2. To: (Receiving Organization) Plutonium Finishing Plant	3. From: (Originating Organization) Criticality and Shielding	4. Related EDT No.: N/A
5. Proj./Prog./Dept./Div.: PFP	6. Cog. Engr.: D. G. Erickson	7. Purchase Order No.: N/A
8. Originator Remarks: Transmittal of CSER 96-028 evaluating the criticality safety of increasing the plutonium limit in cans stored in vault #2 storage racks		9. Equip./Component No.: N/A
		10. System/Blgd./Facility: 234-5Z, PFP
11. Receiver Remarks: 11A. Design Baseline Document? ☐ Yes ☒ No		12. Major Assm. Dwg. No.: N/A
		13. Permit/Permit Application No.: N/A
		14. Required Response Date: N/A

15. DATA TRANSMITTED					(F)	(G)	(H)	(I)
(A) Item No.	(B) Document/Drawing No.	(C) Sheet No.	(D) Rev. No.	(E) Title or Description of Data Transmitted	Approval Designator	Reason for Transmittal	Originator Disposition	Receiver Disposition
1	WHC-SD-SQA-CSA-524		0	CSER 96-028: PFP Vault #2 Storage Racks	S	1,2	/	

16. KEY					
Approval Designator (F)		Reason for Transmittal (G)		Disposition (H) & (I)	
E, S, Q, D or N/A (see WHC-QM-3-5, Sec. 12.7)	1. Approval 2. Release 3. Information	4. Review 5. Post-Review 6. Dist. (Receipt Acknow. Required)	1. Approved 2. Approved w/comment 3. Disapproved w/comment	4. Reviewed no/comment 5. Reviewed w/comment 6. Receipt acknowledged	

17. SIGNATURE/DISTRIBUTION (See Approval Designator for required signatures)											
(G) Reason	(H) Disp.	(J) Name	(K) Signature	(L) Date	(M) MSIN	(G) Reason	(H) Disp.	(J) Name	(K) Signature	(L) Date	(M) MSIN
1	1	Design Authority LT Nirinder	<i>L. Nirinder</i>	11/28/96				Central Files	<i>A3-88</i>		
1		Design Agent LH Rogers	<i>LH Rogers</i>	11/24/96							
1	1	Cog. Engr.: DG Erickson	<i>D. G. Erickson</i>	11/24/96	H0-35						
1	1	Cog. Mgr.: J. Greenborg	<i>J. Greenborg</i>	11/24/96	H0-35						
		QA N/A									
1		Safety: SE Nunn	<i>SE Nunn</i>	11/24/96	H0-11						
1	1	Tech Review: RF Richard	<i>R.F. Richard</i>	11/25/96	H0-35						
		Env. N/A									

18. <i>D. G. Erickson</i> D. G. Erickson Signature of EDT Originator Date: 11/24/96	19. <i>L. Nirinder</i> L. Nirinder Authorized Representative for Receiving Organization Date: 11/30/96	20. <i>J. Greenborg</i> J. Greenborg Design Authority/Signatory Manager Date: 11/24/96	21. DOE APPROVAL (if required) Ctrl. No. ☐ Approved ☐ Approved w/comments ☐ Disapproved w/comments
--	---	---	---

CSER 96-028: PFP Vault #2 Storage Racks

David G. Erickson

Fluor Daniel Northwest, Inc., Richland, WA 99352

U.S. Department of Energy Contract DE-AC06-96RL13200

EDT/ECN: 619224

UC: 507

Org Code: 403

Charge Code: K6058

B&R Code: EW7003000

Total Pages: 54

K61

Key Words: Criticality, Vault, Plutonium

Abstract: A nuclear criticality safety analysis has been performed to increase the approved plutonium mass limit for the Vault #2 storage racks at PFP. There are three racks in the room with separate cubicles used to hold cans of plutonium oxide (PuO_2). The racks were approved to hold up to 2.5 Kg of plutonium in each storage cubicle. The purpose of this CSER is to increase the limit to 4.4 Kg plutonium in PuO_2 per storage cubicle in one rack. The highest k_{eff} calculated for all possible scenarios was 0.893 ± 0.003 , which is well below the criticality safety limit of $k_{\text{eff}} = 0.935$. Consequently, an increase of plutonium mass to 4.4 Kg per can is within acceptable safety limits.

TRADEMARK DISCLAIMER. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise, does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof or its contractors or subcontractors.

Printed in the United States of America. To obtain copies of this document, contact: WHC/BCS Document Control Services, P.O. Box 1970, Mailstop H6-08, Richland WA 99352, Phone (509) 372-2420; Fax (509) 376-4989.

Green A. Holand

Release Approval

12/2/96

Date

Release Stamp

Approved for Public Release

CONTENTS

1.0 INTRODUCTION	1
2.0 DESCRIPTION OF SYSTEM AND FACILITY	2
2.1 FACILITY DESCRIPTION	2
2.2 NORMAL MODEL DESCRIPTION AND ASSUMPTIONS	4
3.0 REQUIREMENTS DOCUMENTATION	6
4.0 METHODOLOGY	6
4.1 MONK VALIDATION	6
5.0 DISCUSSION OF CONTINGENCIES	7
6.0 EVALUATION AND RESULTS	8
6.1 NORMAL CONDITIONS	8
6.2 OFF-NORMAL CONDITIONS	10
6.2.1 Overbatch Contingency	11
6.2.2 Internal Moderation Contingency	11
6.2.3 Interspersed Moderation Contingency	11
6.2.4 Additional Cans of Material Contingency	12
6.2.5 4.5 Kg Plutonium Can in Wrong Racks Contingency	12
7.0 DESIGN FEATURES AND ADMINISTRATIVELY CONTROLLED LIMITS AND REQUIREMENTS	13
8.0 SUMMARY AND CONCLUSIONS	14
9.0 REFERENCES	15
APPENDIX A INDEPENDENT REVIEW COMMENTS AND CHECKLIST	A-1
APPENDIX B ALL INPUT FILES	B-1

This page intentionally left blank

CSER-96-028

Title: CSER 96-028: PFP Vault #2 Storage Racks

Prepared by: Date: 11/25/96
D. G. Erickson, Senior Scientist
Criticality and Shielding

Reviewed by: Date: 11/25/96
R. F. Richard, Advanced Engineer
Criticality and Shielding

Approved by: Date: 11/25/96
J. Greenberg, Manager
Criticality and Shielding

1.0 INTRODUCTION

A nuclear criticality safety analysis has been performed to increase the approved plutonium mass limit for the Vault #2 storage racks at PFP. There are three racks in the room with separate cubicles used to hold cans of plutonium dioxide (PuO_2). The racks were approved to hold up to 2.5 kg of plutonium in PuO_2 in each storage cubicle. The purpose of this CSER is to increase the limit to 4.4 kg of plutonium in PuO_2 (5.0 kg PuO_2) per storage cubicle in one of those racks. The plutonium will be placed into a package called the Hanford Convenience Can (HCC). The HCC allows direct transfer to the DOE 3013 standard outer packages without material rehandling.

The storage racks are used to hold cans of dry PuO_2 ($\text{H}/\text{Pu} < 2$). The PuO_2 is quadruple canned in the HCC configuration, with each can being sealed or welded shut. Each of the cans are made of metal, and have lids on them. There may also be one or more plastic bags around the cans.

The normal and off-normal conditions for the storage racks were analyzed by performing explicit calculations of the Vault #2 storage racks. Normal conditions were conservatively modeled by assuming the most reactive normal material composition (maximum normal moderation and density), position of the cans in the racks, and an extra can being moved in front of the racks, and two people close to the racks (as necessary). Each 'person' is modeled as a cuboid of water 30.48 cm (12 in.) thick, 45.72 cm (18 in.) wide and 152.4 cm (60 in.) tall. For

further conservatism, only one of the four cans was modeled. Several off-normal contingencies were analyzed, including a material overbatch in a can, interspersed moderation between the cans, internal moderation in a can, a 5 position transport wagon between racks, and an extra rack with the 4.5 kg plutonium cans.

All results of this analysis can be found in Section 6. The base case used for the normal condition analysis, and as the basis for all off-normal scenarios (Case V-N-02-A) has a $k_{\text{eff}} \pm 1\sigma$ of 0.830 ± 0.003 . This was the worst normal case calculated.

For the off normal condition (contingency) analysis the overbatch case (V-C-01-A), section 6.2.1, had a calculated $k_{\text{eff}} \pm 1\sigma$ of 0.834 ± 0.003 . The worst case in the internal moderation analysis, section 6.2.2, (Case V-C-11-D) has a final $k_{\text{eff}} \pm 1\sigma$ of 0.834 ± 0.003 . The worst case, without being fully reflected, in the interspersed moderation analysis, section 6.2.3, (Case V-C-21-C) has a $k_{\text{eff}} \pm 1\sigma$ of 0.858 ± 0.003 . The $k_{\text{eff}} \pm 1\sigma$ for the fully reflected case (V-C-21-G) is 0.868 ± 0.003 . The resulting $k_{\text{eff}} \pm 1\sigma$ for the wagon case (V-C-31-A), section 6.2.4, is 0.837 ± 0.003 . The worst calculated result for the extra rack of 4.5 Kg Pu cans, section 6.2.5, was case V-C-41-A with the south and middle racks filled. This case had a $k_{\text{eff}} \pm 1\sigma$ of 0.893 ± 0.003 .

As can be seen all of the normal and off-normal results are below the limiting k_{eff} of 0.935 for plutonium systems calculated using MONK6B for PFP. This also shows that it is acceptable to increase the mass loading of the cans from 2.5 Kg of plutonium to 4.5 Kg of plutonium on one of the three available racks in Vault #2.

2.0 DESCRIPTION OF SYSTEM AND FACILITY

2.1 FACILITY DESCRIPTION

The 234-5Z Building more commonly referred to as the Plutonium Finishing Plant (PFP) is located in the 200 West area. This facility was historically used to process plutonium into oxide or metal forms. The facility is now undergoing a cleanup phase to stabilize the plutonium still stored there. The vault #2 storage room is located in building 2736-Z. This building is adjacent to PFP on its south side. The vault #2 storage racks are currently approved to hold containers with a maximum of 2.5 kg of PuO_2 .

There are three racks in the vault. All of the racks hold a single can per storage cubicle, and are seven cubicles high. Each cubicle is approximately 22.86 cm (9 in.) wide, 30.48 cm (12 in.) deep and 30.48 cm (12 in.) tall. The first of these racks is located along the south wall, and is 36 cubicles wide. The second rack is located 83.82 cm (33 in.) north of the first rack, and the third rack is located 31.75 cm (12.5 in.) further north. Both the second and third racks are 32 cubicles wide, leaving a 91.44 cm (36 in.) space to access the first and second racks on the east side. A sketch of the racks can be found in Figure 2.1. The north wall of vault #2 is shared with vault #1, the racks in question are at the south end of the room, at least 4 m (13 ft) from vault #1, so interaction between the racks and fissile material in vault #1 is not

Figure 2.1. Sketch of Vault #2 Storage Racks, Actual Layout.

of concern. The east wall is shared with the hallway, at most a wagon would be moved down the hall, and a wagon is analyzed between racks, so no further fissile material interaction effects are considered. The west wall is a building exterior, so no interaction effects are considered. The south wall is adjacent to room 636, but there are actually two walls and an air gap separating

them. Room 636 does have a repackaging hood in the middle of it, approximately 4 m (13 ft) away, so interaction between any fissile materials in the hood and the racks will be very small, and therefore is not of concern.

The plutonium will be quadruple canned before it is placed in a cubicle, and each cubicle is limited to a single package. The cans are made of metal, and have a wall thickness of approximately 0.0229 cm (0.009 in.). The outside dimensions of the four cans can be found in Table 2.1.

Table 2.1 Can Dimensions.

Can	OD (cm)	OH (cm)	OD (in.)	OH (in.)
Inner	8.731	20.320	3.438	8.000
Secondary	9.208	20.955	3.625	8.250
Tertiary	10.319	22.860	4.063	9.000
Outer	10.795	23.495	4.250	9.250

2.2 NORMAL MODEL DESCRIPTION AND ASSUMPTIONS

For the purposes of this analysis, only the inner can of the four cans is modeled for conservatism. For the south rack, each can is filled with 4.5 kg of plutonium in PuO_2 (5.1 kg PuO_2) with H_2O added at an H/Pu ratio of 2. This is conservative since it is more than the normal maximum loading of 4.4 kg of plutonium (5.0 kg PuO_2). For both of the other racks, the cans contain 2.5 kg of plutonium in PuO_2 with the same moderation.

The assumed Pu density is 5.5 g/cc. According to ARH-600 (Carter, 1968), if plutonium metal is burned, it can create PuO_2 with a density of 5.3 g/cc, so 5.5 g/cc for the plutonium alone is conservative. The plutonium is also assumed to be pure Pu^{239} . In reality most of the plutonium will have more than 5 wt% Pu^{240} but, there does exist some plutonium at PFP that has less than 3 wt% Pu^{240} so using pure Pu^{239} is conservative.

For the purposes of this evaluation, it was conservatively assumed that the volume of PuO_2 with H_2O added at an H/Pu ratio of 2 is equal to the original volume of the plutonium at a density of 5.5 g/cc. This gives a material density of 6.65 g/cc. If further moderation is added, it will then change the resulting volume and density of the material according to the additional volume of H_2O added.

Each can is modeled as a cylinder with the following interior dimensions: diameter 8.6855 cm (3.420 in.) and height of 20.2743 cm (7.982 in.). As stated above, the walls are 0.0229 cm (0.009 in.) thick. As necessary, 2.54 cm (1.0 in.) of water is placed around a can to approximate the effect of a persons hands when the cans are being handled.

The vault is modeled as a 3 rack by 36 cubicles wide by 7 cubicles high array. The first rack (along the south wall) is separated from the second rack by 60.96 cm (24 in.) of air. The second and third racks are separated by 30.48 cm (12 in.) of air. Both of these separations are less than the actual dimensions of 83.82 cm (33 in.), and 31.75 cm (12.5 in.) respectively. The racks are reflected by 30.48 cm (12 in.) of concrete on all sides. The concrete is close fitting on the back (the south rack), the two sides and the floor. It is assumed that the ceiling is 304.8 cm (10 ft) high, and the front wall is 152.4 cm (5 ft) from the rack. A sketch of the model can be found in Figure 2.2.

Figure 2.2. Sketch of Vault #2 as Modeled.

For all cases, it could be assumed that two people are in the vault. A study will be performed to see what effect they have, and the results of this study will be used to determine the need to model the people for all of the other cases. Each 'person' is modeled as a cuboid of water 30.48 cm (12 in.) thick, 45.72 cm (18 in.) wide and 152.4 cm (60 in.) tall. This is equivalent to a 212 kg (467 lb) person and is therefore quite conservative.

3.0 REQUIREMENTS DOCUMENTATION

There are no unique requirements applicable to this evaluation.

4.0 METHODOLOGY

The MONK6B code was used for this analysis. MONK6B is a commercially licensed code from the British ANSWERS organization (UKEAE, 1988). The MONK6B code uses pointwise cross sections from the United Kingdom Nuclear Data Library (UKNDL). It is currently verified per MONK6B QA plan WHC-SD-SQA-CSWD-20017 (Miller, 1994) and validated on the SUN2 and SUN4 workstations in the SECC. A copy of the executable code for the preferred computer platform was received from the vendor. The verification of this code was received along with the code. A description of the code validation for use on plutonium systems, such as those found in PFP is included below.

4.1 MONK VALIDATION

Validation Procedure

The validation of the method used in the analysis consists of testing the ability of the MONK6A code (UKEAE, 1988) and neutron cross-sections in calculation of known critical configurations from various benchmark experiments with plutonium (Pu) as the fissile material. Such analyses determine a calculational bias (the deviation of calculated K_{eff} from unity) and the uncertainties culminating from the experimental and calculational errors.

The safety criteria for future calculations on undetermined systems requires that the bias-adjusted k_{eff} does not exceed 0.95 at the 95% confidence interval. This is expressed by the following equation;

$$k_{eff} = k_{calc} - bias + (U_b^2 + U_c^2)^{\frac{1}{2}} \leq 0.95 \quad (1)$$

where: k_{calc} = k value given by the calculation of the system
 bias = mean difference ($k_{calc}-1.0$) for benchmark criticals
 U_b = 95% confidence level uncertainty in bias determination
 U_c = 95% confidence level uncertainty in new calculation.

*SUN is a trademark of Sun Microsystems, Inc.

Thus, the bias-adjusted k_{eff} includes the statistical uncertainties.

Generic Validation of Plutonium Systems

A report by Maklin and Miller (1992) presents the results of calculations to determine a generic bias for plutonium configurations, as encountered in the Plutonium Finishing Plant. Seventy benchmark experiments were calculated, ranging from simple metal spheres to highly diluted (9g plutonium per liter) plutonium nitrate solution spheres, and compacts of PuO_2 blended with polystyrene. A mean k_{eff} value of 1.0047 was determined over the full experimental range, with an average standard deviation of 0.0097.

The direct calculational bias is thus +0.0047 (average k_{eff} greater than unity). Accounting for the uncertainties using tolerance limit analysis, the report then concludes that

At least 95% of all critical experiments of this type computed by the MONK6A code will produce calculated k_{eff} values greater than 0.9857 with 95% confidence.

For a standard deviation (σ) of 0.01 or less for the convergence of a future calculation (U_c), the 0.9857 value is lowered to 0.9855. Rounded conservatively, a value of +0.015 can be used for $[-\text{bias}(U_c^2 - U^2)^{1/2}]$. On this basis, it is determined that the true k_{eff} of an analyzed configuration with plutonium will not exceed 0.95 with a 95% confidence level if the calculated value ($k_{\text{calc}}, \sigma \leq 0.01$) is limited to a maximum of 0.935.

The 95% confidence level on 99.9% of the data is 0.9699. So a subcritical margin of 5% is 3.5% larger than the uncertainties between the 95.0% and the 99.9% coverage of the benchmark data.

Validation of MONK6B

The validation of MONK6B code on the SUN microcomputer was documented in Miller (1994). The essence of the validation was cross-correlation of calculational results obtained with this code version and computer with results for identical model input done on a CRAY machine with MONK6A. Also, the equivalence of MONK6A and MONK6B was well documented by the vendor in the verification package shipped with the software.

5.0 DISCUSSION OF CONTINGENCIES

Overbatch - The volume of the inner can is approximately 1.2 liters and at a plutonium density of 5.5 g/cc the can could hold approximately 6.6 kg of plutonium. This is equivalent to approximately 7.5 kg of PuO_2 . This is significantly more than a normal maximum loading of 4.4 kg of plutonium (5.0 kg PuO_2). Since each can will be weighed before it is placed on the shelf, it is highly unlikely that any cans with this much material would be placed on the shelf. Therefore the contingent condition will be to have a single can with this quantity placed into a storage cubicle.

Internal moderation - The material placed into the cans is dry PuO_2 . Dry in this case means the H/Pu ratio is less than 2. In most cases, the H/Pu is much less than 2. The contingent condition would be to have one can with $\text{H/Pu} > 2$ placed into a storage cubicle. In this case a parameter study will be performed with several different H/Pu ratios, until the can is filled to determine the most reactive system. A parameter study of a single can with a reduced Pu loading and increased internal moderation will also be performed.

Interspersed moderation - Interspersed moderation between the cans and the racks from 0% to 100% H_2O will be considered to account for sprinklers or fire fighting sprays. The presence of more than very low density water, such as humid air, other than the moderating or reflecting effects of several people, in the room will be evaluated as a contingent condition.

Additional cans of material - PuO_2 filled cans are moved either one-at-a-time by hand or by the use of a five position wagon. The hand carried single can of PuO_2 is the only allowable method of bringing material in the vault, and is therefore covered in the normal condition analysis. The wagon is not allowed to be brought into the Vault #2 storage area. Therefore a contingency analysis with the wagon in the vault placed close to the south rack will be performed. The normal condition analysis with an extra can, and the wagon analysis both adequately cover the situation where a second can is placed on a shelf already occupied by a can.

4.5 Kg Plutonium cans in wrong racks - The cans containing a maximum 4.5 kg of plutonium are only allowed to be stored in a single rack. The two remaining racks may only contain cans with a maximum 2.5 kg plutonium. For the contingency analysis, three cases will be run. These cases will cover all scenarios of having two of the three racks filled with the 4.5 kg plutonium cans. This will bound all credible accident scenarios where material is placed in cubicles in the wrong racks.

Loss of spacing - The cans would normally be placed in the approximate center of the shelves for convenience, but for this analysis it will be assumed that every two columns of cans are in close proximity to each other. This will be used for all normal and off-normal (contingent) situations, since specific placement is not a requirement.

Earthquake - According to the PFP SAR, the 2736-Z building and the Vault #2 shelves are seismically qualified. The shelves also have devices to keep the cans in place on the shelves. Accordingly, no contingencies due to earthquakes are postulated. Since no contingencies due to earthquake are postulated, this CSER will make the seismic qualification of the building and the racks a requirement.

6.0 EVALUATION AND RESULTS

6.1 NORMAL CONDITIONS

For normal conditions, the vault was modeled as follows. The vault was modeled as a 3 rack by 36 cubicle wide by 7 cubicle high array. Each cubicle is approximately 22.86 cm (9

in.) wide, 30.48 cm (12 in.) deep and 30.48 cm (12 in.) tall. The first rack (along the south wall) is separated from the second rack by 60.96 cm (24 in.) of air. The second and third racks are separated by 30.48 cm (12 in.) of air. The racks are reflected by 30.48 cm (12 in.) of concrete on all sides. The concrete is close fitting on the back, the two sides and the floor. It was assumed that the ceiling is 304.8 cm (10 ft) high, and the front wall is 152.4 cm (5 ft) from the rack.

The PuO_2 was modeled in a stainless steel can with the following interior dimensions: diameter 8.6855 cm (3.420 in.) and height of 20.2743 cm (7.982 in.). As stated above, the walls are 0.2286 cm (0.009 in.) thick. As necessary, 2.54 cm (1.0 in.) of water is placed around a can to approximate the effect of a persons hands when the cans are being handled.

For the purposes of this analysis, only the inner can was modeled for conservatism since stainless steel acts as an absorber. For the south rack, the can is filled with 4.5 kg of plutonium in PuO_2 . Two cases were run with Pu^{240} set at 5 wt% to see what effect it had. Several cases were also run with and without H_2O added at an H/Pu ratio of 2. For both of the other racks, the cans contain 2.5 kg of plutonium in PuO_2 with an H/Pu ratio of 2. To account for the lack of physical controls on the location of each can in the cubicle, every two columns of cans were placed next to each other.

Several cases with and without two people were placed in the room were run. When present, these people were side by side in the southeast corner of the room in close contact with the south rack. An extra can of material was included to account for the effect of transporting a can of material into or out of the cubicle positions. Figure 6.1a and 6.1b show the calculational model with and without the extra can and the people..

Figure 6.1a and Figure 6.1b Overhead Sketch of Model With and Without Extra Can of Plutonium or the People.

The MONK6B result for the base case (Case V-N-02-A) from which all scenarios were postulated was $k_{\text{eff}} = 0.830 \pm 0.003$. Several parameter studies of this scenario were also completed to see the effect if the material were placed in different racks. The results of all of the normal study analyses can be found in Table 6.1.

Table 6.1 Normal Condition Results.

Case	Description				Pu239/ Pu240	H/Pu	Interspersed Moderation	k_{eff}	$\pm 1\sigma$
	Cans	People	Hands	Extra Can					
Normal Condition, Effect of People and Hands									
V-N-02-A*	4.5, 2.5, 2.5	No people	No Hands	Extra	100 / 0	2.00	0.0001	0.830	0.003
V-N-02-B	4.5, 2.5, 2.5	No people	Hands	Extra	100 / 0	2.00	0.0001	0.824	0.003
V-N-02-C	4.5, 2.5, 2.5	People	Hands	Extra	100 / 0	2.00	0.0001	0.822	0.003
V-N-02-D	4.5, 2.5, 2.5	People	No Hands	Extra	100 / 0	2.00	0.0001	0.820	0.003
Normal Condition, Effect of Pu ²³⁹ /Pu ²⁴⁰ ratio and H/Pu ratio									
V-N-01-A	4.5, 2.5, 2.5	No people	No Hands	No extra	100 / 0	2.00	0.0001	0.825	0.003
V-N-01-B	4.5, 2.5, 2.5	No people	No Hands	No extra	95 / 5	2.00	0.0001	0.801	0.003
V-N-01-C	4.5, 2.5, 2.5	No people	No Hands	No extra	100 / 0	0.00	0.0001	0.731	0.003
V-N-01-D	4.5, 2.5, 2.5	No people	No Hands	No extra	95 / 5	0.00	0.0001	0.711	0.003
Normal Condition, Material in different racks									
V-N-03-A	2.5, 4.5, 2.5	No people	No Hands	No extra	100 / 0	2.00	0.0001	0.819	0.003
V-N-03-B	2.5, 2.5, 4.5	No people	No Hands	No extra	100 / 0	2.00	0.0001	0.814	0.003

* Case V-N-02-A is considered the base case upon which other cases are based.

After the analysis was completed, it was discovered that the cans may not all be made of stainless steel. The cans may be 'tin' or stainless steel. Two cases were rerun, the normal base case, and the worst off normal case, to see what effect it had. The normal base case (V-N-02AA), run without the stainless steel cans gave a calculated $k_{\text{eff}} \pm 1\sigma$ of 0.830 ± 0.003 . This is the same as the case with the stainless steel cans. The worst off-normal case which is discussed in section 6.2.5, below, had a $k_{\text{eff}} \pm 1\sigma$ of 0.893 ± 0.003 with the stainless steel cans and a $k_{\text{eff}} \pm 1\sigma$ of 0.892 ± 0.003 without the cans. The difference between these results is not statistically significant. Therefore, it is concluded that all of the analyses with the stainless steel cans are valid, and the reported results and conclusions are also valid no matter what material the cans are made of.

6.2 OFF-NORMAL CONDITIONS

For off-normal conditions the following contingencies were considered: Overbatch, internal moderation, interspersed moderation, additional cans of material and 4.5 kg of plutonium can in the wrong racks. Each of these contingencies will be covered individually in the sections following.

6.2.1 Overbatch Contingency

For the overbatch analysis, a single can of material was placed on the rack with approximately 6.6 kg of plutonium. This is equivalent to almost 7.5 kg of PuO_2 . The PuO_2 also includes H_2O at an H/Pu ratio of 2.0. The results of this case (V-C-01-A) give a $k_{\text{eff}} \pm 1\sigma$ of 0.834 ± 0.003 . This is not a significant increase from the base case of normally filled cans.

6.2.2 Internal Moderation Contingency

For the internal moderation analysis, a parameter study to find the most reactive situation was performed. Table 6.2, below, contains the results of this analysis and the H/Pu ratios used. For all of the cases, a single can of the internally moderated material was placed on the south rack, and other cans were moved so the interaction effects between cans would be maximized. The moderation was varied in two steps. First with the full 4.5 kg of plutonium in the can and then adding water until the can was full, then second by reducing the mass of plutonium, and therefore the volume, then adding additional water to refill the can. This study shows that the addition of a single internally moderated can to the array has no significant impact on the overall system reactivity.

Table 6.2 Results of Internal Moderation Parameter Study.

Case	Description				Pu239/ Pu240	H/Pu	Interspersed Moderation	k _{eff}	± σ
	Cans	People	Hands	Extra Can					
Internal Moderation (4.5 kg Pu in can)									
V-C-11-A	4.5, 2.5, 2.5	No people	No Hands	Extra	100 / 0	2.50	0.0001	0.826	0.003
V-C-11-B	4.5, 2.5, 2.5	No people	No Hands	Extra	100 / 0	3.00	0.0001	0.831	0.003
V-C-11-C	4.5, 2.5, 2.5	No people	No Hands	Extra	100 / 0	3.50	0.0001	0.829	0.003
V-C-11-D	4.5, 2.5, 2.5	No people	No Hands	Extra	100 / 0	4.00	0.0001	0.834	0.003
V-C-11-E	4.5, 2.5, 2.5	No people	No Hands	Extra	100 / 0	4.26	0.0001	0.831	0.003
Internal Moderation (Reduced Pu, Increased H ₂ O in can)									
V-C-12-A	4.5, 2.5, 2.5	No people	No Hands	4.0 Kg extra	100 / 0	5.14	0.0001	0.833	0.003
V-C-12-B	4.5, 2.5, 2.5	No people	No Hands	3.5 Kg extra	100 / 0	6.28	0.0001	0.827	0.003
V-C-12-C	4.5, 2.5, 2.5	No people	No Hands	3.0 Kg extra	100 / 0	7.80	0.0001	0.829	0.003
V-C-12-D	4.5, 2.5, 2.5	No people	No Hands	2.5 Kg extra	100 / 0	9.93	0.0001	0.825	0.003
V-C-12-E	4.5, 2.5, 2.5	No people	No Hands	2.0 Kg extra	100 / 0	13.11	0.0001	0.829	0.003
V-C-12-F	4.5, 2.5, 2.5	No people	No Hands	1.5 Kg extra	100 / 0	18.43	0.0001	0.822	0.003
V-C-12-G	4.5, 2.5, 2.5	No people	No Hands	1.0 Kg extra	100 / 0	29.05	0.0001	0.831	0.003
V-C-12-H	4.5, 2.5, 2.5	No people	No Hands	0.5 Kg extra	100 / 0	60.93	0.0001	0.820	0.003

6.2.3 Interspersed Moderation Contingency

For the interspersed moderation contingency analysis, a parameter study of H_2O densities was performed. Results at water densities between 0% and 100% of full density were computed to find the most reactive density. The results of the parameter study can be found in Table 6.3.

It was found that once the water density exceeded 0.1 g/cc, the racks were effectively isolated from each other, the reactivity was reduced until full water density around each can was reached, which gave full reflection and the maximum reactivity. Full water reflection of a single can is more reactive than the array with interspersed moderation.

Table 6.3 Results of Interspersed Moderation Parameter Study.

Case	Description				Pu239/ Pu240	H/Pu	Interspersed Moderation	k_{eff}	$\pm \sigma$
	Cans	People	Hands	Extra Can					
Internal Moderation (Reduced Pu, Increased H ₂ O in can)									
V-C-21-A	4.5, 2.5, 2.5	No people	No Hands	Extra	100 / 0	2.00	0.005	0.837	0.003
V-C-21-B	4.5, 2.5, 2.5	No people	No Hands	Extra	100 / 0	2.00	0.010	0.851	0.003
V-C-21-C	4.5, 2.5, 2.5	No people	No Hands	Extra	100 / 0	2.00	0.100	0.858	0.003
V-C-21-D	4.5, 2.5, 2.5	No people	No Hands	Extra	100 / 0	2.00	0.250	0.828	0.003
V-C-21-E	4.5, 2.5, 2.5	No people	No Hands	Extra	100 / 0	2.00	0.500	0.833	0.003
V-C-21-F	4.5, 2.5, 2.5	No people	No Hands	Extra	100 / 0	2.00	0.750	0.854	0.003
V-C-21-G	4.5, 2.5, 2.5	No people	No Hands	Extra	100 / 0	2.00	1.000	0.868	0.003

6.2.4 Additional Cans of Material Contingency

PuO₂ filled cans are moved either one-at-a-time by hand or by the use of a five position wagon. The wagon is not allowed to be brought into the Vault #2 storage room. Therefore a contingency analysis with the wagon in the vault placed close to the south rack was performed. The wagon has five fixed positions for cans. For this analysis, the wagon was conservatively modeled as a 2 x 3 array of cans sitting on the concrete floor, each containing 4.5 of Pu. This is conservative since the actual wagon has five cans in a larger area than the six cans in the model. The wagon holds the cans up off of the concrete floor, and the spacing used maximized interaction between the cans on the wagon and the cans on the racks. The resulting $k_{eff} \pm 1\sigma$ of this case (V-C-31-A) is 0.837 ± 0.003 . Figure 6.2 shows a sketch of the vault with the wagon in it, and also shows how the cans were positioned to maximize their interaction with the wagon. Therefore, bringing a fully loaded wagon into the array does not pose a threat to the criticality safety of the vault.

6.2.5 4.5 Kg Plutonium Can in Wrong Racks Contingency

The cans containing a maximum 4.5 kg of plutonium are only allowed in one of the three racks in Vault #2. For the contingency analysis, three scenarios were modeled to cover all the wrong rack possibilities. The scenarios are as follows: 4.5 kg cans in south and middle racks with 2.5 kg cans in north rack, 4.5 kg cans in south and north racks with 2.5 kg cans in middle rack, and 4.5 kg cans in middle and north racks with 2.5 kg cans in south rack. The results of this analysis can be found in Table 6.4.

Figure 6.2. Sketch of Vault Floor with Extra Cans for the Wagon.

Table 6.4 Results of 4.5 Kg Cans in Wrong Racks Contingency Analysis.

Case	Description				Pu239/ Pu240	H/Pu	Interspersed Moderation	k_{eff}	$\pm \sigma$
	Cans	People	Hands	Extra Can					
Internal Moderation (Reduced Pu, Increased H ₂ O in can)									
V-C-41-A	4.5, 4.5, 2.5	No people	No Hands	No extra	100 / 0	2.00	0.0001	0.893	0.003
V-C-41-B	4.5, 2.5, 4.5	No people	No Hands	No extra	100 / 0	2.00	0.0001	0.883	0.003
V-C-41-C	2.5, 4.5, 4.5	No people	No Hands	No extra	100 / 0	2.00	0.0001	0.884	0.003

7.0 DESIGN FEATURES AND ADMINISTRATIVELY CONTROLLED LIMITS AND REQUIREMENTS

The administratively controlled limits applicable to this evaluation of the vault #2 storage racks are:

- 1) Only one can shall be placed in each storage cubicle location.
- 2) Cans with a total loading exceeding 2.5 kg of plutonium and equal to or less than 4.5 kg of plutonium in PuO₂ (5.1 kg of PuO₂.) are only allowed in one of the three racks. Both of the other two racks are limited to a plutonium loading not to exceed 2.5 kg.

- 3) The PuO_2 shall be moderation controlled to an H/Pu less than 2.
- 4) The wagon shall not be allowed to be brought into Vault #2.
- 5) The 2736-Z building and the vault #2 storage racks shall be seismically qualified.
- 6) The cubicles shall be 22.86 cm (9 in.) wide, 30.48 cm (12 in.) deep and 30.48 cm (12 in.) tall with a maximum variation of ± 0.318 cm (± 0.125 in.) in width, depth and height.
- 7) There shall be at least 83.82 cm (33 in.) between the south rack and the middle , and 31.75 cm (12.5 in.) between the middle rack and the north rack.
- 8) The south rack shall be a maximum of 36 cubicles wide and 7 cubicles high, and the other two racks shall be a maximum of 32 cubicles wide and 7 cubicles high.

These administrative limits are necessary since exceeding these limits would be considered a contingent condition. Additional contingencies beyond these conditions were not evaluated.

8.0 SUMMARY AND CONCLUSIONS

This analysis has shown that the operation described above in Section 2, under the controls listed in Section 7 is safe from a criticality stand point. No single identified contingencies were able to exceed the criticality safety limit of k_{eff} of 0.935 for plutonium systems calculated using the MONK6B code.

All results of this analysis can be found in Section 6. The base case used for the normal condition analysis, and as the basis for all off-normal scenarios (Case V-N-02-A) has a $k_{\text{eff}} \pm 1\sigma$ of 0.830 ± 0.003 . This was the worst normal case calculated.

For the off normal condition (contingency) analysis the overbatch case (V-C-01-A) had a calculated $k_{\text{eff}} \pm 1\sigma$ of 0.834 ± 0.003 . The worst case in the internal moderation analysis (Case V-C-11-D) has a final $k_{\text{eff}} \pm 1\sigma$ of 0.834 ± 0.003 . The worst case, without being fully reflected, in the interspersed moderation analysis (Case V-C-21-C) has a $k_{\text{eff}} \pm 1\sigma$ of 0.858 ± 0.003 . The $k_{\text{eff}} \pm 1\sigma$ for the fully reflected case (V-C-21-G) is 0.868 ± 0.003 . The resulting $k_{\text{eff}} \pm 1\sigma$ for the wagon case (V-C-31-A) is 0.837 ± 0.003 . The worst calculated result for the extra rack of 4.5 Kg Pu cans was case V-C-41-A with the south and middle racks filled. This case had a $k_{\text{eff}} \pm 1\sigma$ of 0.893 ± 0.003 . This last case had the highest k_{eff} found for all of the contingency cases considered.

As can be seen all of the normal and off-normal results are below the criticality safety limit. This also shows that it is acceptable to increase the mass loading of the cans from 2.5 Kg of plutonium to 4.5 Kg of plutonium on one of the three available racks in Vault #2.

9.0 REFERENCES

- Carter, R. D., G. R. Kiel, and K. R. Ridgway, 1968, *Criticality Handbook*, ARH-600, 1980 Revision, Atlantic Richfield Hanford Company, Richland, Washington.
- Macklin, L.J. and E.M. Miller, 1992, CCVR 91-001; MONK6A Pu Validation, WHC-SD-SQA-CSWD-20015, REV. 0, Westinghouse Hanford Company, Richland, Washington.
- Miller, E.M., 1994, CCVR 94-001; MONK6B Pu Validation, WHC-SD-SQA-CSWD-20019, REV. 0, Westinghouse Hanford Company, Richland, Washington.
- UKEAE, 1988, MONK6A Monte Carlo Code for Criticality Calculations, Users Manual, AEEW R2195, Answers Business Center, Winfirth Technology Centre, Dorchester, Dorset, DT2 8DH, United Kingdom.

APPENDIX A
INDEPENDENT REVIEW COMMENTS AND CHECKLIST

This page intentionally left blank

An independent technical review of *CSER 96-028: PFP Vault #2 Storage Racks*, was done by R. F. Richard, staff member of the Criticality and Shielding group. His comments are as follows:

The objective of this CSER is to increase the approved plutonium mass limit allowed in each cubicle for one of the Vault #2 Storage racks. The current limit is 2.5 kg of PuO_2 per storage cubicle. This CSER will allow 4.5 kg of plutonium in PuO_2 per storage cubicle in one rack.

The analysis addressed normal storage conditions including an additional can being moved in front of the storage racks and two people in close proximity to the storage racks. Also addressed were contingencies such as material overbatch in a can, internal can moderation, moderation between cans, 5 position transport wagon between racks, and an extra rack with 4.5 kg plutonium cans. All normal and contingency conditions are subcritical with an adequate margin of safety.

The computer code input files were checked for correctness of geometry, materials and atom densities. Output files were checked for convergence. Results were accurately reported. The author repeated some of the calculations with SCALE (KENO V.a) to verify the MONK6B results.

Conservatism was introduced into the calculations by modeling the cans, in pairs of cubicles, to be adjacent rather than centered in each cubicle of the rack. This simulates storage of two cans in a single cubicle. In addition, calculations with the transport wagon included cans on the wagon being next to pairs of cans on the rack, thereby having three cans together. Additional conservatism was included by having the two storage racks north of the south wall to be modeled as having 36 columns rather than the actual 32 columns. Also the racks are spaced closer together than they are actually.

The analysis shows that internal moderation of the cans has a negligible affect on k_{eff} . Interspersed moderation up to full water density encompassing all three racks has a k_{eff} well below the limit, and therefore bounds any conceivable water flooding.

Scenarios involving misloading cans onto the wrong rack resulting in two racks of 4.5 kg cans were addressed. Even if this contingency were to occur, k_{eff} would remain below the allowable limit.

Based on the examination of the input data, assumptions and computer output this reviewer concurs with the conclusions of the CSER. It is acceptable to increase the mass loading of the cans from 2.5 kg of plutonium to 4.5 kg of plutonium on one of the three available racks in Vault #2.

CHECKLIST FOR INDEPENDENT REVIEWDocument Reviewed: CSER 96-028: PFP Vault #2 Storage RacksAuthor: D. G. Erickson

Yes No N/A

☒	☐	☐	Problem completely defined.
☒	☐	☐	Necessary assumptions explicitly stated and supported.
☒	☐	☐	Computer codes and data files documented.
☒	☐	☐	Data checked for consistency with original source information as applicable.
☐	☐	☒	Mathematical derivations checked including dimensional consistency of results.
☒	☐	☐	Models appropriate and used within range of validity or use outside range of established validity justified.
☒	☐	☐	Hand calculations checked for errors.
☒	☐	☐	Code run streams correct and consistent with analysis documentation.
☒	☐	☐	Code output consistent with input and with results reported in analysis documentation.
☒	☐	☐	Acceptability limits on analytical results applicable and supported. Limits checked against sources.
☒	☐	☐	Safety margins consistent with good engineering practices.
☒	☐	☐	Conclusions consistent with analytical results and applicable limits.
☒	☐	☐	Results and conclusions address all points required in the problem statement.
☒	☐	☐	Have all reasonable accidents been considered?
☒	☐	☐	Has low density water (steam) been evaluated as a moderator?
☒	☐	☐	Is the fuel and other hardware composition correct?
☒	☐	☐	Are the cases considered conservative? Too conservative?
☒	☐	☐	Do the computer models adequately reflect the actual geometry? Have cross sectional cuts of the geometry been made and do they show the desired geometry?
☐	☐	☒	Has the analysis been reviewed by Safety? This may not be required in a preliminary design.
☒	☐	☐	Has the reviewer completed the Criticality Safety Course for Managers and Engineers?

Date completed 5/23/96

Reviewed by: R.F. Rickard Date 11/25/96

NOTE: Any hand calculations, notes, or summaries generated as part of this review should be signed, dated, and attached to this checklist. Materials should be labeled and recorded so that it is intelligible to a technically-qualified third party.

APPENDIX B
ALL INPUT FILES

This page intentionally left blank

[illegible]

```

1 CUBOID ORIGIN 0 0 0 6 22.8600 30.4800 0 0 0
* Part 8 Array of 3 racks by 36 cubicles wide by 7 cubicles high
ARRAY 36 7
(1 2)*18 (7)*36 (5 6)*18 (7)*36 (3 4)*18 (7)*36
(1 2)*18 (7)*36 (5 6)*18 (7)*36 (3 4)*18 (7)*36
(1 2)*18 (7)*36 (5 6)*18 (7)*36 (3 4)*18 (7)*36
(1 2)*18 (7)*36 (5 6)*18 (7)*36 (3 4)*18 (7)*36
(1 2)*18 (7)*36 (5 6)*18 (7)*36 (3 4)*18 (7)*36
(1 2)*18 (7)*36 (5 6)*18 (7)*36 (3 4)*18 (7)*36
(1 2)*18 (7)*36 (5 6)*18 (7)*36 (3 4)*18 (7)*36
(1 2)*18 (7)*36 (5 6)*18 (7)*36 (3 4)*18 (7)*36
* Part 9 The rest of it
NEST 3
1 CUBOID PS 411.48 213.36 213.36 -411.48 0.00 0.00
2 CUBOID 6 411.48 365.76 304.80 -411.48 0.00 0.00
3 CUBOID 4 441.96 396.24 335.28 -441.96 -30.48 -30.48
*End of Model
*Control Data
*VENTILATION 5 1.0 STDV 0.0030 -1
*FISSILE REGION 1 IN PART 9 /
END
.....
* V-N-01-D-10p
* Vault #2, Pu239/240 = 95/5, H/Pu = 0, Inter = 0.0001
* 4.5, 2.5, 2.5, no people no hands, no extra
FISSION
* material 1 - Contents PuO2
* material 2 - Water H2O
* material 3 - 304 Stainless
* material 4 - Poly Concrete
* material 5 - Poly CH2
* material 6 - Air (0.0001 H2O)
6 13 NUCNAMES
ATOM 6.24 PU239 0.95 MU240 0.05 0.20
CONC 0.998 HINIZO 0.0 C 1.0
CR 1.74268-02 MS 1.79433E-03 FE 5.93579E-02 NI 7.72974E-03
CONC 0.0001 HINIZO 0.0 AL7 0.003356 SI 0.012995
CA 0.0024547 FK 0.0033437
ATOM 0.36 HINIZO 2.0 C 1.0
ATOM 0.0001 HINIZO 2.0 C 1.0
CN
* Part 1 (4.5 Kg Pu) Can in Right Rear
NEST 4
1 ZROD ORIGIN 0 0 -0.0000 1 4.3428 13.8992
2 ZROD ORIGIN 0 0 -0.0000 6 4.3428 20.2743
3 ZROD ORIGIN 0 0 -0.0229 3 4.3656 20.3200
4 CUBOID ORIGIN 0 0 -0.0229 6 5.0000 25.4800 30.4800 -17.8600 -5.0000 0.0000
* Part 2 (4.5 Kg Pu) Can in Left Rear
NEST 4
1 ZROD ORIGIN 0 0 -0.0000 1 4.3428 13.8992
2 ZROD ORIGIN 0 0 -0.0000 6 4.3428 20.2743
3 ZROD ORIGIN 0 0 -0.0229 3 4.3656 20.3200
4 CUBOID ORIGIN 0 0 -0.0229 6 17.8600 25.4800 30.4800 -5.0000 -5.0000 0.0000
* Part 3 (2.5 Kg Pu) Can in Right Rear
NEST 4
1 ZROD ORIGIN 0 0 -0.0000 1 4.3428 13.8992
2 ZROD ORIGIN 0 0 -0.0000 6 4.3428 20.2743
3 ZROD ORIGIN 0 0 -0.0229 3 4.3656 20.3200
4 CUBOID ORIGIN 0 0 -0.0229 6 17.8600 25.4800 30.4800 -5.0000 -5.0000 0.0000
* Part 4 (2.5 Kg Pu) Can in Left Rear
NEST 4
1 ZROD ORIGIN 0 0 -0.0000 1 4.3428 13.8992
2 ZROD ORIGIN 0 0 -0.0000 6 4.3428 20.2743
3 ZROD ORIGIN 0 0 -0.0229 3 4.3656 20.3200
4 CUBOID ORIGIN 0 0 -0.0229 6 17.8600 25.4800 30.4800 -5.0000 -5.0000 0.0000
* Part 5 (2.5 Kg Pu) Can in Right Front
NEST 4
1 ZROD ORIGIN 0 0 -0.0000 1 4.3428 13.8992
2 ZROD ORIGIN 0 0 -0.0000 6 4.3428 20.2743
3 ZROD ORIGIN 0 0 -0.0229 3 4.3656 20.3200
4 CUBOID ORIGIN 0 0 -0.0229 6 5.0000 30.4800 -17.8600 -5.0000 0.0000
* Part 6 (2.5 Kg Pu) Can in Left Front
NEST 4
1 ZROD ORIGIN 0 0 -0.0000 1 4.3428 13.8992
2 ZROD ORIGIN 0 0 -0.0000 6 4.3428 20.2743
3 ZROD ORIGIN 0 0 -0.0229 3 4.3656 20.3200
4 CUBOID ORIGIN 0 0 -0.0229 6 17.8600 25.4800 30.4800 -5.0000 -5.0000 0.0000
* Part 7 Air for space
NEST 1
1 CUBOID ORIGIN 0 0 0 6 22.8600 30.4800 0 0 0
* Part 8 Array of 3 racks by 36 cubicles wide by 7 cubicles high
ARRAY 36 7
(1 2)*18 (7)*36 (5 6)*18 (7)*36 (3 4)*18 (7)*36
(1 2)*18 (7)*36 (5 6)*18 (7)*36 (3 4)*18 (7)*36
(1 2)*18 (7)*36 (5 6)*18 (7)*36 (3 4)*18 (7)*36
(1 2)*18 (7)*36 (5 6)*18 (7)*36 (3 4)*18 (7)*36
(1 2)*18 (7)*36 (5 6)*18 (7)*36 (3 4)*18 (7)*36
(1 2)*18 (7)*36 (5 6)*18 (7)*36 (3 4)*18 (7)*36
(1 2)*18 (7)*36 (5 6)*18 (7)*36 (3 4)*18 (7)*36
(1 2)*18 (7)*36 (5 6)*18 (7)*36 (3 4)*18 (7)*36
(1 2)*18 (7)*36 (5 6)*18 (7)*36 (3 4)*18 (7)*36
* Part 9 The rest of it
NEST 3
1 CUBOID PS 411.48 213.36 213.36 -411.48 0.00 0.00
2 CUBOID 6 411.48 365.76 304.80 -411.48 0.00 0.00
3 CUBOID 4 441.96 396.24 335.28 -441.96 -30.48 -30.48
*End of Model
*Control Data
*VENTILATION 5 1.0 STDV 0.0030 -1
*FISSILE REGION 1 IN PART 9 /
END
.....
* V-N-02-A-10p
* Vault #2, Pu239/240 = 100/0, H/Pu = 2, Inter = 0.0001
* 4.5, 2.5, 2.5, no people, no hands, extra
FISSION
* material 1 - Contents PuO2-H2O
* material 2 - Water H2O
* material 3 - 304 Stainless
* material 4 - Concrete
* material 5 - Poly CH2
* material 6 - Air (0.0001 H2O)
6 12 NUCNAMES
ATOM 6.24 PU239 2.0 MU240 0.0 0.20
CONC 0.998 HINIZO 0.0 C 1.0
CR 1.74268-02 MS 1.79433E-03 FE 5.93579E-02 NI 7.72974E-03
CONC 0.0001 HINIZO 0.0 AL7 0.003356 SI 0.012995
CA 0.0024547 FK 0.0033437
ATOM 0.36 HINIZO 2.0 C 1.0
ATOM 0.0001 HINIZO 2.0 C 1.0
CN
* Part 1 (4.5 Kg Pu) Can in Right Rear
NEST 4
1 ZROD ORIGIN 0 0 -0.0000 1 4.3428 13.8992
2 ZROD ORIGIN 0 0 -0.0000 6 4.3428 20.2743
3 ZROD ORIGIN 0 0 -0.0229 3 4.3656 20.3200
4 CUBOID ORIGIN 0 0 -0.0229 6 5.0000 25.4800 30.4800 -17.8600 -5.0000 0.0000
* Part 2 (4.5 Kg Pu) Can in Left Rear
NEST 4
1 ZROD ORIGIN 0 0 -0.0000 1 4.3428 13.8992
2 ZROD ORIGIN 0 0 -0.0000 6 4.3428 20.2743
3 ZROD ORIGIN 0 0 -0.0229 3 4.3656 20.3200
4 CUBOID ORIGIN 0 0 -0.0229 6 17.8600 25.4800 30.4800 -5.0000 -5.0000 0.0000
* Part 3 (2.5 Kg Pu) Can in Right Rear
NEST 4
1 ZROD ORIGIN 0 0 -0.0000 1 4.3428 13.8992
2 ZROD ORIGIN 0 0 -0.0000 6 4.3428 20.2743
3 ZROD ORIGIN 0 0 -0.0229 3 4.3656 20.3200
4 CUBOID ORIGIN 0 0 -0.0229 6 17.8600 25.4800 30.4800 -5.0000 -5.0000 0.0000
* Part 4 (2.5 Kg Pu) Can in Left Rear
NEST 4
1 ZROD ORIGIN 0 0 -0.0000 1 4.3428 13.8992
2 ZROD ORIGIN 0 0 -0.0000 6 4.3428 20.2743
3 ZROD ORIGIN 0 0 -0.0229 3 4.3656 20.3200
4 CUBOID ORIGIN 0 0 -0.0229 6 17.8600 25.4800 30.4800 -5.0000 -5.0000 0.0000

```

5 CUBOID ORIGIN 0 0 -0.0229 6 15.8600 7.0000 30.4800 -7.0000 -23.4800 0.0000
 * Part 10 Water for Person
 NEST 4
 1 CUBOID ORIGIN 0 0 6 22.8600 30.4800 30.4800 0 0 0
 * Part 11 (4.5 Kg Pu) Extra Can in Right Rear
 NEST 5
 1 2R0D ORIGIN 0 0 -0.0000 1 4.3428 13.8092
 2 2R0D ORIGIN 0 0 -0.0000 6 4.3428 20.2743
 3 2R0D ORIGIN 0 0 -0.0229 3 4.3656 20.3200
 4 2R0D ORIGIN 0 0 -0.0229 6 6.9056 20.3200
 5 CUBOID ORIGIN 0 0 -0.0229 6 7.0000 23.4800 30.4800 -15.8600 -7.0000 0.0000
 * Part 12 Array of 3 racks by 36 cubicles wide by 7 cubicles high
 ARRAY 36 7
 1 21+18 (10)+4 (7)+32 (7)+36 (5 6)+18 (7)+36 (3 4)+18 (7)+36
 1 21+18 (10)+4 (7)+32 (7)+36 (5 6)+18 (7)+36 (3 4)+18 (7)+36
 1 21+18 (10)+4 (7)+32 (7)+36 (3 4 3 (5 6)+16 (7)+36 (3 4)+18 (7)+36
 8 9 9 (1 2)+16 10 11 10 10 (7)+32 (7)+36 3 4 3 3
 1 (1 2)+18 (10)+4 (7)+32 (7)+36 3 4 3 (5 6)+16 (7)+36 (3 4)+18 (7)+36
 1 (1 2)+18 (10)+4 (7)+32 (7)+36 (5 6)+18 (7)+36 (3 4)+18 (7)+36
 1 (1 2)+18 (7)+36 (7)+36 (5 6)+18 (7)+36 (3 4)+18 (7)+36
 * Part 13 The rest of it
 NEST 3
 1 CUBOID P12 411.48 213.36 213.36 -411.48 0.00 0.00
 2 CUBOID 6 411.48 365.76 304.80 -411.48 0.00 0.00
 3 CUBOID 4 441.56 396.24 335.20 -441.56 -30.48 -30.48
 *End of model!
 *Control Data
 SUPERHEAT 5 1.0
 -5 250 100 0 STOV 0.0030 -1
 END
 FISSION REGION 1 IN PART 13 /
 FISSION
 * V-N-02-Bump
 * Vault 2, Pu239/240 = 100/0, H/Pu = 2, Inter = 0.0001
 4.5, 2.5, 2.5, no people, hands, extra
 FISSION
 * Material 1 - Contents PuO2-H2O
 * Material 2 - Water H2O
 * Material 3 - 304 Stainless
 * Material 5 - Poly CH2
 * Material 6 - Air (0.0001 H2O)
 NUCLENAMES
 6 12
 ATOM 6.65 PU239 1.00 0.30 HINRZO 2.0
 ATOM 0.998 HINRZO 2.0 0.10
 ATOM 0.998 HINRZO 2.0 0.10
 CONC H 0.07023 0.045396-02 FE 5.93159E-02 NI 7.72074E-03
 CONC CA 0.0026167 FE 0.0013437
 ATOM 0.96 HINRZO 2.0 C 1.0
 ATOM 0.0001 HINRZO 2.0 0.10
 CM
 * Part 1 (4.5 Kg Pu) Can in Right Rear
 NEST 4
 1 2R0D ORIGIN 0 0 -0.0000 1 4.3428 13.8092
 2 2R0D ORIGIN 0 0 -0.0000 6 4.3428 20.2743
 3 2R0D ORIGIN 0 0 -0.0229 3 4.3656 20.3200
 4 2R0D ORIGIN 0 0 -0.0229 6 6.9056 20.3200
 5 CUBOID ORIGIN 0 0 -0.0229 6 7.0000 23.4800 30.4800 -15.8600 -23.4800 0.0000
 * Part 2 (4.5 Kg Pu) Can in Left Rear
 NEST 4
 1 2R0D ORIGIN 0 0 -0.0000 1 4.3428 13.8092
 2 2R0D ORIGIN 0 0 -0.0000 6 4.3428 20.2743
 3 2R0D ORIGIN 0 0 -0.0229 3 4.3656 20.3200
 4 CUBOID ORIGIN 0 0 -0.0229 6 7.0000 23.4800 30.4800 -15.8600 -23.4800 0.0000
 * Part 3 (2.5 Kg Pu) Can in Right Rear
 NEST 4
 1 2R0D ORIGIN 0 0 -0.0000 1 4.3428 7.6718
 2 2R0D ORIGIN 0 0 -0.0000 6 4.3428 20.2743
 3 2R0D ORIGIN 0 0 -0.0229 3 4.3656 20.3200
 4 CUBOID ORIGIN 0 0 -0.0229 6 5.0000 25.4800 30.4800 -17.8600 -5.0000 0.0000
 * Part 4 (2.5 Kg Pu) Can in Left Rear
 NEST 4
 1 2R0D ORIGIN 0 0 -0.0000 1 4.3428 7.6718
 2 2R0D ORIGIN 0 0 -0.0000 6 4.3428 20.2743
 3 2R0D ORIGIN 0 0 -0.0229 3 4.3656 20.3200
 4 CUBOID ORIGIN 0 0 -0.0229 6 5.0000 25.4800 30.4800 -17.8600 -5.0000 0.0000
 * Part 5 (2.5 Kg Pu) Can in Right Front
 NEST 4
 1 2R0D ORIGIN 0 0 -0.0000 1 4.3428 7.6718
 2 2R0D ORIGIN 0 0 -0.0000 6 4.3428 20.2743
 3 2R0D ORIGIN 0 0 -0.0229 3 4.3656 20.3200
 4 CUBOID ORIGIN 0 0 -0.0229 6 5.0000 25.4800 30.4800 -17.8600 -5.0000 0.0000
 * Part 6 (2.5 Kg Pu) Can in Left Front
 NEST 4
 1 2R0D ORIGIN 0 0 -0.0000 1 4.3428 7.6718
 2 2R0D ORIGIN 0 0 -0.0000 6 4.3428 20.2743
 3 2R0D ORIGIN 0 0 -0.0229 3 4.3656 20.3200
 4 CUBOID ORIGIN 0 0 -0.0229 6 5.0000 25.4800 30.4800 -17.8600 -5.0000 0.0000
 * Part 7 Air for space
 NEST 1
 1 CUBOID ORIGIN 0 0 6 22.8600 30.4800 30.4800 0 0 0
 * Part 8 (4.5 Kg Pu) Can in Right Front with hands
 NEST 5
 1 2R0D ORIGIN 0 0 -0.0000 1 4.3428 13.8092
 2 2R0D ORIGIN 0 0 -0.0000 6 4.3428 20.2743
 3 2R0D ORIGIN 0 0 -0.0229 3 4.3656 20.3200
 4 2R0D ORIGIN 0 0 -0.0229 6 6.9056 20.3200
 5 CUBOID ORIGIN 0 0 -0.0229 6 7.0000 23.4800 30.4800 -15.8600 -23.4800 0.0000
 * Part 9 (4.5 Kg Pu) Can in Left Front with hands
 NEST 5
 1 2R0D ORIGIN 0 0 -0.0000 1 4.3428 13.8092
 2 2R0D ORIGIN 0 0 -0.0000 6 4.3428 20.2743
 3 2R0D ORIGIN 0 0 -0.0229 3 4.3656 20.3200
 4 2R0D ORIGIN 0 0 -0.0229 6 6.9056 20.3200

WHC-SD-SQA-CSA-524 Rev. 0

[illegible]

WHC-SD-SQA-CSA-524 Rev. 0

[illegible]

WHC-SD-SQA-CSA-524 Rev. 0

[illegible]

WHC-SD-SQA-CSA-524 Rev. 0

* Part 6 Array of 3 racks by 36 cubicles wide by 7 cubicles high
 4 CUBOID ORIGIN 0 0 -0.0229 6 5.0000 25.4800 30.4800 -17.8600 -5.0000 0.0000
 * Part 4 (2.5 Kg Pu) Can in Left Rear
 NEST 4
 1 2R00 ORIGIN 0 0 -0.0000 1 4.3428 7.6718
 2 2R00 ORIGIN 0 0 -0.0000 6 4.3428 20.2743
 3 2R00 ORIGIN 0 0 -0.0229 3 4.3656 20.2743
 4 CUBOID ORIGIN 0 0 -0.0229 6 17.8600 25.4800 30.4800 -5.0000 -5.0000 0.0000
 * Part 5 (2.5 Kg Pu) Can in Right Front
 NEST 4
 1 2R00 ORIGIN 0 0 -0.0600 1 4.3428 7.6718
 2 2R00 ORIGIN 0 0 -0.0000 6 4.3428 20.2743
 3 2R00 ORIGIN 0 0 -0.0229 3 4.3656 20.3200
 4 CUBOID ORIGIN 0 0 -0.0229 6 5.0000 30.4800 -17.8600 -25.4800 0.0000
 * Part 6 (2.5 Kg Pu) Can in Left Front
 NEST 4
 1 2R00 ORIGIN 0 0 -0.0000 1 4.3428 7.6718
 2 2R00 ORIGIN 0 0 -0.0000 6 4.3428 20.2743
 3 2R00 ORIGIN 0 0 -0.0229 3 4.3656 20.3200
 4 CUBOID ORIGIN 0 0 -0.0229 6 5.0000 30.4800 -17.8600 -25.4800 0.0000
 * Part 7 Air for space
 NEST 4
 1 CUBOID ORIGIN 0 0 6.22 8600 30.4800 30.4800 0 0 0

* Part 8 Array of 3 racks by 36 cubicles wide by 7 cubicles high
 4 CUBOID ORIGIN 0 0 -0.0229 6 5.0000 25.4800 30.4800 -17.8600 -5.0000 0.0000
 * Part 4 (2.5 Kg Pu) Can in Left Rear
 NEST 4
 1 2R00 ORIGIN 0 0 -0.0000 1 4.3428 7.6718
 2 2R00 ORIGIN 0 0 -0.0000 6 4.3428 20.2743
 3 2R00 ORIGIN 0 0 -0.0229 3 4.3656 20.2743
 4 CUBOID ORIGIN 0 0 -0.0229 6 17.8600 25.4800 30.4800 -5.0000 -5.0000 0.0000
 * Part 5 (2.5 Kg Pu) Can in Right Front
 NEST 4
 1 2R00 ORIGIN 0 0 -0.0000 1 4.3428 7.6718
 2 2R00 ORIGIN 0 0 -0.0000 6 4.3428 20.2743
 3 2R00 ORIGIN 0 0 -0.0229 3 4.3656 20.3200
 4 CUBOID ORIGIN 0 0 -0.0229 6 5.0000 30.4800 -17.8600 -25.4800 0.0000
 * Part 6 (2.5 Kg Pu) Can in Left Front
 NEST 4
 1 2R00 ORIGIN 0 0 -0.0000 1 4.3428 7.6718
 2 2R00 ORIGIN 0 0 -0.0000 6 4.3428 20.2743
 3 2R00 ORIGIN 0 0 -0.0229 3 4.3656 20.3200
 4 CUBOID ORIGIN 0 0 -0.0229 6 5.0000 30.4800 -17.8600 -25.4800 0.0000
 * Part 7 Air for space
 NEST 4
 1 CUBOID ORIGIN 0 0 6.22 8600 30.4800 30.4800 0 0 0

* Part 9 The rest of it
 NEST 3
 1 CUBOID P8 411.48 213.36 213.36 -411.48 0.00 0.00
 2 CUBOID P8 411.48 365.76 304.80 -411.48 0.00 0.00
 3 CUBOID 4 441.96 396.24 335.28 -441.96 -30.48 -30.48
 *End of model
 *Control Data
 5 1.0
 250 100 0
 -5 HINZ0 2.0
 FISSILE REGION 1 IN PART 9 /
 FISSION REGION 1 IN PART 9 /
 END

 * Part 9 The rest of it
 NEST 3
 1 CUBOID P8 411.48 213.36 213.36 -411.48 0.00 0.00
 2 CUBOID P8 411.48 365.76 304.80 -411.48 0.00 0.00
 3 CUBOID 4 441.96 396.24 335.28 -441.96 -30.48 -30.48
 *End of model
 *Control Data
 5 1.0
 250 100 0
 -5 HINZ0 2.0
 FISSILE REGION 1 IN PART 9 /
 FISSION REGION 1 IN PART 9 /
 END

 * Part 9 The rest of it
 NEST 3
 1 CUBOID P8 411.48 213.36 213.36 -411.48 0.00 0.00
 2 CUBOID P8 411.48 365.76 304.80 -411.48 0.00 0.00
 3 CUBOID 4 441.96 396.24 335.28 -441.96 -30.48 -30.48
 *End of model
 *Control Data
 5 1.0
 250 100 0
 -5 HINZ0 2.0
 FISSILE REGION 1 IN PART 9 /
 FISSION REGION 1 IN PART 9 /
 END

 * Part 9 The rest of it
 NEST 3
 1 CUBOID P8 411.48 213.36 213.36 -411.48 0.00 0.00
 2 CUBOID P8 411.48 365.76 304.80 -411.48 0.00 0.00
 3 CUBOID 4 441.96 396.24 335.28 -441.96 -30.48 -30.48
 *End of model
 *Control Data
 5 1.0
 250 100 0
 -5 HINZ0 2.0
 FISSILE REGION 1 IN PART 9 /
 FISSION REGION 1 IN PART 9 /
 END

 * Part 9 The rest of it
 NEST 3
 1 CUBOID P8 411.48 213.36 213.36 -411.48 0.00 0.00
 2 CUBOID P8 411.48 365.76 304.80 -411.48 0.00 0.00
 3 CUBOID 4 441.96 396.24 335.28 -441.96 -30.48 -30.48
 *End of model
 *Control Data
 5 1.0
 250 100 0
 -5 HINZ0 2.0
 FISSILE REGION 1 IN PART 9 /
 FISSION REGION 1 IN PART 9 /
 END

 * Part 9 The rest of it
 NEST 3
 1 CUBOID P8 411.48 213.36 213.36 -411.48 0.00 0.00
 2 CUBOID P8 411.48 365.76 304.80 -411.48 0.00 0.00
 3 CUBOID 4 441.96 396.24 335.28 -441.96 -30.48 -30.48
 *End of model
 *Control Data
 5 1.0
 250 100 0
 -5 HINZ0 2.0
 FISSILE REGION 1 IN PART 9 /
 FISSION REGION 1 IN PART 9 /
 END

 * Part 9 The rest of it
 NEST 3
 1 CUBOID P8 411.48 213.36 213.36 -411.48 0.00 0.00
 2 CUBOID P8 411.48 365.76 304.80 -411.48 0.00 0.00
 3 CUBOID 4 441.96 396.24 335.28 -441.96 -30.48 -30.48
 *End of model
 *Control Data
 5 1.0
 250 100 0
 -5 HINZ0 2.0
 FISSILE REGION 1 IN PART 9 /
 FISSION REGION 1 IN PART 9 /
 END

 * Part 9 The rest of it
 NEST 3
 1 CUBOID P8 411.48 213.36 213.36 -411.48 0.00 0.00
 2 CUBOID P8 411.48 365.76 304.80 -411.48 0.00 0.00
 3 CUBOID 4 441.96 396.24 335.28 -441.96 -30.48 -30.48
 *End of model
 *Control Data
 5 1.0
 250 100 0
 -5 HINZ0 2.0
 FISSILE REGION 1 IN PART 9 /
 FISSION REGION 1 IN PART 9 /
 END

 * Part 9 The rest of it
 NEST 3
 1 CUBOID P8 411.48 213.36 213.36 -411.48 0.00 0.00
 2 CUBOID P8 411.48 365.76 304.80 -411.48 0.00 0.00
 3 CUBOID 4 441.96 396.24 335.28 -441.96 -30.48 -30.48
 *End of model
 *Control Data
 5 1.0
 250 100 0
 -5 HINZ0 2.0
 FISSILE REGION 1 IN PART 9 /
 FISSION REGION 1 IN PART 9 /
 END

 * Part 9 The rest of it
 NEST 3
 1 CUBOID P8 411.48 213.36 213.36 -411.48 0.00 0.00
 2 CUBOID P

[illegible]

WHC-SD-SQA-CSA-524 Rev. 0

END	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
END	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
END	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
END	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
END	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
END	1	2	3	4	5	6																																																																																														

WHC-SD-SQA-CSA-524 Rev. 0

[illegible]

[illegible]

WHC-SD-SQA-CSA-524 Rev. 0

* Part 10 Water for person									
1	CUBOID	ORIGIN 0 0	0	22.8600	30.4800	0	0	0	0.0000
NEST 1									
* Part 2 (4.5 Kg Pu) Extra Can in Right Rear									
NEST 5									
1	ZROD	ORIGIN 0 0 -0.0000 1	4.3428	13.8992					
2	ZROD	ORIGIN 0 0 -0.0000 6	4.3428	20.2743					
3	ZROD	ORIGIN 0 0 -0.0000 6	4.3428	20.2743					
4	ZROD	ORIGIN 0 0 -0.0229 6	4.3556	20.3200					
5	CUBOID	ORIGIN 0 0 -0.0229 6	13.8600	23.4800	30.4800	-3.0000	-5.0000	0.0000	
* Part 3 (2.5 Kg Pu) Can in Right Rear									
NEST 4									
1	ZROD	ORIGIN 0 0 -0.0000 1	4.3428	13.8992					
2	ZROD	ORIGIN 0 0 -0.0000 6	4.3428	20.2743					
3	ZROD	ORIGIN 0 0 -0.0229 6	4.3556	20.3200					
4	CUBOID	ORIGIN 0 0 -0.0229 6	5.0000	25.4800	30.4800	-17.8600	-5.0000	0.0000	
* Part 4 (2.5 Kg Pu) Can in Left Rear									
NEST 4									
1	ZROD	ORIGIN 0 0 -0.0000 1	4.3428	13.8992					
2	ZROD	ORIGIN 0 0 -0.0000 6	4.3428	20.2743					
3	ZROD	ORIGIN 0 0 -0.0229 6	4.3556	20.3200					
4	CUBOID	ORIGIN 0 0 -0.0229 6	5.0000	25.4800	30.4800	-17.8600	-5.0000	0.0000	
* Part 5 (2.5 Kg Pu) Can in Right Front									
NEST 4									
1	ZROD	ORIGIN 0 0 -0.0000 1	4.3428	13.8992					
2	ZROD	ORIGIN 0 0 -0.0000 6	4.3428	20.2743					
3	ZROD	ORIGIN 0 0 -0.0229 6	4.3556	20.3200					
4	CUBOID	ORIGIN 0 0 -0.0229 6	5.0000	25.4800	30.4800	-17.8600	-5.0000	0.0000	
* Part 6 (2.5 Kg Pu) Can in Left Front									
NEST 4									
1	ZROD	ORIGIN 0 0 -0.0000 1	4.3428	13.8992					
2	ZROD	ORIGIN 0 0 -0.0000 6	4.3428	20.2743					
3	ZROD	ORIGIN 0 0 -0.0229 6	4.3556	20.3200					
4	CUBOID	ORIGIN 0 0 -0.0229 6	5.0000	25.4800	30.4800	-17.8600	-5.0000	0.0000	
* Part 7 Air for space									
NEST 1									
1	CUBOID	ORIGIN 0 0 0	22.8600	30.4800	30.4800	0	0	0	
* Part 8 (4.5 Kg Pu, H/Pu=3.00) Can in Right Front with no hands									
NEST 4									
1	ZROD	ORIGIN 0 0 -0.0000 7	4.3428	20.2743					
2	ZROD	ORIGIN 0 0 -0.0000 6	4.3428	20.2743					
3	ZROD	ORIGIN 0 0 -0.0229 6	4.3556	20.3200					
4	CUBOID	ORIGIN 0 0 -0.0229 6	7.0000	30.4800	-15.8600	-23.4800	0.0000		
* Part 9 (4.5 Kg Pu) Can in Left Front with no hands									
NEST 4									
1	ZROD	ORIGIN 0 0 -0.0000 1	4.3428	13.8992					
2	ZROD	ORIGIN 0 0 -0.0000 6	4.3428	20.2743					
3	ZROD	ORIGIN 0 0 -0.0229 6	4.3556	20.3200					
4	CUBOID	ORIGIN 0 0 -0.0229 6	5.0000	25.4800	30.4800	-17.8600	-5.0000	0.0000	
* Part 10 Water for person									
NEST 5									
1	CUBOID	ORIGIN 0 0 0	22.8600	30.4800	30.4800	0	0	0	
* Part 11 (4.5 Kg Pu) Extra Can in Right Rear									
NEST 5									
1	ZROD	ORIGIN 0 0 -0.0000 1	4.3428	13.8992					
2	ZROD	ORIGIN 0 0 -0.0000 6	4.3428	20.2743					
3	ZROD	ORIGIN 0 0 -0.0229 6	4.3556	20.3200					
4	ZROD	ORIGIN 0 0 -0.0229 6	4.9056	20.3200					
5	CUBOID	ORIGIN 0 0 -0.0229 6	7.0000	23.4800	30.4800	-15.8600	-7.0000	0.0000	
* Part 12 Array of 3 racks by 36 vehicles wide by 7 vehicles high									
ARRAY 18 7									
1	21+18	(101+4 (7)+32 (7)+36 (5 6)+18 (3 4)+18 (7)+36							
1	21+18	(101+4 (7)+32 (7)+36 (5 6)+18 (3 4)+18 (7)+36							
2	21+18	(101+4 (7)+32 (7)+36 (5 6)+18 (3 4)+18 (7)+36							
8	8 9	1 (1)+18 (101+4 (7)+32 (7)+36 (5 6)+18 (3 4)+18 (7)+36							
1	21+18	(101+4 (7)+32 (7)+36 (5 6)+18 (3 4)+18 (7)+36							
1	21+18	(101+4 (7)+32 (7)+36 (5 6)+18 (3 4)+18 (7)+36							
1	21+18	(101+4 (7)+32 (7)+36 (5 6)+18 (3 4)+18 (7)+36							
* Part 13 The rest of it									
NEST 18									
1	ZROD	P12 411.48 213.36 213.36 -411.48	0.00	0.00					
2	CUBOID	6 411.48 365.76 304.80 -411.48	0.00	0.00					
3	CUBOID	4 411.96 386.24 335.28 -441.96 -30.48 -30.48							
*End of model									
*Control Data									
1	SUPERHIST	5	1.0	STDV	0.0030	-1			
*FISILE REGION 1 IN PART 13 /									
END									

* V-C-12-A-Lup									
* Vault #2, PU23/240 = 100/0, H/Pu = 2, Inter = 0.0001									
* Vault #3, #5, #7, #8, no preplay, no hands, enter, one H/Pu = 5.14, 4000g Pu									
FISSTON									
* material 1 - Contents Pu02+H2O									
* material 2 - Concrete									
* material 3 - 304 Stainless									
* material 4 - Concrete									
* material 5 - Poly (0.0001 CH2									
* material 6 - Poly (0.0001 CH2									
* material 7 - Supply Contents Pu02-H2O									

* Part 10 Water for person									
NEST 5									
1	CUBOID	ORIGIN 0 0 0	22.8600	30.4800	30.4800	0	0	0	
* Part 11 (4.5 Kg Pu) Extra Can in Right Rear									
NEST 5									
1	ZROD	ORIGIN 0 0 -0.0000 1	4.3428	13.8992					
2	ZROD	ORIGIN 0 0 -0.0000 6	4.3428	20.2743					
3	ZROD	ORIGIN 0 0 -0.0229 6	4.3556	20.3200					
4	ZROD	ORIGIN 0 0 -0.0229 6	4.9056	20.3200					
5	CUBOID	ORIGIN 0 0 -0.0229 6	7.0000	23.4800	30.4800	-15.8600	-7.0000	0.0000	
* Part 12 Array of 3 racks by 36 vehicles wide by 7 vehicles high									
ARRAY 18 7									
1	21+18	(101+4 (7)+32 (7)+36 (5 6)+18 (3 4)+18 (7)+36							
1	21+18	(101+4 (7)+32 (7)+36 (5 6)+18 (3 4)+18 (7)+36							
2	21+18	(101+4 (7)+32 (7)+36 (5 6)+18 (3 4)+18 (7)+36							
8	8 9	1 (1)+18 (101+4 (7)+32 (7)+36 (5 6)+18 (3 4)+18 (7)+36							
1	21+18	(101+4 (7)+32 (7)+36 (5 6)+18 (3 4)+18 (7)+36							
1	21+18	(101+4 (7)+32 (7)+36 (5 6)+18 (3 4)+18 (7)+36							
1	21+18	(101+4 (7)+32 (7)+36 (5 6)+18 (3 4)+18 (7)+36							
* Part 13 The rest of it									
NEST 18									
1	ZROD	P12 411.48 213.36 213.36 -411.48	0.00	0.00					
2	CUBOID	6 411.48 365.76 304.80 -411.48	0.00	0.00					
3	CUBOID	4 411.96 386.24 335.28 -441.96 -30.48 -30.48							
*End of model									
*Control Data									
1	SUPERHIST	5	1.0	STDV	0.0030	-1			
*FISILE REGION 1 IN PART 13 /									
END									

* V-C-12-A-Lup									
* Vault #2, PU23/240 = 100/0, H/Pu = 2, Inter = 0.0001									
* Vault #3, #5, #7, #8, no preplay, no hands, enter, one H/Pu = 5.14, 4000g Pu									
FISSTON									
* material 1 - Contents Pu02+H2O									
* material 2 - Concrete									
* material 3 - 304 Stainless									

[illegible]

WHC-SD-SQA-CSA-524 Rev. 0

```

2 CUBOID 6 411.48 165.76 354.85 -411.48 0.00 0.00
3 CUBOID 4 441.96 396.24 335.28 -441.96 -30.48 -30.48
*End of model*
*Control Data
SUPERHIST 5 1.0 STDV 0.0030 -1
FISSILE REGION 1 IN PART 13 /
END
*****
* Part 6 (2.5 Kg Pu) Can in Left Front
NEST 4
1 2R0D ORIGIN 0 0 -0.0000 1 4.328 7.6718
2 2R0D ORIGIN 0 0 -0.0000 6 4.328 20.2743
3 2R0D ORIGIN 0 0 -0.0229 3 4.356 20.3200
4 CUBOID ORIGIN 0 0 -0.0229 6 5.000 30.4800 -17.8600 -23.4800 0.0000
* Part 7 (2.5 Kg Pu) Can in Left Front
NEST 4
1 2R0D ORIGIN 0 0 -0.0000 1 4.328 7.6718
2 2R0D ORIGIN 0 0 -0.0000 6 4.328 20.2743
3 2R0D ORIGIN 0 0 -0.0229 3 4.356 20.3200
4 CUBOID ORIGIN 0 0 -0.0229 6 5.000 30.4800 -17.8600 -23.4800 0.0000
* Part 7 Air for space
NEST 5
1 CUBOID ORIGIN 0 0 0 22.8600 30.4800 30.4800 0 0 0
* Part 8 (4.5 Kg Pu, H/Pu=3.00) Can in Right Front with no hands
NEST 4
1 2R0D ORIGIN 0 0 -0.0000 7 4.328 20.2743
2 2R0D ORIGIN 0 0 -0.0229 3 4.356 20.3200
3 2R0D ORIGIN 0 0 -0.0229 6 5.000 30.4800 -17.8600 -23.4800 0.0000
4 CUBOID ORIGIN 0 0 -0.0229 6 7.000 30.4800 -15.8600 -23.4800 0.0000
* Part 9 (4.5 Kg Pu) Can in Left Front with no hands
NEST 5
1 CUBOID ORIGIN 0 0 -0.0000 1 4.328 13.8092
2 2R0D ORIGIN 0 0 -0.0000 6 4.328 20.2743
3 2R0D ORIGIN 0 0 -0.0229 3 4.356 20.3200
4 2R0D ORIGIN 0 0 -0.0229 6 5.000 30.4800 -17.8600 -23.4800 0.0000
5 CUBOID ORIGIN 0 0 -0.0229 6 15.8600 7.000 30.4800 -7.0000 -23.4800 0.0000
* Part 10 Water for person
NEST 3
1 CUBOID ORIGIN 0 0 0 6 22.8600 30.4800 30.4800 0 0 0
* Part 11 (4.5 Kg Pu) Extra Can in Right Rear
NEST 5
1 CUBOID ORIGIN 0 0 -0.0000 1 4.328 13.8092
2 2R0D ORIGIN 0 0 -0.0000 6 4.328 20.2743
3 2R0D ORIGIN 0 0 -0.0229 3 4.356 20.3200
4 2R0D ORIGIN 0 0 -0.0229 6 5.000 30.4800 -17.8600 -23.4800 0.0000
5 CUBOID ORIGIN 0 0 -0.0229 6 7.000 30.4800 -15.8600 -23.4800 0.0000
* Part 12 Array of 3 racks by 36 cubicles wide by 7 cubicles high
ARRAY 36 7
(1.21-18 (10)*4 (7)*32 (7)*36 (5.6)*18 (7)*36 (3.4)*18 (7)*36
(1.21-18 (10)*4 (7)*32 (7)*36 (5.6)*18 (7)*36 (3.4)*18 (7)*36
(1.21-18 (10)*4 (7)*32 (7)*36 (5.6)*18 (7)*36 (3.4)*18 (7)*36
8 8 9 (1.21-16 10 11 10 (7)*32 (7)*36 (5.6)*18 (7)*36 (3.4)*18 (7)*36
(1.21-18 (10)*4 (7)*32 (7)*36 (5.6)*18 (7)*36 (3.4)*18 (7)*36
(1.21-18 (10)*4 (7)*32 (7)*36 (5.6)*18 (7)*36 (3.4)*18 (7)*36
(1.21-18 (10)*4 (7)*32 (7)*36 (5.6)*18 (7)*36 (3.4)*18 (7)*36
* Part 13 The rest of it
NEST 3
1 CUBOID P12 411.48 237.36 233.36 411.48 0.00 0.00
2 CUBOID P11 411.48 237.36 233.36 411.48 0.00 0.00
3 CUBOID 6 441.96 396.24 335.28 -441.96 -30.48 -30.48
*End of model*
*Control Data
SUPERHIST 5 1.0
-5 230 100 0 STDV 0.0030 -1
FISSILE REGION 1 IN PART 13 /
END
*****

```

WHC-SD-SQA-CSA-524 Rev. 0

```

* V-C-12-5.1mp
* Vault #2, Pu239/240 = 100/0, H/Pu = 2, Inter = 0.0001
* 4.5, 2.5, 2.5, no people, no hands, extra, one H/Pu = 9.9, 2500g Pu
FISSION
  * material 1 - Contents PuO2-H2O
  * material 2 - Water H2O
  * material 3 - 30d Stainless
  * material 4 - Polyethylene
  * material 5 - Poly CH2
  * material 6 - Air (0.0001 H2O)
  * material 7 - Soggy Contents PuO2-H2O
  7 12 NUCHEMES
ATOM 6.45 Pu239 1.00 0 3.0 HINRHO 2.0
ATOM 0.988 HINRHO 2.0 0 1.0 1432E-03 FE 5.9579E-02 NI 7.72074E-03
CONC W 0.0070233 M 0.043396 AL27 0.003358 SI 0.012905
CA 0.0026147 FE 0.0013437
ATOM 0.96 HINRHO 2.0 0 1.0
ATOM 3.14 Pu239 1.000 0 6.963 HINRHO 9.927
CM
  * Part 1 (4.5 Kg Pu) Can in Right Rear
  NEST 4
  1 ZROD ORIGIN 0 0 -0.0000 1 4.3428 13.8092
  2 ZROD ORIGIN 0 0 -0.0000 6 4.3428 20.2743
  3 ZROD ORIGIN 0 0 -0.0229 3 4.3656 20.3200
  4 CUBOID ORIGIN 0 0 -0.0229 6 5.0000 25.4800 30.4800 -17.8600 -5.0000 0.0000
  * Part 2 (4.5 Kg Pu) Can in Left Rear
  NEST 4
  1 ZROD ORIGIN 0 0 -0.0000 1 4.3428 13.8092
  2 ZROD ORIGIN 0 0 -0.0000 6 4.3428 20.2743
  3 ZROD ORIGIN 0 0 -0.0229 3 4.3656 20.3200
  4 CUBOID ORIGIN 0 0 -0.0229 6 5.0000 25.4800 30.4800 -17.8600 -5.0000 -5.0000 0.0000
  * Part 3 (2.5 Kg Pu) Can in Right Rear
  NEST 4
  1 ZROD ORIGIN 0 0 -0.0000 1 4.3428 13.8092
  2 ZROD ORIGIN 0 0 -0.0000 6 4.3428 20.2743
  3 ZROD ORIGIN 0 0 -0.0229 3 4.3656 20.2743
  4 CUBOID ORIGIN 0 0 -0.0229 6 5.0000 25.4800 30.4800 -17.8600 -5.0000 0.0000
  * Part 4 (2.5 Kg Pu) Can in Left Rear
  NEST 4
  1 ZROD ORIGIN 0 0 -0.0000 1 4.3428 13.8092
  2 ZROD ORIGIN 0 0 -0.0000 6 4.3428 20.2743
  3 ZROD ORIGIN 0 0 -0.0229 3 4.3656 20.3200
  4 CUBOID ORIGIN 0 0 -0.0229 6 5.0000 25.4800 30.4800 -17.8600 -5.0000 -5.0000 0.0000
  * Part 5 (2.5 Kg Pu) Can in Right Front
  NEST 4
  1 ZROD ORIGIN 0 0 -0.0000 1 4.3428 13.8092
  2 ZROD ORIGIN 0 0 -0.0000 6 4.3428 20.2743
  3 ZROD ORIGIN 0 0 -0.0229 3 4.3656 20.3200
  4 CUBOID ORIGIN 0 0 -0.0229 6 5.0000 25.4800 30.4800 -17.8600 -5.0000 -5.0000 0.0000
  * Part 6 (2.5 Kg Pu) Can in Left Front
  NEST 4
  1 ZROD ORIGIN 0 0 -0.0000 1 4.3428 13.8092
  2 ZROD ORIGIN 0 0 -0.0000 6 4.3428 20.2743
  3 ZROD ORIGIN 0 0 -0.0229 3 4.3656 20.3200
  4 CUBOID ORIGIN 0 0 -0.0229 6 5.0000 25.4800 30.4800 -17.8600 -5.0000 -5.0000 0.0000
  * Part 7 Air for space
  NEST 1
  1 CUBOID ORIGIN 0 0 0 22.8600 30.4800 30.4800 0 0 0
  * Part 8 (4.5 Kg Pu, H/Pu=3.00) Can in Right Front with no hands
  NEST 5
  1 ZROD ORIGIN 0 0 -0.0000 1 4.3428 20.2743
  2 ZROD ORIGIN 0 0 -0.0229 3 4.3656 20.3200
  3 ZROD ORIGIN 0 0 -0.0229 6 6.9056 20.3200
  4 CUBOID ORIGIN 0 0 -0.0229 6 7.0000 30.4800 -15.8600 -23.4800 0.0000
  * Part 9 (4.5 Kg Pu) Can in Left Front with no hands
  NEST 5
  1 ZROD ORIGIN 0 0 -0.0000 1 4.3428 13.8092
  2 ZROD ORIGIN 0 0 -0.0000 6 4.3428 20.2743
  3 ZROD ORIGIN 0 0 -0.0229 3 4.3656 20.3200
  4 ZROD ORIGIN 0 0 -0.0229 6 6.9056 20.3200
  5 CUBOID ORIGIN 0 0 -0.0229 6 15.8600 7.0000 30.4800 -17.0000 -23.4800 0.0000
  * Part 10 Water for person
  NEST 1
  1 CUBOID ORIGIN 0 0 0 6.22.8600 30.4800 30.4800 0 0 0
  * Part 11 (4.5 Kg Pu) Extra Can in Right Rear
  NEST 5
  1 ZROD ORIGIN 0 0 -0.0000 1 4.3428 13.8092
  2 ZROD ORIGIN 0 0 -0.0000 6 4.3428 20.2743
  3 ZROD ORIGIN 0 0 -0.0229 3 4.3656 20.3200
  4 ZROD ORIGIN 0 0 -0.0229 6 6.9056 20.3200
  5 CUBOID ORIGIN 0 0 -0.0229 6 7.0000 23.4800 30.4800 -15.8600 -17.0000 0.0000
  * Part 12 Array of 3 racks by 36 cubicles wide by 7 cubicles high
  ARRAY 36 7
  (1 2)*18 (10)*4 (7)*32 (7)*36 (5 6)*18 (7)*36 (3 4)*18 (7)*36
  (1 2)*18 (10)*4 (7)*32 (7)*36 (5 6)*18 (7)*36 (3 4)*18 (7)*36
  8 9 9 (1 2)*16 10 11 10 10 (7)*32 (7)*36 3 4 3 3
  (1 2)*18 (10)*4 (7)*32 (7)*36 3 4 3 3 (5 6)*16 (7)*36 (3 4)*18 (7)*36
  (1 2)*18 (10)*4 (7)*32 (7)*36 3 4 3 3 (5 6)*16 (7)*36 (3 4)*18 (7)*36
  (1 2)*18 (7)*36 (7)*36 (5 6)*18 (7)*36 (3 4)*18 (7)*36
  * Part 13 The rest of it
  NEST 5
  1 CUBOID P12 411.48 315.76 213.36 -411.48 0.00 0.00
  2 CUBOID P 411.48 315.76 304.80 -411.48 0.00 0.00
  3 CUBOID P 441.96 396.24 335.28 -441.96 -30.48 -30.48
  *End of model
  *Control Data
  SUPERMIT 500 1.0
  FISSION REGION 1 IN PART 13
  END
  *****
  * V-C-12-E.1mp
  * Vault #2, Pu239/240 = 100/0, H/Pu = 2, Inter = 0.0001
  * 4.5, 2.5, 2.5, no people, no hands, extra, one H/Pu = 13.11, 9000g Pu
  FISSION
  * material 1 - Contents PuO2-H2O
  * material 3 - 30d Stainless
  * material 4 - Poly CH2
  * material 5 - Poly (0.0001 H2O)
  * material 6 - Air (0.0001 H2O)
  * material 7 - Soggy Contents PuO2-H2O

```

[illegible]

* Part 1 (4.5 Kg Pu) Can In Right Rear

NEST 4
1 2KMO ORIGIN 0 0 -0.0000 1 4.3428 13.8992
2 2KMO ORIGIN 0 0 -0.0009 6 4.3428 20.1743
3 2KMO ORIGIN 0 0 -0.0229 6 5.0000 25.4800
4 CUBOID ORIGIN 0 0 -0.0229 6 5.0000 25.4800

* Part 2 (4.5 Kg Pu) Can In Left Rear

NEST 4
1 2KMO ORIGIN 0 0 -0.0000 1 4.3428 13.8992
2 2KMO ORIGIN 0 0 -0.0009 6 4.3428 20.1743
3 2KMO ORIGIN 0 0 -0.0229 6 4.3656 20.3200
4 CUBOID ORIGIN 0 0 -0.0229 6 4.3656 20.3200

* Part 3 (2.5 Kg Pu) Can In Right Rear

NEST 4
1 2KMO ORIGIN 0 0 -0.0000 1 4.3428 13.8992
2 2KMO ORIGIN 0 0 -0.0009 6 4.3428 20.1743
3 2KMO ORIGIN 0 0 -0.0229 6 5.0000 25.4800
4 CUBOID ORIGIN 0 0 -0.0229 6 5.0000 25.4800

* Part 4 (2.5 Kg Pu) Can In Left Rear

NEST 4
1 2KMO ORIGIN 0 0 -0.0000 1 4.3428 13.8992
2 2KMO ORIGIN 0 0 -0.0009 6 4.3428 20.1743
3 2KMO ORIGIN 0 0 -0.0229 6 5.0000 25.4800
4 CUBOID ORIGIN 0 0 -0.0229 6 5.0000 25.4800

* Part 5 (2.5 Kg Pu) Can In Right Front

NEST 4
1 2KMO ORIGIN 0 0 -0.0000 1 4.3428 13.8992
2 2KMO ORIGIN 0 0 -0.0009 6 4.3428 20.1743
3 2KMO ORIGIN 0 0 -0.0229 6 5.0000 25.4800
4 CUBOID ORIGIN 0 0 -0.0229 6 5.0000 25.4800

* Part 6 (2.5 Kg Pu) Can In Left Front

NEST 4
1 2KMO ORIGIN 0 0 -0.0000 1 4.3428 13.8992
2 2KMO ORIGIN 0 0 -0.0009 6 4.3428 20.1743
3 2KMO ORIGIN 0 0 -0.0229 6 4.3656 20.3200
4 CUBOID ORIGIN 0 0 -0.0229 6 4.3656 20.3200

* Part 7 Air for Aperture

NEST 1
1 CUBOID ORIGIN 0 0 6 22.8600 30.4800 30.4800 0 0 0
* Part 8 (4.5 Kg Pu, H/Pu=3.00) Can In Right Front with no hands

NEST 4
1 2KMO ORIGIN 0 0 -0.0000 1 4.3428 20.1743
2 2KMO ORIGIN 0 0 -0.0229 6 4.3656 20.3200
3 2KMO ORIGIN 0 0 -0.0229 6 4.3656 20.3200
4 CUBOID ORIGIN 0 0 -0.0229 6 7.0000 30.4800

* Part 9 (4.5 Kg Pu) Can In Left Front with no hands

NEST 4
1 2KMO ORIGIN 0 0 -0.0000 1 4.3428 13.8992
2 2KMO ORIGIN 0 0 -0.0009 6 4.3428 20.1743
3 2KMO ORIGIN 0 0 -0.0229 6 4.3656 20.3200
4 CUBOID ORIGIN 0 0 -0.0229 6 7.0000 30.4800

* Part 10 Water for person

NEST 1
1 CUBOID ORIGIN 0 0 6 22.8600 30.4800 30.4800 0 0 0
* Part 11 (4.5 Kg Pu) Extra Can In Right Rear

NEST 5
1 2KMO ORIGIN 0 0 -0.0000 1 4.3428 13.8992
2 2KMO ORIGIN 0 0 -0.0009 6 4.3428 20.1743
3 2KMO ORIGIN 0 0 -0.0229 6 4.3656 20.3200

5 2KMO ORIGIN 0 0 -0.0229 6 6.9956 23.3200

4 CUBOID ORIGIN 0 0 -0.0229 6 7.0000 23.4800 30.4800 -15.8600 -7.0000 0.0000
* Part 12 Array of 3 racks by 36 cubicles wide by 7 cubicles high

NEST 1
1 2KMO ORIGIN 0 0 -0.0000 1 4.3428 13.8992
2 2KMO ORIGIN 0 0 -0.0009 6 4.3428 20.1743
3 2KMO ORIGIN 0 0 -0.0229 6 4.3656 20.3200
4 CUBOID ORIGIN 0 0 -0.0229 6 7.0000 30.4800

* Part 13 The rest of it

NEST 3
1 CUBOID ORIGIN 0 0 -0.0000 1 4.3428 13.8992
2 CUBOID ORIGIN 0 0 -0.0009 6 4.3428 20.1743
3 CUBOID ORIGIN 0 0 -0.0229 6 4.3656 20.3200

* End of model

* Control Data
SUPERSTRT 20 100 1.0 STW 0.0030 -1
PULSE WIDTH 1 IN PART 13 /
END

* V-C-12-G-imp
* Vault #2, Pu239/240 = 100/G, H/Pu = 2, Inter = 0.0001
* Fission 2.75, 2.75, no prople, no hands, extra, one H/Pu = 23.05, 100mg Pu

* Material 1 - Contents PuO2-820
* Material 2 - 304 Stainless
* Material 3 - Concrete
* Material 4 - Poly (0.001 H2O)
* Material 5 - Air (0.001 H2O)
* Material 6 - Empty Contents
* Material 7 - Empty Contents

7 12 NCMAMES
ATCM 6.65 Pu239 1.00 0 3.0 HINZMO 2.0
ATCM 0.998 HINZMO 2.0 0 1.0
CONC CR 1.74286-02 W0 1.74638-03 FF 5.34579-02 NI 7.72074E-03
CONC CR 0.007023 0 0.063396 ALZ7 0.003358 SI 0.012905
ATCM 0.96 HINZMO 2.0 0.001473 C 1.0
ATCM 0.0001 HINZMO 2.0 0 1.0
ATCM 1.86 Pu239 1.00 0 16.527 HINZMO 29.054

CM

* Part 1 (4.5 Kg Pu) Can In Right Rear
NEST 4
1 2KMO ORIGIN 0 0 -0.0000 1 4.3428 13.8992
2 2KMO ORIGIN 0 0 -0.0009 6 4.3428 20.1743
3 2KMO ORIGIN 0 0 -0.0229 6 4.3656 20.3200
4 CUBOID ORIGIN 0 0 -0.0229 6 5.0000 30.4800

* Part 2 (4.5 Kg Pu) Can In Left Rear

NEST 4
1 2KMO ORIGIN 0 0 -0.0000 1 4.3428 13.8992
2 2KMO ORIGIN 0 0 -0.0009 6 4.3428 20.1743
3 2KMO ORIGIN 0 0 -0.0229 6 4.3656 20.3200
4 CUBOID ORIGIN 0 0 -0.0229 6 17.8600 25.4800 30.4800 -5.0000 -5.0000 0.0000

4 CUBOID ORIGIN 0 0 -0.0229 6 17.8600 25.4800 30.4800 -5.0000 -5.0000 0.0000

WHC-SD-SQA-CSA-524 Rev. 0

[illegible]

WHC-SD-SQA-CSA-524 Rev. 0


```

NEST 1
1 CUBOID ORIGIN 0 0 0 6 22.8600 30.4800 0 0 0 0
* Part 8 (4.5 Kg Pul) Can in Right Front With Hands
NEST 5
1 ZROD ORIGIN 0 0 -0.0000 1 4.3428 13.8092
2 ZROD ORIGIN 0 0 -0.0000 6 4.3428 20.2743
3 ZROD ORIGIN 0 0 -0.0229 3 4.3428 20.3200
4 ZROD ORIGIN 0 0 -0.0229 6 6.9056 20.3200
5 CUBOID ORIGIN 0 0 -0.0229 6 7.0000 7.0000 30.4800 -15.8600 -23.4800 0.0000
* Part 9 (4.5 Kg Pul) Can in Left Front With Hands
NEST 5
1 ZROD ORIGIN 0 0 -0.0000 1 4.3428 13.8092
2 ZROD ORIGIN 0 0 -0.0000 6 4.3428 20.2743
3 ZROD ORIGIN 0 0 -0.0229 3 4.3428 20.3200
4 ZROD ORIGIN 0 0 -0.0229 6 6.9056 20.3200
5 CUBOID ORIGIN 0 0 -0.0229 6 7.0000 7.0000 30.4800 -15.8600 -23.4800 0.0000
* Part 10 Water for Person
NEST 1
1 CUBOID ORIGIN 0 0 0 6 22.8600 30.4800 0 0 0 0
* Part 11 (4.5 Kg Pul) Extra Can in Right Rear
NEST 5
1 ZROD ORIGIN 0 0 -0.0000 1 4.3428 13.8092
2 ZROD ORIGIN 0 0 -0.0000 6 4.3428 20.2743
3 ZROD ORIGIN 0 0 -0.0229 3 4.3428 20.3200
4 ZROD ORIGIN 0 0 -0.0229 6 6.9056 20.3200
5 CUBOID ORIGIN 0 0 -0.0229 6 7.0000 7.0000 30.4800 -15.8600 -23.4800 0.0000
* Part 12 Array of 3 racks by 36 cubicles wide by 7 cubicles high
ARRAY 36 7 7
(1 2)*18 (10)*4 (7)*32 (7)*36 (5 6)*18 (7)*36 (3 4)*18 (7)*36
(1 2)*18 (10)*4 (7)*32 (7)*36 (3 4)*18 (7)*36
(1 2)*18 (10)*4 (7)*32 (7)*36 (3 4)*18 (7)*36 (3 4)*18 (7)*36
8 6 9 9 (1 2)*16 10 11 10 10 (7)*32 (7)*36 3 4 3 3
(1 2)*18 (10)*4 (7)*32 (7)*36 3 4 3 3 (5 6)*18 (7)*36 (3 4)*18 (7)*36
(1 2)*18 (10)*4 (7)*32 (7)*36 (3 4)*18 (7)*36 (3 4)*18 (7)*36
(1 2)*18 (10)*4 (7)*32 (7)*36 (5 6)*18 (7)*36 (3 4)*18 (7)*36
* Part 13 The rest of it
NEST 3
1 CUBOID F12 411.48 313.36 213.36 -411.48 0.00 0.00
2 CUBOID F6 411.48 365.76 304.80 -411.48 0.00 0.00
3 CUBOID F4 441.96 396.24 335.28 -441.96 -30.48 -30.48
*End of Model
*Global Data
*SUPPLEMENT 5 1.0
*SUPPLEMENT -5 250 100 0 STW 0.0030 -1
FISSILE REGION 1 IN PART 13 /
END
*****
* VcC-31m-4mp
* Vault #2, Pu239/240 = 100/0, H/Pu = 2, inner = 0.010
* 4.5, 2.5, 2.5, no people, no hands, extra
FISSILE
*****
* material 1 - Contents FuO2-H2O
* material 2 - Water H2O
* material 3 - J04 Stainless
* material 4 - Polyethylene
* material 5 - Polyethylene
* material 6 - Air (0.0001 H2O)

```

```

3 ZROD  ORIGIN 0 0 -0.0229 3 4.3656 20.3200
4 ZROD  ORIGIN 0 0 -0.0229 6 6.9056 20.3200
5 CUBOID ORIGIN 0 0 -0.0229 6 15.8600 7.0000 30.4800 -7.0000 -23.4800 0.0000

* Part 10 Water for person
NEST 1
1 CUBOID ORIGIN 0 0 6 22.8600 30.4800 30.4800 0 0 0

* Part 11 (4.5 Kg Pu) Extra Can in Right Rear
NEST 5
1 ZROD  ORIGIN 0 0 -0.0000 1 4.3428 13.8992
2 ZROD  ORIGIN 0 0 -0.0000 6 4.3428 20.2743
3 ZROD  ORIGIN 0 0 -0.0229 3 4.3656 20.3200
4 ZROD  ORIGIN 0 0 -0.0229 6 6.9056 20.3200
5 CUBOID ORIGIN 0 0 -0.0229 6 17.8600 25.4800 30.4800 -5.0000 -5.0000 0.0000

* Part 12 Array of 3 racks by 36 cubicles wide by 7 cubicles high
NEST 4
1 ZROD  ORIGIN 0 0 -0.0000 1 4.3428 13.8992
2 ZROD  ORIGIN 0 0 -0.0000 6 4.3428 20.2743
3 ZROD  ORIGIN 0 0 -0.0229 3 4.3656 20.3200
4 ZROD  ORIGIN 0 0 -0.0229 6 6.9056 20.3200
5 CUBOID ORIGIN 0 0 -0.0229 6 7.0000 23.4800 30.4800 -15.8600 -7.0000 0.0000

* Part 13 The rest of it
NEST 3
1 ZROD  ORIGIN 0 0 -0.0000 1 4.3428 13.8992
2 ZROD  ORIGIN 0 0 -0.0000 6 4.3428 20.2743
3 ZROD  ORIGIN 0 0 -0.0229 3 4.3656 20.3200

* Part 14 Array of 3 racks by 36 cubicles wide by 7 cubicles high
NEST 4
1 ZROD  ORIGIN 0 0 -0.0000 1 4.3428 13.8992
2 ZROD  ORIGIN 0 0 -0.0000 6 4.3428 20.2743
3 ZROD  ORIGIN 0 0 -0.0229 3 4.3656 20.3200
4 ZROD  ORIGIN 0 0 -0.0229 6 6.9056 20.3200
5 CUBOID ORIGIN 0 0 -0.0229 6 7.0000 23.4800 30.4800 -15.8600 -7.0000 0.0000

* Part 15 (4.5 Kg Pu) Can in Left Rear
NEST 4
1 ZROD  ORIGIN 0 0 -0.0000 1 4.3428 13.8992
2 ZROD  ORIGIN 0 0 -0.0000 6 4.3428 20.2743
3 ZROD  ORIGIN 0 0 -0.0229 3 4.3656 20.3200
4 ZROD  ORIGIN 0 0 -0.0229 6 6.9056 20.3200
5 CUBOID ORIGIN 0 0 -0.0229 6 17.8600 25.4800 30.4800 -5.0000 -5.0000 0.0000

* Part 16 (2.5 Kg Pu) Can in Right Rear
NEST 4
1 ZROD  ORIGIN 0 0 -0.0000 1 4.3428 13.8992
2 ZROD  ORIGIN 0 0 -0.0000 6 4.3428 20.2743
3 ZROD  ORIGIN 0 0 -0.0229 3 4.3656 20.3200
4 ZROD  ORIGIN 0 0 -0.0229 6 6.9056 20.3200
5 CUBOID ORIGIN 0 0 -0.0229 6 17.8600 25.4800 30.4800 -5.0000 -5.0000 0.0000

* Part 17 (2.5 Kg Pu) Can in Left Front
NEST 4
1 ZROD  ORIGIN 0 0 -0.0000 1 4.3428 13.8992
2 ZROD  ORIGIN 0 0 -0.0000 6 4.3428 20.2743
3 ZROD  ORIGIN 0 0 -0.0229 3 4.3656 20.3200
4 ZROD  ORIGIN 0 0 -0.0229 6 6.9056 20.3200
5 CUBOID ORIGIN 0 0 -0.0229 6 17.8600 25.4800 30.4800 -5.0000 -5.0000 0.0000

* Part 18 (2.5 Kg Pu) Can in Right Front
NEST 4
1 ZROD  ORIGIN 0 0 -0.0000 1 4.3428 13.8992
2 ZROD  ORIGIN 0 0 -0.0000 6 4.3428 20.2743
3 ZROD  ORIGIN 0 0 -0.0229 3 4.3656 20.3200
4 ZROD  ORIGIN 0 0 -0.0229 6 6.9056 20.3200
5 CUBOID ORIGIN 0 0 -0.0229 6 17.8600 25.4800 30.4800 -5.0000 -5.0000 0.0000

* Part 19 (4.5 Kg Pu) Can in Left Front with hands
NEST 5
1 ZROD  ORIGIN 0 0 -0.0000 1 4.3428 13.8992
2 ZROD  ORIGIN 0 0 -0.0000 6 4.3428 20.2743
3 ZROD  ORIGIN 0 0 -0.0229 3 4.3656 20.3200
4 ZROD  ORIGIN 0 0 -0.0229 6 6.9056 20.3200
5 CUBOID ORIGIN 0 0 -0.0229 6 7.0000 23.4800 30.4800 -15.8600 -7.0000 0.0000

* Part 20 (4.5 Kg Pu) Can in Right Front with hands
NEST 5
1 ZROD  ORIGIN 0 0 -0.0000 1 4.3428 13.8992
2 ZROD  ORIGIN 0 0 -0.0000 6 4.3428 20.2743
3 ZROD  ORIGIN 0 0 -0.0229 3 4.3656 20.3200
4 ZROD  ORIGIN 0 0 -0.0229 6 6.9056 20.3200
5 CUBOID ORIGIN 0 0 -0.0229 6 17.8600 25.4800 30.4800 -5.0000 -5.0000 0.0000

* Part 21 Water for person
NEST 1
1 CUBOID ORIGIN 0 0 6 22.8600 30.4800 30.4800 0 0 0

* Part 22 (4.5 Kg Pu) Extra Can in Right Rear
NEST 5
1 ZROD  ORIGIN 0 0 -0.0000 1 4.3428 13.8992
2 ZROD  ORIGIN 0 0 -0.0000 6 4.3428 20.2743
3 ZROD  ORIGIN 0 0 -0.0229 3 4.3656 20.3200
4 ZROD  ORIGIN 0 0 -0.0229 6 6.9056 20.3200
5 CUBOID ORIGIN 0 0 -0.0229 6 17.8600 25.4800 30.4800 -5.0000 -5.0000 0.0000

```


WHC-SD-SQA-CSA-524 Rev. 0

```

3 CUBOID ORIGIN 0 0 -0.0229 6 7.0056 23.4800 30.4800 -15.8600 -7.0000 0.0000

* Part 12 Array of 3 racks by 36 cubicles wide by 7 cubicles high
ARRAY 36 7 101+4 (7)*32 (7)*16 (5 6)*18 (7)*36 (3 4)*18 (7)*36
1 2*18 (101+4 (7)*32 (7)*36 (5 6)*18 (7)*36 (3 4)*18 (7)*36
1 2*18 (101+4 (7)*32 (7)*36 3 4 3 (5 6)*16 (7)*36 (3 4)*18 (7)*36
8 8 9 (1 2)*18 10 11 10 10 (7)*32 (7)*36 3 4 3
1 2*18 (101+4 (7)*32 (7)*36 3 4 3 (5 6)*16 (7)*36 (3 4)*18 (7)*36
1 2*18 (101+4 (7)*32 (7)*36 (5 6)*18 (7)*36 (3 4)*18 (7)*36
1 2*18 (101+4 (7)*32 (7)*36 (5 6)*18 (7)*36 (3 4)*18 (7)*36
1 2*18 (7)*36 (7)*36 (5 6)*18 (7)*36 (3 4)*18 (7)*36

* Part 13 The rest of it
NEST 3
1 CUBOID P12 411.48 213.36 213.36 -411.48 0.00 0.00
2 CUBOID P12 411.48 364.80 -411.48 0.00 0.00
3 CUBOID P12 411.48 364.80 -411.48 0.00 0.00
4 CUBOID P12 411.48 364.80 -411.48 0.00 0.00

* End of model
*****

* Control Data
SUPERSTRT 5 1.0
-5 250 100 0 STDV 0.0030 -1
END

*****

* V-C-21-B-mp
* Vault #2, Pu239/240 = 100/G, H/Pu = 2, Inter = 0.250
* 4.5, 2.5, 2.5, no people, no hands, extra
FISSTOW
*****
* material 1 - Contents PuO2+H2O
* material 2 - Water H2O
* material 3 - Soil Stainless
* material 4 - Concrete CRK
* material 5 - Poly
* material 6 - Air (0.0001 MCO)
6 12 NUKEMRES
ATOM 6.45 Pu239 1.00 0 3.0 HINEMO 2.0
ATOM 0.996 HINEMO 2.0 0 1.0
CONC H 0.0456E-02 0 1.0
CONC H 0.007023 0 0.045396 AL57 0.003358 SI 0.01905
CA 0.0026147 FE 0.0013437
ATOM 0.96 HINEMO 2.0 C 1.0
ATOM 0.2500 HINEMO 2.0 C 1.0
CM
* Part 1 (4.5 Kg Pu) Can in Right Rear
NEST 4
1 ZROD ORIGIN 0 0 -0.0000 1 4.3428 13.8992
2 ZROD ORIGIN 0 0 -0.0000 6 4.3428 20.2743
3 ZROD ORIGIN 0 0 -0.0229 3 4.3656 20.3200
4 CUBOID ORIGIN 0 0 -0.0229 6 5.0000 25.4800 30.4800 -17.8600 -5.0000 0.0000

* Part 2 (4.5 Kg Pu) Can in Left Rear
NEST 4
1 ZROD ORIGIN 0 0 -0.0000 1 4.3428 13.8992
2 ZROD ORIGIN 0 0 -0.0000 6 4.3428 20.2743
3 ZROD ORIGIN 0 0 -0.0229 3 4.3656 20.3200
4 CUBOID ORIGIN 0 0 -0.0229 6 17.8600 25.4800 30.4800 -5.0000 -5.0000 0.0000

* Part 3 (2.5 Kg Pu) Can in Right Rear
NEST 4
1 ZROD ORIGIN 0 0 -0.0000 1 4.3428 13.8992
2 ZROD ORIGIN 0 0 -0.0000 6 4.3428 20.2743
3 ZROD ORIGIN 0 0 -0.0229 3 4.3656 20.3200
4 CUBOID ORIGIN 0 0 -0.0229 6 17.8600 25.4800 30.4800 -5.0000 -5.0000 0.0000

* Part 4 (2.5 Kg Pu) Can in Left Front
NEST 4
1 ZROD ORIGIN 0 0 -0.0000 1 4.3428 13.8992
2 ZROD ORIGIN 0 0 -0.0000 6 4.3428 20.2743
3 ZROD ORIGIN 0 0 -0.0229 3 4.3656 20.3200
4 CUBOID ORIGIN 0 0 -0.0229 6 17.8600 25.4800 30.4800 -5.0000 -5.0000 0.0000

* Part 5 (2.5 Kg Pu) Can in Right Front
NEST 4
1 ZROD ORIGIN 0 0 -0.0000 1 4.3428 13.8992
2 ZROD ORIGIN 0 0 -0.0000 6 4.3428 20.2743
3 ZROD ORIGIN 0 0 -0.0229 3 4.3656 20.3200
4 CUBOID ORIGIN 0 0 -0.0229 6 17.8600 25.4800 30.4800 -5.0000 -5.0000 0.0000

* Part 6 (2.5 Kg Pu) Can in Left Front
NEST 4
1 ZROD ORIGIN 0 0 -0.0000 1 4.3428 13.8992
2 ZROD ORIGIN 0 0 -0.0000 6 4.3428 20.2743
3 ZROD ORIGIN 0 0 -0.0229 3 4.3656 20.3200
4 CUBOID ORIGIN 0 0 -0.0229 6 17.8600 25.4800 30.4800 -5.0000 -5.0000 0.0000

* Part 7 Air for space
NEST 1
1 CUBOID ORIGIN 0 0 0 22.8600 30.4800 30.4800 0 0 0

* Part 8 (4.5 Kg Pu) Can in Right Front with hands
NEST 5
1 ZROD ORIGIN 0 0 -0.0000 1 4.3428 13.8992
2 ZROD ORIGIN 0 0 -0.0000 6 4.3428 20.2743
3 ZROD ORIGIN 0 0 -0.0229 3 4.3656 20.3200
4 ZROD ORIGIN 0 0 -0.0229 6 9.0556 20.3200
5 CUBOID ORIGIN 0 0 -0.0229 6 7.0000 7.0000 30.4800 -15.8600 -23.4800 0.0000

* Part 9 (4.5 Kg Pu) Can in Left Front with hands
NEST 5
1 ZROD ORIGIN 0 0 -0.0000 1 4.3428 13.8992
2 ZROD ORIGIN 0 0 -0.0000 6 4.3428 20.2743
3 ZROD ORIGIN 0 0 -0.0229 3 4.3656 20.3200
4 ZROD ORIGIN 0 0 -0.0229 6 9.0556 20.3200
5 CUBOID ORIGIN 0 0 -0.0229 6 15.8600 15.8600 30.4800 -7.0000 -23.4800 0.0000

* Part 10 Water for person
NEST 1
1 CUBOID ORIGIN 0 0 0 22.8600 30.4800 30.4800 0 0 0

* Part 11 (4.5 Kg Pu) Extra Can in Right Rear
NEST 5
1 ZROD ORIGIN 0 0 -0.0000 1 4.3428 13.8992
2 ZROD ORIGIN 0 0 -0.0000 6 4.3428 20.2743
3 ZROD ORIGIN 0 0 -0.0229 3 4.3656 20.3200
4 ZROD ORIGIN 0 0 -0.0229 6 9.0556 20.3200
5 CUBOID ORIGIN 0 0 -0.0229 6 7.0000 23.4800 30.4800 -15.8600 -7.0000 0.0000

* Part 12 Array of 3 racks by 36 cubicles wide by 7 cubicles high
ARRAY 36 7 101+4 (7)*32 (7)*36 (5 6)*18 (7)*36 (3 4)*18 (7)*36
1 2*18 (101+4 (7)*32 (7)*36 (5 6)*18 (7)*36 (3 4)*18 (7)*36
1 2*18 (101+4 (7)*32 (7)*36 3 4 3 (5 6)*16 (7)*36 (3 4)*18 (7)*36
8 8 9 (1 2)*18 10 11 10 10 (7)*32 (7)*36 3 4 3
1 2*18 (101+4 (7)*32 (7)*36 3 4 3 (5 6)*16 (7)*36 (3 4)*18 (7)*36
1 2*18 (101+4 (7)*32 (7)*36 (5 6)*18 (7)*36 (3 4)*18 (7)*36
1 2*18 (7)*36 (7)*36 (5 6)*18 (7)*36 (3 4)*18 (7)*36

* Part 13 The rest of it
NEST 4

```

```

NEST 3
1 CUBOID P12 411.48 213.36 -411.48 0.00 0.00
2 CUBOID 6 411.48 385.76 304.80 -411.48 0.00 0.00
3 CUBOID 4 441.96 395.24 335.28 -441.96 -30.48 -30.48
*End of model
*Control Data
*EXHAUST 5 100 1.0 STDV 0.0030 -1
-5
FISSILE REGION 1 IN PART 13 /
END
*****
* N=2, E=2, L=2, H=2
* Vailt # 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100, 101, 102, 103, 104, 105, 106, 107, 108, 109, 110, 111, 112, 113, 114, 115, 116, 117, 118, 119, 120, 121, 122, 123, 124, 125, 126, 127, 128, 129, 130, 131, 132, 133, 134, 135, 136, 137, 138, 139, 140, 141, 142, 143, 144, 145, 146, 147, 148, 149, 150, 151, 152, 153, 154, 155, 156, 157, 158, 159, 160, 161, 162, 163, 164, 165, 166, 167, 168, 169, 170, 171, 172, 173, 174, 175, 176, 177, 178, 179, 180, 181, 182, 183, 184, 185, 186, 187, 188, 189, 190, 191, 192, 193, 194, 195, 196, 197, 198, 199, 200, 201, 202, 203, 204, 205, 206, 207, 208, 209, 210, 211, 212, 213, 214, 215, 216, 217, 218, 219, 220, 221, 222, 223, 224, 225, 226, 227, 228, 229, 230, 231, 232, 233, 234, 235, 236, 237, 238, 239, 240, 241, 242, 243, 244, 245, 246, 247, 248, 249, 250, 251, 252, 253, 254, 255, 256, 257, 258, 259, 260, 261, 262, 263, 264, 265, 266, 267, 268, 269, 270, 271, 272, 273, 274, 275, 276, 277, 278, 279, 280, 281, 282, 283, 284, 285, 286, 287, 288, 289, 290, 291, 292, 293, 294, 295, 296, 297, 298, 299, 300, 301, 302, 303, 304, 305, 306, 307, 308, 309, 310, 311, 312, 313, 314, 315, 316, 317, 318, 319, 320, 321, 322, 323, 324, 325, 326, 327, 328, 329, 330, 331, 332, 333, 334, 335, 336, 337, 338, 339, 340, 341, 342, 343, 344, 345, 346, 347, 348, 349, 350, 351, 352, 353, 354, 355, 356, 357, 358, 359, 360, 361, 362, 363, 364, 365, 366, 367, 368, 369, 370, 371, 372, 373, 374, 375, 376, 377, 378, 379, 380, 381, 382, 383, 384, 385, 386, 387, 388, 389, 390, 391, 392, 393, 394, 395, 396, 397, 398, 399, 400, 401, 402, 403, 404, 405, 406, 407, 408, 409, 410, 411, 412, 413, 414, 415, 416, 417, 418, 419, 420, 421, 422, 423, 424, 425, 426, 427, 428, 429, 430, 431, 432, 433, 434, 435, 436, 437, 438, 439, 440, 441, 442, 443, 444, 445, 446, 447, 448, 449, 450, 451, 452, 453, 454, 455, 456, 457, 458, 459, 460, 461, 462, 463, 464, 465, 466, 467, 468, 469, 470, 471, 472, 473, 474, 475, 476, 477, 478, 479, 480, 481, 482, 483, 484, 485, 486, 487, 488, 489, 490, 491, 492, 493, 494, 495, 496, 497, 498, 499, 500, 501, 502, 503, 504, 505, 506, 507, 508, 509, 510, 511, 512, 513, 514, 515, 516, 517, 518, 519, 520, 521, 522, 523, 524, 525, 526, 527, 528, 529, 530, 531, 532, 533, 534, 535, 536, 537, 538, 539, 540, 541, 542, 543, 544, 545, 546, 547, 548, 549, 550, 551, 552, 553, 554, 555, 556, 557, 558, 559, 560, 561, 562, 563, 564, 565, 566, 567, 568, 569, 570, 571, 572, 573, 574, 575, 576, 577, 578, 579, 580, 581, 582, 583, 584, 585, 586, 587, 588, 589, 590, 591, 592, 593, 594, 595, 596, 597, 598, 599, 600, 601, 602, 603, 604, 605, 606, 607, 608, 609, 610, 611, 612, 613, 614, 615, 616, 617, 618, 619, 620, 621, 622, 623, 624, 625, 626, 627, 628, 629, 630, 631, 632, 633, 634, 635, 636, 637, 638, 639, 640, 641, 642, 643, 644, 645, 646, 647, 648, 649, 650, 651, 652, 653, 654, 655, 656, 657, 658, 659, 660, 661, 662, 663, 664, 665, 666, 667, 668, 669, 670, 671, 672, 673, 674, 675, 676, 677, 678, 679, 680, 681, 682, 683, 684, 685, 686, 687, 688, 689, 690, 691, 692, 693, 694, 695, 696, 697, 698, 699, 700, 701, 702, 703, 704, 705, 706, 707, 708, 709, 710, 711, 712, 713, 714, 715, 716, 717, 718, 719, 720, 721, 722, 723, 724, 725, 726, 727, 728, 729, 730, 731, 732, 733, 734, 735, 736, 737, 738, 739, 740, 741, 742, 743, 744, 745, 746, 747, 748, 749, 750, 751, 752, 753, 754, 755, 756, 757, 758, 759, 760, 761, 762, 763, 764, 765, 766, 767, 768, 769, 770, 771, 772, 773, 774, 775, 776, 777, 778, 779, 780, 781, 782, 783, 784, 785, 786, 787, 788, 789, 790, 791, 792, 793, 794, 795, 796, 797, 798, 799, 800, 801, 802, 803, 804, 805, 806, 807, 808, 809, 810, 811, 812, 813, 814, 815, 816, 817, 818, 819, 820, 821, 822, 823, 824, 825, 826, 827, 828, 829, 830, 831, 832, 833, 834, 835, 836, 837, 838, 839, 840, 841, 842, 843, 844, 845, 846, 847, 848, 849, 850, 851, 852, 853, 854, 855, 856, 857, 858, 859, 860, 861, 862, 863, 864, 865, 866, 867, 868, 869, 870, 871, 872, 873, 874, 875, 876, 877, 878, 879, 880, 881, 882, 883, 884, 885, 886, 887, 888, 889, 890, 891, 892, 893, 894, 895, 896, 897, 898, 899, 900, 901, 902, 903, 904, 905, 906, 907, 908, 909, 910, 911, 912, 913, 914, 915, 916, 917, 918, 919, 920, 921, 922, 923, 924, 925, 926, 927, 928, 929, 930, 931, 932, 933, 934, 935, 936, 937, 938, 939, 940, 941, 942, 943, 944, 945, 946, 947, 948, 949, 950, 951, 952, 953, 954, 955, 956, 957, 958, 959, 960, 961, 962, 963, 964, 965, 966, 967, 968, 969, 970, 971, 972, 973, 974, 975, 976, 977, 978, 979, 980, 981, 982, 983, 984, 985, 986, 987, 988, 989, 990, 991, 992, 993, 994, 995, 996, 997, 998, 999, 1000, 1001, 1002, 1003, 1004, 1005, 1006, 1007, 1008, 1009, 1010, 1011, 1012, 1013, 1014, 1015, 1016, 1017, 1018, 1019, 1020, 1021, 1022, 1023, 1024, 1025, 1026, 1027, 1028, 1029, 1030, 1031, 1032, 1033, 1034, 1035, 1036, 1037, 1038, 1039, 1040, 1041, 1042, 1043, 1044, 1045, 1046, 1047, 1048, 1049, 1050, 1051, 1052, 1053, 1054, 1055, 1056, 1057, 1058, 1059, 1060, 1061, 1062, 1063, 1064, 1065, 1066, 1067, 1068, 1069, 1070, 1071, 1072, 1073, 1074, 1075, 1076, 1077, 1078, 1079, 1080, 1081, 1082, 1083, 1084, 1085, 1086, 1087, 1088, 1089, 1090, 1091, 1092, 1093, 1094, 1095, 1096, 1097, 1098, 1099, 1100, 1101, 1102, 1103, 1104, 1105, 1106, 1107, 1108, 1109, 1110, 1111, 1112, 1113, 1114, 1115, 1116, 1117, 1118, 1119, 1120, 1121, 1122, 1123, 1124, 1125, 1126, 1127, 1128, 1129, 1130, 1131, 1132, 1133, 1134, 1135, 1136, 1137, 1138, 1139, 1140, 1141, 1142, 1143, 1144, 1145, 1146, 1147, 1148, 1149, 1150, 1151, 1152, 1153, 1154, 1155, 1156, 1157, 1158, 1159, 1160, 1161, 1162, 1163, 1164, 1165, 1166, 1167, 1168, 1169, 1170, 1171, 1172, 1173, 1174, 1175, 1176, 1177, 1178, 1179, 1180, 1181, 1182, 1183, 1184, 1185, 1186, 1187, 1188, 1189, 1190, 1191, 1192, 1193, 1194, 1195, 1196, 1197, 1198, 1199, 1200, 1201, 1202, 1203, 1204, 1205, 1206, 1207, 1208, 1209, 1210, 1211, 1212, 1213, 1214, 1215, 1216, 1217, 1218, 1219, 1220, 1221, 1222, 1223, 1224, 1225, 1226, 1227, 1228, 1229, 1230, 1231, 1232, 1233, 1234, 1235, 1236, 1237, 1238, 1239, 1240, 1241, 1242, 1243, 1244, 1245, 1246, 1247, 1248, 1249, 1250, 1251, 1252, 1253, 1254, 1255, 1256, 1257, 1258, 1259, 1260, 1261, 1262, 1263, 1264, 1265, 1266, 1267, 1268, 1269, 1270, 1271, 1272, 1273, 1274, 1275, 1276, 1277, 1278, 1279, 1280, 1281, 1282, 1283, 1284, 1285, 1286, 1287, 1288, 1289, 1290, 1291, 1292, 1293, 1294, 1295, 1296, 1297, 1298, 1299, 1300, 1301, 1302, 1303, 1304, 1305, 1306, 1307, 1308, 1309, 1310, 1311, 1312, 1313, 1314, 1315, 1316, 1317, 1318, 1319, 1320, 1321, 1322, 1323, 1324, 1325, 1326, 1327, 1328, 1329, 1330, 1331, 1332, 1333, 1334, 1335, 1336, 1337, 1338, 1339, 1340, 1341, 1342, 1343, 1344, 1345, 1346, 1347, 1348, 1349, 1350, 1351, 1352, 1353, 1354, 1355, 1356, 1357, 1358, 1359, 1360, 1361, 1362, 1363, 1364, 1365, 1366, 1367, 1368, 1369, 1370, 1371, 1372, 1373, 1374, 1375, 1376, 1377, 1378, 1379, 1380, 1381, 1382, 1383, 1384, 1385, 1386, 1387, 1388, 1389, 1390, 1391, 1392, 1393, 1394, 1395, 1396, 1397, 1398, 1399, 1400, 1401, 1402, 1403, 1404, 1405, 1406, 1407, 1408, 1409, 1410, 1411, 1412, 1413, 1414, 1415, 1416, 1417, 1418, 1419, 1420, 1421, 1422, 1423, 1424, 1425, 1426, 1427, 1428, 1429, 1430, 1431, 1432, 1433, 1434, 1435, 1436, 1437, 1438, 1439, 1440, 1441, 1442, 1443, 1444, 1445, 1446, 1447, 1448, 1449, 1450, 1451, 1452, 1453, 1454, 1455, 1456, 1457, 1458, 1459, 1460, 1461, 1462, 1463, 1464, 1465, 1466, 1467, 1468, 1469, 1470, 1471, 1472, 1473, 1474, 1475, 1476, 1477, 1478, 1479, 1480, 1481, 1482, 1483, 1484, 1485, 1486, 1487, 1488, 1489, 1490, 1491, 1492, 1493, 1494, 1495, 1496, 1497, 1498, 1499, 1500, 1501, 1502, 1503, 1504, 1505, 1506, 1507, 1508, 1509, 1510, 1511, 1512, 1513, 1514, 1515, 1516, 1517, 1518, 1519, 1520, 1521, 1522, 1523, 1524, 1525, 1526, 1527, 1528, 1529, 1530, 1531, 1532, 1533, 1534, 1535, 1536, 1537, 1538, 1539, 1540, 1541, 1542, 1543, 1544, 1545, 1546, 1547, 1548, 1549, 1550, 1551, 1552, 1553, 1554, 1555, 1556, 1557, 1558, 1559, 1560, 1561, 1562, 1563, 1564, 1565, 1566, 1567, 1568, 1569, 1570, 1571, 1572, 1573, 1574, 1575, 1576, 1577, 1578, 1579, 1580, 1581, 1582, 1583, 1584, 1585, 1586, 1587, 1588, 1589, 1590, 1591, 1592, 1593, 1594, 1595, 1596, 1597, 1598, 1599, 1600, 1601, 1602, 1603, 1604, 1605, 1606, 1607, 1608, 1609, 1610, 1611, 1612, 1613, 1614, 1615, 1616, 1617, 1618, 1619, 1620, 1621, 1622, 1623, 1624, 1625, 1626, 1627, 1628, 1629, 1630, 1631, 1632, 1633, 1634, 1635, 1636, 1637, 1638, 1639, 1640, 1641, 1642, 1643, 1644, 1645, 1646, 1647, 1648, 1649, 1650, 1651, 1652, 1653, 1654, 1655, 1656, 1657, 1658, 1659, 1660, 1661, 1662, 1663, 1664, 1665, 1666, 1667, 1668, 1669, 1670, 1671, 1672, 1673, 1674, 1675, 1676, 1677, 1678, 1679, 1680, 1681, 1682, 1683, 1684, 1685, 1686, 1687, 1688, 1689, 1690, 1691, 1692, 1693, 1694, 1695, 1696, 1697, 1698, 1699, 1700, 1701, 1702, 1703, 1704, 1705, 1706, 1707, 1708, 1709, 1710, 1711, 1712, 1713, 1714, 1715, 1716, 1717, 1718, 1719, 1720, 1721, 1722, 1723, 1724, 1725, 1726, 1727, 1728, 1729, 1730, 1731, 1732, 1733, 1734, 1735, 1736, 1737, 1738, 1739, 1740, 1741, 1742, 1743, 1744, 1745, 1746, 1747, 1748, 1749, 1750, 1751, 1752, 1753, 1754, 1755, 1756, 1757, 1758, 1759, 1760, 1761, 1762, 1763, 1764, 1765, 1766, 1767, 1768, 1769, 1770, 1771, 1772, 1773, 1774, 1775, 1776, 1777, 1778, 1779, 1780, 1781, 1782, 1783, 1784, 1785, 1786, 1787, 1788, 1789, 1790, 1791, 1792, 1793, 1794, 1795, 1796, 1797, 1798, 1799, 1800, 1801, 1802, 1803, 1804, 1805, 1806, 1807, 1808, 1809, 1810, 1811, 1812, 1813, 1814, 1815, 1816, 1817, 1818, 1819, 1820, 1821, 1822, 1823, 1824, 1825, 1826, 1827, 1828, 1829, 1830, 1831, 1832, 1833, 1834, 1835, 1836, 1837, 1838, 1839, 1840, 1841, 1842, 1843, 1844, 1845, 1846, 1847, 1848, 1849, 1850, 1851, 1852, 1853, 1854, 1855, 1856, 1857, 1858, 1859, 1860, 1861, 1862, 1863, 1864, 1865, 1866, 1867, 1868, 1869, 1870, 1871, 1872, 1873, 1874, 1875, 1876, 1877, 1878, 1879, 1880, 1881, 1882, 1883, 1884, 1885, 1886, 1887, 1888, 1889, 1890, 1891, 1892, 1893, 1894, 1895, 1896, 1897, 1898, 1899, 1900, 1901, 1902, 1903, 1904, 1905, 1906, 1907, 1908, 1909, 1910, 1911, 1912, 1913, 1914, 1915, 1916, 1917, 1918, 1919, 1920, 1921, 1922, 1923, 1924, 1925, 1926, 1927, 1928, 1929, 1930, 1931, 1932, 1933, 1934, 1935, 1936, 1937, 1938, 1939, 1940, 1941, 1942, 1943, 1944, 1945, 1946, 1947, 1948, 1949, 1950, 1951, 1952, 1953, 1954, 1955, 1956, 1957, 1958, 1959, 1960, 1961, 1962, 1963, 1964, 1965, 1966, 1967, 1968, 1969, 1970, 1971, 1972, 1973, 1974, 1975, 1976, 1977, 1978, 1979, 1980, 1981, 1982, 1983, 1984, 1985, 1986, 1987, 1988, 1989, 1990, 1991, 1992, 1993, 1994, 1995, 1996, 1997, 1998, 1999, 2000, 2001, 2002, 2003, 2004, 2005, 2006, 2007, 2008, 2009, 2010, 2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020, 2021, 2022, 2023, 2024, 2025, 2026, 2027, 2028, 2029, 2030, 2031, 2032, 2033, 2034, 2035, 2036, 2037, 2038, 2039, 2040, 2041, 2042, 2043, 2044, 2045, 2046, 2047, 2048, 2049, 2050, 2051, 2052, 2053, 2054, 2055, 2056, 2057, 2058, 2059, 2060, 2061, 2062, 2063, 2064, 2065, 2066, 2067, 2068, 2069, 2070, 2071, 2072, 2073, 2074, 2075, 2076, 2077, 2078, 2079, 2080, 2081, 2082, 2083, 2084, 2085, 2086, 2087, 2088, 2089, 2090, 2091, 2092, 2093, 2094, 2095, 2096, 2097, 2098, 2099, 2100, 2101, 2102, 2103, 2104, 2105, 2106, 2107, 2108, 2109, 2110, 2111, 2112, 2113, 2114, 2115, 2116, 2117, 2118, 2119, 2120, 2121, 2122, 2123, 2124, 2125, 2126, 2127, 2128, 2129, 2130, 2131, 2132, 2133, 2134, 2135, 2136, 2137, 2138, 2139, 2140, 2141, 2142, 2143, 2144, 2145, 2146, 2147, 2148, 2149, 2150, 2151, 2152, 2153, 2154, 2155, 2156, 2157, 2158, 2159, 2160, 2161, 2162, 2163, 2164, 2165, 2166, 2167, 2168, 2169, 2170, 2171, 2172, 2173, 2174, 2175, 2176, 2177, 2178, 2179, 2180, 2181, 2182, 2183, 2184, 2185, 2186, 2187, 2188, 2189, 2190, 2191, 2192, 2193, 2194, 2195, 2196, 2197, 2198, 2199, 
```

WHC-SD-SQA-CSA-524 Rev. 0

```

* V-C-21-F-1rp
* Vault #2, Pu239/240 = 100/0, H/Fu = 2, Inter = 0.30
* 4.5, 2.5, 2.5, no people, no hands, extra
FISCON

* Material 1 - Contents PuO2-H2O
* material 2 - Water
* material 3 - Concrete
* material 4 - Concrete
* material 5 - Poly CH2
* material 6 - Air (0.0001 H2O)
6 12 NUCNAMES

ATCM 6.65 Pu239 1.00 O 3.0 HINHE2O 2.0
ATCM 0.998 HINHE2O 2.0 O 1.0 Pu239-03 FE 5.89796-02 MI 7.72074E-03
CONC SI 0.007023 O 0.043936 AL27 0.003358 SI 0.012905
CA 0.002147 FE 0.001347
C 1.0
ATCM 0.96 HINHE2O 2.0 C 1.0
ATCM 0.7500 HINHE2O 2.0 C 1.0
CH

* Part 1 (4.5 Kg Pu) Can in Right Rear
NEST 4
1 2R00 ORIGIN 0 0 -0.0000 1 4.3428 13.8092
2 2R00 ORIGIN 0 0 -0.0000 6 4.3428 20.2743
3 2R00 ORIGIN 0 0 -0.0229 3 4.3566 20.3200
4 CUBOID ORIGIN 0 0 -0.0229 6 5.0000 25.4800 30.4800 -17.8600 -5.0000 0.0000

* Part 2 (4.5 Kg Pu) Can in Left Rear
NEST 4
1 2R00 ORIGIN 0 0 -0.0000 1 4.3428 13.8092
2 2R00 ORIGIN 0 0 -0.0000 6 4.3428 20.2743
3 2R00 ORIGIN 0 0 -0.0229 3 4.3566 20.3200
4 CUBOID ORIGIN 0 0 -0.0229 6 5.0000 25.4800 30.4800 -17.8600 -5.0000 0.0000

* Part 3 (2.5 Kg Pu) Can in Right Rear
NEST 4
1 2R00 ORIGIN 0 0 -0.0000 1 4.3428 7.6718
2 2R00 ORIGIN 0 0 -0.0000 6 4.3428 20.2743
3 2R00 ORIGIN 0 0 -0.0229 3 4.3566 20.3200
4 CUBOID ORIGIN 0 0 -0.0229 6 5.0000 25.4800 30.4800 -17.8600 -5.0000 0.0000

* Part 4 (2.5 Kg Pu) Can in Left Rear
NEST 4
1 2R00 ORIGIN 0 0 -0.0000 1 4.3428 7.6718
2 2R00 ORIGIN 0 0 -0.0000 6 4.3428 20.2743
3 2R00 ORIGIN 0 0 -0.0229 3 4.3566 20.3200
4 CUBOID ORIGIN 0 0 -0.0229 6 5.0000 25.4800 30.4800 -17.8600 -5.0000 0.0000

* Part 5 (2.5 Kg Pu) Can in Right Front
NEST 4
1 2R00 ORIGIN 0 0 -0.0000 1 4.3428 7.6718
2 2R00 ORIGIN 0 0 -0.0000 6 4.3428 20.2743
3 2R00 ORIGIN 0 0 -0.0229 3 4.3566 20.3200
4 CUBOID ORIGIN 0 0 -0.0229 6 5.0000 25.4800 30.4800 -17.8600 -5.0000 0.0000

* Part 6 (2.5 Kg Pu) Can in Left Front
NEST 4
1 2R00 ORIGIN 0 0 -0.0000 1 4.3428 7.6718
2 2R00 ORIGIN 0 0 -0.0000 6 4.3428 20.2743
3 2R00 ORIGIN 0 0 -0.0229 3 4.3566 20.3200
4 CUBOID ORIGIN 0 0 -0.0229 6 5.0000 25.4800 30.4800 -17.8600 -5.0000 0.0000

* Part 7 Air for space
NEST 4
1 CUBOID ORIGIN 0 0 6.22.8600 30.4800 30.4800 0 0 0 0

* Part 8 (4.5 Kg Pu) Can in Right Front with hands
NEST 5
1 2R00 ORIGIN 0 0 -0.0000 1 4.3428 13.8092
2 2R00 ORIGIN 0 0 -0.0000 6 4.3428 20.2743
3 2R00 ORIGIN 0 0 -0.0229 3 4.3566 20.3200
4 2R00 ORIGIN 0 0 -0.0229 6 6.9056 20.3200
5 CUBOID ORIGIN 0 0 -0.0229 6 7.0000 7.0000 30.4800 -15.8600 -23.4800 0.0000

* Part 9 (4.5 Kg Pu) Can in Left Front with hands
NEST 5
1 2R00 ORIGIN 0 0 -0.0000 1 4.3428 13.8092
2 2R00 ORIGIN 0 0 -0.0000 6 4.3428 20.2743
3 2R00 ORIGIN 0 0 -0.0229 3 4.3566 20.3200
4 2R00 ORIGIN 0 0 -0.0229 6 6.9056 20.3200
5 CUBOID ORIGIN 0 0 -0.0229 6 15.8600 7.0000 30.4800 -15.8600 -23.4800 0.0000

* Part 10 Water for person
NEST 1
1 CUBOID ORIGIN 0 0 6.22.8600 30.4800 30.4800 0 0 0 0

* Part 11 (4.5 Kg Pu) Extra Can in Right Rear
NEST 5
1 2R00 ORIGIN 0 0 -0.0000 1 4.3428 13.8092
2 2R00 ORIGIN 0 0 -0.0000 6 4.3428 20.2743
3 2R00 ORIGIN 0 0 -0.0229 3 4.3566 20.3200
4 2R00 ORIGIN 0 0 -0.0229 6 7.0000 7.0000 30.4800 -15.8600 -23.4800 0.0000
5 CUBOID ORIGIN 0 0 -0.0229 6 7.0000 23.4800 30.4800 -15.8600 -23.4800 0.0000

* Part 12 Array of 3 racks by 36 cubicles wide by 7 cubicles high
NEST 3
1 2R18 100+4 (7)*32 (7)*36 (5 6)*18 (7)*36 (3 4)*18 (7)*36
(1 2)*18 100+4 (7)*32 (7)*36 (5 6)*18 (7)*36 (3 4)*18 (7)*36
1 2)*18 100+4 (7)*32 (7)*36 3 4 3 (5 6)*16 (7)*36 (3 4)*18 (7)*36
8 9 9 (1 2)*16 10 11 10 10 17)*32 (7)*36 (5 6)*16 (7)*36 (3 4)*18 (7)*36
(1 2)*18 100+4 (7)*32 (7)*36 3 4 3 (5 6)*16 (7)*36 (3 4)*18 (7)*36
1 2)*18 100+4 (7)*32 (7)*36 (5 6)*18 (7)*36 (3 4)*18 (7)*36
(1 2)*18 (7)*36 (7)*36 (3 6)*18 (7)*36 (3 4)*18 (7)*36

* Part 13 The rest of it
NEST 3
NEST 3
1 2R00 P42 411.49 513.36 213.36 -411.48 0.00 0.00
2 CUBOID 4 411.49 365.76 304.80 -411.48 0.00 0.00
3 CUBOID 4 441.96 394.24 335.28 -441.96 -30.48 -30.48

*End of model
*Control Data
SUPERMIST 5 1.0 STDV 0.0030 -1
-5 -230 100 0
FISFILE REGION 1 IN PART 13 /
END
*****
* V-C-21-G-1rp
* Vault #2, Pu239/240 = 100/0, H/Fu = 2, Inter = 1.000
* 4.5, 2.5, 2.5, no people, no hands, extra
FISCON

* Material 1 - Contents PuO2-H2O
* material 2 - Water
* material 3 - Concrete
* material 4 - Concrete
* material 5 - Poly CH2
* material 6 - Air (0.0001 H2O)
6 12 NUCNAMES

ATCM 6.65 Pu239 1.00 O 3.0 HINHE2O 2.0
ATCM 0.998 HINHE2O 2.0 O 1.0 Pu239-03 FE 5.89796-02 MI 7.72074E-03
CONC SI 0.007023 O 0.043936 AL27 0.003358 SI 0.012905
CA 0.002147 FE 0.001347
C 1.0
ATCM 0.96 HINHE2O 2.0 C 1.0
ATCM 0.7500 HINHE2O 2.0 C 1.0
CH

* Part 1 (4.5 Kg Pu) Can in Right Rear
NEST 4
1 2R00 ORIGIN 0 0 -0.0000 1 4.3428 13.8092
2 2R00 ORIGIN 0 0 -0.0000 6 4.3428 20.2743
3 2R00 ORIGIN 0 0 -0.0229 3 4.3566 20.3200
4 CUBOID ORIGIN 0 0 -0.0229 6 5.0000 25.4800 30.4800 -17.8600 -5.0000 0.0000

* Part 2 (4.5 Kg Pu) Can in Left Rear
NEST 4
1 2R00 ORIGIN 0 0 -0.0000 1 4.3428 13.8092
2 2R00 ORIGIN 0 0 -0.0000 6 4.3428 20.2743
3 2R00 ORIGIN 0 0 -0.0229 3 4.3566 20.3200
4 CUBOID ORIGIN 0 0 -0.0229 6 5.0000 25.4800 30.4800 -17.8600 -5.0000 0.0000

* Part 3 (2.5 Kg Pu) Can in Right Rear
NEST 4
1 2R00 ORIGIN 0 0 -0.0000 1 4.3428 7.6718
2 2R00 ORIGIN 0 0 -0.0000 6 4.3428 20.2743
3 2R00 ORIGIN 0 0 -0.0229 3 4.3566 20.3200
4 CUBOID ORIGIN 0 0 -0.0229 6 5.0000 25.4800 30.4800 -17.8600 -5.0000 0.0000

* Part 4 (2.5 Kg Pu) Can in Left Rear
NEST 4
1 2R00 ORIGIN 0 0 -0.0000 1 4.3428 7.6718
2 2R00 ORIGIN 0 0 -0.0000 6 4.3428 20.2743
3 2R00 ORIGIN 0 0 -0.0229 3 4.3566 20.3200
4 CUBOID ORIGIN 0 0 -0.0229 6 5.0000 25.4800 30.4800 -17.8600 -5.0000 0.0000

* Part 5 (2.5 Kg Pu) Can in Right Front
NEST 4
1 2R00 ORIGIN 0 0 -0.0000 1 4.3428 7.6718
2 2R00 ORIGIN 0 0 -0.0000 6 4.3428 20.2743
3 2R00 ORIGIN 0 0 -0.0229 3 4.3566 20.3200
4 CUBOID ORIGIN 0 0 -0.0229 6 5.0000 25.4800 30.4800 -17.8600 -5.0000 0.0000

* Part 6 (2.5 Kg Pu) Can in Left Front
NEST 4
1 2R00 ORIGIN 0 0 -0.0000 1 4.3428 7.6718
2 2R00 ORIGIN 0 0 -0.0000 6 4.3428 20.2743
3 2R00 ORIGIN 0 0 -0.0229 3 4.3566 20.3200
4 CUBOID ORIGIN 0 0 -0.0229 6 5.0000 25.4800 30.4800 -17.8600 -5.0000 0.0000

* Part 7 Air for space
NEST 4
1 CUBOID ORIGIN 0 0 6.22.8600 30.4800 30.4800 0 0 0 0

```

[illegible]


```

2 2R0D  ORIGIN 0 -0.0000 6 4.3428 20.2743
3 2R0D  ORIGIN 0 -0.0229 3 4.3656 20.3200
4 CUBOID ORIGIN 0 -0.0229 6 5.0000 25.4800 -17.8600 -5.0000 0.0000

* Part 4 (2.5 Kg Pu) Can in Left Rear
NEST 4
1 2R0D  ORIGIN 0 -0.0000 1 4.3428 7.6718
2 2R0D  ORIGIN 0 -0.0000 6 4.3428 20.2743
3 2R0D  ORIGIN 0 -0.0000 6 4.3428 20.2743
4 CUBOID ORIGIN 0 -0.0229 6 5.0000 30.4800 -17.8600 -5.0000 0.0000

* Part 5 (4.5 Kg Pu) Can in Right Front
NEST 5
1 2R0D  ORIGIN 0 -0.0000 1 4.3428 13.8092
2 2R0D  ORIGIN 0 -0.0000 6 4.3428 20.2743
3 2R0D  ORIGIN 0 -0.0229 3 4.3656 20.3200
4 CUBOID ORIGIN 0 -0.0229 6 5.0000 30.4800 -17.8600 -5.0000 0.0000

* Part 6 (4.5 Kg Pu) Can in Left Front
NEST 6
1 2R0D  ORIGIN 0 -0.0000 1 4.3428 13.8092
2 2R0D  ORIGIN 0 -0.0000 6 4.3428 20.2743
3 2R0D  ORIGIN 0 -0.0229 3 4.3656 20.3200
4 CUBOID ORIGIN 0 -0.0229 6 5.0000 30.4800 -17.8600 -5.0000 0.0000

* Part 7 (4.5 Kg Pu) Can in Right Rear
NEST 7
1 2R0D  ORIGIN 0 -0.0000 1 4.3428 13.8092
2 2R0D  ORIGIN 0 -0.0000 6 4.3428 20.2743
3 2R0D  ORIGIN 0 -0.0229 3 4.3656 20.3200
4 CUBOID ORIGIN 0 -0.0229 6 5.0000 30.4800 -17.8600 -5.0000 0.0000

* Part 8 (2.5 Kg Pu) Can in Left Rear
NEST 8
1 2R0D  ORIGIN 0 -0.0000 1 4.3428 7.6718
2 2R0D  ORIGIN 0 -0.0000 6 4.3428 20.2743
3 2R0D  ORIGIN 0 -0.0229 3 4.3656 20.3200
4 CUBOID ORIGIN 0 -0.0229 6 5.0000 30.4800 -17.8600 -5.0000 0.0000

* Part 9 The rest of it
NEST 9
1 CUBOID P8 411.48 213.36 213.36 -411.48 0.00 0.00
2 CUBOID P8 411.48 213.36 213.36 -411.48 0.00 0.00
3 CUBOID 6 411.96 366.24 335.28 -411.96 -30.48 -30.48

*End of model

*Control Data
SUPERHIT 5 1.0
-5 250 100 0 STUV 0.0030 -1
FEYLE REGION 1 IN PART 9 /
END

*****

* V-C-41-B-imp
* Vault 42, Pu239/240 = 100/0, H/Pu = 2, inter = 0.001
* 4.5, 2.5, 4.5, no people no hands, no extra
FUSION
* material 1 - Contents PuO2-H2O
* material 2 - Water H2O
* material 3 - Concrete CH2
* material 4 - Concrete CH2
* material 5 - Poly
* material 6 - Air (0.0001 H2O)

6 12 NUCNAMES
2 CUBOID P8 411.48 213.36 213.36 -411.48 0.00 0.00
3 CUBOID 6 411.96 366.24 335.28 -411.96 -30.48 -30.48

```

```

3 CUBOID 4 441.96 394.24 335.28 -441.96 -30.48 -30.48

*End of model
*Control Data
SUPERHIST 5 1.0
-5 250 100 0 STDV 0.0030 -1
END

*****
* V-C-41-C-imp
* Vault #2, Pz139/240 = 100/0, H/Pu = 2, Inter = 0.0031
* 2.5, 4.5, 4.5, no people no hands, no extra
FISSION
*****
* material 1 - Contents PuO2-H2O
* material 2 - Water H2O
* material 3 - 304 Stainless
* material 4 - Polyethylene CH2
* material 5 - Polyethylene CH2
* material 6 - Air (0.0001 H2O)

6 12 NUCNAMES
ATOM 6.65 PU239 1.00 0 3.0 HINHEO 2.0
ATOM 0.998 HINHEO 2.0238E-02 0 1.0 HINHEO 2.0
CONC H 0.043336 AL27 0.003358 SI 0.012965
C 0.007025 FE 0.0013437
ATOM 0.96 HINHEO 2.0 0 1.0
ATOM 0.0001 HINHEO 2.0 0 1.0

CM

* Part 1 (4.5 Kg Pu) Can in Right Rear
NEST 4
1 ZROD ORIGIN 0 0 -0.0000 1 4.3428 13.8092
2 ZROD ORIGIN 0 0 -0.0000 6 4.3428 20.2743
3 ZROD ORIGIN 0 0 -0.0000 3 4.3556 20.3200
4 CUBOID ORIGIN 0 0 -0.0229 6 5.0000 25.4800 30.4800 -17.8600 -17.8600 -17.8600 -5.0000 0.0000

* Part 2 (4.5 Kg Pu) Can in Left Rear
NEST 4
1 ZROD ORIGIN 0 0 -0.0000 1 4.3428 13.8092
2 ZROD ORIGIN 0 0 -0.0000 6 4.3428 20.2743
3 ZROD ORIGIN 0 0 -0.0229 3 4.3556 20.3200
4 CUBOID ORIGIN 0 0 -0.0229 6 17.8600 5.0000 30.4800 -5.0000 -25.4800 0.0000

* Part 3 (2.5 Kg Pu) Can in Right Rear
NEST 4
1 ZROD ORIGIN 0 0 -0.0000 1 4.3428 13.8092
2 ZROD ORIGIN 0 0 -0.0000 6 4.3428 20.2743
3 ZROD ORIGIN 0 0 -0.0229 3 4.3556 20.3200
4 CUBOID ORIGIN 0 0 -0.0229 6 5.0000 25.4800 30.4800 -17.8600 -17.8600 -17.8600 -5.0000 0.0000

* Part 4 (2.5 Kg Pu) Can in Left Rear
NEST 4
1 ZROD ORIGIN 0 0 -0.0000 1 4.3428 13.8092
2 ZROD ORIGIN 0 0 -0.0000 6 4.3428 20.2743
3 ZROD ORIGIN 0 0 -0.0229 3 4.3556 20.3200
4 CUBOID ORIGIN 0 0 -0.0229 6 5.0000 25.4800 30.4800 -17.8600 -17.8600 -17.8600 -5.0000 0.0000

* Part 5 (4.5 Kg Pu) Can in Right Front
NEST 4
1 ZROD ORIGIN 0 0 -0.0000 1 4.3428 13.8092
2 ZROD ORIGIN 0 0 -0.0000 6 4.3428 20.2743
3 ZROD ORIGIN 0 0 -0.0229 3 4.3556 20.3200
4 CUBOID ORIGIN 0 0 -0.0229 6 5.0000 30.4800 -17.8600 -25.4800 0.0000

* Part 6 (4.5 Kg Pu) Can in Left Front
NEST 4
1 ZROD ORIGIN 0 0 -0.0000 1 4.3428 13.8092
2 ZROD ORIGIN 0 0 -0.0000 6 4.3428 20.2743
3 ZROD ORIGIN 0 0 -0.0229 3 4.3556 20.3200
4 CUBOID ORIGIN 0 0 -0.0229 6 17.8600 5.0000 30.4800 -5.0000 -25.4800 0.0000

* Part 7 Air for space
NEST 1
1 CUBOID ORIGIN 0 0 0 6 22.8600 30.4800 30.4800 0 0 0 0

* Part 8 Array of 3 racks by 36 cubicles wide by 7 cubicles high
ARRAY 36 7
(3 4)-18 (7)-36 (7)-36 (5 6)-18 (7)-36 (1 2)-18 (7)-36
(3 4)-18 (7)-36 (5 6)-18 (7)-36 (1 2)-18 (7)-36
(3 4)-18 (7)-36 (5 6)-18 (7)-36 (1 2)-18 (7)-36
(3 4)-18 (7)-36 (5 6)-18 (7)-36 (1 2)-18 (7)-36
(3 4)-18 (7)-36 (7)-36 (5 6)-18 (7)-36 (1 2)-18 (7)-36
(3 4)-18 (7)-36 (7)-36 (5 6)-18 (7)-36 (1 2)-18 (7)-36
(3 4)-18 (7)-36 (7)-36 (5 6)-18 (7)-36 (1 2)-18 (7)-36
(3 4)-18 (7)-36 (7)-36 (5 6)-18 (7)-36 (1 2)-18 (7)-36

* Part 9 The rest of it
NEST 3
1 CUBOID Pz 411.40 411.36 213.36 -411.40 0.00 0.00
2 CUBOID Pz 411.40 411.36 213.36 -411.40 0.00 0.00
3 CUBOID 4 441.96 394.24 335.28 -441.96 -30.48 -30.48

*End of model
*Control Data
-5 250 100 0 STDV 0.0030 -1
END
FISSION REGION 1 IN PART 9 /
END

```

DISTRIBUTION SHEET

To Distribution	From Criticality and Shielding	Page 1 of 1			
		Date 11/25/96			
Project Title/Work Order CSER 96-028 : PFP Vault #2 Storage Racks		EDT No. 619224			
		ECN No. N/A			
Name	MSIN	Text With All Attach.	Text Only	Attach./ Appendix Only	EDT/ECN Only

E.P. Bonadie	T5-55	X
K.D. Dobbin	H0-35	X
D.G. Erickson (2)	H0-35	X
S.R. Gedeon	H0-35	X
M.W. Gibson	T5-55	X
J. Greenborg	H0-35	X
K.E. Hillesland	H0-35	X
S.F. Kessler	H0-35	X
C.M. Kronvall	T5-15	X
J.S. Lan	H0-35	X
W.S. Lewis	T5-55	X
E.M. Miller	H0-35	X
L.T. Nirider	T5-53	X
S.E. Nunn	T5-11	X
L.L. Pedersen (3)	H0-35	X
R.F. Richards	H0-35	X
S.P. Roblyer	H0-35	X
L.H. Rodgers	T5-54	X
R.H. Ruben	H0-35	X
K.N. Schwinkendorf	H0-35	X
W.D. Wittekind	H0-35	X
W.T. Watson	H0-35	X
Central Files (Original +2)	A3-88	X