DISTRIBUTION SHEET

To Distribution	From Radiation Physics and Shielding	Page 1 of 1
		Date Sept. 1 ,1994
Project Title/Work Order Shielding Analysis of the Modified Cask Loading Station in FFTF/RSB		EDT No. 603203
		ECN No.

Name	MSIN	Text With All Attach.	Text Only	Attach./ Appendix Only	EDT/ECN Only
J. Greenborg	H0-35	X			
J. L. Marshall	N2-02	X			
E. J. Krejci	N1-72	X			
R. B. Packard	N2-53	X			
J. E. Parker	N1-71	X			
P. R. Prevo	N1-72	X			
R. L. Simons	H0-35	X			
A. E. Waltar	H0-32	X			
Central Files (Original + 3)	L8-04	X			
ECM Station 7	L8-14	X			+ Cover Page
OSTI (2 copies)	L8-07	X			

35 Station 21

ENGINEERING DATA TRANSMITTAL

Page 1 of 1

1. EDT 603203

2. To: (Receiving Organization) IEM Cell & Refueling Mech. Eng.		3. From: (Originating Organization) Radiation Physics & Shielding		4. Related EDT No.: N/A							
5. Proj./Prog./Dept./Div.: FFTF		6. Cog. Engr.: R. L. Simons		7. Purchase Order No.: N/A							
8. Originator Remarks: Shielding analysis for the modified cask loading station in FFTF/RSB.				9. Equip./Component No.: N/A							
				10. System/Bldg./Facility: 41/RSB/FFTF							
11. Receiver Remarks: N/A				12. Major Assm. Dwg. No.: H-4-66808							
				13. Permit/Permit Application No.: N/A							
				14. Required Response Date: 10-94							
15. DATA TRANSMITTED											
(A) Item No.	(B) Document/Drawing No.	(C) Sheet No.	(D) Rev. No.	(E) Title or Description of Data Transmitted	(F) Approval Designator	(G) Reason for Transmittal	(H) Originator Disposition	(I) Receiver Disposition			
1	WHC-SD-FF-TA-033		0	Shld. Anal. for CLS/RSB	2SQ	1	1	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						
(G)	(H)	17. SIGNATURE/DISTRIBUTION (See Approval Designator for required signatures)						(G)	(H)		
Reason	Disp.	(J) Name	(K) Signature	(L) Date	(M) MSIN	(J) Name	(K) Signature	(L) Date	(M) MSIN	Reason	Disp.
1	/	Cog.Eng. RL Simons	<i>RL Simons</i>	7-14-94	HO-35						
1	/	Cog. Mgr. J. Grennborg	<i>J. Grennborg</i>	7-14-94	HO-35						
1	/	QA SL Mischke	<i>SL Mischke</i>	10/14/94	H1-71						
1	/	Safety EJ Krejci	<i>EJ Krejci</i>	10/14/94	H2-53						
		Env.									
1	/	RJ Morford	<i>RJ Morford</i>	7-21-94	HO-35						
1	/	RB Packard	<i>RB Packard</i>	7/29/94	H2-53						
18. RL Simons <i>RL Simons</i> 7-14-94 Signature of EDT Date Originator		19. J. Marshall <i>J. Marshall</i> 10/13/94 Authorized Representative Date for Receiving Organization		20. J. Grennborg <i>J. Grennborg</i> 7/14/94 Cognizant Manager Date		21. DOE APPROVAL (if required) Ctrl. No. ☐ Approved ☐ Approved w/comments ☐ Disapproved w/comments					

RELEASE AUTHORIZATION

Document Number: WHC-SD-FF-TA-033, REV.0

Document Title: Shielding Effectiveness of the Modified Cask Loading Station in FFTF/RSB

Release Date: October 31, 1994

This document was reviewed following the procedures described in WHC-CM-3-4 and is:

APPROVED FOR PUBLIC RELEASE

WHC Information Release Administration Specialist:

Vicky Birkland

10/31/94

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.

This report has been reproduced from the best available copy. Available in paper copy and microfiche. Printed in the United States of America. Available to the U.S. Department of Energy and its contractors from:

U.S. Department of Energy
Office of Scientific and Technical Information (OSTI)
P.O. Box 62
Oak Ridge, TN 37831
Telephone: (615) 576-8401

Available to the public from:

U.S. Department of Commerce
National Technical Information Service (NTIS)
5285 Port Royal Road
Springfield, VA 22161
Telephone: (703) 487-4650

DISCLAIMER

Portions of this document may be illegible in electronic image products. Images are produced from the best available original document.

SUPPORTING DOCUMENT		1. Total Pages 13
2. Title Shielding Effectiveness of the Modified Cask Loading Station in FFTF/RSB	3. Number WHC-SD-FF-TA-033	4. Rev No. 0
5. Key Words Neutron, Gamma ray, Dose Rates, Shielding, Driver Fuel Assembly APPROVED FOR PUBLIC RELEASE <i>D. Burkland</i> 10/31/94	6. Author Name: R. L. Simons <i>R. L. Simons</i> Signature Organization/Charge Code 8D570/B192H	
7. Abstract The Cask Loading Station (CLS) designed for the Maintenance and Storage Facility (MASF) was modified so that it could be placed in the Fast Flux Test Facility Reactor Service Building (FFTF/RSB). The modification to the CLS design required to adapt the CLS to the FFTF/RSB included an aluminum cover plate between the CLS cover plate and the cell walls. The purpose of the present analysis was to determine if scattered radiation through the aluminum covered gap significantly increased the radiation dose rate at the 550 foot level. No significant dose rates by this pathway were found. The CLS design for the MASF excluded a supplemental shield block due to low calculated dose rates. A review of the shielding evaluation for the MASF CLS concluded that extra shielding was included around the core component container (CCC) that caused the low calculated dose rate and the Co60 gamma ray source was not considered. Inclusion of these two factors caused the dose rate to increase substantially around the sides of the floor valve and adaptor plates. However, either inclusion of the supplemental shield blocks or restricting the accessibility to the area during the CCC transfer reduces the dose rates below the 200 mrem/hr transient limit.		
8. PURPOSE AND USE OF DOCUMENT - This document was prepared for use within the U.S. Department of Energy and its contractors. It is to be used only to perform, direct, or integrate work under U.S. Department of Energy contracts. This document is not approved for public release until reviewed. PATENT STATUS - This document copy, since it is transmitted in advance of patent clearance, is made available in confidence solely for use in performance of work under contracts with the U.S. Department of Energy. This document is not to be published nor its contents otherwise disseminated or used for purposes other than specified above before patent approval for such release or use has been secured, upon request, from the Patent Counsel, U.S. Department of Energy Field Office, Richland, WA.		10. RELEASE STAMP <div style="border: 1px solid black; padding: 5px; text-align: center;">OFFICIAL RELEASE BY WHC DATE OCT 31 1994 35 Station 21</div>
DISCLAIMER		
This report was prepared as an account of work sponsored by an agency of the United States Government. Neither the United States Government nor any agency thereof, nor any of their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. 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. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government or any agency thereof.		
9. Impact Level LSQ		

MASTER

for

Shielding Effectiveness of the Modified Cask Loading Station in FFTF/RSB

The proposed location for the Cask Loading Station (CLS) [1] was moved from the Maintenance and Storage Facility (MASF) to the Reactor Service Building (RSB). Modifications to the CLS were necessary to interface with the available cell space in RSB. The CLS has a larger cell opening, which will be covered with an aluminum plate. It also has an additional radiation source from scattering from structures in cell to the area above the aluminum cover plate. The geometry model of the MASF/CLS [1] was modified to account for these changes. Additional details of the core component container (CCC) were also included. Figure 1 shows a vertical section of the modified two dimensional geometry model. Figure 2 shows a cross section view of the CLS at the 550 foot level. Calculations of the gamma ray and neutron dose rates above the aluminum cover plate were made with the MCNP computer code [2].

The original analysis [1] did not include the Co60 gamma ray source in the DFA and include a steel shield that lowered the dose rate. The source region geometry model was also modified to accurately depict the CCC loaded with six DFA. As such the dose rate is higher than in the original analysis [1]. Figure 3 shows the calculated dose rates from the original analysis and the corrected source that includes the Co60 gamma rays for the small solid waste cask valve dimension (side). The maximum dose rate at the minimum accessible radius (>85 cm) is 160 mrem/hr with shield block A present and 1700 mrem/hr with the shield block absent. In the latter case the dose rate drops to 200 mrem/hr limit about 75 cm (30 inches) from the side of the SWC valve. Figure 4 shows the dose rates for the large dimension (front). The maximum dose rate for the minimum accessible dimension (>140 cm) is 280 mrem/hr with the shield block absent and 24 mrem/hr with the shield block in place.

Shield block A is not included in the design of this Cask Loading Station (CLS). These dose rates above the 200 mrem/hr limit occur in a very narrow beam (approximately 1" high) at floor level (550'). Since this CLS does not require any access below the 550' level during operation, any potential exposure would to the feet of the operator.

The normal measurement point for personnel dose readings is at 30 cm (12") from the surface. The 280 mrem/hr surface dose rate for the large dimension drops to approximately 170 mrem/hr at 30 cm and is therefore acceptable.

The 1700 mrem/hr surface dose rate for the small dimension does not fall below 200 mrem/hr until a distance of approximately 75 cm (30") is reached. However due to the very narrow beam at shoe level it will be considered acceptable for design with final acceptance deferred to after the shielding test using the following logic:

- . When the dose rate is measured during the shielding test, it may very well fall within the 200 mrem/hr at 30 cm limit due to the conservatism in the calculations.
- . If the 200 mrem/hr is exceeded during the shielding test, a decision will be made to either add shielding or make an exclusion area.

- NOTES: 1) Access to this area is not required during operation of the CLS.
- 2) Adding additional shielding now or later will cost about the same.

A potential streaming path below the 550 foot level occurs between the top of the interim storage cask (ISC) and the CLS support plate (see figure 1). A Monte Carlo calculation, which included scattering from the structures below the 550 foot level up through the aluminum cover plate, did not show any significant deviation from the point kernel calculation (see figure 4). A factor of two or more statistical uncertainty prevented quantifying the increased dose rate due to scattered gamma rays and neutrons.

Attachment A gives the input data file to MCNP for the CLS.

REFERENCES:

1. R. L. Simons, "Shielding Analysis for New Cask Loading Station in the Maintenance and Storage Facility," EDT-110889, Westinghouse Hanford Company, Richland, WA, December 30, 1992.
2. L. L. Carter, "Certification of MCNP Version 4 for CRAY and Sun Workstations," WHC-SD-MP-SWD-30001, rev 5, ECN-186708, Westinghouse Hanford Company, Richland, WA, April 20, 1993.

Figure 1 Vertical Section View of Modified CLS Geometry Model with Large Radius.

07/11/94 14:31:31
 CASK LOADING STATION DOSE RATES:
 SOURCE IS A DFA W/ SOURCE FROM
 OMBRELLARO
 probid = 07/11/94 14:28:33
 basis:
 (1.000000, 0.000000, 0.000000)
 (0.000000, 0.000000, 1.000000)
 origin:
 (0.00, 0.00, 150.00)
 extent = (240.00, 240.00)

Figure 2 Cross Section View at the 550 Foot Level of the Modified CLS Geometry Model.

06/24/94 11:42:02
CASK LOADING STATION DOSE RATES:
SOURCE IS A DFA W/ SOURCE FROM
OMBRELLARO
probid = 06/24/94 11:34:46
basis:
(1.000000, 0.000000, 0.000000)
(0.000000, 1.000000, 0.000000)
origin:
(0.00, 0.00, 125.00)
extent = (250.00, 250.00)

Figure 3 Total Dose Rate Radially from the Disposable Solid Waste Valve from Small Diameter Dimension.

—■— w/o blk (pk) - - □ - - w/ blk (pk) —x— Ref. 1 ▲ MC w/o blk A

Figure 4 Total Dose Rate Radially from the Disposable Solid Waste Valve from Large Diameter Dimension.

—■— w/o blk (pk) - - - □ - - - w/ blk (pk) —*— Ref. 1 —▲— w/o blk (MC)

Attachment A
Input Data File for the Cask Loading Station Problem

CASK LOADING STATION DOSE RATES: SOURCE IS A DFA W/ SOURCE FROM OMBRELLARO
OR A TYPICAL DFA IRRADIATED TO 150 MWD/KG AND DECAYED TO 250 W

c Large RADIUS FOR ISC FV

1	2	-7.86	4	-12	23	-24		\$ SWC
2	0		12	23	-24	-16		
3	0		5	-23	22	-8 (-28:-7)		
4	2	-7.86	8	-13	22	-28		\$ ISC VALVE
5	0		13	33	-16	-23		
7	0		18	9	-25	-19		
8	2	-7.86	18	-20	5	-9		
9	0		20	-21	5	-9		
10	2	-7.86	27	5	-30	-10		
11	2	-7.86	27	10	-12	-29		\$ BLOCK A
12	2	-7.86	30	-22	-13	5	6	
13	2	-7.86	28	7	-23	-13		\$ SWC VALVE
14	2	-7.86	19	5	-27	-34 (21:9)		\$ MASF CLS
15	0		17	25	-19	-15 #41 #42 #40		
16	5	-2.357	17	15	-35	-16		\$ CELL WALL
18	0		18	-23	4	-5		
19	0		18	-24	103	-4		
24	0		(24:16:-17)					\$ OUTSIDE WORLD
25	0		27	-33	14	-16		
26	0		12	-14	-29	27		
27	0		10	-14	29	-33		
28	2	-7.86	33	11	-13	-30		
29	0		10	-11	33	-30		
30	0		-6	5	-22			
31	0		15	-16	35	-36		
32	2	-7.86	15	-16	36	-37		
33	0		15	-16	37	-38		
34	2	-7.86	15	-16	38	-27		
35	6	-2.70	34	-15	-27	38		
36	0		34	-15	19	-38		
37	0		41	-18	-40	3		\$ DSWC
38	5	-2.357	40	17	-18	-25		
39	2	-7.86	-41	17	3	-40		
40	2	-7.86	43	-39	-49	48		\$ I Beam
41	2	-7.86	44	-45	47	-48		
42	2	-7.86	43	-39	46	-47		
117	0		-103	17	-24	(-3:18)		
			(114:-107:115)					
118	0		-114	107	-115			
			#119 #120 #121 #122 #123 #124					
			#125 #126 #127 #129 #128 #130 #131 #132 #133 #134 #135 #136					
			#137 #138 #139					
119	9	-7.93	-105	104	107	-114		
120	0		-104	106	107	-114		
121	0		-106	107	-114			
122	9	-7.93	-1051	1041	107	-114		
123	0		-1041	1061	107	-114		
124	0		-1061		107	-114 fill=2		\$ tube A
125	9	-7.93	-1052	1042	107	-114		
126	0		-1042	1062	107	-114		
127	0		-1062		107	-114 fill=2		\$ tube B
128	9	-7.93	-1053	1043	107	-114		
129	0		-1043	1063	107	-114		
130	0		-1063		107	-114 fill=2		\$ tube C
131	9	-7.93	-1054	1044	107	-114		
132	0		-1044	1064	107	-114		
133	0		-1064		107	-114 fill=2		\$ tube D
134	9	-7.93	-1055	1045	107	-114		
135	0		-1045	1065	107	-114		
136	0		-1065		107	-114 fill=2		\$ tube E
137	9	-7.93	-1056	1046	107	-114		
138	0		-1046	1066	107	-114		
139	0		-1066		107	-114 fill=2		\$ tube F
140	8	-5.903	-108				u=2	\$ inlet nozzle
141	8	-4.407	108	-109			u=2	\$ lower shld
142	7	-4.461	109	-110			u=2	\$ lower refl
143	4	-4.960	110	-111			u=2	\$ DFA core
144	7	-4.461	111	-112			u=2	\$ upper refl
145	8	-1.844	112	-113			u=2	\$ plenum
146	8	-1.380	113				u=2	\$ H. Socket

1 cz 7.62
 2 cz 22.86
 3 cz 25.25
 4 cz 34.62
 5 cz 36.52
 6 kz 98.19 1 1
 7 cz 38.10
 8 cz 51.13
 9 cz 52.705
 10 cz 60.96
 11 cz 62.23
 12 cz 81.28
 c 13 cz 85.5 \$ small radius DSW
 13 cz 136.525 \$ large radius DSW
 14 cz 85.395
 15 cz 212.86
 16 cz 238.40
 17 pz -43.00
 18 pz 107.272
 19 pz 109.832
 20 pz 115.547
 21 pz 118.722
 22 pz 138.61
 23 pz 212.31
 24 pz 440.0
 c isc radius originally 106.68 cm.
 25 cz 106.68 \$ added 1 foot of concrete.
 26 pz 79.28
 27 pz 125.072
 28 pz 170
 29 pz 129.263
 30 pz 132.76
 31 pz 170.72
 32 pz 10
 33 pz 129.568
 34 cz 152.26
 35 pz 79.26
 36 pz 104.072
 37 pz 111.072
 38 pz 123.802
 39 cz 150.75
 40 cz 34.62
 41 pz 75.22
 43 cz 125.21
 44 cz 136.73
 45 cz 138.23
 46 pz 61.19
 47 pz 62.20
 48 pz 101.76
 49 pz 104.27
 103 cz 29.388
 104 cz 8.10
 105 cz 8.30
 106 cz 6.338
 c
 c The following 8 elevations are adjusted by the same increment
 c to elevate the CCC. The POS parameter must also be adjusted.
 c
 107 pz 18.82 \$ DFA Midplane at 501.103 foot level
 108 pz 58.70 \$ POS elevation is 186.02 cm.
 109 pz 127.70
 110 pz 143.18
 111 pz 234.62 \$ On MTT the DFA MP is at 510 feet
 112 pz 250.10
 113 pz 357.40
 114 pz 390.93
 115 cz 25.25
 1041 c/z 16.83 0.000 8.100
 1042 c/z 8.42 14.52 8.100
 1043 c/z 8.42 -14.52 8.100
 1044 c/z -16.83 0.000 8.100
 1045 c/z -8.42 -14.52 8.100

1046 c/z -8.42 14.52 8.100
 1051 c/z 16.83 0.000 8.300
 1052 c/z 8.42 14.52 8.300
 1053 c/z 8.42 -14.52 8.300
 1054 c/z -16.83 0.000 8.300
 1055 c/z -8.42 -14.52 8.300
 1056 c/z -8.42 14.52 8.300
 1061 c/z 16.83 0.000 6.338
 1062 c/z 8.42 14.52 6.338
 1063 c/z 8.42 -14.52 6.338
 1064 c/z -16.83 0.000 6.338
 1065 c/z -8.42 -14.52 6.338
 1066 c/z -8.42 14.52 6.338

mode p
 c void 11
 idum 1
 phys:p j 1
 cut:p 1.0e+08 0.050 -0.50 -0.25
 imp:p 2 2 4 8 1 4 3r 8 4 8 4 1 1 4 4 0 8 3r 4 4
 4m 4m 4m 4m 4m 4m 1 35r
 sdef erg=d1 cel=d4 pos=fcel d5 rad=d2 axs=0.0 0.0 1.0
 ext=d3
 wgt= 9.98E+14 \$ Source strength for 6 DFA containing 2248 Ci Co60 each.
 sc1 Gamma spectrum for 150,000 MWD/MT burnup DFA decayed 5 years.
 # si1 sp1 sb1
 l d
 1.1732 1.0 1.1732
 1.3332 1.0 1.3332
 sc2 radial range of source
 si2 0.0 6.378
 sc3 axial extent of source
 si3 -170.00 -159.51 -149.03 -138.54 -128.05 -121.45 -114.85 -108.26
 -101.67 -95.07 -88.47 -81.88 -75.28 -69.03 -62.78 -57.92
 -53.05 -48.19 -46.14 -41.01 -35.89 -30.76 -25.63 -20.51
 -15.38 -10.25 -5.13 0.00 5.13 10.25 15.38 20.51
 25.63 30.76 35.89 41.01 46.19 48.19 53.05 57.92
 62.78 67.19 71.59 81.32 92.28 104.00 113.43 122.86
 132.29 141.71 151.14 160.57 170.00 185.00 200.00
 sp3 0.00 5.14E-04 1.42E-03 2.65E-03 4.28E-03 6.45E-04 1.01E-03 1.08E-02
 1.64E-02 2.45E-02 3.94E-02 5.89E-02 4.60E-02 6.48E-02 7.68E-02 8.49E-02
 8.38E-02 6.79E-02 6.15E-03 8.44E-03 6.74E-03 6.93E-03 7.46E-03 7.96E-03
 8.40E-03 8.68E-03 8.81E-03 8.83E-03 8.70E-03 8.44E-03 8.09E-03 7.61E-03
 7.03E-03 6.41E-03 5.78E-03 5.38E-03 6.32E-03 1.46E-02 4.67E-02 5.38E-02
 2.44E-02 1.85E-02 1.64E-02 2.92E-02 2.38E-02 1.75E-02 9.94E-03 7.11E-03
 4.98E-03 3.38E-03 2.18E-03 1.26E-03 5.11E-04 1.34E-04 4.46E-05
 sc4 cell distribution
 si4 l 124 127 130 133 136 139
 sp4 d 1 1 1 1 1 1
 sb4 d 1 1 1 1 1 1
 ds5 l 16.83 0.00 186.02
 8.42 14.52 186.02
 8.42 -14.52 186.02
 -16.83 0.00 186.02
 -8.42 -14.52 186.02
 -8.42 14.52 186.02
 fc15 dose rate at detectors (mrem/hr)
 f15z:p 129.41 85.4 1
 129.41 95.0 1
 129.41 105.0 1
 129.41 120.0 1
 129.41 140.0 1
 129.41 160.0 1
 125.1 180.0 1
 129.41 180.0 1
 125.1 200.0 1
 129.41 200.0 1
 125.1 220.0 1
 129.41 220.0 1
 108.0 120.0 1
 de15 0.01 0.03 0.05 0.07 0.10 0.15 0.2 0.25 0.3
 0.35 0.4 0.45 0.5 0.55 0.6 0.65 0.7 0.8
 1.0 1.4 1.8 2.2 2.6 2.8 3.25 3.75 4.25

4.75 5. 5.25 5.75 6.25 6.75 7.5 9.0 11.
 13. 15.

df15 3.96-3 5.82-4 2.90-4 2.58-4 2.83-4 3.79-4 5.01-4 6.31-4 7.59-4
 8.78-4 9.85-4 1.08-3 1.17-3 1.27-3 1.36-3 1.44-3 1.52-3 1.68-3
 1.98-3 2.51-3 2.99-3 3.42-3 3.82-3 4.01-3 4.41-3 4.83-3 5.23-3
 5.60-3 5.80-3 6.01-3 6.37-3 6.74-3 7.11-3 7.66-3 8.77-3 1.03-2
 1.18-2 1.33-2

m1 1001.50 -0.1429 6012.50 -0.8571
 m2 26000.55 -1
 m3 26000.55 -1
 m4 \$ DFA Core in CCC
 26000.55 -0.2866 24000.50 -0.0727 28000.50 -0.0556
 42000.51 -0.0086 25055.51 -0.0043
 8016.50 -0.0678 92238.50 -0.3578 94239.55 -0.1467
 m5 1001.50 -0.009 6012.50 -0.05 8016.50 -0.473
 14000.50 -0.208 20000.50 -0.26
 m6 13027.50 -1.0
 m7 \$ Reflectors
 26000.55 -0.3317 24000.50 -0.1643 28000.50 -0.4855
 42000.51 -0.0085 25055.51 -0.0100
 m8 \$Stainless Steel 316 for shld, plenum, and H. S.
 26000.55 -0.67 24000.50 -0.17 28000.50 -0.13 42000.51 -0.02
 25055.51 -0.01
 m9 \$Stainless Steel
 26000.55 -0.68 28000.50 -0.14 24000.50 -0.18

print
 ctme 30

CHECKLIST FOR INDEPENDENT TECHNICAL REVIEW

DOCUMENT REVIEWED

NUMBER: WHC-SD-FF-TA-033

TITLE: SHIELDING EFFECTIVENESS OF THE MODIFIED CASK LOADING STATION IN
FFTF/RSB

AUTHOR(s): R. L. SIMONS

I. Method(s) of Review

- ☒ (x) 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)

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

III. Comments: _____

IV. REVIEWER: RJ Morford DATE: 8-23-94