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Project Title/Work Order Addendum 6 to CSAR 79-038: Out-of-Hood Plutonium Storage (Burial Box)		EDT No. 141678 ECN No.

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ENGINEERING DATA TRANSMITTAL

Page 1 of 1
1. EDT No. 141678

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1	1	Cog. Mgr. A. L. Ramble A. L. Ramble 5/18/95 H4-64									
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		Env.									
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**This document was reviewed following the
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5. Key Words change fissile limits, array fissile limits, fissile limit for burial box	6. Author Name: T. Chiao <i>Tang Chiao</i> Signature Organization/Charge Code 8M400/A6D23	
7. Abstract <p>This Addendum considered an increase in the limit of fissile material in a stacked container array to 500 grams. In other words, the sum of fissile material in an array of containers is limited to 500 grams, regardless of whether the containers are stacked or not. The results of this evaluation indicates that with the modification of the fissile limits described, the system of a container array will stay sub-critical.</p>		

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8. RELEASE STAMP

ADDENDUM 6 TO CSAR 79-038

Title: OUT-OF-HOOD PLUTONIUM STORAGE (BURIAL BOX)

Prepared by: Tony Chien Date: 5/16/95
Criticality Engineer, Consequence Analyses

Reviewed by: Allen J. Hesse Date: 5/26/95
Criticality Engineer, Consequence Analyses

Approved by: D. S. Lumb Date: 5/18/95
Manager, Consequence Analyses

I. INTRODUCTION AND SUMMARY

It has been determined that Criticality Prevention Specification (CPS) number CPS-SW-149-00002 is in need of revision to simplify the criticality limits for steel burial boxes which contain HEPA filters or flushed and drained equipment (item 4 of Section 2.1.4 in CPS-SW-149-00002, p. 4 of 6). The changed limits, however, are still to assure that all box storage in the Central Waste Complex remains sub-critical. The current criticality limits require that the sum of fissile material within a stacked container array must be limited to 250 grams. Containers with 250 g or more fissile are not allowed in arrays. (An array is any close clustering of two or more boxes, and 3 ft edge-to-edge spacing is required between arrays). If the same containers are not stacked but arranged side by side, the limit on the sum of fissile material is 500 grams.

This evaluation considered an increase in the limit of fissile material in a stacked container array to 500 grams. In other words, the sum of fissile material in an array of containers is limited to 500 grams, regardless of whether the containers are stacked or not. The results of this evaluation indicates that with the modification of the fissile limits described, the system of a container array will stay sub-critical.

In addition, the conditions for modifying the fissile limit for an individual burial box larger than 2.5' X 2.5' X 2.5' but less than 4' X 4' X 7' from 250 to 325 are reviewed. This modification is allowed if the fissile material in each box is scattered over more than 1/10 of the volume of the container and the fissile material in the array is less than 500 grams.

The results of this analysis show that increasing the fissile material limit in the array to 500 grams for both stacked and un-

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stacked (one tier) containers is acceptable.

II. SYSTEM DESCRIPTION

The Central Waste Complex was built and approved for the storage of waste containing fissile material such as Pu, ^{233}U and ^{235}U . Each CWC building is a pre-engineered steel structure with roll-up doors for receipt and movement of waste containers. The foundation is integrated into a 6 in. high perimeter concrete curb. The concrete floor is smooth and is finished with a chemically resistant epoxy-sealer. The buildings meet containment requirements stipulated by WAC 173-303.

The solid wastes that are approved for storage at CWC include low-level waste, low-level mixed waste, contact-handled transuranic waste, and contact-handled transuranic mixed waste. The acceptable containers include 55-gallon or larger DOT 17C, 17H, or UN1A2 drums with solid waste, PUREX TRU HEPA filter burial boxes, lead-lined DOT approved drums, approved fissile shipping containers, steel burial boxes containing flushed and drained equipment, containerized uranium bearing waste, and Transuranic Metal Boxes as overpacks. The smallest approved steel burial box is 2.5 X 2.5 X 2.5 ft in dimensions. Additional containers require specific evaluation and associated changes to the safety documentation.

III. DISCUSSION OF CURRENT LIMITS AND THEIR BASES

A number of criticality analyses have been performed for the burial boxes (References 1 through 9). Accordingly, a Criticality Prevention Specification (CPS-SW-149-00002, Appendix 1) was developed to support the Central Waste Complex for the storage of waste containing fissile material.

According to Appendix 1, the array restrictions for all fissile containers (> 1 gram) were defined such that, for **stacked** containers with less than 250 grams fissile material, the sum of fissile content within an array is limited to 250 grams, while for **un-stacked** (single-tier) containers with less than 250 grams fissile, the sum of fissile content within any single tier array is limited to 500 grams. For containers with equal or greater than 250 grams fissile, only one container is allowed in the array.

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III. ANALYSIS FOR NORMAL STORAGE

The smallest burial box (2.5' X 2.5' X 2.5') stored in the CWC was used in this analysis. If the sum of stacked containers is increased to 500 grams, the total fissile content in the array is still less than the minimum spherical criticality mass with full water reflection.

According to Addendum 2 to CSAR 79-038 (Reference 10), the fissile limit of 1000 grams for a 7 X 4 X 4 foot box is safe because if the permitted 1000 grams of plutonium were to be leached onto the soil, the resulting average surface density (less than 36 grams per square foot) is less than the 240 grams per square foot required for criticality in a fully reflected infinite slab of a ²³⁹Pu-water mixture (ARH-600, p. III.A.8-100). Also the amount of fissile material is less than the 1700 grams total plutonium (97% ²³⁹Pu) required for a critical spherical mass of fully saturated soil with full water reflection (ARH-600, p. III.A.6(97)-4).

Using the smallest burial box, the foot print of a stacked container can not be less than 6.25 ft² (2.5' X 2.5'), if the permitted 500 grams of plutonium were to be leached onto the floor, the average surface density of fissile is less than 80 grams/ft². Therefore, the same reasoning stated in Reference 10 is also applicable to stacked containers with a sum of fissile material less than 500 grams. In a case of double batching, the average surface density of fissile material and the total fissile material are still below the critical areal density by a large margin.

The current limit of fissile material in each container is 250 grams for a container larger than 2.5' X 2.5' X 2.5', but smaller than 3' X 4' X 5'; 350 grams for a container larger than 3' X 4' X 5', but smaller than 4' X 4' X 7'. It is desirable to simplify the fissile limits for containers larger than 2.5' X 2.5' X 2.5', but less than 4' X 4' X 7'. In this analysis, it was found that the limit of fissile material may be modified to be 325 grams for a container larger than 2.5' X 2.5' X 2.5' but less than 4' X 4' X 7' if:

1. The total fissile of stacked container is limited to 500 grams;
2. The fissile material in each box is scattered over more than 1/10 of the volume of the container. Generally this condition is met because the discarded equipment stored in the container is flushed and drained and no heavy concentrations of Pu are expected.

The intention of the change is to simplify the fissile limits for

containers smaller than 4' X 4' X 7' and be consistent with the fissile limit for a WIPP overpack.

V. CONTINGENCY ANALYSIS FOR ABNORMAL CASES

In the following sections, the abnormal cases for modification of the fissile limits are defined. A MONK6B analysis model was established. Finally, calculations based on the defined abnormal cases and established model were performed verifying that the system with the modified fissile content limits are sub-critical.

V.1 Abnormal Cases

The following abnormal cases (Table 1) were considered in the contingency analysis:

Table 1 Definition of Abnormal Cases

ABN-1	All fissile contents (<500 grams) in stacked containers are leached onto the floor.
ABN-2	One or more containers are double batched.
ABN-3	Flooding; Different amounts of water get into the one or more containers.
ABN-4	The total fissile content in the stacked containers exceeds 500 grams limit.

According to the double contingency principle in Section 2 of the Nuclear Criticality Safety Manual (WHC-CM-4-29), "process design shall incorporate sufficient factors of safety to require at least two unlikely, independent, and concurrent changes in process conditions before a criticality accident is possible". Therefore it will be acceptable from the point of criticality safety that the stacked container array stays sub-critical under any ONE of the above abnormal conditions.

Section IV has already discussed the first abnormal case, ABN-1. If was found that the system will stay sub-critical. However, for evaluation of the rest of the abnormal cases, models for the

container and array must be established and calculations must be carried out to derive the k_{eff} values.

V.2 Container Model and Array for Abnormal Cases

A model of the burial box was designed for evaluations of the rest of the abnormal conditions. The smallest burial box (2.5' X 2.5' X 2.5') was chosen as the most conservative case. The box wall thickness is 1/4" and it is made of steel. The fissile material source (350 grams of ^{239}Pu , slightly larger than the limit allows in order to be conservative) was mixed with water and defined as a right cylinder (Diameter = Height). This source was located at the center of the burial box. The density of Pu was defined to be 30 g/L, a density at which the critical mass is approximately at the minimum. The water mixture was introduced to model the contribution to the k_{eff} from all reflective and moderating materials in the box. Since the burial box contains only discarded equipment which has been flushed and drained, it is unlikely that all the remaining fissile material will be concentrated together in one location in the box as the model suggests. Therefore, the source model with water is considered so conservative that other reflecting material such as plastics, clothes, etc., can be neglected in the model. The discarded equipment (in reality it can be neutron absorbing steel) was not included to provide additional conservatism.

An array of 16 containers stacked into a 2 X 2 X 4 array as shown in Figure 1 was modeled for stacked containers.

V.3 Calculations and Calculation Results

Calculations (Table 2) were performed with the container model defined in the Section V.2 for the abnormal cases.

The first calculation, boxe01, exceeds the fissile limit (500 grams) for stacked containers. However, the k_{eff} is 0.772 ± 0.003 and the stacked container array stays sub-critical.

In the second calculation, boxf02, one of the containers contains 650 g Pu. This is considered a double batching abnormal case if 325 g fissile material is chosen to be the limit for a container larger than 2.5' X 2.5' X 2.5'. Both the stacked container array and the single container violate the limits for a stacked container array. The k_{eff} is 0.930 ± 0.003 and the stacked container array stays sub-critical.

The third calculation, boxf03, is the same as the second calculation except that two of containers have 650 gram of fissile material each. The k_{eff} is 0.933 ± 0.003 . The small increase of k_{eff} indicates that the interaction among containers contributes only small portion of the k_{eff} values. The system is sub-critical with an acceptable margin, including calculational bias and uncertainty.

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The last five calculations deal with different amounts of water in the containers. In these cases, the stacked limit is still violated. However, the array system stays sub-critical under the postulated flooding.

One concern about the cylindrical source model used in the calculations is that the interaction among containers may be reduced because of the spacing between fissile masses, which allows neutron to escape from the system. Consequently, the calculated k_{eff} could be less conservative. In reality, the Pu source will be dispersed inside the container and the fissile material would be distributed over a much larger volume. It is necessary to determine which model would provide a more conservative k_{eff} ; a concentrated fissile source with larger space between sources or dispersed sources with more interaction between sources. Additional calculations listed in Table 3 were performed to investigate this concern. In these calculations, 350 grams of fissile material was assumed to be distributed within $1/10_{th}$ of the volume of a container as a slab mixed with water at the bottom of each container. This slab source will increase the interactions between containers, but reduce the Pu density in the water to about 8 g/L, which is slightly higher than the minimum needed for criticality.

In Table 3 for the first calculation, boxa01, the container has 350 g of ^{239}Pu mixed with water at the bottom of the container. The fissile source occupies about $1/10_{th}$ of the container's inside volume with a density of about 8 g/L. No additional material modeled in the container. The k_{eff} is 0.360. This value is much below the k_{eff} of the first calculation, boxe01, in Table 2. It indicates that the concentrated source model in boxe01 is much conservative than scattered source although the scattered source seems closer to reality.

If the fissile content is scattered within the container, the fissile material in each container can be very close and the fissile material can also be surrounded by plastic material. The rest of the calculations in Table 3 were designed to evaluate these different situations. Each case is described in Table 3 along with the listing of calculated k_{eff} values.

The last calculation, boxa05, assumed that the four containers in the bottom tier of the array have 700 grams of Pu each and all of this is located at the top of the containers while the fissile sources in the containers of the second tier are located at the bottom of the containers. Therefore, the fissile source in the second tier containers are very close to double batched sources in the first tier containers; separated by the container walls only. All containers were also filled with cellulose material (0.65 g/L) to represent typical glovebox waste materials. The

k_{eff} is 0.700, so the system is sub-critical by about 30%. *REV. 4*

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VI. CONCLUSIONS

The evaluation results indicate the following conclusions:

1. The total limit for a stacked containers with <250 grams of fissile material in item 4 of 2.1.4 on CPS-SW-149-00002 (p.4 of 6) can be raised from 250 grams to 500 grams without additional restrictions.
2. If the maximum fissile material content for containers greater than 2.5' x 2.5' x 2.5', but less than 4' x 4' x 7', is changed to 325 grams (item 2 of 2.1.4, p. 3 of 6, and item 4 of 2.1.4, p. 4 of 6) the following conditions need to be met:
 - 2.1 The total amount of fissile material in stacked containers is limited to 500 grams.
 - 2.2 The fissile material inside each box must be distributed over more than $1/10^{\text{th}}$ of the volume of the container.

Table 2 Evaluation of Abnormal Cases

MONK6B CASE ID	Box Fissile Configurations 2x2x4 Array of 2.5' cube boxes on concrete floor	% of H ₂ O Filling Rest of Box	k _{eff} ±0.3%	Abnormal Codings
boxe01	350 g Pu in all boxes as Pu/H ₂ O in cylinder (D=H). Pu at 30 g/L	0%	0.772	ABN-4
boxf02	350 g Pu in all boxes except one having 650 g Pu as Pu/H ₂ O in cylinder (D=H). Pu at 30 g/L.	0%	0.930	ABN-4 ABN-2
boxf03	350 g Pu in all boxes except two having 650 g Pu each as Pu/H ₂ O in cylinder (D=H). Pu at 30 g/L.	0%	0.933	ABN-4 ABN-2
boxe04	Container filled w/ H ₂ O mist, 350 g Pu in all boxes as Pu/H ₂ O in cylinder (D=H). Pu at 30 g/L	20%	0.827	ABN-4 ABN-3
boxe05	Container filled w/ H ₂ O mist, 350 g Pu in all boxes as Pu/H ₂ O in cylinder (D=H). Pu at 30 g/L	40%	0.847	ABN-4 ABN-3
boxe06	Container filled w/ H ₂ O mist, 350 g Pu in all boxes as Pu/H ₂ O in cylinder (D=H). Pu at 30 g/L	60%	0.879	ABN-4 ABN-3
boxe07	Container filled w/ H ₂ O mist, 350 g Pu in all boxes as Pu/H ₂ O in cylinder (D=H). Pu at 30 g/L	80%	0.909	ABN-4 ABN-3
boxe08	Cylinder (D=H) filled w/ H ₂ O, 2x2x4 container array, 350 g Pu in all containers. Pu Density is 30g/L	100%	0.900	ABN-4 ABN-3

Table 3 Calculations with Spread Fissile Sources

MONK6B CASE ID	Box Fissile Configurations 2x2x4 Array of 2.5' cube boxes on concrete floor	k_{eff} (+/-1) 0.003)	Abnormal Conditions
boxa01	350 g of ^{239}Pu at the bottom of each container mixed with H ₂ O at 8 g/L of Pu No other material modeled in container	0.360	ABN-4
boxa02	350 g of ^{239}Pu at the bottom of each container mixed with H ₂ O at 8 g/L of Pu Cellulose material (0.65g/L) modeled in the rest space of the container	0.438	ABN-4
boxa03	The top three tiers of containers in the array have 350 g of ^{239}Pu each, mixed with H ₂ O at the bottom of each container. The four containers at the bottom tier of array have 350 g of ^{239}Pu each, mixed with H ₂ O, positioning at the top of each container. All Pu at 8 g/L. No other material modeled in container	0.447	ABN-4
boxa04	The top three tiers of containers in the array have 350 g of ^{239}Pu each, mixed with H ₂ O at the bottom of each container. The four containers at the bottom tier of array have 350 g of ^{239}Pu each, mixed with H ₂ O, positioning at the top of each container. All Pu at 8 g/L. Cellulose material (0.65g/L) modeled in the rest of the container space	0.566	ABN-4
boxa05	The top three tiers of containers in the array have 350 g of ^{239}Pu mixed with H ₂ O at the bottom of each container. The four containers at the bottom tier of array have 700 g of ^{239}Pu each, mixed with H ₂ O, positioning at the top of each container. All Pu at 8 g/L. Cellulose material (0.65g/L) modeled in the rest of the container space	0.700	ABN-4 ABN-2

REVIEWERS' COMMENTS

Technical review of this evaluation was carried out by A. L. Hess of the Criticality Safety group of the Consequence Analyses section of Safety Analyses and Nuclear Engineering, who provides the following comments.

The prime control for criticality safety regarding fissile-bearing materials in waste storage boxes is the requirement on form and distribution. Most wastes from the fissile processing plants, from glovebox operations, etc., are readily accommodated in 55-gallon drums. For boxes, however, in the burial ground trenches or above ground storage, the fissile material can be present only as either contaminated filters or as contaminated failed or discarded equipment, which must have been first flushed and drained to remove all but the most resistant, insoluble contamination deposits or residues. With these restraints, it is most logical to expect that any significant residual Pu or U in the equipment boxes will be well distributed with the equipment material effectively interspersed (for neutronic considerations); filter loadings have specific volumetric distribution requirements.

The minimum box size, a 2.5 ft per side cube, provides an available volume of 442 liters, so that if the fissile residue is truly spread over 10% or more of the space the contaminated volume would be at least 44 liters. Per ARH-600, under the most optimum shape and reflection conditions, to be critical in 44 or more liters requires at least 700 grams of pure ^{239}Pu homogeneously mixed with water. Individual boxes would thus be surely safe even if their NDA value is off by a factor of 2. Compression accidents with a double batched box might be postulated, but with the conservative shape model, accounting for neutron absorption in the equipment media and the real filling of the rest of the box volume, a criticality is not plausible.

The allowed loadings of 55-gallon drums (200 g if occupying more than 20 vol. %) equates to an maximum effective-average fissile density of 4.8 g/liter, which is about 2/3rds that for the small box with a 325 g limit. However, the 200 g drum limit is based on being in 5-tier, infinite horizontal drum arrays. For a comparable safety margin, thus, the extent of box arrays must be restricted. The 500 gram limit per array of boxes is certainly conservative, and there has never been a rational explanation why the vertical stacking should be more reactive than a one-tier clustering (which really has more reflection due to the floor). With this low limit also, given the in-box distribution rules, there is no reason why one box of the array cannot be loaded with up to 325 grams fissile (as the calculations of this evaluation show).

For simplification, the residue on contaminated equipment placed in the large boxes (greater than 4 x 4 x 7 feet dimensions) could be reduced to 325 g maximum per piece. The spacing between arrays, or from a single box of more than 325 g fissile content, will remain at 3 ft (edge to edge), with non-fissile boxes (less than 1 g) being allowed to provide spacing.

The boxes exhumed from the burial grounds and possibly transferred to the CWC will most likely be re-assayed and scanned for contents. The procedures should include provisions to isolate boxes which scanning indicates have fissile accumulations not conforming with the distribution requirements.

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5. SD-SOA-CSA-20130, Rev. 0: "CSER 82-003, Packaging, Storage and/or Disposal of Solid Waste (Burial Containers and Uranic Burial)", W. A. Blyckert. Report approved April 20, 1982, released as SD March 3, 1989.
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7. WHC-SD-SOA-CSA-20208, Rev. 0: "CSAR 79-038 Addendum 4, Out-of-Hood Plutonium Storage (Burial Box)", W. A. Blyckert. Report approved 4/20/82, SD issue date January 19, 1990. (about 3'x 4'x 5' burial box)
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9. SD-SOA-CSA-20101, Rev. 0: "CSAR 80-021 Addendum 5, 55 Gallon Drums and Boxes in Above Grade (Surface) Storage", W. A. Blyckert, Jan. 31, 1989
10. WHC-SD-SOA-CSA-20206, Rev. 0: "CSAR 79-038 Addendum 2, Out-of-Hood Plutonium Storage ", W. A. Blyckert. Report approved 8/12/80, SD issue date January 19, 1990. (concerns seven added box types)

APPENDIX 1

CRITICALITY PREVENTION SPECIFICATION

WESTINGHOUSE HANFORD COMPANY

OPERATING COMPONENT: SOLID WASTE MANAGEMENT

WORK LOCATION: CENTRAL WASTE COMPLEX
(BLDG/ROOMS)

TITLE: WASTE STORAGE - CENTRAL WASTE COMPLEX

OPERATIONS INVOLVED:

PROCESSING ☐ STORING ☒ TRANSPORTING ☒ TRANSPORTING
WITHIN A BUILDING BETWEEN BLDGS

FISSIONABLE MATERIAL DESCRIPTION

These facilities are approved for the storage of waste containing the following isotopes:

Pu (all isotopes)
²³³U
²³⁵U

Gram limits in this specification refer to total grams of these isotopes unless otherwise specified in the limit. Other fissionable materials may be handled in accordance with the fissionable material equivalence specified in WHC-CM-4-29.

1.0 PROCESS AND EQUIPMENT DESCRIPTION

Containers of transuranic (TRU) waste are transferred to the Central Waste Complex (CWC) from fissionable material facilities for temporary storage. Waste containers are assayed at the generating facility prior to transfer to the CWC.

The fissionable materials covered under this specification are containerized. Waste containers are not opened at any of the CWC facilities.

The following containers with the permitted contents are approved to be handled and stored at these facilities:

1. 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
2. PUREX TRU HEPA Filter Burial Box containing HEPA filters
3. Lead-lined 55-gallon DOT Specification drum containing miscellaneous solid waste

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4. Fissile shipping containers (DOT- and Certificate of Compliance [COC]-approved containers)
5. 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)
6. Containerized uranium bearing waste
7. Transuranic metal boxes (TMB) as overpacks

2.0 LIMITS FOR CRITICALITY SAFETY

2.1.1 Criticality limits for containers 1 and 2

55-gallon (or larger) DOT Specification 17C, 17H, or UN1A2 drum, painted or galvanized, containing miscellaneous solid waste and PUREX TRU HEPA filter burial box, as described in H-2-35000 containing HEPA filters.

1. Maximum fissile material limit

a. Fissile material occupies 20 percent or more of the container volume:	200 grams
b. Fissile material occupies less than 20 percent of the container volume:	100 grams

2. Array restrictions

a. Maximum number of layers (tiers):	5
b. Maximum array size:	Unlimited

2.1.2 Criticality limits for container 3

Lead-lined drums containing miscellaneous solid waste.

1. Maximum fissile material limit

a. Maximum fissile material content:	100 grams

2. Array restrictions

a. Maximum number of layers (tiers):	5
b. Maximum array size:	Unlimited

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2.1.3 Criticality limits for container 4

Special containers (DOT and COC approved)

1. Maximum fissile material limit
 - a. Maximum fissile material content may not exceed that which is acceptable for shipment as specified in the DOT or COC approval.
2. Array restrictions
 - a. Maximum number of containers per array: 1
 - b. Minimum separation from other containers: 3 feet

2.1.4 Criticality limits for container 5

Steel burial boxes containing HEPA filters and/or failed equipment (flushed and drained).

1. Maximum fissile material limit (not including ^{235}U when enrichment is $\leq 1.15\%$. ^{235}U content is not restricted when its enrichment in associated uranium is $\leq 1.15\%$)

Per Equipment Piece: 350 grams

Per HEPA Filter: 10 grams/³ft

In associated waste (not equipment or HEPAs): 15 grams

2. In addition to the limits established in subsection 2.1.4, item 1, above, the following container limits are established.

Maximum fissile material content for containers greater than 2.5 x 2.5 x 2.5 ft (0.7 x 0.7 x 0.7 m): 250 grams

Maximum fissile material content for containers greater than 3 x 4 x 5 ft (0.9 x 1.2 x 1.5 m): 350 grams

Maximum fissile material content for containers greater than 4 x 4 x 7 ft (1.2 x 1.2 x 2.1 m): 1000 grams

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3. The additional limit for ^{235}U enrichment greater than 1.15% and $\leq$ 1.97% is established.

Maximum fissile material content and Uranium content for containers greater than 4 x 4 x 7 ft (1.2 x 1.2 x 2.1 m):

500 kilograms total Uranium and 350 grams other fissile material

4. Array restrictions for all fissile (> 1 gram) containers.

For containers with $\geq$ ~~250~~ ³⁵⁰ grams fissile:

1 container

For stacked containers with $<$ ~~250~~ ³⁵⁰ grams fissile:

Sum of fissile content within array limited to ~~250~~ ⁵⁰⁰ grams

For unstacked (single-tier) containers with $<$ ~~250~~ ³⁵⁰ grams fissile

Sum of fissile content within single tier array limited to 500 grams

Minimum separation of fissile container array:
 (Separation may be achieved using a non-fissile container with width of 3 feet or more)

3 feet

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REFERENCES

- SD-SQA-CSA-20121 "CSAR 80-021, Packaging, Storage and Disposal of Solid Waste (55-gallon drums, Unrestricted H/Pu Only)"
- SD-SQA-CSA-083 "CSAR 80-021 Addendum 3, Lifetime of 55 Gallon Drums in Underground Storage, Boxes as Overpacks, Specification Clarifications"
- 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-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-20132 "CSAR 85-004, Department of Transportation Specification and Certificate of Compliance-Approved Containers"
- SD-SQA-CSA-20204 "CSAR 79-038, Out-of-Hood Plutonium Storage"
- SD-SQA-CSA-20208 CSAR 79-038 Addendum 4, 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"

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[15] From: Robert M (Mat) Irwin at -WHC228 3/27/95 1:12PM (2406 bytes: 1 ln)
Priority: Urgent
To: Alan L Ramble at -WHC276, Allen L Hess at -WHC276
cc: Dean B Jr Powell, Paul L Hapke
Subject: Criticality Evaluation for CPS-SW-149-00002

----- Message Contents -----

Text item 1: Text_1

Al,

I am sending you this message to request a criticality evaluation in support of storage of fissile material in boxes at the Central Waste Complex. Currently, boxes are received and controlled at CWC in accordance with CPS-SW-149-00002. As I'm sure Al Hess has informed you, SWM had a CPS infraction identified last Wednesday, March 22. The infraction involved an array of stacked containers with a quantity exceeding 250 grams. An occurrence report has been generated and the boxes have been reconfigured in accordance with a documented recovery plan. During this occurrence it has been identified that the current CPS requirements are confusing and an evaluation needs to be performed to clarify the requirements for boxes in CWC. We have been given a timetable for completing the required evaluation and changes and thus we need an expidited response. What we are looking for is an evaluation of criticality requirements with respect to boxes stored in CWC. Currently the CPS addresses limits for single boxes based on box size, single tier arrays, and stacked arrays. The requirements are inconsistent and ultra conservative for stacked containers. SWM must have CPS requirements which are consistent and user friendly to ensure we do not have infractions in the future. I have discussed our needs with Al Hess. SWM needs this evaluation completed by April 12 to support our course of action to mitigate the potential for future confusion with regard to our CPS requirements. Please evaluate this request with your current work load and notify me if this deadline is unacceptable. SWM will assist in any way possible.

Thanks,

Mat Irwin 3-5424

*See Me
JL*

RECEIVED

MAR 27 1995

A.L. RAMBLE