MAY 01 1996

ENGINEERING DATA TRANSMITTAL

Page 1 of 1

1. EDT 603240

2. To: (Receiving Organization)	3. From: (Originating Organization) Nuclear Physics and Shielding	4. Related EDT No.:
5. Proj./Prog./Dept./Div.: West Valley	6. Cog. Engr.: V. E. Roetman	7. Purchase Order No.:
8. Originator Remarks: Documentation of Shielding Calculations for West Valley Vitrification Cell		9. Equip./Component No.:
		10. System/Bldg./Facility:
11. Receiver Remarks:		12. Major Assm. Dwg. No.:
		13. Permit/Permit Application No.:
		14. Required Response Date:

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 Designa- tor	Reason for Trans- mittal	Originator Dispo- sition	Receiver Dispo- sition
1	WHC-SD-WV-CN-001	85 89	0	MCNP Calculational Models of West Valley Vitrification Cell and Point-Kernel Dose Contour Plots	N/A	1		

16. KEY		Approval Designator (F)		Reason for Transmittal (G)		Disposition (H) & (I)			
E, S, Q, D or N/A (see WHC-CM-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)	(H)	(J) Name	(K) Signature	(L) Date	(M) MSIN	(J) Name	(K) Signature	(L) Date	(M) MSIN
Reason	Disp.								
1	1	Cog.Eng. V.E. Roetman (3 copies)	<i>V. E. Roetman</i>	4/29/96	H0-35	Central Files (Original + 3 copies)		A3-88	6
1	1	Cog. Mgr. J. Greenborg	<i>J. Greenborg</i>	4/29/96	H0-35				
		QA							
		Safety							
		Env.							
1	1	Tech. Review: R.L. Simons	<i>R. L. Simons</i>	4/29/96	H0-35				
18. V.E. Roetman <i>V. E. Roetman</i> Signature of EDT Originator									
19. <i>V. E. Roetman</i> Authorized Representative Date									
20. J. Greenborg <i>J. Greenborg</i> Cognizant Manager Date									
21. DOE APPROVAL (if required) Ctrl. No. ☐ Approved ☐ Approved w/comments ☐ Disapproved w/comments									

MCNP Calculational Models of West Valley Vitrification Cell and Point-Kernel Dose Contour Plots

V. E. Roetman

Westinghouse Hanford Company, Richland, WA 99352

U.S. Department of Energy Contract DE-AC06-87RL10930

EDT/ECN: 603240

UC: 507

Org Code: 8M730

Charge Code: YX332

B&R Code: EX3133000

Total Pages: 69

Key Words: West Valley, Vitrification, Dose Rates, Shielding

Abstract: This documents the radiation physics model and dose rate calculations for the West Valley vitrification cell.

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.

Janis R. Bishop
Release Approval

5-1-96
Date

Approved for Public Release

MCNP CALCULATIONAL MODELS OF WEST VALLEY VITRIFICATION CELL AND POINT-KERNEL DOSE CONTOUR PLOTS

1.0 INTRODUCTION

The West Valley Vitrification Facility cell contains the concentrator tank, the feed tank, the melter, and up to twenty glass filled canisters. It is shielded with 48 inch concrete walls at the lower elevations, and by 34 and 26 inch walls at the upper elevations, as well as two steel doors. MCNP (see References 1 and 2) physics calculational models were constructed that included these sources and the shields. The MCNP models used for streaming calculations (e.g. the crane maintenance room, HEPA filter room) were developed from these models.

The dose rates inside and outside the cell were computed using the point-kernel option of MCNP, resulting in dose contour plots at four elevations for two source configurations (fifteen canisters, and twenty canisters).

2.0 METHODOLOGY

Figures 1 through 7 show three dimensional Sabrina (See Reference 3) plots of the MCNP calculational model.

The cell was modeled using the construction drawings of the facility (see Reference 4). The MCNP origin (0,0,0) for all physical dimensions was located at the north-west corner of the inside of the cell at EL 100'. The modeled cell internal width at elevation 91.44 cm (EL 103' or 3 feet above ground level) is 1036 cm, and the internal length is 1920 cm. At MCNP elevation 1051.56 cm (drawing EL 134.5') the cell model is 1158.24 cm wide, and 1975.8 cm long (internal). The model places the crane maintenance room (CMR) door at 2083.04 cm from the north cell wall (at EL 134.5'), and the iron door is 22.86 cm thick. The concrete walls at the lower elevation are modeled as 121.92 cm thick, and the walls at the upper elevation are 66.04 cm thick. Not included in the calculational model was the equipment on the west half of the cell. This is conservative because this equipment would provide some additional shielding.

Some other conservative assumptions made in this calculation are:

The canisters are 100% filled instead of 85%.

The source has an extra 15% curie concentration due to process uncertainties.

The concrete density is assumed to be at 142 lb/ft³.

No reinforcing bar and very little structural steel was modeled in the walls.

All the vessels and containers were assumed full.

The maximum height of a canister on the crane is EL 130' 8.125".

A full MCNP photon source description includes the concentrator tank, the feed tank, the melter, and twenty glass filled canisters. Four canisters are located in the turntable underneath the melter, eight in the pit storage rack, two in the welder station, one in the decontamination station, four on the transfer cart, and one on the crane against the east wall with the canister top at the maximum elevation of 935.04 cm. The other source configuration is the same except it excludes the canister on the crane and the four canisters on the cart, making the total number of canisters fifteen. The source strength and spectrum are specified in the MCNP input files (see the listing of the input files in Attachment A).

The photon source was obtained using the information provided by West Valley in Tables 1 and 2, where the melter feed source is described in curies/cm³ for each nuclide in Table 1, and the glass source is described in curies/g for each nuclide in Table 2. The volume and densities of each source type is as follows:

Feed Tank and Concentrator:	Material Density: 1.3 g/cm ³
	Volume: 1.897x10 ⁷ cm ³

Melter Glass:	Material Density: 2.7 g/cm ³
	Volume: 8.587x10 ⁵ cm ³

Canister Glass:	Material Density: 2.7 g/cm ³
	Volume: 2.298x10 ⁵ cm ³

The photon energy spectrum and the total photons per second per unit volume (for feed) or unit mass (for glass) of material was generated with ISOSHLD (see Reference 5 and Attachment B). The total photons/g of the glass and total photons/cm³ of the feed were multiplied by the total mass of the glass and the total volume of the feed to get the total source strength in photons/sec, which was 3.4x10¹⁶ photons/sec.

Table 1. Radionuclide concentration in curies for 1 cm³ of waste feed.

Fe-55 1.20-7	Eu-154 4.96-5	Th-232 1.38-9
Co-60 2.95-7	Eu-155 8.68-6	Th-234 6.72-10
Ni-59 8.92-8	Tl-207 7.92-9	Pa-231 1.28-8
Ni-63 6.18-6	Tl-208 2.52-9	Pa-233 1.98-8
Se-79 3.11-9	Pb-209 1.81-10	Pa-234* 6.72-10
Sr-90 4.89-3	Pb-211 7.95-9	U-232 5.54-9
Y-90 4.89-3	Pb-212 7.02-9	U-233 7.61-9
Zr-93 2.29-7	Bi-211 7.95-9	U-234 3.64-9
Nb-93* 1.71-7	Bi-212 7.02-9	U-235 7.97-11
Tc-99 1.02-7	Bi-213 1.81-10	U-236 2.34-10
Ru-106 2.14-10	Po-212 4.50-9	U-238 6.72-10
Rh-106 1.94-10	Po-213 1.77-10	Np-236 7.98-9
Pd-107 9.28-9	Po-215 7.95-9	Np-237 1.98-8
Cd-113* 1.49-6	Po-216 7.02-9	Np-239 2.92-7
Sn-121* 1.35-8	At-217 1.81-10	Pu-236 7.10-10
Sn-126 8.77-8	Rn-219 7.95-9	Pu-238 6.67-6
Sb-125 1.36-6	Rn-220 7.02-9	Pu-239 1.37-6
Sb-126 1.23-8	Fr-221 1.81-10	Pu-240 1.01-6
Sb-126* 8.77-8	Fr-223 1.10-10	Pu-241 5.09-5
Te-125* 3.51-7	Ra-223 7.95-9	Pu-242 1.37-9
I-129 1.52-10	Ra-224 7.02-9	Am-241 4.51-5
Cs-134 5.89-7	Ra-225 1.81-10	Am-242 2.42-7
Cs-135 1.38-7	Ra-228 1.33-9	Am-242* 2.43-7
Cs-137 5.38-3	Ac-225 1.81-10	Am-243 2.92-7
Ba-137* 5.09-3	Ac-227 7.95-9	Cm-242 2.01-7
Ce-144 2.62-12	Ac-228 1.33-9	Cm-243 9.76-8
Pr-144 2.63-12	Th-227 7.83-9	Cm-244 5.12-6
Pm-146 4.28-9	Th-228 7.02-9	Cm-245 7.43-10
Pm-147 1.51-5	Th-229 1.81-10	Cm-246 8.50-11
Sm-151 6.78-5	Th-230 4.94-11	
Eu-152 2.26-7	Th-231 7.97-11	

* isomeric state

Table 2. Radionuclide concentration in curies for 1 gram of glass.

Fe-55 2.93-7	Eu-155 2.13-5	Th-234 1.65-9
Co-60 7.25-7	Tl-207 1.94-8	Pa-231 3.14-8
Ni-59 2.19-7	Tl-208 6.19-9	Pa-233 4.85-8
Ni-63 1.52-5	Pb-209 4.44-10	Pa-234* 1.65-9
Se-79 7.29-9	Pb-211 1.95-8	U-232 1.36-8
Sr-90 1.20-2	Pb-212 1.72-8	U-233 1.87-8
Y-90 1.20-2	Bi-211 1.95-8	U-234 8.95-9
Zr-93 5.63-7	Bi-212 1.72-8	U-235 1.96-10
Nb-93* 4.19-7	Bi-213 4.44-10	U-236 5.73-10
Tc-99 2.25-7	Po-212 1.11-8	U-238 1.65-9
Ru-106 4.75-10	Po-213 4.34-10	Np-236 1.96-8
Rh-106 4.76-10	Po-215 1.95-8	Np-237 4.85-8
Pd-107 2.28-8	Po-216 1.72-8	Np-239 7.17-7
Cd-113* 3.30-6	At-217 4.44-10	Pu-236 1.74-9
Sn-121* 3.32-8	Rn-219 1.95-8	Pu-238 1.64-5
Sn-126 2.15-7	Rn-220 1.72-8	Pu-239 3.36-6
Sb-125 3.35-6	Fr-221 4.44-10	Pu-240 2.47-6
Sb-126 3.01-8	Fr-223 2.69-10	Pu-241 1.25-4
Sb-126* 2.15-7	Ra-223 1.95-8	Pu-242 3.36-9
Te-125* 8.21-7	Ra-224 1.72-8	Am-241 1.11-4
Cs-134 1.42-6	Ra-225 4.44-10	Am-242 5.94-7
Cs-135 3.34-7	Ra-228 3.26-9	Am-242* 5.97-7
Cs-137 1.30-2	Ac-225 4.44-10	Am-243 7.17-7
Ba-137* 1.23-2	Ac-227 1.95-8	Cm-242 4.93-7
Ce-144 6.44-12	Ac-228 3.26-9	Cm-243 2.40-7
Pr-144 6.45-12	Th-227 1.92-8	Cm-244 1.26-5
Pm-146 1.05-8	Th-228 1.72-8	Cm-245 1.82-9
Pm-147 3.71-5	Th-229 4.44-10	Cm-246 2.09-10
Sm-151 1.67-4	Th-230 1.21-10	
Eu-152 5.56-7	Th-231 1.96-10	* isomeric state
Eu-154 1.22-4	Th-232 3.39-9	

The material compositions used in the MCNP input files are shown in Table 3. All percentages are mass density unless otherwise specified.

An array of 2000 point detectors was positioned at each of four levels in order to calculate point-kernel dose rate information for obtaining contour plots. The elevations of the detectors are 91.44 cm (EL 103'), 403.86 cm (EL 113.25'), 822.96 cm (EL 127'), and 1051.56 cm (EL 134.5'). The dose rates were calculated using MCNPH, the Hanford version of MCNP, which includes the ability to tally large arrays of point detectors in point kernel mode. The dose contour plots were generated from the MCNPH output data using the visualization package PV-Wave (see Reference 6).

3.0 RESULTS

Figures 8 through 19 show the dose contour plots at each of the four levels with the full canister configuration, and at the upper two levels with the canister configuration without the cart or crane sources. There are two plots for each level, one detailing the dose rates inside of the cell, and one detailing the dose rates outside the cell, making a total of twelve plots. The dimension scale is in cm according to the MCNP coordinates. The view is a plan view of the cell with north being to the left. The dose rate contour lines are labeled as rem or mrem, referring to rem/hour and mrem/hour respectively. The plot elevation is labeled in feet where the ground level is at EL 100'.

These dose plots were generated using PV-Wave and were calculated from the dose point arrays generated from MCNPH point-kernel calculations. The contour line positions were calculated from linear interpolation along an array of the log of the dose values.

The dose rates at three specific points were also calculated with the point-kernel method. All three of these points were at the same X value as the center of the canister on the crane. The top of the crane canister is at 935.04 cm.

- 1) Dose at MCNP location x,y,z = 1318.02, 1453.17, 1051.56
(EL 134.5', 114.18" east of the outside upper wall)
3.00 mrem/hr

Table 3. Material Densities and Compositions.

Material 1: Dirt. Density 1.5 g/cm ³		
C 44.93%	Si 24.46%	Ca 6.31%
Fe 9.59%	Al 7.32%	Mg 2.76%
K 1.02%	Na 1.78%	Ti 1.46%
Mn .16%	P .21%	
Material 2: Ordinary concrete. Density 2.28 g/cm ³		
(atom density)		
H 6.42%	O 59.16%	Si 24.05%
Ca 7.38%	Fe 2.99%	
Material 3: Air. Density .0012 g/cm ³		
N 76.5%	O 23.5%	
Material 4: Water. Density 1 g/cm ³		
(atom density)		
H 66.67%	O 33.33%	
Material 5: 304 SS (stainless steel). Density 7.9 g/cm ³		
Mn 2%	Si 1%	Cr 19%
Ni 10%	Fe 68%	
Material 6: K-3 melter block. Density 3.83 g/cm ³		
Al 28.57%	Cr 25.46%	
Fe 6.15%	O 39.81%	
Material 7: H melter block. Density 3.139 g/cm ³		
Al 50.96%	Na 2.74%	
O 46.29%		
Material 8: Z (Zircaloy) melter block. Density 2.95 g/cm ³		
Al 36.97%	Zr 17.67%	
Si 2.93%	O 42.43%	
Material 9: AL-66 melter refractory. Density 2.72 g/cm ³		
Al 50.63%	Ca 1.57%	Fe 1.09%
Si .27%	O 46.44%	
Material 10: Melter FEED material. Density 1.3 g/cm ³		
Fe 2.65%	N 1.92%	Na 4.64%
Th 1.05%	C 2.83%	H 5.90%
B 2.83%	P .36%	Si 6.54%
O 71.14%		
Material 11: Glass waste material. Density 2.7 g/cm ³		
Si 25.82%	Th 4.00%	Fe 10.55%
Na 9.82%	B 4.00%	O 45.82%
Material 12: Iron for the doors. Density 7.8 g/cm ³		
Fe 100%		
Material 13: AL-57 melter refractory. Density 1.04 g/cm ³		

- 2) Dose at MCNP location x,y,z = 1318.02, 1878.17, 1051.56
(EL 134.5', 281.5" east of the outside upper wall)
1.44 mrem/hr
- 3) Dose at MCNP location x,y,z = 1318.02, 1453.17, 853.44
(EL 128', 114.18" east of the outside upper wall)
6.50 mrem/hr

The first two points are above the canister by 116.52 cm. The third point is horizontally and vertically in line with the top section of the canister.

There are some anomalies in the dose contours plots. These are caused by:

- 1) inherent assumptions in the buildup factors used in point-kernel calculations. At large angles through a shield, point-kernel assumes the line-of-sight shield thickness. For some geometric situations, this will cause lower calculated values closer to the shield wall than farther away.
- 2) statistical uncertainties due to very low dose rates, such as around corners. At these low values the statistical uncertainties of the Monte Carlo sampling of the source are large, therefore causing some uncertainties in the contour lines.
- 3) The penetrations in the CMR doorway allow some of the points a view of the sources with very little shielding, thereby reading high dose values. Because this view may be at an angle, but the dose points lie on a horizontal plane, the dose lines may appear to be isolated islands.
- 4) The PV-Wave package uses a linear interpolation approximation to calculate the position of a dose line between detector positions, which may give results slightly different than what MCNP would calculate.

The point-kernel method of calculating dose rates is especially well suited to direct shielding, i.e. a source, a shield (such as a wall) and a detector where the line between the source and the detector lies perpendicular to the wall. The approximations tend to give lower values when the line between the source and the detector becomes more parallel to the wall. This is because the point-kernel method assumes a thick shield in these cases, and does not consider the possibility of a particle approaching the wall at a shallow

angle, and reflecting at a sharp angle, straight through the wall and into a detector.

Figure 12 shows an example of the limitations of point-kernel calculations for complex geometrical situations. According to the figure, the dose rate increases when moving away from the wall at the top of the page (on the east side of the building) eventually exceeding .25 mrem/h. This exaggerated effect is coming from the source that is on the crane, against the upper wall. Because the upper wall is much thinner than the lower walls, the dose rates due to that source will be higher than the other sources in the cell. Close to the wall, the line between the canister on the crane and the detector goes at a sharp angle through the wall, where point-kernel assumes a thick shield and therefore low dose rates. As the detector moves further out from the wall, the angle grows more shallow, and the apparent shield becomes thinner, and the dose rates increase. At larger distances from the wall, the point-kernel results will be similar to monte-carlo results, but at distances close to the wall, the dose rates will read lower from point-kernel than they would in a full monte carlo calculation. Although the dose rates probably would increase as one moves farther from the wall, this effect is exaggerated in the point-kernel calculation, and the dose rates closer to the wall are underestimated. The increased dose rates will come from scattered photons from the upper source through the thin wall, which is not taken into consideration in the point-kernel model.

Likewise the higher elevation dose rates would be better estimated using full Monte-Carlo calculations, because the scattering of the lower level source radiation in the thin upper walls is not taken into consideration in the point-kernel buildup factors.

These input files are archived on CFS under the directory /v93586/wv/source/ and are named inp5.CraneOnWall and inp5.NoCart.

4.0 CONCLUSIONS

These MCNP calculational models of the vitrification cell were used as a starting point for many of the streaming calculations that were done with MCNP. These models include two input files that differ only from the description of two different source configurations. These calculational models were also utilized for point kernel calculations of dose rates beyond the bulk walls and within the cell.

5.0 REFERENCES

1. Breismeister, J. F., Editor, "MCNP - A General Monte Carlo Code N-Particle Transport Code, Version 4A," LA-12625, Los Alamos National Laboratory, Los Alamos, New Mexico (1993).
2. Carter, L. L., "Certification of MCNP Version 4A for WHC Computer Platforms," ECN 186710, January, 1994.
3. Van Riper, K. A., "SABRINA Users's Guide," LA-UR-93-3696, Los Alamos National Laboratory, Los Alamos, New Mexico (1993).
4. Drawings provided by West Valley Nuclear Services, West Valley, New York:
 - 58-5221-5-662 1 of 3 rev 0
 - 58-5221-5-662 2 of 3 rev 1
 - 58-5221-5-662 3 of 3 rev 0
 - 63-M-001-1 rev 2
 - 63-M-001-2 rev 3
 - 63-M-001-3 rev 2
 - 63-M-002-1 rev 0
 - 63-M-002-2 rev 1
 - 63-M-002-3 rev 3
 - 63-M-002-4 rev 3
 - 63-M-002-7C rev 1
 - 900C-1130 rev 0
 - 900D-1092 1 of 2 rev 5
 - 900D-1092 sheet 2 rev 2
 - 900D-1132 rev 0
 - 900D-1133 rev 0
 - 900D-1134 rev 0
 - 900D-2782 1 of 7 rev 4
 - 900D-2782 sheet 2 rev 1
 - 900D-2782 sheet 3 rev 3
 - 900D-2782 sheet 4 rev 2
 - 900D-2782 sheet 5 rev 2
 - 900D-2782 sheet 6 rev 2
 - 900D-2782 sheet 7 rev 0
 - 900D-3000 1 of 5 rev 0
 - 900D-3000 sheet 2 rev 0

900D-3000 sheet 3 rev 0
900D-3009 1 of 1 rev 0
900D-3010 1 of 2 rev 0
900D-3010 sheet 2 rev 0
900D-4820 1 of 3 rev 0
900D-4820 sheet 2 rev 0
900D-4820 sheet 3 rev 0
902-D-101 rev 4
905-D-030 rev 3
905-D-031 rev 1
905-D-032 rev 2
905-D-033 rev 1
905-D-034 rev 3
905-D-035 rev 2
905-D-036 rev 2
905-D-037 rev 3
905-D-038 rev 2
905-D-039 rev 3
905-D-040 rev 2
905-D-107 rev 15
905-D-108 rev 8
905-D-135 rev 5
905-D-138 rev 4
905-D-141 rev 7
905-D-145 rev 4
905-D-160 rev 8
905-D-199 rev 6
905-D-401 rev 1
905-D-402 rev 10
905-D-403 rev 12
905-D-404 rev 15
9985-GA-3 rev 1
PNL-011-01 1 of 18 rev 5
PNL-011-02 2 of 18 rev 5
PNL-011-03 rev ?
PNL-011-04 rev ?
PNL-011-05 5 of 18 rev 4
PNL-011-06 rev ?
PNL-011-07 rev 4
PNL-011-08 8 of 18 rev 4
PNL-011-09 rev 4
PNL-065-01 1 of 5 rev 5

PNL-065-02 2 of 5 rev 1
PNL-065-03 3 of 5 rev 1
PNL-065-04 4 of 5 rev 1
PNL-065-05 5 of 5 rev 3

5. Israel O. Laurant, "Validation of ISOSHL-D-PC on the IBM PC (PS-2/AT/XT), EDT-109878, WHC-SD-SQA-CSWD-303, Rev. 0, February 1990.

6. PV-Wave Version 5.0 © 1994 by Visual Numerics, Inc.

6.0 COMPUTATION

The source strength was calculated as follows:

The input for ISOSHL D was the given source description for one gram of glass and the output was the total photons per second, as well as the photons per second of each energy group. This was also done for the source description of one cubic centimeter of feed waste. The ISOSHL D output files are included in Attachment B.

The output shows one gram of glass to be 5.326×10^8 photons/sec*g. One cubic centimeter of feed is 2.105×10^8 photons/sec*cm³.

The volume of one canister of glass is 8.512×10^5 cm³, and the density of the glass is 2.7 g/cm³. This makes the mass of one canister to be 2.298×10^6 g. The source strength in photons/sec of one canister is 2.298×10^6 g * 5.326×10^8 photons/sec*g = 1.224×10^{15} photons/sec. The melter glass region has a volume of 8.587×10^5 cm³ and a mass of 2.319×10^6 g. This makes a source strength of 1.235×10^{15} photons/sec. The feed tank and the concentrator tanks both have a source volume of 1.897×10^7 cm³, and with a source strength of 2.105×10^8 photons/sec*cm³, the source strength of each tank is 3.993×10^{15} photons/sec.

The total source strength in the cell is the feed/concentrator strength * 2 + the melter strength + 20 * the canister strength; $2 * 3.993 \times 10^{15} + 1.235 \times 10^{15} + 20 * 1.224 \times 10^{15} = 3.370 \times 10^{16}$ photons/sec. This source strength is increased by 15% for a conservative calculation, making the total source strength in the cell to be 3.88×10^{16} photons/sec. This matches the source card wgt of 3.91×10^{16} (the slight difference is from using more significant figures in this calculation than in the previous calculation).

Each individual source is assigned a fraction of the total source weight based on the number of photons/sec from that source, and is assigned a weighted energy distribution which also was generated with ISOSHL D.

Figure 1.
External View of Vitrification Cell Shielding.

Figure 2.
Top View of Inside of Vitrification Cell.

Figure 3.
Detail of Pit as Viewed from Above.

Figure 4.
Cutaway of Cell as Viewed from the East.

Figure 5.
Cutaway Detail of Melter and Pit.

Figure 6.
Inside of Cell as Viewed from the East.

Figure 7.
Inside of Cell as Viewed from the West.

Figure 8.

Figure 9.

Figure 11.

Figure 12.

Figure 13.

Figure 14.

Figure 15.

Figure 16.

Dose Rates (per hour) at 127 ft. No canisters on cart or crane. (15 canisters)

Figure 18.

Figure 19.

Attachment A.

CHECKLIST FOR INDEPENDENT TECHNICAL REVIEW

DOCUMENT REVIEWED MCNP Calculational Models of West Valley VitrificationCell and Point-Kernel Dose Contour PlotsAUTHOR(s) Victor E. Roetman

I. Method(s) of Review

- ☒ Input data checked for accuracy
- ☐ Independent calculation performed
 - ☐ Hand calculation
 - ☐ Alternate computer code: _____
- ☐ Comparison to experiment or previous results
- ☐ Alternate method (define) _____

II. Checklist (either check or enter NA if not applied)

- ☐ Task completely defined
- ☐ Activity consistent with task specification
- ☐ Necessary assumptions explicitly stated and supported
- ☐ Resources properly identified and referenced
- ☐ Resource documentation appropriate for this application
- ☐ Input data explicitly stated
- ☐ Input data verified to be consistent with original source
- ☐ Geometric model adequate representation of actual geometry
- ☐ Material properties appropriate and reasonable
- ☒ Mathematical derivations checked including dimensional consistency
- ☒ Hand calculations checked for errors
- ☐ Assumptions explicitly stated and justified
- ☐ Computer software appropriate for task and used within range of validity
- ☒ Use of resource outside range of established validity is justified
- ☐ Software runstreams correct and consistent with results
- ☐ Software output consistent with input
- ☒ Results consistent with applicable previous experimental or analytical findings
- ☐ Results and conclusions address all points and are consistent with task requirements and/or established limits or criteria
- ☐ Conclusions consistent with analytical results and established limits
- ☐ Uncertainty assessment appropriate and reasonable
- ☒ Other (define) _____

III. Comments:

IV. REVIEWER: Robert L. Ammin DATE: 29 April 1996

Attachment B.
MCNP Input Files

Input file for the full canister configuration (20 canisters):

```

west valley, 20 canisters, crane canister against east wall
c #1 outside world
  1 0 43
c #2 airspace above pit bottom of room north end
  2 3 -0.0012 ((((-19 10 -16 18 4 -37 )){40 :31 :-4 } )
    (108 :-99 :102 :-105 :29 :-96 )){(-25 :82 :-28 :27 :126 :-29 )}
    (-68 :67 :-69 :70 :128 :-127 )
c #3 concrete pit floor
  3 2 -2.2800 7 -16 1 -2 17 -20
c #4 north wall (lower section)
  4 2 -2.2800 ((-10 7 -37 2 18 -19 )){42 :-115 :-4 :-116 )}
    (-118 :-117 :42 :-115 )
c #5 north wall middle section
  5 2 -2.2800 (-9 7 37 -33 22 -24 ){(-118 :15 :42 :-115 )}
c #6 north wall upper section
  6 2 -2.2800 -8 7 -5 33 21 -23
c #7 west pit wall
  7 2 -2.2800 7 -16 -4 2 17 -18
c #8 ceiling
  8 2 -2.2800 5 -6 109 -110 -12 7
c #9 west wall
  9 2 -2.2800 ((((((7 -13 4 -37 -18 17 )){(-119 :-25 :121 )} )
    (-120 :-117 :-25 :121 )){(-119 :-124 :231 )}{(-117 :-120 :-124 :231 )}
    (-119 :-232 :233 )){(-232 :233 :-117 :-120 )}
c #10 west wall middle section
  10 2 -2.2800 (((37 -38 17 -22 -13 7 )){(-120 :15 :-25 :121 )} )
    (-120 :15 :-124 :231 )){(-120 :15 :-232 :233 )}
c #11 cell floor (south of pit)
  11 2 -2.2800 3 -4 16 -202 17 -20
c #12 west wall small section
  12 2 -2.2800 38 -33 17 -22 7 -12
c #13 west wall top section
  13 2 -2.2800 109 -21 33 -5 7 -12
c #14 east wall pit
  14 2 -2.2800 -16 7 2 -4 19 -20
c #15 east cell wall
  15 2 -2.2800 ((((((7 -13 4 -37 19 -20 )){(-25 :121 :122 )} )
    (-117 :123 :-25 :121 )){(-124 :231 :122 )}{123 :-117 :-124 :231 )}
    (-232 :233 :122 )){123 :-117 :-232 :233 )}
c #16 east wall middle section
  16 2 -2.2800 (((124 -20 -38 37 -13 7 )){123 :-25 :121 :15 )} )
    (123 :15 :-124 :231 )){123 :15 :-232 :233 )}
c #17 east wall small section
  17 2 -2.2800 24 -20 38 -33 7 -12
c #18 inside of feed tank waste section
  18 10 -1.3000 -200 49 -47
c #19 shell of concentrator
  19 5 -7.9000 -4 32 -39 44
c #20 inside of scrubber
  20 3 -0.0012 -51 52 -50
c #21 east wall top section
  21 2 -2.2800 -12 7 33 -5 23 -110
c #22 south wall pit
  22 2 -2.2800 14 -16 -4 2 -19 18
c #23 N wall plate
  23 5 -7.9000 -42 115 116 -10 4 -37
c #24 cell air space small section (above middle section)
  24 3 -0.0012 (37 9 -33 -11 -24 22 )}{192 :-194 )}
c #25 cell air space top section
  25 3 -0.0012 (8 -11 -5 33 -23 21 )}{192 :193 )}
c #26 airspace in pit west end
  26 3 -0.0012 ((((-105 10 18 -14 -4 2 )){35 :41 :-36 )}{40 :-34 )} )
    (-32 :39 )}
c #27 dirt underneath cell
  27 1 -1.5000 ((-43 -4 )){(-3 :4 :202 :-16 :-17 :20 )} )
    (16 :-1 :-7 :4 :-17 :20 )}
c #28 space outside cell
  28 3 -0.0012 ((((-43 4 )){(-7 :-17 :20 :33 :11 )}{(-7 :11 :-33 :6 :-109
    :110 )}{(-11 :202 :212 :209 :-211 )}
c #29 airspace in pit north east end
  29 3 -0.0012 ((((-19 10 -171 105 -4 2 )){140 :-139 :142 )} )
    (140 :-139 :141 )){140 :-139 :144 )){143 :140 :-139 )}
c #30 concentrator inside waste section
  30 10 -1.3000 -199 46 -44
c #31 concentrator lid
  31 5 7.9000 -4 45 -44
c #32 concentrator bottom
  32 5 -7.9000 -46 32 -44
c #33 feed tank shell

```

```

33 5 -7.9000 34 -31 -40 47
c #34 feed tank lid
34 5 -7.9000 -31 48 -47
c #35 feed tank bottom
35 5 -7.9000 -49 34 -47
c #36 scrubber shell
36 5 -7.9000 -41 50 36 -35
c #37 scrubber lid
37 5 -7.9000 -50 -35 51
c #38 scrubber bottom
38 5 -7.9000 -50 -52 36
c #39 melter K block
39 6 -3.8300 (((66 55 64 74 -72 -80 62 63 -78 76 )
(-53 :-59 :-58 :-54 :55 :-60 :-61 :-57 :56 :80 )));
(75 -73 -71 80 77 -79 ))(-54 :55 :-57 :56 :71 :80 )
c #40 melter W block
40 7 -3.1390 (77 -79 -29 71 75 -73 )(-69 :70 :67 :-68 :29 :-71 )
c #41 melter glass waste area
41 11 -2.7000 57 -56 61 60 53 59 58 54 -55 -198
c #42 airspace in pit south east end
42 3 -0.0012 ((((((19 -14 171 105 -4 2 )(152 :-151 :157 ))
(158 :152 :-151 ))(159 :152 :-151 ))(160 :152 :-151 ))
(153 :152 :-151 ))(154 :152 :-151 ))(155 :152 :-151 ))
(156 :152 :-151 ))
c #43 melter Z block
43 8 -2.9500 ((-80 81 91 -83 89 -90 )(80 :-74 :72 :-65 :-64 :-66 :-62
:-76 :78 :-63 )):(73 -82 -29 80 77 -79 )
c #44 melter AL66 fill
44 9 -2.7200 ((((((29 30 25 -26 28 -27 )(82 :-75 :29 :-80 :-77 :79 ))
(-81 :83 :-91 :80 :-89 :90 ))(93 :86 :-87 :-84 ))
(92 :86 :-87 :-84 ))(93 :87 :-88 :-85 ))(92 :87 :-88 :-85 )
c #45 west air gap in melter (above fill cannister)
45 3 -0.0012 (-92 -87 88 85 ):(-92 87 -86 84 )
c #46 east air gap in melter (above cannister fill)
46 3 -0.0012 (-93 84 -86 87 ):(-93 88 -87 85 )
c #47 stainless shell outside of melter
47 5 -7.9000 (99 96 -29 -102 105 -108 )(-98 :-95 :29 :101 :-104 :107 )
c #48 water cooling shell around melter
48 4 -1.0000 (98 -107 -101 104 95 -29 )(-94 :29 :-97 :106 :100 :-103 )
c #49 stainless shell inside melter
49 5 -7.9000 (-106 97 -100 103 -29 94 )(29 :-30 :-28 :26 :27 :-25 )
c #50 N wall ledge plate
50 5 -7.9000 118 -116 117 -37 -42 115
c #51 N wall upper plate
51 5 -7.9000 -15 37 118 -9 -42 115
c #52 W wall N section plate
52 5 -7.9000 25 -121 119 -18 -37 4
c #53 south wall lower section with door gap
53 2 -2.2800 (((((((11 -13 18 -19 -37 4 )(-113 :111 :114 ))
(-225 :230 :-275 :264 :(270 -224 )):(219 -269 )))
(238 :-239 :37 :240 :-235 ))(238 :-239 :235 :241 :225 ))
(238 :-239 :-237 :-242 :236 ))(238 :-239 :-236 :-243 :-230 ))
(247 :-246 :244 :-245 :238 :-239 ))(248 :-230 :-274 :265 )
c #54 south wall above upper door
54 2 -2.2800 112 11 -12 -5 21 -23
c #55 air gap around crane room door
55 3 -0.0012 (((((((213 218 -215 38 -216 12 )(507 :505 ))
(-503 :515 :512 ))(508 :512 ))(507 :-504 ))(508 :-514 ))
(515 :-514 :502 ))(134 :-137 :138 :-510 :-132 :131 ))
(-505 :-507 :510 :504 :-137 :138 ))(507 :-509 :507 :511 :-38 :-137
:138 )
c #56 south wall lower door gap
56 3 -0.0012 113 -111 -114 4 -13 11
c #57 W wall N section ledge plate
57 5 -7.9000 120 -119 117 -37 25 -121
c #58 W wall N section upper plate
58 5 -7.9000 -22 120 -15 37 25 -121
c #59 E wall N section plate
59 5 -7.9000 25 -121 -122 19 -37 4
c #60 E wall N section ledge plate
60 5 -7.9000 122 -123 -37 117 25 -121
c #61 E wall N section upper plate
61 5 -7.9000 37 -15 -123 24 25 -121
c #62 W wall middle section plate
62 5 -7.9000 4 -37 124 119 -18 -231
c #63 W wall middle section ledge plate
63 5 -7.9000 117 120 -119 -37 124 -231
c #64 W wall middle section upper plate
64 5 -7.9000 120 -22 -15 37 124 -231
c #65 E wall middle section plate
65 5 -7.9000 19 -122 124 -231 -37 4
c #66 W wall middle section ledge plate

```

```

66 5 -7.9000 122 -123 -37 117 124 -231
c #67 melter lid AL-66
67 9 -2.7200 (-201 29 28 -27 -82 25 )(-68 :67 :125 :-69 :70 )
c #68 steel plate above melter lid
68 5 -7.9000 68 -67 69 -70 -128 127
c #69 south wall middle section
69 2 -2.2800 (((37 -38 22 -24 -13 11 )(-225 :-275 :270 ))
(-225 :-224 :219 ))(-225 :-269 :264 ))
c #70 south wall upper section
70 2 -2.2800 38 -33 22 -24 11 -12
c #71 W wall middle section upper plate
71 5 -7.9000 37 -15 24 -123 124 -231
c #72 lower steel door
72 12 -7.8000 129 -130 -133 4 135 -136
c #73 upper steel door
73 12 -7.8000 ((((-134 38 132 -131 -138 137 )(510 :505 ))(-504 :510 ))
(507 :509 ))(507 :-511 ))
c #74 turntable cannister shell
74 5 -7.9000 145 -141 -140 139
c #75 turntable cannister shell
75 5 -7.9000 147 -144 -140 139
c #76 turntable cannister shell
76 5 -7.9000 146 -142 -140 139
c #77 turntable cannister shell
77 5 -7.9000 -143 148 -140 139
c #78 turntable cannister inside
78 11 -2.7000 -145 -150 149
c #79 turntable cannister inside
79 11 -2.7000 -147 -150 149
c #80 turntable cannister inside
80 11 -2.7000 -146 -150 149
c #81 turntable cannister inside
81 11 -2.7000 -148 -150 149
c #82 turntable cannister lid
82 3 -0.0012 -145 150 -140
c #83 turntable cannister bottom
83 5 -7.9000 -145 -149 139
c #84 turntable cannister lid
84 3 -0.0012 -147 150 -140
c #85 turntable cannister bottom
85 5 -7.9000 -149 139 -147
c #86 turntable cannister lid
86 3 -0.0012 -146 150 -140
c #87 turntable cannister bottom
87 5 -7.9000 -146 -149 139
c #88 turntable cannister lid
88 3 -0.0012 -148 150 -140
c #89 turntable cannister bottom
89 5 -7.9000 -149 139 -148
c #90 cable passageway
90 3 -0.0012 505 -503 (((11 -516 517 -521 ):(-516 -520 521 519 )):
(-518 519 -216 520 ))
c #91 rack cannister inside
91 11 -2.7000 -169 170 -164
c #92 rack cannister inside
92 11 -2.7000 -169 170 -163
c #93 rack cannister inside
93 11 -2.7000 -169 170 -162
c #94 rack cannister inside
94 11 -2.7000 -169 170 -161
c #95 rack cannister inside
95 11 -2.7000 -169 170 -165
c #96 rack cannister inside
96 11 -2.7000 -169 170 -166
c #97 rack cannister inside
97 11 -2.7000 -169 -167 170
c #98 rack cannister inside
98 11 -2.7000 -169 170 -168
c #99 washer cannister bottom
99 5 -7.9000 180 -190 -188
c #100 cable passageway
100 3 -0.0012 -504 502 (((-516 517 11 -521 ):(-516 -520 521 519 )):
(-518 519 -216 520 ))
c #101 rack cannister shell
101 5 -7.9000 -152 151 164 -156
c #102 rack cannister shell
102 5 -7.9000 -152 151 163 -155
c #103 rack cannister shell
103 5 -7.9000 -152 151 162 -154
c #104 rack cannister shell
104 5 -7.9000 -152 151 161 -153
c #105 rack cannister shell

```

105 5 -7.9000 -152 151 168 -160
c #106 rack cannister shell
106 5 -7.9000 -152 151 167 -159
c #107 rack cannister shell
107 5 -7.9000 -152 151 166 -158
c #108 rack cannister shell
108 5 -7.9000 -152 151 165 -157
c #109 rack cannister lid
109 3 -0.0012 -164 169 -152
c #110 rack cannister bottom
110 5 -7.9000 -164 -170 151
c #111 rack cannister lid
111 3 -0.0012 -163 169 -152
c #112 rack cannister bottom
112 5 -7.9000 -163 -170 151
c #113 rack cannister lid
113 3 -0.0012 -162 169 -152
c #114 rack cannister bottom
114 5 -7.9000 -162 151 -170
c #115 rack cannister lid
115 3 -0.0012 -161 169 -152
c #116 rack cannister bottom
116 5 -7.9000 -161 -170 151
c #117 rack cannister lid
117 3 -0.0012 -168 169 -152
c #118 rack cannister bottom
118 5 -7.9000 -170 151 -168
c #119 rack cannister lid
119 3 -0.0012 -167 169 -152
c #120 rack cannister bottom
120 5 -7.9000 -167 -170 151
c #121 rack cannister lid
121 3 -0.0012 169 -152 -166
c #122 rack cannister bottom
122 5 -7.9000 -166 151 -170
c #123 rack cannister lid
123 3 -0.0012 -165 169 -152
c #124 rack cannister bottom
124 5 -7.9000 -165 -170 151
c #125 airspace lower section south end
125 3 0.0012 {(((((((116 -11 18 -19 -37 4))(-180 :181 :172))
(181 :-180 :173))(181 :-180 :176))(-180 :181 :179))
(181 :-180 :178))(181 :-180 :177))(181 :-180 :174))
(-226 :-250 :-274 :265 :(271 -223))(220 -268))
c #126 welder cannister inside
126 11 -2.7000 -191 190 -183
c #127 welder cannister inside
127 11 -2.7000 -191 190 -182
c #128 cart cannister inside
128 11 -2.7000 -191 190 -184
c #129 cart cannister inside
129 11 -2.7000 -191 190 -185
c #130 cart cannister inside
130 11 -2.7000 -191 190 -186
c #131 cart cannister inside
131 11 -2.7000 -191 190 -187
c #132 washer cannister inside
132 11 -2.7000 -191 190 -188
c #133 extra wall section 5 wall
133 2 -2.2800 230 -248 11 4 271 -223
c #134 welder cannister shell
134 5 -7.9000 -181 180 182 -172
c #135 welder cannister shell
135 5 -7.9000 -181 180 183 -173
c #136 washer cannister shell
136 5 -7.9000 -181 180 -174 188
c #137 extra wall section 5 wall
137 2 -2.2800 230 -248 11 4 220 -268
c #138 cart cannister shell
138 5 -7.9000 -181 180 184 -176
c #139 cart cannister shell
139 5 -7.9000 -181 180 187 -177
c #140 cart cannister shell
140 5 -7.9000 -181 180 185 -179
c #141 cart cannister shell
141 5 -7.9000 -181 180 186 -178
c #142 cart cannister lid
142 5 -7.9000 191 -181 -185
c #143 cart cannister bottom
143 5 -7.9000 180 -190 -185
c #144 cart cannister lid
144 5 -7.9000 -181 191 -186

c #145 cart canister bottom
145 5 -7.9000 -190 180 -186
c #146 cart canister lid
146 5 -7.9000 191 181 -184
c #147 cart canister bottom
147 5 -7.9000 180 -190 -184
c #148 cart canister lid
148 5 -7.9000 191 181 -187
c #149 cart canister bottom
149 5 -7.9000 180 -190 -187
c #150 welder canister lid
150 3 -0.0012 191 181 -182
c #151 welder canister bottom
151 5 -7.9000 180 -190 -182
c #152 welder canister lid
152 3 -0.0012 191 181 -183
c #153 welder canister bottom
153 5 -7.9000 180 -190 -183
c #154 washer canister lid
154 5 -7.9000 191 181 -186
c #155 crane hook canister shaft
155 5 -7.9000 -193 195 194
c #156 crane hook canister inside
156 11 -2.7000 197 -195 -196
c #157 crane hook canister lid
157 3 -0.0012 196 -193 -195
c #158 crane hook canister bottom
158 5 -7.9000 -197 194 -195
c #159 welder canister inside
159 3 -0.0012 -125 68 -67 71 69 -70
c #160 welder canister inside
160 3 -0.0012 198 54 -55 -71 58 57 -56 59
c #161 concentrator air space
161 3 -0.0012 45 -44 199
c #162 feed tank air space
162 3 -0.0012 -46 -47 200
c #163 meter lid AL-57
163 13 -1.0400 201 -126 28 -27 -82 25
c #164 transfer tunnel M wall
164 2 -2.2800 (-207 -113 -202 13 -203 4)(-206 :208)
c #165 crane room distance room floor
165 2 -2.2800 (-209 -202 211 11 -210 203)(-20 :17 :13)
c #166 transfer tunnel E wall
166 2 -2.2800 (205 -204 -202 11 -203 4)(-20 :13)
c #167 crane room ceiling
167 2 -2.2800 (213 -202 11 -212 -209 211)(-6 :12 :110 :-109)
c #168 crane room wall
168 2 -2.2800 -202 11 -209 214 -213 210
c #169 crane room wall
169 2 -2.2800 -202 11 -209 214 -213 210
c #170 ledge underneath crane room door
170 2 -2.2800 13 -216 -38 210 -215 218
c #171 part of crane room west wall
171 2 -2.2800 ((-216 11 -214 215 -213 210)(-110 :12 :12 :-33))
c #172 part of crane room west wall
172 2 -2.2800 ((-216 11 -218 217 -213 210)(-17 :13 :33))(-33 12 -13)
c #173 crane room air space
173 3 -0.0012 -214 217 -202 216 -213 210
c #174 airspace S of cell M of transfer tunnel, beyond 191
174 3 -0.0012 (-202 11 211 -207 -203 4)(-13 :261 :-262))((-274 :265 :
253):-256 :-261)(-263))(257 :-260 :261 :-262))(-274 :265 :
271 -273))(220 -268))
c #175 airspace E of transfer tunnel
175 3 -0.0012 (-209 204 -202 11 -203 4)
c #176 transfer tunnel airspace
176 3 -0.0012 ((206 13 -205 -202 -203 4)(-208 :113))
c #177 hvac duct hole
177 3 -0.0012 227 222 -228 -221 -13 11
c #178 hvac duct liner #1
178 5 -7.9000 (226 223 -229 -220 -13 11)(-227 :-222 :226 :221)
c #179 hvac duct liner #2
179 5 -7.9000 (225 224 -219 -230 -13 11)(-226 :-223 :229 :220)
c #180 M wall S section ridge plate
180 5 -7.9000 232 118 -18 -233 37 4
c #181 M wall S section ridge plate
181 5 -7.9000 120 117 -119 232 -233
c #182 M wall S section upper plate
182 5 -7.9000 120 -15 37 232 -233
c #183 E wall S section plate


```

183 5 -7.9000 232 -233 -122 19 -37 4
c #184 E wall S section ledge plate
184 5 -7.9000 122 -123 -37 117 232 -233
c #185 E wall S section upper plate
185 5 -7.9000 -15 37 -123 24 232 -233
c #186 Stainless plate above Duct
186 5 -7.9000 (-241 11 -37 -225 -238 239 )(-240 :-235 )
c #187 stainless plate below duct
187 5 -7.9000 (243 -13 237 230 -238 239 )(236 :242 )
c #188 stainless plate inside S wall (around ducts)
188 5 -7.9000 (-244 245 -238 239 246 -247 )(-225 :230 :264 :-275 :
(270 -224 ):(219 -269 ))
c #189 stainless plate in S wall part of cell duct
189 5 -7.9000 230 -248 11 4 ((-271 274 ):(-220 223 ):(-265 268 ))
c ends of 1st duct
190 3 -0.0012 (((227 -228 13 -263 ):(-254 255 263 261 )));
(259 -258 -261 262 ))222 -221
191 5 -7.9000 (((226 -229 -263 13 ):(-253 256 261 263 13 )));
(-257 260 -261 262 ))223 -220 #190
192 3 -0.0012 4 222 -221 249 -11 227
193 5 -7.9000 4 223 -220 -11 226 250 (-222 :221 :-227 :-249 )
c 2nd (+) duct
c #194 hvac duct hole
194 3 -0.0012 227 267 -228 -266 -13 11
c #195 hvac duct liner #1
195 5 -7.9000 (226 268 -229 -265 -13 11 )(-227 :-267 :228 :266 )
c #196 hvac duct liner #2
196 5 -7.9000 (225 269 -264 -230 -13 11 )(-226 :-268 :229 :265 )
197 3 -0.0012 (((227 -228 13 -263 ):(-254 255 263 261 )));
(259 -258 -261 262 ))267 -266
198 5 -7.9000 (((226 -229 -263 13 ):(-253 256 261 263 13 )));
(-257 260 -261 262 ))268 -265 #197
199 3 -0.0012 4 267 -266 249 -11 227
200 5 -7.9000 4 268 -265 -11 226 250 (-267 :266 :-227 :-249 )
c 3rd (-) duct
c #201 hvac duct hole
201 3 -0.0012 227 273 -228 -272 -13 11
c #202 hvac duct liner #1
202 5 -7.9000 (226 274 -229 -271 -13 11 )(-227 :-273 :228 :272 )
c #203 hvac duct liner #2
203 5 -7.9000 (225 275 -270 -230 -13 11 )(-226 :-274 :229 :271 )
204 3 -0.0012 (((227 -228 13 -263 ):(-254 255 263 261 )));
(259 -258 -261 262 ))273 -272
205 5 -7.9000 (((226 -229 -263 13 ):(-253 256 261 263 13 )));
(-257 260 -261 262 ))274 -271 #204
206 3 -0.0012 4 273 -272 249 -11 227
207 5 -7.9000 4 274 -271 -11 226 250 (-273 :272 :-227 :-249 )
c #208 crane room door opening
208 3 -0.0012 11 -12 (((((-112 21 -23 506 ):(33 501 -500 -506 )));
(507 -503 21 -506 )):(505 -503 508 -507 )):(502 -23 -506 507 )));
(502 -504 508 -507 ))
c #209 concrete piece under crane door opening
209 2 -2.2800 (((500 -506 -23 33 -12 11 )(-502 :-508 :504 ))
(-502 :-507 ))(516 :-517 :520 :504 :-502 ))(520 :-521 :-519 :517
:504 :-502 )
c #210 concrete piece under crane door opening
210 2 -2.2800 (((21 -501 -506 33 11 -12 ))(-508 :503 :-505 ))
(-507 -503 ))(516 :-517 :521 :-505 :503 ))(516 :-521 :520 :-519
:-505 :503 )
c #211 concrete piece under crane room door
211 2 -2.2800 ((((-215 514 -507 38 12 -216 ))(504 :-508 :-502 ))
(-515 :502 ))(520 :-519 :504 :-502 ))(518 :-519 :-520 :504 :-502 )
c #212 concrete piece under crane room door
212 2 -2.2800 ((((-218 512 -507 38 12 -216 ))(-508 :-505 :503 ))
(-515 :-503 ))(518 :-519 :-505 :503 ))(520 :-518 :-505 :503 ))
1 pz -549.0000
2 pz -427.0000
3 pz -121.92
4 pz 0.0000
5 pz 1311.0000
6 pz 1395.0000
7 px -121.9
8 px -55.8
9 px -45.72
10 px 0.0000
11 px 1920.0000
12 px 2012.0000
13 px 2042.0000
14 px 762.0000
15 pz 762.0000
16 px 884.0000

```

17	py	-121.92		
18	py	0.0000		
19	py	1036.0000		
20	py	1158.0000		
21	py	-61.12		
22	py	-35.56		
23	py	1097.12		
24	py	1071.64		
25	px	30.48		
26	px	330.2		
27	py	917.89		
28	py	666.43		
29	pz	240.03		
30	pz	54.61		
31	pz	115.0000		
32	pz	-366.0000		
33	pz	823.0000		
34	pz	-396.0000		
35	pz	-30.48		
36	pz	-395.6		
37	pz	609.6		
38	pz	792.5		
39	c/z	548.6000	183.0000	153.3500
40	c/z	213.40	213.40	153.35
41	c/z	488.0000	488.0000	121.9200
42	py	1005.5200		
43	s	900.0000	500.0000	600.0000 3000.0000
44	c/z	548.6000	183.0000	152.4000
45	pz	-0.9500		
46	pz	-365.0500		
47	c/z	213.4000	213.4000	152.4000
48	pz	115.0500		
49	pz	-395.0500		
50	c/z	488.0000	488.0000	120.9700
51	pz	-31.4300		
52	pz	-394.6500		
53	pz	93.3500		
54	px	69.5300		
55	px	196.5300		
56	py	878.5200		
57	py	705.8000		
58	p	-2.4800	0.0000	1.0000 -315.3050
59	p	2.4800	0.0000	1.0000 344.5200
60	p	0.0000	0.5994	1.0000 557.5500
61	p	0.0000	-0.5994	1.0000 -392.1700
62	p	0.0000	0.5994	1.0000 539.7800
63	p	0.0000	-0.5994	1.0000 -409.9400
64	p	-2.4800	0.0000	1.0000 -356.0500
65	p	2.4800	0.0000	1.0000 303.7700
66	pz	78.1100		
67	px	204.1500		
68	px	61.9100		
69	py	698.1800		
70	py	886.1400		
71	pz	182.2400		
72	px	211.7700		
73	px	219.3900		
74	px	54.2900		
75	px	46.6700		
76	py	690.5600		
77	py	682.9400		
78	py	893.7600		
79	py	901.3800		
80	pz	172.0900		
81	px	38.7400		
82	px	234.6300		
83	px	245.4300		
84	px	254.6300		
85	px	271.1400		
86	pz	213.3600		
87	pz	139.0700		
88	pz	93.3500		
89	py	674.6900		
90	py	909.6300		
91	pz	62.8700		
92	c/z	278.76	732.47	30.48
93	c/z	278.76	851.85	30.48
94	pz	53.34		
95	pz	47.31		
96	pz	46.04		
97	px	25.21		
98	px	23.18		

99	px	21.91	
100	px	331.47	
101	px	337.50	
102	px	338.77	
103	py	665.16	
104	py	659.13	
105	py	657.86	
106	py	919.16	
107	py	925.19	
108	py	926.46	
109	py	-127.16	
110	py	1163.16	
111	pz	457.20	
112	pz	1219.22	
113	py	594.04	
114	py	990.28	
115	py	30.48	
116	px	-0.95	
117	pz	608.65	
118	px	-46.67	
119	py	-0.95	
120	py	-36.51	
121	px	685.80	
122	py	1036.95	
123	py	1072.59	
124	px	822.96	
125	pz	252.73	
126	pz	284.61	
127	pz	302.33	
128	pz	304.48	
129	py	568.64	
130	py	1015.68	
131	py	1118.08	
132	py	-82.08	
133	pz	487.68	
134	pz	1238.29	
135	px	2057.24	
136	px	2090.26	
137	px	2027.24	
138	px	2050.10	
139	pz	-327.66	
140	pz	-28.57	
141	c/z	278.13 851.88	30.48
142	c/z	278.13 732.44	30.48
143	c/z	397.57 732.44	30.48
144	c/z	397.57 851.88	30.48
145	c/z	278.13 851.88	30.14
146	c/z	278.13 732.44	30.14
147	c/z	397.57 851.88	30.14
148	c/z	397.57 732.44	30.14
149	pz	-327.16	
150	pz	-28.89	
151	pz	-365.76	
152	pz	-66.67	
153	c/z	612.46 892.17	30.48
154	c/z	612.46 825.50	30.48
155	c/z	612.46 758.82	30.48
156	c/z	612.46 692.15	30.48
157	c/z	684.21 892.17	30.48
158	c/z	684.21 825.50	30.48
159	c/z	684.21 758.82	30.48
160	c/z	684.21 692.15	30.48
161	c/z	612.46 892.17	30.14
162	c/z	612.46 825.50	30.14
163	c/z	612.46 758.82	30.14
164	c/z	612.46 692.15	30.14
165	c/z	684.21 892.17	30.14
166	c/z	684.21 825.50	30.14
167	c/z	684.21 758.82	30.14
168	c/z	684.21 692.15	30.14
169	pz	-66.99	
170	pz	-365.28	
171	px	500.0000	
172	c/z	994.17 940.75	30.48
173	c/z	1056.56 940.75	30.48
174	c/z	1569.48 959.80	30.48
176	c/z	1272.30 837.88	30.48
177	c/z	1363.74 837.88	30.48
178	c/z	1363.74 746.44	30.48
179	c/z	1272.30 746.44	30.48
180	pz	30.48	
181	pz	329.57	

182	c/z	994.17	940.75	30.14
183	c/z	1066.56	940.75	30.14
184	c/z	1272.30	837.88	30.14
185	c/z	1272.30	746.44	30.14
186	c/z	1363.74	746.44	30.14
187	c/z	1363.74	837.88	30.14
188	c/z	1569.48	959.80	30.14
190	pz	30.96		
191	pz	329.25		
192	c/z	1318.02	1008.54	30.48
193	pz	935.04		
194	pz	635.95		
195	c/z	1318.02	1008.54	30.14
196	pz	934.72		
197	pz	636.43		
198	pz	161.40		
199	pz	-105.0000		
200	pz	-135.0000		
201	pz	270.51		
202	px	2642.0000		
203	pz	670.56		
204	py	1218.96		
205	py	1097.04		
206	py	563.56		
207	py	472.12		
208	px	2105.50		
209	py	1285.64		
210	pz	731.52		
211	py	-249.64		
212	pz	1440.18		
213	pz	1371.60		
214	py	1224.83		
215	py	1127.60		
216	px	2072.96		
217	py	-188.83		
218	py	-91.60		
219	py	363.22		
220	py	359.41		
221	py	358.14		
222	py	307.34		
223	py	306.07		
224	py	302.26		
225	p	1.0000	0.0000	-1.0000 1427.0100
226	p	1.0000	0.0000	-1.0000 1432.4000
227	p	1.0000	0.0000	-1.0000 1434.2000
228	p	1.0000	0.0000	-1.0000 1477.3100
229	p	1.0000	0.0000	-1.0000 1479.1100
230	p	1.0000	0.0000	-1.0000 1484.5000
231	px	1280.1600		
232	px	1417.3200		
233	px	1913.2600		
235	pz	548.6400		
236	pz	504.1900		
237	pz	443.2300		
238	py	472.4400		
239	py	177.8000		
240	px	1925.0800		
241	px	1931.4300		
242	px	2036.9200		
243	px	2030.5700		
244	pz	563.8800		
245	pz	477.5200		
246	px	1978.4600		
247	px	1983.5400		
248	px	1921.2700		
249	px	1889.5200		
250	px	1898.2500		
253	c/y	2074.3289	577.2711	45.7200
254	c/y	2074.3289	577.2711	44.4500
255	c/y	2074.3289	577.2711	13.9700
256	c/y	2074.3289	577.2711	12.7000
257	px	2120.0489		
258	px	2118.7789		
259	px	2088.2989		
260	px	2087.0289		
261	pz	577.2711		
262	p	333.0000		
263	p	0.7071	0.0000	0.7071 1674.9643
264	py	457.2000		
c	following surfaces for 2nd(+) and 3rd(-) duct			
265	py	453.3900		
266	py	452.1200		

```

267 py 401.3200
268 py 400.0500
269 py 396.2400
270 py 261.6200
271 py 257.8100
272 py 256.5400
273 py 205.7400
274 py 204.4700
275 py 200.6600
500 py 975.2000
c following surfaces for crane maint. room door.
501 py 60.8000
502 py 1022.8300
503 py 13.1700
504 py 1053.3100
505 py -17.3100
506 pz 970.2800
507 pz 964.5700
508 pz 938.5300
509 py 39.8500
510 pz 977.2700
511 py 996.1600
512 py 30.3200
514 py 1005.6800
515 pz 961.3900
516 pz 923.2900
517 pz 900.4300
518 pz 896.6200
519 pz 873.7600
520 p 1.0000 0.0000 1.0000 2910.7000
521 p 1.0000 0.0000 1.0000 2878.3700

```

```

mode p
c *****
c * materials *
c *****
c
c m1 all hwpv dirt density 1.5 g/cc
m1 8000.01p -.511 14000.01p -.2782 20000.01p -.0717
26000.01p -.1091 13000.01p -.08326 12000.01p -.03142
19000.01p -.01155 11000.01p -.02022 22000.01p -.01655
25000.01p -.001781 15000.01p -.0024
c m2 ordinary H concrete density 2.28 g/cc
m2 1000.01p 0.0642 8000.01p 0.5916 14000.01p 0.2405
20000.01p 0.0738 26000.01p 0.0299
c m3 air density .0012 g/cc
m3 7000.01p -0.765 8000.01p -0.235
c m4 water density 1 g/cc
m4 1000.01p .6667 8000.01p .3333
c m5 304 SS (stainless steel) density 7.9 g/cc
m5 25000.01p -.02 14000.01p -.01 24000.01p -.19
28000.01p -.10 26000.01p -.68
c m6 K-3 block density 3.83 g/cc
m6 13000.01p -.2857 24000.01p -.2546
26000.01p -.0615 8000.01p -.3981
c m7 H block melter density 3.139 g/cc
m7 13000.01p -.5096 11000.01p -.0274
8000.01p -.4629
c m8 Z (Zimul) melter block density 2.95 g/cc
m8 13000.01p -.3697 40000.01p -.1767
14000.01p -.0293 8000.01p -.4243
c m9 AL-66 melter refractory density 2.72 g/cc
m9 13000.01p -.5063 20000.01p -.0157 26000.01p -.0109
14000.01p -.0027 8000.01p -.4644
c m10 is melter FEED material density 1.3 g/cc
m10 26000.01p -.0345 7000.01p -.0250 11000.01p -.0604
90000.01p -.0136 6000.01p -.0386 1000.01p -.0767
5000.01p -.0368 15000.01p -.0047 14000.01p -.0851
8000.01p -.9255
c m11 is glass waste material density 2.7 g/cc
m11 14000.01p -.7100 90000.01p -.1100 26000.01p -.2900
11000.01p -.2700 5000.01p -.1100 8000.01p -1.260
c m12 is iron for the doors density 7.8 g/cc
m12 26000.01p -1.00
c m13 AL-57 melter refractory density 1.04 g/cc
m13 13000.01p -.5075 20000.01p -.01584 26000.01p -.01109
14000.01p -.00139 8000.01p -.4642
imp:p 0 1 210r $ 1, 213
c
c *****
c * SOURCE *
c *****

```

```

c      source description
sdef  cel d1 pos fcel d2 axs 0. 0. 1.
      ext fcel d3 wgt 3.91+16
      rad fcel d4 erg fcel d5
sc1    source cell probability distribution
s11    1  18 30 41 78 79
        80 81 91 92 93
        94 95 96 97 98
        126 127 128 129
        130 131 132 156
spl    d  .1139 .1139 .0355 .0351 19r
sbl    d  .1139 .1139 .0355 .0351 19r
ds2    1  213.4 213.4 -.265. $ xyz cell centers
        548.6 183.0 -.235.
        133.03 792.16 127.375
        278.13 851.88 -178.
        397.57 851.88 -178.
        278.13 732.44 -178.
        397.57 732.44 -178.
        612.46 692.15 -216.
        612.46 758.82 -218.
        612.46 825.5 -215.
        612.46 892.17 -216.
        684.21 892.17 -216.
        684.21 825.5 -216.
        684.21 758.82 -216.
        684.21 692.15 -216.
        1066.56 940.75 180.1
        994.17 940.75 180.1
        1272.3 837.88 180.1
        1272.3 746.44 180.1
        1363.74 746.44 180.1
        1363.74 837.88 180.1
        1569.48 959.8 180.1
        1318.0 1008.54 785.6
ds3    s  6 6 7 8 19r $ distrib. #s for ext
s16    130.
s17    93.35
s18    149.
ds4    s  9 9 10 11 19r $ distrib. #s for radius
s19    152.4
s110   105.
s111   30.14
ds5    s  12 12 13 20r $ distrib. #s for spectra
#      s112      sp12      sb12 $ feed spectrum
      1          d          d
      .015      8.39+6      .005
      .025      3.15+6      .002
      .035      1.56+7      .01
      .045      1.83+6      .001
      .055      1.51+6      .001
      .065      7.70+5      .001
      .075      6.94+5      .001
      .085      7.22+5      .001
      .095      5.51+5      .001
      .15      3.32+6      .004
      .25      9.45+5      .001
      .35      4.05+5      .001
      .475     3.76+5      .001
      .65      1.71+8      1.0
      .825     3.80+5      .01
      1.0      5.66+5      .05
      1.225    7.51+5      .1
      1.475    6.27+4      .05
      1.7      1.82+3      .05
      1.9      1.09+4      .1
      2.1      2.51+1      .02
      2.3      2.14+4      .001
      2.5      3.27+4      .002
      2.7      9.25+1      .05
      3.0      2.90+3      .001
#      s113      sp13      sb13 $ glass spectrum
      1          d          d
      .015      2.83+7      .007
      .025      1.21+7      .003
      .035      4.02+7      .01
      .045      6.18+6      .002
      .055      4.94+6      .002
      .065      2.94+6      .002
      .075      2.64+6      .002
      .085      2.61+6      .002
      .095      2.10+6      .002

```

```

.15      1.15+7      .008
.25      3.35+6      .004
.35      1.48+6      .002
.475     1.26+6      .002
.65      4.12+8      1.0
.825     9.97+5      .005
1.0      1.43+6      .01
1.225    1.86+6      .03
1.475    1.59+5      .04
1.7      5.27+3      .02
1.9      2.69+4      .1
2.1      6.61+1      .01
2.3      6.53-4      .01
2.5      8.59-4      .02
2.7      2.27+2      .2
3.0      7.11-3      .05
e0       .1 .3 .5 .6 .7 .9 1.1 1.3 2 2.5 10
c       ansi/ans-6.1.1-1991
c       fluence-to-dose,photons(mrem/hr)/(p/cm**2/s)
de0      log .01 .015 .02 .03 .04 .05
          .05 .08 .10 .15 .20 .30
          .40 .50 .60 .80 1.0 1.5
          2.0 3.0 4.0 5.0 6.0 8.0
          10. 12.
df0      log 2.232e-5 5.652e-5 8.568e-5 1.184e-4 1.314e-4 1.382e-4
          1.440e-4 1.624e-4 1.919e-4 2.797e-4 3.708e-4 5.616e-4
          7.415e-4 9.144e-4 1.076e-3 1.379e-3 1.656e-3 2.246e-3
          2.758e-3 3.672e-3 4.500e-3 5.292e-3 6.012e-3 7.488e-3
          8.892e-3 1.040e-2
c       *** pt. kernel, ansi jpbuff
idum     2
phys:p   j i
ctme     480.0
c       print 10 30 40 50 60 110 120 126 170
c       this makes a mctal file
prdmf    j -240 l

```

Input file for the canister configuration without the cart or crane sources
(15 canisters):

```

west valley, 15 canisters, no crane, no transfer cart
c #1 outside world
1 0 43
c #2 airspace above pit bottom of room north end
2 3 -0.0012 (((-19 10 -16 18 4 -37 )(40 :31 :-4 ))
(108 :-99 :102 :-105 :29 :-96 ))(-25 :82 :-28 :27 :126 :-29 ))
(-68 :67 :-69 :70 :128 :-127 )
c #3 concrete pit floor
3 2 -2.2800 7 -16 1 -2 17 -20
c #4 north wall (lower section)
4 2 -2.2800 ((-10 7 -37 2 18 -19 )(42 :-115 :-4 :-116 ))
(-118 :-117 :42 :-115 )
c #5 north wall middle section
5 2 -2.2800 (-9 7 37 -33 22 -24 )(-118 :15 :42 :-115 )
c #6 north wall upper section
6 2 -2.2800 -8 7 -5 33 21 -23
c #7 west pit wall
7 2 -2.2800 7 -16 -4 2 17 -18
c #8 ceiling
8 2 -2.2800 5 -6 109 -110 -12 7
c #9 west wall
9 2 -2.2800 (((((7 -13 4 -37 -18 17 )(-119 :-25 :121 ))
(-120 :-117 :-25 :121 ))(-119 :-124 :231 ))(-117 :-120 :-124 :231 ))
(-119 :-232 :233 ))(-232 :233 :-117 :-120 ))
c #10 west wall middle section
10 2 -2.2800 (((37 -38 17 -22 -13 7 )(-120 :15 :-25 :121 ))
(-120 :15 :-124 :231 ))(-120 :15 :-232 :233 ))
c #11 cell floor (south of pit)
11 2 -2.2800 3 -4 16 -202 17 -20
c #12 west wall small section
12 2 -2.2800 38 -33 17 -22 7 -12
c #13 west wall top section
13 2 -2.2800 109 -21 33 -5 7 -12
c #14 east wall pit
14 2 -2.2800 -16 7 2 -4 19 -20
c #15 east cell wall
15 2 -2.2800 (((((7 -13 4 -37 19 -20 )(-25 :121 :122 ))
(-117 :123 :125 :121 ))(-124 :231 :122 ))(123 :-117 :-124 :231 ))
(-232 :233 :122 ))(123 :-117 :-232 :233 ))
c #16 east wall middle section
16 2 -2.2800 (((24 -20 -38 37 -13 7 )(123 :-25 :121 :15 ))
(123 :15 :-124 :231 ))(123 :15 :-232 :233 ))
c #17 east wall small section
17 2 -2.2800 24 -20 38 -33 7 -12
c #18 inside of feed tank waste section
18 10 -1.3000 -200 49 -47
c #19 shell of concentrator
19 5 -7.9000 -4 32 -39 44
c #20 inside of scrubber
20 3 -0.0012 -51 52 -50
c #21 east wall top section
21 2 -2.2800 -12 7 33 -5 23 -110
c #22 south wall pit
22 2 -2.2800 14 -16 -4 2 -19 18
c #23 N wall plate
23 5 -7.9000 -42 115 116 -10 4 -37
c #24 cell air space small section (above middle section)
24 3 -0.0012 (37 9 -33 -11 -24 22 )(192 :-194 )
c #25 cell air space top section
25 3 -0.0012 (8 -11 -5 33 -23 21 )(192 :193 )
c #26 airspace in pit west end
26 3 -0.0012 ((((-105 10 18 -14 -4 2 )(35 :41 :-36 ))(40 :-34 ))
(-32 :39 ))
c #27 dirt underneath cell
27 1 -1.5000 ((-43 -4 )(-3 :4 :202 :-16 :-17 :20 ))
(16 :-1 :-7 :4 :-17 :20 ))
c #28 space outside cell
28 3 -0.0012 ((((-43 4 )(-7 :-17 :20 :33 :11 ))(-7 :11 :-33 :6 :-109
:110 ))(-11 :202 :212 :209 :-211 ))
c #29 airspace in pit north east end
29 3 -0.0012 ((((-19 10 -171 105 -4 2 )(140 :-139 :142 ))
(140 :-139 :141 ))(140 :-139 :144 ))(143 :140 :-139 ))
c #30 concentrator inside waste section
30 10 -1.3000 -199 45 -44
c #31 concentrator lid
31 5 -7.9000 -4 45 -44
c #32 concentrator bottom

```



```

32 5 -7.9000 -46 32 -44
c #33 feed tank shell
33 5 -7.9000 34 -31 -40 47
c #34 feed tank lid
34 5 -7.9000 -31 48 -47
c #35 feed tank bottom
35 5 -7.9000 -49 34 -47
c #36 scrubber shell
36 5 -7.9000 -41 50 36 -35
c #37 scrubber lid
37 5 -7.9000 -50 -35 51
c #38 scrubber bottom
38 5 -7.9000 -50 -52 36
c #39 melter K block
39 6 -3.8300 (((66 65 64 74 -72 -80 62 63 -78 76 )
(-53 :-59 :-58 :-54 :55 :-60 :-61 :-57 :56 :80 )));
(75 -73 -71 80 77 -79 ))(-54 :55 :-57 :56 :71 :-80 )
c #40 melter H block
40 7 -3.1390 (77 -79 -29 71 75 -73 )(-69 :70 :67 :-68 :29 :-71 )
c #41 melter glass waste area
41 11 -2.7000 57 -56 61 60 53 59 58 54 -55 -198
c #42 airspace in pit south east end
42 3 -0.0012 ((((((19 -14 171 105 -4 2 ))(152 :-151 :157 ))
(150 :152 :-151 ))(159 :152 :-151 ))(160 :152 :-151 ))
(153 :152 :-151 ))(154 :152 :-151 ))(155 :152 :-151 ))
(156 :152 :-151 ))
c #43 melter Z block
43 8 -2.9500 ((-80 81 91 -83 89 -90 )(80 :-74 :72 :-65 :-64 :-66 :-62
:-76 :78 :-63 )):(73 -82 -29 80 77 -79 )
c #44 melter AL66 fill
44 9 -2.7200 ((((((29 30 25 -26 28 -27 ))(82 :-75 :29 :-80 :-77 :79 ))
(-81 :83 :-91 :80 :-89 :90 ))(93 :86 :-87 :-84 ))
(92 :86 :-87 :-84 ))(93 :87 :-88 :-85 ))(92 :87 :-88 :-85 ))
c #45 west air gap in melter (above fill cannister)
45 3 -0.0012 (-92 -87 88 85 )(-92 87 -86 84 )
c #46 east air gap in melter (above cannister fill)
46 3 -0.0012 (-93 84 -86 87 )(-93 88 -87 85 )
c #47 stainless shell outside of melter
47 5 -7.9000 (99 96 -29 -102 105 -108 )(-98 :-95 :29 :101 :-104 :107 )
c #48 water cooling shell around melter
48 4 -1.0000 (98 -107 -101 104 95 -29 )(-94 :29 :-97 :106 :100 :-103 )
c #49 stainless shell inside melter
49 5 -7.9000 (-106 97 -100 103 -29 94 )(29 :-30 :-28 :26 :27 :-25 )
c #50 N wall ledge plate
50 5 -7.9000 118 -116 117 -37 -42 115
c #51 N wall upper plate
51 5 -7.9000 -15 37 118 -9 -42 115
c #52 W wall N section plate
52 5 -7.9000 25 -121 119 -18 -37 4
c #53 south wall lower section with door gap
53 2 -2.2800 ((((((11 -13 18 -19 -37 4 ))(-113 :111 :114 ))
(-225 :230 :-275 :264 :(270 -224 )):(219 -269 )))
(238 :-239 :37 :240 :-235 ))(238 :-239 :235 :241 :225 ))
(238 :-239 :-237 :-242 :236 ))(238 :-239 :-236 :-243 :-230 ))
(247 :-246 :244 :-245 :238 :-239 ))(248 :-230 :-274 :265 ))
c #54 south wall above upper door
54 2 -2.2800 112 11 -12 -5 21 -23
c #55 air gap around crane room door
55 3 -0.0012 (((((((213 218 -215 38 -216 12 ))(507 :505 ))
(-503 :515 :512 ))(508 :512 ))(507 :-504 ))(508 :-514 ))
(515 :-514 :502 ))(134 :-137 :138 :-510 :-132 :131 ))
(-505 :-507 :510 :504 :-137 :138 ))(507 :-509 :507 :511 :-38 :-137
:138 ))
c #56 south wall lower door gap
56 3 -0.0012 113 -111 -114 4 -13 11
c #57 W wall N section ledge plate
57 5 -7.9000 120 -119 117 -37 25 -121
c #58 W wall N section upper plate
58 5 -7.9000 -22 120 -15 37 25 -121
c #59 E wall N section plate
59 5 -7.9000 25 -121 -122 19 -37 4
c #60 E wall N section ledge plate
60 5 -7.9000 122 -123 -37 117 25 -121
c #61 E wall N section upper plate
61 5 -7.9000 37 -15 -123 24 25 -121
c #62 W wall middle section plate
62 5 -7.9000 4 -37 124 119 -18 -231
c #63 W wall middle section ledge plate
63 5 -7.9000 117 120 -119 -37 124 -231
c #64 W wall middle section upper plate
64 5 -7.9000 120 -22 -15 37 124 -231
c #65 E wall middle section plate

```

```

65 5 -7.9000 19 -122 124 -231 -37 4
c #66 w wall middle section ledge plate
66 5 -7.9000 122 -123 -37 117 124 -231
c #67 melter lid AL-66
67 9 -2.7200 (-201 29 28 -27 -82 25 )(-68 :67 :125 :-69 :70 )
c #68 steel plate above melter lid
68 5 -7.9000 68 -67 69 -70 -128 127
c #69 south wall middle section
69 2 -2.2800 (((37 -38 22 -24 -13 11 ))(-225 :-275 :270 ))
(-225 :-224 :219 ))(-225 :-269 :264 )
c #70 south wall upper section
70 2 -2.2800 38 -33 22 -24 11 -12
c #71 w wall middle section upper plate
71 5 -7.9000 37 -15 24 -123 124 -231
c #72 lower steel door
72 12 -7.8000 129 -130 -133 4 135 -136
c #73 upper steel door
73 12 -7.8000 ((((-134 38 132 -131 -138 137 ))(510 :505 ))(-504 :510 ))
(507 :509 ))(507 :-511 )
c #74 turntable cannister shell
74 5 -7.9000 145 -141 -140 139
c #75 turntable cannister shell
75 5 -7.9000 147 -144 -140 139
c #76 turntable cannister shell
76 5 -7.9000 146 -142 -140 139
c #77 turntable cannister shell
77 5 -7.9000 -143 148 -140 139
c #78 turntable cannister inside
78 11 -2.7000 -145 -150 149
c #79 turntable cannister inside
79 11 -2.7000 -147 -150 149
c #80 turntable cannister inside
80 11 -2.7000 -146 -150 149
c #81 turntable cannister inside
81 11 -2.7000 -148 -150 149
c #82 turntable cannister lid
82 3 -0.0012 -145 150 -140
c #83 turntable cannister bottom
83 5 -7.9000 -145 -149 139
c #84 turntable cannister lid
84 3 -0.0012 -147 150 -140
c #85 turntable cannister bottom
85 5 -7.9000 -149 139 -147
c #86 turntable cannister lid
86 3 -0.0012 -146 150 -140
c #87 turntable cannister bottom
87 5 -7.9000 -146 -149 139
c #88 turntable cannister lid
88 3 -0.0012 -148 150 -140
c #89 turntable cannister bottom
89 5 -7.9000 -149 139 -148
c #90 cable passageway
90 3 -0.0012 505 -503 (((11 -516 517 -521 ):(-516 -520 521 519 )):
(-518 519 -216 520 ))
c #91 rack cannister inside
91 11 -2.7000 -169 170 -164
c #92 rack cannister inside
92 11 -2.7000 -169 170 -163
c #93 rack cannister inside
93 11 -2.7000 -169 170 -162
c #94 rack cannister inside
94 11 -2.7000 -169 170 -161
c #95 rack cannister inside
95 11 -2.7000 -169 170 -165
c #96 rack cannister inside
96 11 -2.7000 -169 170 -166
c #97 rack cannister inside
97 11 -2.7000 -169 -167 170
c #98 rack cannister inside
98 11 -2.7000 -169 170 -168
c #99 washer cannister bottom
99 5 -7.9000 180 -190 -188
c #100 cable passageway
100 3 -0.0012 -504 502 ((((-516 517 11 -521 ):(-516 -520 521 519 )):
(-518 519 -216 520 ))
c #101 rack cannister shell
101 5 -7.9000 -152 151 164 -156
c #102 rack cannister shell
102 5 -7.9000 -152 161 163 -155
c #103 rack cannister shell
103 5 -7.9000 -152 151 162 -154
c #104 rack cannister shell

```

104 5 -7.9000 -152 151 161 -153
c #105 rack cannister shell
105 5 -7.9000 -152 151 168 -160
c #106 rack cannister shell
106 5 -7.9000 -152 151 167 -159
c #107 rack cannister shell
107 5 -7.9000 -152 151 166 -158
c #108 rack cannister shell
108 5 -7.9000 -152 151 165 -157
c #109 rack cannister lid
109 3 -0.0012 -164 169 -152
c #110 rack cannister bottom
110 5 -7.9000 -164 -170 151
c #111 rack cannister lid
111 3 -0.0012 -163 169 -152
c #112 rack cannister bottom
112 5 -7.9000 -163 -170 151
c #113 rack cannister lid
113 3 -0.0012 -162 169 -152
c #114 rack cannister bottom
114 5 -7.9000 -162 151 -170
c #115 rack cannister lid
115 3 -0.0012 -161 169 -152
c #116 rack cannister bottom
116 5 -7.9000 -161 -170 151
c #117 rack cannister lid
117 3 -0.0012 -160 169 -152
c #118 rack cannister bottom
118 5 -7.9000 -170 151 -168
c #119 rack cannister lid
119 3 -0.0012 -167 169 -152
c #120 rack cannister bottom
120 5 -7.9000 -167 -170 151
c #121 rack cannister lid
121 3 -0.0012 169 -152 -166
c #122 rack cannister bottom
122 5 -7.9000 -166 151 -170
c #123 rack cannister lid
123 3 -0.0012 -165 169 -152
c #124 rack cannister bottom
124 5 -7.9000 -165 -170 151
c #125 airspace lower section south end
125 3 -0.0012 (((((((16 -11 18 -19 -37 4))(-180 :181 :172))
(181 :-180 :173))(181 :-180 :176))(-180 :181 :179))
(181 :-180 :178))(181 :-180 :177))(181 :-180 :174))
(-226 :-250 :-274 :265 :(-271 -223)):(220 -268))
c #126 welder cannister inside
126 11 -2.7000 -191 190 -183
c #127 welder cannister inside
127 11 -2.7000 -191 190 -182
c #128 cart cannister inside
128 3 -0.0012 -191 190 -184
c #129 cart cannister inside
129 3 -0.0012 -191 190 -185
c #130 cart cannister inside
130 3 -0.0012 -191 190 -186
c #131 cart cannister inside
131 3 -0.0012 -191 190 -187
c #132 washer cannister inside
132 11 -2.7000 -191 190 -188
c #133 extra wall section 5 wall
133 2 -2.2800 230 -248 11 4 271 -223
c #134 welder cannister shell
134 5 -7.9000 -181 180 182 -172
c #135 welder cannister shell
135 5 -7.9000 -181 180 183 -173
c #136 washer cannister shell
136 5 -7.9000 -181 180 -174 188
c #137 extra wall section 5 wall
137 2 -2.2800 230 -248 11 4 220 -268
c #138 cart cannister shell
138 3 -0.0012 -181 180 184 -176
c #139 cart cannister shell
139 3 -0.0012 -181 180 187 -177
c #140 cart cannister shell
140 3 -0.0012 -181 180 185 -179
c #141 cart cannister shell
141 3 -0.0012 -181 180 186 -178
c #142 cart cannister lid
142 3 -0.0012 191 -181 -185
c #143 cart cannister bottom
143 3 -0.0012 180 -190 -185

```

c #144 cart cannister lid
144 3 -0.0012 -181 191 -186
c #145 cart cannister bottom
145 3 -0.0012 -190 180 -186
c #146 cart cannister lid
146 3 -0.0012 191 -181 -184
c #147 cart cannister bottom
147 3 -0.0012 180 -190 -184
c #148 cart cannister lid
148 3 -0.0012 191 -181 -187
c #149 cart cannister bottom
149 3 -0.0012 180 -190 -187
c #150 welder cannister lid
150 3 -0.0012 191 -181 -182
c #151 welder cannister bottom
151 5 -7.9000 180 -190 -182
c #152 welder cannister lid
152 3 -0.0012 191 -181 -183
c #153 welder cannister bottom
153 5 -7.9000 180 -190 -183
c #154 washer cannister lid
154 5 -7.9000 191 -181 -188
c #155 crane hook cannister shell
155 3 -0.0012 -193 -192 195 194
c #156 crane hook cannister inside
156 3 -0.0012 197 -195 -196
c #157 crane hook cannister lid
157 3 -0.0012 196 -193 -195
c #158 crane hook cannister bottom
158 3 -0.0012 -197 194 -195
c #159 melter airspace inside
159 3 -0.0012 -125 68 -67 71 69 -70
c #160 melter airspace inside
160 3 -0.0012 198 54 -55 -71 58 57 -56 59
c #161 concentrator air space
161 3 -0.0012 -45 -44 199
c #162 feed tank air space
162 3 -0.0012 -48 -47 200
c #163 melter lid AL-57
163 13 -1.0400 201 -126 28 -27 -82 25
c #164 Transfer Tunnel W wall
164 2 -2.2800 (207 -113 -202 13 -203 4 )(-206 :208 )
c #165 crane maintenance room floor
165 2 -2.2800 (-209 -202 211 11 -210 203 )(20 :-17 :13 )
c #166 transfer tunnel E wall
166 2 -2.2800 (205 -204 -202 11 -203 4 )(20 :13 )
c #167 crane room ceiling
167 2 -2.2800 (213 -202 11 -212 -209 211 )(6 :12 :110 :-109 )
c #168 crane room east wall
168 2 -2.2800 -202 11 -209 214 -213 210
c #169 crane room W wall
169 2 -2.2800 211 -217 -202 11 210 -213
c #170 ledge underneath crane room door
170 2 -2.2800 13 -216 -38 210 -215 218
c #171 part of crane room east wall
171 2 -2.2800 (((-216 11 -214 215 -213 210 )(110 :12 :-33 ))
(13 :20 :13 ))(-33 -20 215 38 -13 12 )
c #172 part of crane room west wall
172 2 -2.2800 (((-216 11 -218 217 -213 210 )(12 :-109 :-33 ))
(-17 :13 :33 ))(-33 17 -218 38 12 -13 )
c #173 crane room air space
173 3 -0.0012 -214 217 -202 216 -213 210
c #174 airspace S of cell W of transfer tunnel, beyond 191
174 3 -0.0012 (-202 11 211 -207 -203 4 )(13 :-17 )(((((-226 :229 :263 )
(253 :-256 :-261 :-263 ))(257 :-260 :261 :-262 )):-274 :265 :
(271 -223 )):(220 -268 ))
c #175 airspace E of transfer tunnel
175 3 -0.0012 -209 204 -202 11 -203 4
c #176 transfer tunnel airspace
176 3 -0.0012 ((206 13 -205 -202 -203 4 )(-208 :113 ))
(-129 -135 -136 :130 :133 )
c #177 hvac duct hole
177 3 -0.0012 227 222 -228 -221 -13 11
c #178 hvac duct liner #1
178 5 -7.9000 (226 223 -229 -220 -13 11 )(-227 :-222 :228 :221 )
c #179 hvac duct liner #2
179 5 -7.9000 (225 224 -219 -230 -13 11 )(-226 :-223 :229 :220 )
c #180 W wall S section plate
180 5 -7.9000 232 119 -18 -233 -37 4
c #181 W wall S section ledge plate
181 5 -7.9000 120 117 -37 -119 232 -233
c #182 W wall S section upper plate

```

```

182 5 -7.9000 120 -22 -15 37 232 -233
c #183 E wall S section plate
183 5 -7.9000 232 -233 -122 19 -37 4
c #184 E wall S section ledge plate
184 5 -7.9000 122 -123 -37 117 232 -233
c #185 E wall S section upper plate
185 5 -7.9000 -15 37 -123 24 232 -233
c #186 Stainless plate above Duct
186 5 -7.9000 (-241 11 -37 -225 -238 239 )(-240 :-235 )
c #187 stainless plate below duct
187 5 -7.9000 (243 -13 237 230 -238 239 )(236 :242 )
c #188 stainless plate inside S wall (around ducts)
188 5 -7.9000 (-244 245 -238 239 246 -247 )(-225 :230 :264 :-275 :
(270 -224 ):(219 -269 ))
c #189 stainless plate in S wall part of cell duct
189 5 -7.9000 230 -248 11 4 ((-271 274 ):(-220 223 ):(-265 268 ))
c ends of 1st duct
190 3 -0.0012 (((227 -228 13 -263 ):(-254 255 263 261 )):
(259 -258 -261 262 ))222 -221
191 5 -7.9000 (((226 -229 -263 13 ):(-253 256 261 263 13 )):
(-257 260 -261 262 ))223 -220 #190
192 3 -0.0012 4 222 -221 249 -11 227
193 5 -7.9000 4 223 -220 -11 226 250 (-222 :221 :-227 :-249 )
c 2nd (+) duct
c #194 hvac duct hole
194 3 -0.0012 227 267 -228 -266 -13 11
c #195 hvac duct liner #1
195 5 -7.9000 (226 268 -229 -265 -13 11 )(-227 :-267 :228 :266 )
c #196 hvac duct liner #2
196 5 -7.9000 (225 269 -264 -230 -13 11 )(-226 :-268 :229 :265 )
197 3 -0.0012 (((227 -228 13 -263 ):(-254 255 263 261 )):
(259 -258 -261 262 ))267 -266
198 5 -7.9000 (((226 -229 -263 13 ):(-253 256 261 263 13 )):
(-257 260 -261 262 ))268 -265 #197
199 3 -0.0012 4 267 -266 249 -11 227
200 5 -7.9000 4 268 -265 -11 226 250 (-267 :266 :-227 :-249 )
c 3rd (-) duct
c #201 hvac duct hole
201 3 -0.0012 227 273 -228 -272 -13 11
c #202 hvac duct liner #1
202 5 -7.9000 (226 274 -229 -271 -13 11 )(-227 :-273 :228 :272 )
c #203 hvac duct liner #2
203 5 -7.9000 (225 275 -270 -230 -13 11 )(-226 :-274 :229 :271 )
204 3 -0.0012 (((227 -228 13 -263 ):(-254 255 263 261 )):
(259 -258 -261 262 ))273 -272
205 5 -7.9000 (((226 -229 -263 13 ):(-253 256 261 263 13 )):
(-257 260 -261 262 ))274 -271 #204
206 3 -0.0012 4 273 -272 249 -11 227
207 5 -7.9000 4 274 -271 -11 226 250 (-273 :272 :-227 :-249 )
c #208 crane room door opening
208 3 -0.0012 11 -12 (((((-112 21 -23 506 ):(33 501 -500 -506 )):
(507 -503 21 -506 )):(505 -503 508 -507 )):(502 -23 -506 507 )):
(502 -504 508 -507 ))
c #209 concrete piece under crane door opening
209 2 -2.2800 (((500 -506 -23 33 -12 11 )(-502 :-508 :504 ))
(-502 :-507 ))(516 :-517 :520 :504 :-502 ))(520 :-521 :-519 :517
:504 :-502 )
c #210 concrete piece under crane door opening
210 2 -2.2800 (((((-21 -501 -506 33 11 -12 )(-508 :503 :-505 ))
(-507 :503 ))(516 :-517 :521 :-505 :503 ))(516 :-521 :520 :-519
:-505 :503 ))
c #211 concrete piece under crane room door
211 2 -2.2800 (((((-215 514 -507 38 12 -216 )(-504 :-508 :-502 ))
(-515 :502 ))(520 :-519 :504 :-502 ))(518 :-519 :-520 :504 :-502 ))
c #212 concrete piece under crane room door
212 2 -2.2800 (((((-218 -512 -507 38 12 -216 )(-508 :505 :503 ))
(-515 :-503 ))(518 :-519 :-505 :503 ))(520 :-518 :-505 :503 ))
1 pz -549.0000
2 pz -427.0000
3 pz -121.92
4 pz 0.0000
5 pz 1311.0000
6 pz 1395.0000
7 px -121.9
8 px -55.8
9 px -45.72
10 px 0.0000
11 px 1920.0000
12 px 2012.0000
13 px 2042.0000
14 px 762.0000

```

15	pz	762.0000		
16	px	884.0000		
17	py	-121.92		
18	py	0.0000		
19	py	1036.0000		
20	py	1158.0000		
21	py	-61.12		
22	py	-35.56		
23	py	1097.12		
24	py	1071.64		
25	px	30.48		
26	px	330.2		
27	py	917.89		
28	py	666.43		
29	pz	240.03		
30	pz	54.61		
31	pz	116.0000		
32	pz	-366.0000		
33	pz	823.0000		
34	pz	-396.0000		
35	pz	-30.48		
36	pz	-395.6		
37	pz	609.6		
38	pz	792.5		
39	c/z	548.6000	183.0000	153.3500
40	c/z	213.40	213.40	153.35
41	c/z	488.0000	488.0000	121.9200
42	py	1005.5200		
43	s	900.0000	500.0000	600.0000 3000.0000
44	c/z	548.6000	183.0000	152.4000
45	pz	-0.9500		
46	pz	-365.0500		
47	c/z	213.4000	213.4000	152.4000
48	pz	115.0500		
49	pz	-395.0500		
50	c/z	488.0000	488.0000	120.9700
51	pz	-31.4300		
52	pz	-394.6500		
53	pz	93.3500		
54	px	69.5300		
55	px	196.5300		
56	py	878.5200		
57	py	705.8000		
58	p	-2.4800	0.0000	1.0000 -315.3050
59	p	2.4800	0.0000	1.0000 344.5200
60	p	0.0000	0.5994	1.0000 557.5500
61	p	0.0000	-0.5994	1.0000 -392.1700
62	p	0.0000	0.5994	1.0000 539.7800
63	p	0.0000	-0.5994	1.0000 -409.9400
64	p	-2.4800	0.0000	1.0000 -356.0500
65	p	2.4800	0.0000	1.0000 303.7700
66	pz	78.1100		
67	px	204.1500		
68	px	61.9100		
69	py	698.1800		
70	py	886.1400		
71	pz	182.2400		
72	px	211.7700		
73	px	219.3900		
74	px	54.2900		
75	px	46.6700		
76	py	690.5600		
77	py	682.9400		
78	py	893.7600		
79	py	901.3800		
80	pz	172.0900		
81	px	38.7400		
82	px	234.6300		
83	px	245.4300		
84	px	254.6300		
85	px	271.1400		
86	pz	213.3600		
87	pz	139.0700		
88	pz	93.3500		
89	py	674.6900		
90	py	909.6300		
91	pz	62.8700		
92	c/z	278.76	732.47	30.48
93	c/z	278.76	851.85	30.48
94	pz	53.34		
95	pz	47.31		
96	pz	46.04		

97	px	29.21		
98	px	23.18		
99	px	21.91		
100	px	331.47		
101	px	337.50		
102	px	338.77		
103	py	665.16		
104	py	659.13		
105	py	657.86		
106	py	619.16		
107	py	925.19		
108	py	926.46		
109	py	-127.16		
110	py	1163.16		
111	pz	457.20		
112	pz	1219.22		
113	py	594.04		
114	py	990.28		
115	py	30.48		
116	px	-0.95		
117	pz	608.65		
118	px	-46.67		
119	py	-0.95		
120	py	-36.51		
121	px	685.80		
122	py	1036.95		
123	py	1072.59		
124	px	622.96		
125	pz	252.73		
126	pz	284.61		
127	pz	302.33		
128	pz	304.48		
129	py	568.64		
130	py	1015.68		
131	py	1118.08		
132	py	-82.08		
133	pz	487.68		
134	pz	1238.29		
135	px	2057.24		
136	px	2090.26		
137	px	2027.24		
138	px	2050.10		
139	pz	-327.66		
140	pz	-28.57		
141	c/z	278.13	851.88	30.48
142	c/z	278.13	732.44	30.48
143	c/z	397.57	732.44	30.48
144	c/z	397.57	851.88	30.48
145	c/z	278.13	851.88	30.14
146	c/z	278.13	732.44	30.14
147	c/z	397.57	851.88	30.14
148	c/z	397.57	732.44	30.14
149	pz	-327.18		
150	pz	-28.89		
151	pz	-365.76		
152	pz	-66.67		
153	c/z	612.46	892.17	30.48
154	c/z	612.46	825.50	30.48
155	c/z	612.46	758.82	30.48
156	c/z	612.46	692.15	30.48
157	c/z	684.21	892.17	30.48
158	c/z	684.21	825.50	30.48
159	c/z	684.21	758.82	30.48
160	c/z	684.21	692.15	30.48
161	c/z	612.46	892.17	30.14
162	c/z	612.46	825.50	30.14
163	c/z	612.46	758.82	30.14
164	c/z	612.46	692.15	30.14
165	c/z	684.21	892.17	30.14
166	c/z	684.21	825.50	30.14
167	c/z	684.21	758.82	30.14
168	c/z	684.21	692.15	30.14
169	pz	-66.99		
170	pz	-365.28		
171	px	500.0000		
172	c/z	994.17	940.75	30.48
173	c/z	1066.56	940.75	30.48
174	c/z	1569.48	959.80	30.48
176	c/z	1272.30	837.88	30.48
177	c/z	1363.74	837.88	30.48
178	c/z	1363.74	746.44	30.48
179	c/z	1272.30	746.44	30.48

```

180 pz 30.48
181 pz 329.57
182 c/z 994.17 940.75 30.14
183 c/z 1066.56 940.75 30.14
184 c/z 1272.30 837.88 30.14
185 c/z 1272.30 746.44 30.14
186 c/z 1363.74 746.44 30.14
187 c/z 1363.74 837.88 30.14
188 c/z 1569.48 959.80 30.14
190 pz 30.96
191 pz 329.25
192 c/z 1318.02 1008.54 30.48
193 pz 935.04
194 pz 635.95
195 c/z 1318.02 1008.54 30.14
196 pz 934.72
197 pz 636.43
198 pz 161.40
199 pz -105.0000
200 pz -135.0000
201 pz 270.51
202 px 2642.0000
203 pz 670.56
204 py 1218.96
205 py 1097.04
206 py 563.56
207 py 472.12
208 px 2105.50
209 py 1285.64
210 pz 731.52
211 py -249.64
212 pz 1440.18
213 pz 1371.60
214 py 1224.83
215 py 1127.60
216 px 2072.96
217 py -188.83
218 py -91.60
219 py 363.22
220 py 359.41
221 py 358.14
222 py 307.34
223 py 306.07
224 py 302.26
225 p 1.0000 0.0000 -1.0000 1427.0100
226 p 1.0000 0.0000 -1.0000 1432.4000
227 p 1.0000 0.0000 -1.0000 1434.2000
228 p 1.0000 0.0000 -1.0000 1477.3100
229 p 1.0000 0.0000 -1.0000 1479.1100
230 p 1.0000 0.0000 -1.0000 1484.5000
231 px 1280.1600
232 px 1417.3200
233 px 1913.2600
235 pz 548.6400
236 pz 504.1900
237 pz 443.2300
238 py 472.4400
239 py 177.8000
240 px 1925.0800
241 px 1931.4300
242 px 2036.9200
243 px 2030.5700
244 pz 563.8800
245 pz 477.5200
246 px 1978.4600
247 px 1983.5400
248 px 1921.2700
249 px 1889.5200
250 px 1886.2500
253 c/y 2074.3289 577.2711 45.7200
254 c/y 2074.3289 577.2711 44.4500
255 c/y 2074.3289 577.2711 13.9700
256 c/y 2074.3289 577.2711 12.7000
257 px 2120.0489
258 px 2118.7789
259 px 2088.2989
260 px 2087.0289
261 pz 577.2711
262 pz 333.0000
263 p 0.7071 0.0000 0.7071 1874.9643
c following surfaces for 2nd(+) and 3rd(-) duct
264 py 457.2000

```



```

265 py 453.3900
266 py 452.1200
267 py 401.3200
268 py 400.0500
269 py 396.2400
270 py 261.6200
271 py 257.8100
272 py 256.5400
273 py 205.7400
274 py 204.4700
275 py 200.6600
c following surfaces for crane maint. room door.
500 py 975.2000
501 py 60.8000
502 py 1022.8300
503 py 13.1700
504 py 1053.3100
505 py -17.3100
506 pz 970.2800
507 pz 964.5700
508 pz 938.5300
509 py 39.8500
510 pz 977.2700
511 py 996.1600
512 py 30.3200
514 py 1005.6800
515 pz 961.3900
516 pz 923.2900
517 pz 900.4300
518 pz 896.6200
519 pz 873.7600
520 p 1.0000 0.0000 1.0000 2910.7000
521 p 1.0000 0.0000 1.0000 2878.3700

mode p
c *****
c * materials *
c *****
c
c m1 all hwpv dirt density 1.5 g/cc
8000.01p -.511 14000.01p -.2782 20000.01p -.0717
26000.01p -.1091 13000.01p -.08326 12000.01p -.03142
19000.01p -.01155 11000.01p -.02022 22000.01p -.01655
25000.01p -.001781 15000.01p -.0024
c m2 m2 ordinary H concrete density 2.28 g/cc
1000.01p 0.0642 8000.01p 0.5916 14000.01p 0.2405
20000.01p 0.0738 26000.01p 0.0299
c m3 m3 air density .0012 g/cc
7000.01p -0.765 8000.01p -0.235
c m4 m4 water density 1 g/cc
1000.01p .6667 8000.01p .3333
c m5 m5 304 SS (stainless steel) density 7.9 g/cc
25000.01p -.02 14000.01p -.01 24000.01p -.19
28000.01p -.10 26000.01p -.68
c m6 m6 K-3 block density 3.83 g/cc
13000.01p -.2857 24000.01p -.2546
26000.01p -.0615 8000.01p -.3981
c m7 m7 H block melter density 3.139 g/cc
13000.01p -.5096 11000.01p -.0274
8000.01p -.4629
c m8 m8 Z (Zirmul) melter block density 2.95 g/cc
13000.01p -.3697 40000.01p -.1767
14000.01p -.0293 8000.01p -.4243
c m9 m9 AL-66 melter refractory density 2.72 g/cc
13000.01p -.5053 20000.01p -.0157 26000.01p -.0109
14000.01p -.0027 8000.01p -.4644
c m10 m10 is melter FEED material density 1.3 g/cc
26000.01p -.0345 7000.01p -.0250 11000.01p -.0604
90000.01p -.0136 6000.01p -.0386 1000.01p -.0767
5000.01p -.0368 15000.01p -.0047 14000.01p -.0851
8000.01p -.9255
c m11 m11 is glass waste material density 2.7 g/cc
14000.01p -.7100 90000.01p -.1100 26000.01p -.2900
11000.01p -.2700 5000.01p -.1100 8000.01p -1.260
c m12 m12 is iron for the doors density 7.8 g/cc
26000.01p -1.00
c m13 m13 AL-57 melter refractory density 1.04 g/cc
13000.01p -.5075 20000.01p -.01584 26000.01p -.01109
14000.01p -.00139 8000.01p -.4642
imp:p 0 1 210r $ 1. 213
c
c *****

```

SOURCE		C	
SOURCE description		C	
ext fct d3 wgt 3.20-10		sdef	
rad fct d4 wgt fct d5		s1	
source cell probability distribution		scl	
1 10 30 41 78 79		s11	
126 127 132		s1 d	
94 95 96 97 98		s1 d	
80 81 91 92 93		s1 d	
126 127 132		s1 d	
1139 .1139 .0355 .0351 14r		s1 d	
213.4 213.4 -265. \$ xyz cell centers		d52 1	
548.6 183.0 -235.		d52 1	
133.03 792.16 127.775		d53	
278.13 851.88 -178.		d53	
397.57 851.88 -178.		d53	
278.13 732.44 -178.		d53	
397.57 732.44 -178.		d53	
612.46 692.15 -216.		d53	
612.46 756.82 -216.		d53	
612.46 825.5 -216.		d53	
612.46 892.17 -216.		d53	
684.21 892.17 -216.		d53	
684.21 825.5 -216.		d53	
684.21 756.82 -216.		d53	
684.21 692.15 -216.		d53	
1066.56 940.75 180.1		d53	
994.17 940.75 180.1		d53	
1569.48 959.8 180.1		d53	
6 6 7 8 14r \$ distrib. #s for ext		d53	
130.		s16	
93.35		s17	
149.		s18	
9 10 11 14r \$ distrib. #s for radius		d54	
152.4		s19	
105.		s110	
30.14		s111	
12 12 13 15r \$ distrib. #s for spectra		d55	
12 12 13 15r \$ distrib. #s for spectra		d55	
1		d	
8.39-6		d	
3.15-6		d	
1.56-7		d	
1.83-6		d	
1.51-6		d	
7.70-5		d	
7.94-5		d	
7.22-5		d	
5.51-5		d	
3.32-6		d	
4.05-5		d	
4.95-5		d	
3.76-5		d	
1.71-8		d	
3.80-5		d	
5.66-5		d	
7.51-5		d	
6.27-4		d	
1.82-3		d	
1.09-4		d	
2.51-1		d	
2.14-4		d	
3.27-4		d	
9.25-1		d	
2.90-3		d	
5b13		d	
5b13		d	
2.83-7		d	
1.21-7		d	
4.02-7		d	
6.10-6		d	
4.94-6		d	
2.94-6		d	
2.64-6		d	
2.61-6		d	
2.10-6		d	
1.15-7		d	
3.35-6		d	
1.89-6		d	
1.26-6		d	

```

      .65      4.12+8      1.0
      .825     9.97+5     .005
      1.0      1.43+6     .01
      1.225     1.86+6     .03
      1.475     1.59+5     .04
      1.7      5.27+3     .02
      1.9      2.69+4     .1
      2.1      6.61+1     .01
      2.3      6.53-4     .01
      2.5      8.59-4     .02
      2.7      2.27+2     .2
      3.0      7.11-3     .05
e0      .1 .3 .5 .6 .7 .9 1.1 1.3 2 2.5 10
c      ansi/ans-6.1.1-1991
c      fluence-to-dose.photons(mrem/hr)/(p/cm**2/s)
de0     log      .01 .015 .02 .03 .04 .05
           .06 .08 .10 .15 .20 .30
           .40 .50 .60 .80 1.0 1.5
           2.0 3.0 4.0 5.0 6.0 8.0
           10. 12.
df0     log      2.232e-5 5.652e-5 8.568e-5 1.184e-4 1.314e-4 1.382e-4
           1.440e-4 1.624e-4 1.919e-4 2.797e-4 3.708e-4 5.616e-4
           7.416e-4 9.144e-4 1.075e-3 1.379e-3 1.656e-3 2.246e-3
           2.758e-3 3.672e-3 4.500e-3 5.292e-3 6.012e-3 7.488e-3
           8.892e-3 1.040e-2
c      *** pt. kernel, ansi gpbuf
idum 2
phys:p      j 1
ctme      480.0
c      print      10 30 40 50 60 110 120 126 170
c      this makes a mctal file
prdm p      j -240 1

```

The detector cards for the six input files were not included in this listing due to their size. One of the detector cards from one of the files is included below as an example:

```
fc395  Dose point at 2121 (PV-Wave coordinates)
f395:p  -1123.000000 2121.000000 91.440002 0
        -1038.000000 2121.000000 91.440002 0
        -953.000000 2121.000000 91.440002 0
        -868.000000 2121.000000 91.440002 0
        -783.000000 2121.000000 91.440002 0
        -698.000000 2121.000000 91.440002 0
        -613.000000 2121.000000 91.440002 0
        -528.000000 2121.000000 91.440002 0
        -443.000000 2121.000000 91.440002 0
        -358.000000 2121.000000 91.440002 0
        -273.000000 2121.000000 91.440002 0
        -188.000000 2121.000000 91.440002 0
        -122.000000 2121.000000 91.440002 0
        1.000000 2121.000000 91.440002 0
        67.000000 2121.000000 91.440002 0
        152.000000 2121.000000 91.440002 0
        237.000000 2121.000000 91.440002 0
        322.000000 2121.000000 91.440002 0
        407.000000 2121.000000 91.440002 0
        492.000000 2121.000000 91.440002 0
        577.000000 2121.000000 91.440002 0
        662.000000 2121.000000 91.440002 0
        747.000000 2121.000000 91.440002 0
        832.000000 2121.000000 91.440002 0
        917.000000 2121.000000 91.440002 0
        1002.000000 2121.000000 91.440002 0
        1087.000000 2121.000000 91.440002 0
        1172.000000 2121.000000 91.440002 0
        1257.000000 2121.000000 91.440002 0
        1342.000000 2121.000000 91.440002 0
        1427.000000 2121.000000 91.440002 0
        1512.000000 2121.000000 91.440002 0
        1597.000000 2121.000000 91.440002 0
        1682.000000 2121.000000 91.440002 0
        1767.000000 2121.000000 91.440002 0
        1852.000000 2121.000000 91.440002 0
        1919.000000 2121.000000 91.440002 0
        2043.000000 2121.000000 91.440002 0
        2107.000000 2121.000000 91.440002 0
        2192.000000 2121.000000 91.440002 0
        2277.000000 2121.000000 91.440002 0
        2362.000000 2121.000000 91.440002 0
        2447.000000 2121.000000 91.440002 0
        2532.000000 2121.000000 91.440002 0
        2617.000000 2121.000000 91.440002 0
        2702.000000 2121.000000 91.440002 0
        2787.000000 2121.000000 91.440002 0
        2872.000000 2121.000000 91.440002 0
        2957.000000 2121.000000 91.440002 0
        3042.000000 2121.000000 91.440002 0
```

One detector was created at each X and Y location along a grid. Each level had a different grid. These grids are described in Table B-1.

Table B-1.

103' level:		113.25' level:		127' level:		134.5' level:	
Z = 91.44		Z = 403.86		Z = 822.96		Z = 1051.56	
Y =	X =	Y =	X =	Y =	X =	Y =	X =
-1155	-1123	-1155	-1123	-1155	-1123	-1155	-1123
-1071	-1038	-1071	-1038	-1071	-1038	-1071	-1038
-987	-953	-987	-953	-987	-953	-987	-953
-903	-868	-903	-868	-903	-868	-903	-868
-819	-783	-819	-783	-819	-783	-819	-783
-735	-698	-735	-698	-735	-698	-735	-698
-651	-613	-651	-613	-651	-613	-651	-613
-567	-528	-567	-528	-567	-528	-567	-528
-483	-443	-483	-443	-483	-443	-483	-443
-399	-358	-399	-358	-399	-358	-399	-358
-315	-273	-315	-273	-315	-273	-315	-273
-231	-188	-231	-188	-250	-188	-250	-188
-147	-122	-147	-122	-188	-122	-188	-122
-122	1	-122	1	-128	-45	-128	-45
1	67	1	67	-30	67	-30	67
105	152	105	152	105	152	105	152
189	237	189	237	189	237	189	237
273	322	273	322	273	322	273	322
357	407	357	407	357	407	357	407
441	492	441	492	441	492	441	492
525	577	525	577	525	577	525	577
609	662	609	662	609	662	609	662
693	747	693	747	693	747	693	747
777	832	777	832	777	832	777	832
861	917	861	917	861	917	861	917
945	1002	945	1002	945	1002	945	1002
1035	1087	1035	1087	1066	1087	1066	1087
1159	1172	1159	1172	1164	1172	1164	1172
1219	1257	1219	1257	1224	1257	1224	1257
1281	1342	1281	1342	1286	1342	1286	1342
1365	1427	1365	1427	1365	1427	1365	1427
1449	1512	1449	1512	1449	1512	1449	1512
1533	1597	1533	1597	1533	1597	1533	1597
1617	1682	1617	1682	1617	1682	1617	1682
1701	1767	1701	1767	1701	1767	1701	1767
1785	1852	1785	1852	1785	1919	1785	1919
1869	1919	1869	1919	1869	2027	1869	2027
1953	2043	1953	2043	1953	2051	1953	2051
2037	2107	2037	2107	2037	2073	2037	2073
2121	2192	2121	2192	2121	2192	2121	2192
	2277		2277		2277		2277
	2362		2362		2362		2362
	2447		2447		2447		2447
	2532		2532		2532		2532
	2617		2617		2617		2617
	2702		2702		2702		2702
	2787		2787		2787		2787
	2872		2872		2872		2872
	2957		2957		2957		2957
	3042		3042		3042		3042

Attachment C.
ISOSHL output files.

ISOSHL D 4.0

UNIX/IBM PC (September 1994)
Radiation Physics & Shielding
Westinghouse Handford Company
Richland, WA 99352

Initializing photon library: REAC*4 8/19/92 14:46:17
Initializing mass attenuation library: attnuate.lib

SHIELD COMPOSITION, g/cc

	Shield 1	Shield 2	Shield 3	Shield 4	Shield 5
SI	7.100E-01				
TH	1.100E-01				
FE	2.900E-01				
NA	2.700E-01				
B	1.100E-01				
O	1.260E+00				

>>Retrieving data from ISODAT.QQQ
SRC FOR 1g of WV GLASS
Feb 1,95 12:58:47 S

Scale factor = 1.000E+00

Isotopic Source Term (unscaled)

FE- 55	2.930E-07	CO- 60	7.250E-07	NI- 59	2.190E-07
SE- 79	7.290E-09	SR- 90	1.200E-02	Y - 90	1.200E-02
ZR- 93	5.630E-07	NB- 93*	4.190E-07	TC- 99	2.250E-07
RU-106	4.750E-10	RH-106	4.760E-10	PD-107	2.280E-08
CD-113*	3.300E-06	SN-121*	3.320E-08	SN-126	2.150E-07
SB-125	3.350E-06	SB-126	3.010E-08	SB-126*	2.150E-07
TE-125*	8.210E-07	CS-134	1.420E-06	CS-135	3.340E-07

CS-137	1.300E-02	BA-137*	1.230E-02	CE-144	6.440E-12
PR-144	6.450E-12	PM-146	1.050E-08	PM-147	3.710E-05
SM-151	1.670E-04	EU-152	5.560E-07	EU-154	1.220E-04
EU-155	2.130E-05	TL-207	1.940E-08	TL-208	6.190E-09
PB-209	4.440E-10	PB-211	1.950E-08	PB-212	1.720E-08
BI-211	1.950E-08	BI-212	1.720E-08	BI-213	4.440E-10
PO-215	1.950E-08	PO-216	1.720E-08	RN-219	1.950E-08
RN-220	1.720E-08	FR-221	4.440E-10	FR-223	2.690E-10
RA-223	1.950E-08	RA-224	1.720E-08	RA-225	4.440E-10
RA-228	3.260E-09	AC-225	4.440E-10	AC-227	1.950E-08
AC-228	3.260E-09	TH-227	1.920E-08	TH-228	1.720E-08
TH-229	4.440E-10	TH-230	1.210E-10	TH-231	1.960E-10
TH-232	3.390E-09	TH-234	1.650E-09	PA-231	3.140E-08
PA-233	4.850E-08	PA-234*	1.650E-09	U -232	1.360E-08
U -233	1.870E-08	U -234	8.950E-09	U -235	1.960E-10
U -236	5.730E-10	U -238	1.650E-09	NP-236	1.960E-08
NP-237	4.850E-08	NP-239	7.170E-07	PU-236	1.740E-09
PU-238	1.640E-05	PU-239	3.360E-06	PU-240	2.470E-06
PU-241	1.250E-04	PU-242	3.360E-09	AM-241	1.110E-04
AM-242	5.940E-07	AM-242*	5.970E-07	AM-243	7.170E-07
CM-242	4.930E-07	CM-243	2.400E-07	CM-244	1.260E-05
CM-245	1.820E-09	CM-246	2.090E-10		

Case Title: Brems. generation in GLASS

Geometry:	SOURCE:	SHIELDS:	MODE = 1
	Spherical	Spherical	IGEOM = 3
			ICONC = 0
			SFACT = 1.000E+00
			ISPEC = 3

Dimensions, cm:

X = 4.500E+01	SLTH = 0.000E+00
Y = 0.000E+00	VOLUME = 1.414E+04
D = X - SUM(TN) = 3.000E+01	NSHLD = 1

Shield Thickness, cm:

1.500E+01

Integration Specification:

NTHETA = 0
NPSI = 1

Buildup Data:

Taylor Coefficient
For Shield: 1

DELTA = 0.000E+00

Effective At. No. 10.2

Group	Average Energy MeV	Bremsstr. photons/sec	Source Total photons/sec	Energy Flux MeV/cm2/s	Exposure Roentgens/hr
1	1.500E-02	2.115E+07	2.832E+07	0.000E+00	0.000E+00
2	2.500E-02	1.188E+07	1.208E+07	0.000E+00	0.000E+00
3	3.500E-02	7.033E+06	4.022E+07	0.000E+00	0.000E+00
4	4.500E-02	4.760E+06	6.183E+06	0.000E+00	0.000E+00
5	5.500E-02	3.460E+06	4.936E+06	0.000E+00	0.000E+00
6	6.500E-02	2.925E+06	2.938E+06	0.000E+00	0.000E+00
7	7.500E-02	2.624E+06	2.642E+06	0.000E+00	0.000E+00
8	8.500E-02	2.345E+06	2.609E+06	0.000E+00	0.000E+00
9	9.500E-02	2.090E+06	2.098E+06	0.000E+00	0.000E+00
10	1.500E-01	9.403E+06	1.146E+07	1.793E+01	3.098E-05
11	2.500E-01	3.040E+06	3.348E+06	1.452E+01	2.845E-05
12	3.500E-01	1.465E+06	1.475E+06	1.076E+01	2.216E-05
13	4.750E-01	1.082E+06	1.264E+06	1.434E+01	2.925E-05
14	6.500E-01	6.306E+05	4.121E+08	6.417E+03	1.335E-02
15	8.250E-01	2.290E+05	9.969E+05	1.858E+01	3.716E-05
16	1.000E+00	1.513E+05	1.430E+06	3.323E+01	6.413E-05
17	1.225E+00	7.494E+04	1.864E+06	5.372E+01	9.884E-05
18	1.475E+00	2.378E+04	1.587E+05	5.552E+00	9.772E-06
19	1.700E+00	5.262E+03	5.274E+03	2.204E-01	3.769E-07
20	1.900E+00	1.067E+03	2.687E+04	1.267E+00	2.104E-06
21	2.100E+00	5.958E+01	6.610E+01	3.456E-03	5.530E-09
22	2.300E+00	6.533E-04	6.533E-04	3.775E-08	5.813E-14
23	2.500E+00	3.225E-04	8.590E-04	5.439E-08	8.268E-14
24	2.700E+00	1.409E-04	2.271E+02	1.560E-02	2.309E-08
25	3.000E+00	5.780E-05	7.114E-03	5.458E-07	7.805E-13
26	3.600E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
27	4.500E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
28	5.500E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
29	6.600E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
30	8.600E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
TOTALS		7.438E+07	5.362E+08	6.587E+03	1.367E-02

*** End of Run ***

1 WV source for 1g glass, 15.0 cm rad, dose 45 cm from cent.

Brems. generation in GLASS

\$INPUT

NEXT= 1, OPTION= 1, ISPEC= 3,

IGEOM= 3, X= 45.0,

NSHLD= 1, JBUF= 1,

T(1)= 15.0,

\$

SI 0.71

TH 0.11

FE 0.29

NA 0.27

B 0.11

10 1.26

Last case

\$INPUT NEXT=6 \$

ISOSHL D 4.0

UNIX/IBM PC (September 1994)
Radiation Physics & Shielding
Westinghouse Handford Company
Richland, WA 99352

Initializing photon library: REAC*4 8/19/92 14:46:17
Initializing mass attenuation library: attnuate.lib

SHIELD COMPOSITION, g/cc

	Shield 1	Shield 2	Shield 3	Shield 4	Shield 5
FE	3.450E-02				
N	2.500E-02				
NA	6.040E-02				
TH	1.360E-02				
C	3.860E-02				
H	7.670E-02				
B	3.680E-02				
P	4.700E-03				
SI	8.510E-02				
O	9.255E-01				

>>Retrieving data from ISODAT.QQQ
SRC FOR 1 cc of WV (glass) FEED
Feb 3,95 15:23:23 lass) FEED

Scale factor = 1.000E+00

Isotopic Source Term (unscaled)

FE- 55	1.200E-07	CO- 60	2.950E-07	NI- 59	8.920E-08
SE- 79	3.110E-09	SR- 90	4.890E-03	Y - 90	4.890E-03
ZR- 93	2.290E-07	NB- 93*	1.710E-07	TC- 99	1.020E-07

RU-106	2.140E-10	RH-106	1.940E-10	PD-107	9.280E-09
CD-113*	1.490E-06	SN-121*	1.350E-08	SN-126	8.770E-08
SB-125	1.360E-06	SB-126	1.230E-08	SB-126*	8.770E-08
TE-125*	3.510E-07	I -129	1.520E-10	CS-134	5.890E-07
CS-135	1.380E-07	CS-137	5.380E-03	BA-137*	5.090E-03
CE-144	2.620E-12	PR-144	2.630E-12	PM-146	4.280E-09
PM-147	1.510E-05	SM-151	6.780E-05	EU-152	2.260E-07
EU-154	4.960E-05	EU-155	8.680E-06	TL-207	7.920E-09
TL-208	2.520E-09	PB-209	1.810E-10	PB-211	7.950E-09
PB-212	7.020E-09	BI-211	7.950E-09	BI-212	7.020E-09
BI-213	1.810E-10	PO-215	7.950E-09	PO-216	7.020E-09
RN-219	7.950E-09	RN-220	7.020E-09	FR-221	1.810E-10
FR-223	1.100E-10	RA-223	7.950E-09	RA-224	7.020E-09
RA-225	1.810E-10	RA-228	1.330E-09	AC-225	1.810E-10
AC-227	7.950E-09	AC-228	1.330E-09	TH-227	7.830E-09
TH-228	7.020E-09	TH-229	1.810E-10	TH-230	4.940E-11
TH-231	7.970E-11	TH-232	1.380E-09	TH-234	6.720E-10
PA-231	1.280E-08	PA-233	1.980E-08	PA-234*	6.720E-10
U -232	5.540E-09	U -233	7.610E-09	U -234	3.640E-09
U -235	7.970E-11	U -236	2.340E-10	U -238	6.720E-10
NP-236	7.980E-09	NP-237	1.980E-08	NP-239	2.920E-07
PU-236	7.100E-10	PU-238	6.670E-06	PU-239	1.370E-06
PU-240	1.010E-06	PU-241	5.090E-05	PU-242	1.370E-09
AM-241	4.510E-05	AM-242	2.420E-07	AM-242*	2.430E-07
AM-243	2.920E-07	CM-242	2.010E-07	CM-243	9.760E-08
CM-244	5.120E-06	CM-245	7.430E-10	CM-246	8.500E-11

Case Title: Brems. generation in FEED

Geometry:	SOURCE:	SHIELDS:	MODE = 1
	Spherical	Spherical	IGEOM = 3
			ICONC = 0
			SFACT = 1.000E+00
			ISPEC = 3
Dimensions, cm:			
X =	4.500E+01	SLTH =	0.000E+00
Y =	0.000E+00	VOLUME =	1.414E+04
D = X - SUM(TN) =	3.000E+01	NSHLD =	1

Shield Thickness, cm:
1.500E+01

Integration Specification:

NTHETA = 0

NPSI = 1

DELR = 0.000E+00

Buildup Data:

Taylor Coefficient

For Shield: 1

Effective At. No. 4.6

Group	Average Energy MeV	Bremsstr. photons/sec	Source Total photons/sec	Energy Flux MeV/cm2/s	Exposure Roentgens/hr
1	1.500E-02	5.444E+06	8.395E+06	0.000E+00	0.000E+00
2	2.500E-02	3.070E+06	3.150E+06	0.000E+00	0.000E+00
3	3.500E-02	1.830E+06	1.556E+07	0.000E+00	0.000E+00
4	4.500E-02	1.247E+06	1.825E+06	0.000E+00	0.000E+00
5	5.500E-02	9.059E+05	1.505E+06	0.000E+00	0.000E+00
6	6.500E-02	7.651E+05	7.702E+05	0.000E+00	0.000E+00
7	7.500E-02	6.866E+05	6.940E+05	0.000E+00	0.000E+00
8	8.500E-02	6.139E+05	7.215E+05	0.000E+00	0.000E+00
9	9.500E-02	5.474E+05	5.507E+05	0.000E+00	0.000E+00
10	1.500E-01	2.484E+06	3.322E+06	1.908E+01	3.297E-05
11	2.500E-01	8.196E+05	9.449E+05	1.088E+01	2.132E-05
12	3.500E-01	4.013E+05	4.052E+05	7.050E+00	1.452E-05
13	4.750E-01	3.018E+05	3.757E+05	9.408E+00	1.919E-05
14	6.500E-01	1.808E+05	1.705E+08	4.782E+03	9.947E-03
15	8.250E-01	6.744E+04	3.800E+05	1.173E+01	2.345E-05
16	1.000E+00	4.584E+04	5.656E+05	1.997E+01	3.855E-05
17	1.225E+00	2.361E+04	7.509E+05	3.196E+01	5.881E-05
18	1.475E+00	7.838E+03	6.271E+04	3.156E+00	5.555E-06
19	1.700E+00	1.811E+03	1.816E+03	1.099E-01	1.879E-07
20	1.900E+00	3.828E+02	1.087E+04	7.311E-01	1.214E-06
21	2.100E+00	2.249E+01	2.515E+01	1.857E-03	2.971E-09
22	2.300E+00	2.145E-04	2.145E-04	1.714E-08	2.639E-14
23	2.500E+00	1.085E-04	3.268E-04	2.835E-08	4.309E-14
24	2.700E+00	4.865E-05	9.246E+01	8.625E-03	1.276E-08
25	3.000E+00	2.076E-05	2.897E-03	2.991E-07	4.278E-13
26	3.600E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
27	4.500E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
28	5.500E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
29	6.600E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
30	8.600E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
TOTALS		1.944E+07	2.105E+08	4.896E+03	1.016E-02

*** End of Run ***

1 WV SRC for 1 cc (glass) FEED, 15.0 cm rad, dose 45 cm from cent.

Brems. generation in FEED

\$INPUT

NEXT= 1, OPTION= 1, ISPEC= 3,

IGEOM= 3, X= 45.0,

NSHLD= 1, JBUF= 1,

T(1)= 15.0,

\$

FE 0.0345

N 0.0250

NA 0.0604

TH 0.0136

C 0.0386

H 0.0767

B 0.0368

P 0.0047

SI 0.0851

10 0.9255

Last case

\$INPUT NEXT=6 \$

DISTRIBUTION SHEET

To	From	Page 1 of 1			
Distribution	Nuclear Physics and Shielding	Date 04/30/96			
Project Title/Work Order		EDT No. 603240			
MCNP Calculational Models of West Valley Vittrification Cell and Point-Kernel Dose Contour Plots		ECN No. N/A			
Name	MSIN	Text With All Attach.	Text Only	Attach./Appendix Only	EDT/ECN Only

J. Greenborg (2 copies)	H0-35	X
V. E. Roetman (10 copies)	H0-35	X
R. L. Simons	H0-35	X
Central Files (Original + 3)	A3-88	X