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Abstract: This evaluation designates the waste receipt, storage, assay, and shipping portions of WRAP I as a Limited Control Facility. The technical basis for this designation comes from CSERs in other facilities. The limits and controls for this CSER come from other facilities. This is deemed sufficient, since any fissile material being received at WRAP I, will come from those facilities, and as long as the limits for limited control are maintained, the areas considered in this CSER can be designated appropriately.

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Release Approval

Date

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CSER 96-018

**Designation of the Waste Receipt, Storage, Assay and Shipping Portions
of the WRAP I Facility as a Limited Control Facility**

1.0 INTRODUCTION

Wrap I receives contact handled (CH) transuranic (TRU) and low level waste (LLW) in drums and waste boxes from other facilities and performs nondestructive examination (NDE) and nondestructive assay (NDA) in order to certify the waste to be shipped to the appropriate facility for permanent disposal. The waste certification process is accomplished by nondestructively evaluating the container contents and repackaging the material as necessary so that the new container meets the appropriate waste disposal criteria. The portion of the facility designated for the repackaging process is described in CSER 96-011 (Friar, 1996). In this document, the shipping and receiving, storage, and NDE/NDA areas of the WRAP I facility are evaluated for criticality safety. By the definition of WHC-CM-4-29, a limited control facility is a facility which may contain more than one-third of a minimum critical mass of fissionable material, however, the form or distribution of the material precludes a criticality accident, as documented in a criticality safety evaluation. This document determines how these criteria apply in the shipping and receiving, storage, and NDE/NDA areas of WRAP I.

The operating organization will have an inventory of fissile material in the facility. TRU waste material is stored in 55 gallon drums or standard waste boxes (SWB). These containers are labeled with the fissile material content. If the highest number on the label is above the value determined in this CSER for standard processing, then the drum is not stored in the storage area stacker retriever (ASRS) prior to NDE/NDA and processing. This CSER demonstrates that the arrays in the storage areas are safely subcritical so long as restrictions set forth herein are maintained, and therefore, allow the shipping and receiving, and NDE/NDA areas to be designated as a limited control facility.

Two items deserve special mention. First, a limited control facility does not require a criticality alarm (see also the facility SAR document). Second, the facility may use the CPS documents prepared by the source facility to govern the specific package type, if the limits are appropriate to the WRAP I operations.

If a drum that does not conform to the applicable criticality safety limits is discovered, the criticality safety nonconformance procedures in WHC-CM-4-29 shall be followed.

2.0 REQUIREMENTS

The requirements for a limited control facility are specified in WHC-CM-4-29, the Nuclear Criticality Safety Manual (WHC, 1995). A facility may contain more than one-third of Minimum Critical Mass (MCM) of fissile material, as long as the form and/or distribution of the material precludes a criticality.

Typically, item fissile content values at WRAP I will be based on NDA values, sample results, or other estimation techniques, to help assure that fissile material content within the drum is not more than 200 g. Drums in the storage area ASRS are stacked no more than three high. Containers in the remaining areas of WRAP I are normally not stacked.

Other requirements for a limited control facility, for example posting, training, inspection, and documentation, are listed in WHC-CM-4-29.

If the limited control facility receives an item or a sample result that, upon verification, exceeds the maximum limited control facility values, the procedure for a criticality safety nonconformance is initiated. This procedure is described in WHC-CM-4-29, Section 15.

3.0 FACILITY DESCRIPTION

WRAP I is located in the 200 West Area of the Hanford site. The facility will receive retrieved and newly generated contact handled low level and TRU solid waste containers for processing and certification before transfer to permanent disposal. The WRAP I facility will receive waste in containers, conduct NDE and NDA, repackage as necessary, and store outgoing waste containers. It consists of four functional areas; the shipping and receiving area, the NDE/NDA area, the process area, and support area.

The shipping and receiving area consists of two truck bays for incoming or outgoing waste, storage areas for waste containers waiting to undergo NDE/NDA, processing, or disposal, a TRUPACT accumulation area, and a TRUPACT loading area. Waste containers are transferred along the process by automated guided vehicles (AGVs), forklifts, and conveyors. TRU waste arrives in drums and standard waste boxes at either of the two truck bays. The contents of the waste drums are kept in the same configuration, in which they were received from the shipping facility until they are separated for individual NDE/NDA or for processing. The drums are transferred from wood to metal pallets for

storage or movement within the WRAP facility. They are then sent to NDE/NDA or to the storage area.

After NDE/NDA, the waste may be processed or returned to the storage area. At no time while the container is outside of the processing area enclosures, is a container opened and its contents disturbed. The waste is stored in its original container (or is overpacked in the case of drums with questionable integrity) and is stacked only in the storage area with an ASRS design that limits the storage to no more than three containers high. The ASRS has storage positions for a maximum of either 216 drums or 54 pallets. After the waste has been processed and repackaged in new containers, the containers are returned to storage pending the appropriate disposal, or configured for placement in TRUPACT containers (14 barrels or 2 standard waste boxes per TRUPACT container). The TRU to be loaded in TRUPACT containers is then transferred to the TRUPACT accumulation conveyor, ready for loading and shipment.

The NDE/NDA area consists of equipment for gamma energy assay and imaging passive active neutron assay. Boxed waste evaluation starts in the box NDE enclosure, and is transferred via forklift and conveyor to box NDA. Waste boxes are not opened or repackaged in WRAP I. There are six NDE/NDA stations (2 NDE and 4 NDA) provided for drum evaluations. Following NDE/NDA, drums to be processed or repackaged are placed on a carousel which feeds a conveyor, the conveyor passes through an airlock and into the process area.

The process area consists of a series of enclosures physically separated from each other. The separate lines process either LLW, and TRU waste. Separate restricted enclosures are provided to process noncertifiable materials removed from the LLW and TRU lines. There are also AGVs, conveyors, drum storage areas, and a LLW waste compactor within this area. Waste drums are opened and waste redistributed only inside of the enclosures. Therefore this is the area of highest potential concern. It is covered by CSER 96-011 (WHC-SD-SQA-CSA-510 Rev. 0).

The support area consists of offices, locker rooms, lunch and conference rooms, etc. No TRU or LLW waste is brought into this area.

4.0 Limits and Controls

The requirements for an limited control facility are given in WHC-CM-4-29, the Nuclear Criticality Safety Manual. Container types shall not be intermixed in a single array, unless specifically analyzed. A single container type loaded with quantities or forms of fissionable material requiring different limits also shall not be intermixed in a single array.

The majority of the waste will be received at WRAP I in standard 55 gallon drums and standard waste boxes, but the receipt of other types of containers is not precluded. Limits for individual containers have been established in the CSERs listed in the reference section of this document. A list of waste containers used in Hanford SWD facilities and the material and array limits on those containers are given below:

1. Standard procedures, 55 gallon (or larger) U. S. Department of Transportation (DOT) Specification 17C, 17H, UN1A2/Y400 (> 23 kg. empty weight is acceptable) drum, painted or galvanized, containing miscellaneous solid waste
 - a. Maximum fissile material limit
 - (1) Fissile material $\geq$ 20 % of container volume: 200 g
 - (2) Fissile material < 20% of container volume: 100 g
 - b. Array restrictions
 - (1) Maximum number of layers (tiers): 5
 - (2) Maximum array size: Unlimited
2. Special procedures, 55 gallon (or larger) U. S. Department of Transportation (DOT) Specification 17C, 17H, UN1A2/Y400 (> 23 kg. empty weight is acceptable) drum, painted or galvanized, containing miscellaneous solid waste
 - a. Maximum fissile material limit
 - (1) Fissile material: 400 g
 - b. Array restrictions
 - (1) Maximum number of layers (tiers): 1
 - (2) Maximum array size: 10x10x1 containers
 - (3) Minimum Separation from other drums 3 feet
3. PUREX TRU HEPA Filter Burial Box containing HEPA filters
 - a. Maximum fissile material limit
 - (1) Fissile material $\geq$ 20 % of container volume: 200 g
 - (2) Fissile material < 20 % of container volume: 100 g
 - b. Array restrictions
 - (1) Maximum number of layers (tiers): 5

- (2) Maximum array size: Unlimited
4. Lead-lined 55-gallon DOT Specification drum containing miscellaneous solid waste
- a. Maximum fissile material limit
 - (1) Maximum material content: 100 g
 - b. Array restrictions
 - (1) Maximum number of layers (tiers): 5
 - (2) Maximum array size: Unlimited
5. Fissile shipping containers (DOT- and Certificate of Compliance approved containers)
- a. Maximum fissile material limit

Maximum fissile material content may not exceed that which is acceptable for shipment as specified in DOT and Certificate of Compliance approval.
 - b. Array restrictions
 - (1) Maximum number of containers per array: 1
 - (2) Minimum separation from other containers: 3 ft.
6. Steel burial boxes containing HEPA filters or flushed and drained equipment (other hydrogenous material may be in the container but not packed around the equipment)
- a. Maximum fissile material limit
 - (1) Per equipment piece: 350 g
 - (2) Per HEPA Filter: 10 g/ ft³
 - (3) In associated waste (not equipment/HEPA): 15 g
 - (4) Limits per container size (not superseding those above):

≤ 2.5 x 2.5 x 2.5 ft	250 g
≤ 3 x 4 x 5 ft	350 g
≤ 4 x 4 x 7 ft	1000 g
 - b. Array restriction for all fissile (> 1 g) containers

- (1) For containers with ≥ 250 g fissile material: 1 container
- (2) For all containers (stacked or unstacked), < 250 g fissile;
Sum of fissile content within array limited to 500 g
- (3) Minimum separation of fissile container array (Separation may be achieved using a non-fissile container with width of 3 ft or more): 3ft

7. Transuranic metal boxes (TMB) as overpacks

TRU boxes may be used as overpacks for container category 1 so long as the containers are packaged as specified above.

The firefighting category is B, in accordance with CSER 80-021, unless another package type in the facility has a more restrictive fire fighting requirement. The fire category requirements for the most restrictive package type in the facility will establish the category for the entire facility.

5.0 METHOD OF ANALYSIS

Since waste containers at WRAP I will be received from other facilities, and since those facilities have their own CSERs, criticality safety for the types of containers being received has already been analyzed and established. A list of appropriate CSERs is in Section 7 of this document. The specifications listed in Section 4 are a subset (those specifications dealing with TRU only) of the Criticality Specification for Central Waste Complex, which in turn is based on the documents in Section 7.

Typical of the criticality safety analysis for standard 55 gallon drums is CSAR 80-21. Analysis was done through the use of Monte Carlo computer code (KENO-III and KENO-IV) with 18 energy group cross sections, generated by the GAMTEC II code. Configuration errors were analyzed. The errors examined were overstacking, overbatching in single drum array, loss of drum integrity (array collapse), and failure of the drum to meet specification.

Safety analysis for burial boxes is typified by Addendum 4 to CSAR 79-038. In this document, the density in g/ft³ is analyzed under various error conditions such as double batching, container integrity failing and TRU leaching into the soil, etc. From this analysis it is determined that, under the limits established in section 4, the amount of TRU is less than the just critical mass for the boxes analyzed.

The following observations are made:

- TRU waste is shipped from other SWD facilities, where they can be stored five containers high. These facilities have their own CSERs, and the limiting criteria for storage are the same as for WRAP I. WRAP I is more conservative, storing containers only three containers high. Drums or other containers assayed at more than 200 g TRU should be stored per the appropriate CPS limits and processed only under special procedures approved by Criticality Engineering.
- When previously buried containers are removed from the burial grounds, current procedure requires that it undergo NDE/NDA in the field. If NDE/NDA is not done in the field, a procedure should be in place to provide an equivalent evaluation of the fissile material content. In this way, it is determined whether the TRU content of the container is < 200 g. Again, only drums with ≤ 200 g of fissile material are to be stored in the storage area ASRS.
- Shipment to WIPP requires that drums contain less than 200 g fissionable material, and TRUPACT containers are limited to 14 drums with a total of not more than 325 g fissionable material. Also, the TRUPACT containers are not stacked on the accumulation conveyor.

Error and accident (contingency) analysis is described in the respective source facility or shipping authorization evaluation documents.

6.0 TECHNICAL PEER REVIEWER

If the conditions as noted for other TRU waste handling facility CSERs and in Section 5 of this document are maintained, then the criteria for limited control facilities are met.

7.0 REFERENCES

WHC 1995, Nuclear Criticality Safety Manual, WHC-CM-4-29, Westinghouse Hanford Company, Richland, Washington

WHC-SD-SQA-CSA-516 Rev. 0

SD-SQA-CSA-20121 CSAR 80-021 "Packaging, Storage and Disposal of Solid Waste (55-Gallon Drums, Unrestricted H/Pu Only)"

SD-SQA-CSA-0082 "CSAR 80-021 Addendum 4, Transfer and Storage of Lead-Lined 55-Gallon Drums, Concentrated Core Drums"

SD-SQA-CSA-20101 "CSAR 80-021 Addendum 5, 55 gallon Drums and Boxes in Above Ground (Surface) Storage"

SD-SQA-CSA-20123 "CSAR 80-021 Addendum 2, Packaging - Storage and Disposal of Solid Waste (55 Gallon Drums, Unrestricted H/PU Only)"

SD-SQA-CSA-20129 "CSAR-82-001, Transportation and Burial of PUREX Burial Box"

SD-SQA-CSA-20130 "CSAR 82-003, Packaging, Storage, and/or Disposal of Solid Wastes (Burial Containers and Uranic Burial)"

SD-SQA-CSA-20204 "CSAR 79-038, Out-of-Hood Plutonium Storage"

SD-SQA-CSA-20208 "CSAR 79-038 Out of Hood Plutonium Storage (Burial Box)"

SD-SQA-CSA-20397 "Addendum 6 to CSAR 79-038 Out of Hood Plutonium Storage (Burial Box)"

HS-V-P-0045 "Drums; UN1A2; Removable Head; Solid Material, 30/57/114/208/322 Liter: Lt. Blue; Steel"

WHC-SD-W026-SAR-001, "Waste Receiving and Processing Facility Module 1 (WRAP 1) Safety Analysis Report"

CPS-SW-149-0001, Rev. B1, Transuranic Waste Storage in 224-T

CPS-SW-149-00002, Rev. B3, 03/19/96 Waste Storage - Central Waste Complex