Original

FEB 12 1997 (20) **ENGINEERING DATA TRANSMITTAL** FEB 12 1997 (20) Page 1 of 1

1. EDT 142437

2. To: (Receiving Organization)	3. From: (Originating Organization)	4. Related EDT No.:
Distribution	Facility Operation Safety Support	N/A
5. Proj./Prog./Dept./Div.: ~~29530~~ F55/19120/K35F2	6. Cog. Engr.: J. R. Brehm, 376-8602, ~~H4-68~~ A2-25	7. Purchase Order No.: N/A
8. Originator Remarks: The attached document is distributed for final approval. Release was delayed pending approval of the ISB & IOSR. In the meantime, the original EDT was lost. mjb Benecke 2/11/97		9. Equip./Component No.: N/A
		10. System/Bldg./Facility: 300 Area N Reactor Fuel Fabrication and Storage Facility
11. Receiver Remarks:		12. Major Assm. Dwg. No.: N/A
		13. Permit/Permit Application No.: N/A
		14. Required Response Date: February 22, 1994

15. DATA TRANSMITTED

(A) Item No.	(B) Document/Drawing No.	(C) Sheet No.	(D) Rev. No.	(E) Title or Description of Data Transmitted	(F) Impact Level	(G) Reason for Transmittal	(H) Originator Disposition	(I) Receiver Disposition
1	~~WHC~~-SD-NR-HC-006 HNF mjb 2/11/97	N/A	0	Hazard Categorization for 300 Area N Reactor Fuel Fabrication and Storage Facility	~~ISQ~~ DSQ mjb 2/11/97	1	1 mjb	N/A 2/11/97

16. KEY

Impact Level (F)	Reason for Transmittal (G)	Disposition (H) & (I)
1, 2, 3, or 4 (see MRP 5.43)	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 Impact Level for required signatures)

(G) Reason	(H) Disp.	(J) Name	(K) Signature	(L) Date	(M) MSIN	(J) Name	(K) Signature	(L) Date	(M) MSIN	(G) Reason	(H) Disp.
1	1	Cog.Eng. J. R. Brehm	J R Brehm	2-22-94	H4-68	Fuel Supply J. A. Remaize			L6-18	1	1
1	1	Cog. Mgr. A. L. Ramble		2/22/94	H4-68	SEAC R. J. Cash		3/9/94	R2-78	1	1
1	1	QA D. W. Smith		2-25-94	L6-35	2-25-94					
1	1	Safety E. J. Krejci		2/25/94	N1-72	J.D. Beiggs		2/12/97	G3-42	1	1
1	1	Saf. Tech. Sup. C. L. Bennett		2-24-94							

18.	19.	20.	21. DOE APPROVAL (if required)
Signature of EDT Originator — Date: 2-22-94	N/A mjb 2/11/97 — Authorized Representative for Receiving Organization — Date	Cognizant/Project Engineer's Manager — Date: 2/23/94	Ltr. No. 95-SNM-033 [X] Approved [ ] Approved w/comments [ ] Disapproved w/comments mjb 2/11/97

INSTRUCTIONS FOR COMPLETION OF THE ENGINEERING DATA TRANSMITTAL

(USE BLACK INK OR TYPE)

BLOCK	TITLE	
(1)*	EDT	• Enter the assigned EDT number.
(2)	To: (Receiving Organization)	• Enter the individual's name, title of the organization, or entity (e.g., Distribution) that the EDT is being transmitted to.
(3)	From: (Orginating Organization)	• Enter the title of the organization originating and transmitting the EDT.
(4)	Related EDT	• Enter EDT numbers which relate to the data being transmitted.
(5)*	Project/Program/Dept./Div.	• Enter the Project/Program/Department/Division title or Project/Program acronym or Project Number, Work Order Number or Organization Code.
(6)	Cognizant/Project Engineer	• Enter the name of the individual identified as being responsible for coordinating disposition of the EDT.
(7)	Purchase Order No.	• Enter related Purchase Order (P.O.) Number, if available.
(8)*	Originator Remarks	• Enter special or additional comments concerning transmittal, or "Key" retrieval words may be entered.
(9)	Equipment/Component No.	• Enter equipment/component number of affected item, if appropriate.
(10)	System/Bldg./Facility	• Enter appropriate system, building or facility number, if appropriate.
(11)	Receiver Remarks	• Enter special or additional comments concerning transmittal.
(12)	Major Assm. Dwg. No.	• Enter applicable drawing number of major assembly, if appropriate.
(13)	Permit/Permit Application No.	• Enter applicable permit or permit application number, if appropriate.
(14)	Required Response Date	• Enter the date a response is required from individuals identified in Block 17 (Signature/Distribution).
(15)*	Data Transmitted	
	(A)* Item Number	• Enter sequential number, beginning with 1, of the information listed on EDT.
	(B)* Document/Drawing No.	• Enter the unique identification number assigned to the document or drawing being transmitted.
	(C)* Sheet No.	• Enter the sheet number of the information being transmitted. If no sheet number, leave blank.
	(D)* Rev. No.	• Enter the revision number of the information being transmitted. If no revision number, leave blank.
	(E) Title or Description of Data Transmitted	• Enter the title of the document or drawing or a brief description of the subject if no title is identified.
	(F) Impact Level	• Enter the appropriate Impact Level (Block 15). Use NA for non-engineering documents.
	(G) Reason for Submittal	• Enter the appropriate code to identify the purpose of the data transmittal (see Block 16).
	(H) Originator Disposition	• Enter the appropriate disposition code (see Block 16).
	(I) Receiver Disposition	• Enter the appropriate disposition code (see Block 16).
(16)	Key	• Number codes used in completion of Blocks 15 (G), (H), and (I), and 17 (G), (H) (Signature/Distribution).
(17)	Signature/Distribution	
	(G) Reason	• Enter the code of the reason for transmittal (Block 16).
	(H) Disposition	• Enter the code for the disposition (Block 16).
	(J) Name	• Enter the signature of the individual completing the Disposition 17 (H) and the Transmittal.
	(L) Date	• Enter date signature is obtained.
	(M) MSIN	• Enter MSIN. Note: If Distribution Sheet is used, show entire distribution (including that indicated on Page 1 of the EDT) on the Distribution Sheet.
(18)	Signature of EDT Originator	• Enter the signature and date of the individual originating the EDT (entered prior to transmittal to Receiving Organization). If the EDT originator is the Cognizant/Project Engineer, sign both Blocks 17 and 18.
(19)	Authorized Representative for Receiving Organization	• Enter the signature and date of the individual identified by the Receiving Organization as authorized to approve disposition of the EDT and acceptance of the data transmitted, as applicable.
(20)*	Cognizant/Project Manager	• Enter the signature and date of the Cognizant/Project Engineer's manager. (This signature is authorization for release.)
(21)	DOE Approval	• Enter DOE approval (if required) by letter number and indicate DOE action.

*Asterisk denote the required minimum items checked by Configuration Documentation prior to release; these are the minimum release requirements.

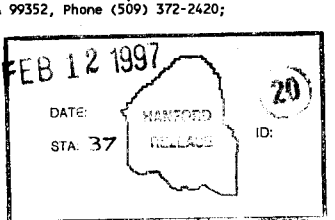
Hazard Categorization for 300 Area N Reactor Fuel Fabrication and Storage Facility

J. R. Brehm
Fluor Daniel Northwest, Richland, WA 99352
U.S. Department of Energy Contract DE-AC06-96RL13200

EDT/ECN: 142437 UC: 2050
Org Code: 19120 Charge Code: K35F2
B&R Code: DP0405501 Total Pages: 17

Key Words: Hazard Category, Uranium Fuel Storage, Fuel Supply Shutdown

Abstract: Final hazard categorization for the 300 Area N Reactor fuel storage facility resulted in the assignment of Nuclear Facility Hazard Category 3 for the uranium storage buildings.



Release Approval Date

Release Stamp

Approved for Public Release

THIS PAGE INTENTIONALLY
LEFT BLANK

HAZARD CATEGORIZATION FOR FUEL SUPPLY SHUTDOWN FACILITY

WESTINGHOUSE HANFORD COMPANY

April 1995

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

This page intentionally left blank.

CONTENTS

LIST OF TABLES

This page intentionally left blank.

HAZARD CATEGORIZATION FOR FUEL SUPPLY SHUTDOWN FACILITY

1.0 INTRODUCTION

A final hazard categorization has been prepared for the 300 Area Fuel Supply Shutdown (FSS) facility in accordance with DOE-STD-1027-92, *Hazard Categorization and Accident Analysis Techniques for Compliance with DOE Order 5480.23, Nuclear Safety Analysis Reports* (DOE 1992). Prior to using the hazard category methodology, hazard classifications were prepared in accordance with the requirements of the Westinghouse Hanford Company (Westinghouse Hanford) controlled manual, WHC-CM-4-46, *Safety Analysis Manual*, Chapter 4.0, "Hazard Classification."

A hazard classification (Huang 1995) was previously prepared for the FSS in accordance with WHC-CM-4-46. The analysis lead to the conclusion that the FSS should be declared a Nuclear Facility with a Moderate Hazard Class rating. The analysis and results contained in the hazard classification can be used to provide additional information to support other safety analysis documentation. Also, the hazard classification provides analyses of the toxicological hazards inherent with the FSS inventory; whereas, a hazard categorization prepared in accordance with DOE-STD-1027-92, considers only the radiological component of the inventory.

1.1 BACKGROUND

The FSS, consisting of fuel fabrication buildings, laboratories, a concretion facility (mixing uranium fines and sludge with masonry cement), uranium and Zircaloy-2 fines incinerator, uranium special nuclear material storage buildings, and offices (see Table 1-1) is located in the northeast corner of the 300 Area on the Hanford Site. Fuel fabrication and incinerator operations have been completely shutdown. The FSS is now used to store uranium billets, assembled and partially assembled fuel elements and scrap, and is also used for office space. The FSS is currently undergoing transition activities required for permanent closure.

1.2 SUMMARY AND CONCLUSIONS

A final hazard categorization has been prepared for the FSS in accordance with DOE-STD-1027-92. The hazard categorization was prepared based on a conservative, credible release fraction for the FSS and facility-specific Threshold Quantity (TQ) values for individual radionuclides. The FSS is assigned a hazard categorization of Category 3, since the inventory available for release is greater than the facility-specific recalculated Category 3 TQs, but less than the recalculated Category 2 TQs.

Table 1-1. Fuel Supply Shutdown Facility Building Identification, Current Function/Activity.

BUILDING	CURRENT FUNCTION/ACTIVITY
303-A	Fuel Storage
303-B	Uranium Billet Storage
303-E	Fuel Storage
303-F/311-Tank Farm	Pump House/Outside Chemical Storage and Transfer System
303-G	Uranium Billet Storage
303-K/3707-G	Mixed/Radioactive Solid Waste Storage/RCRA Closure
303-M	Uranium Oxide Facility (Shutdown)
304	RCRA Closure
313	Metal Fabrication (North end) /RCRA Closure
333	Offices/Cleanup, RCRA Closure
334 and Tank Farm	Process Sewer Monitoring
334-A	RCRA Closure
3712	Finished Fuel & Billet Storage
3716	Unfinished Uranium Fuel Storage
MO-052 Trailer	Offices

2.0 RADIOLOGICAL SOURCE TERM

The radiological source term for the FSS is based on a representative mixture composition of 0.009 wt% ^{234}U (5.8 E-01 Ci); 1.25 wt% ^{235}U (2.7 E-02 Ci); 0.069 wt% ^{236}U (4.7 E-02 Ci); 98.67 wt% ^{238}U (3.5 E-01 Ci); and 10 ppm ^{99}Tc for 1 Metric Ton Uranium (MTU) (Johnson 1994). The 3712 Building contains the maximum quantity of uranium, 1122 MTU, in a single building and is used as the radiological inventory available for release, based on the "worst case" accident (Huang 1995). Table 2-1, contains the quantities of the individual isotopes for the FSS (maximum inventory permitted in the 3712 Building). This inventory is also considered to be the inventory at risk for the FSS. Facility segmentation is permitted by DOE-STD-1027-92, as long as the hazardous material in one segment (or building) could not interact with the hazardous material in other segments (or buildings). Since the heating, ventilation, and air conditioning (HVAC), and piping systems are independent among the various fuel storage buildings (i.e., there are no HVAC or process piping systems in these buildings that could allow hazardous material interaction) and there is a physical separation between the buildings, independence is demonstrated for facility segmentation purposes. Other buildings, with lesser inventory capacities, are also considered for hazard classification, as identified in Section 3.2.

Table 2-1. Radiological Source Term for the 3712 Building.

RADIONUCLIDE	COMPOSITION	1 MTU QUANTITY (Ci)	RADIONUCLIDE INVENTORY (Ci)
Uranium-234	0.009 wt%	5.8 E-01	650.8
Uranium-235	1.25 wt%	2.7 E-02	30.3
Uranium-236	0.069 wt%	4.7 E-02	52.7
Uranium-238	98.67 wt%	3.5 E-01	392.7
Technetium-99	10 ppm	1.7 E-01	190.7
Total U + ^{99}Tc	100.00 wt%	~1.0	1317.2*

*Based on 1122 MTU in 3712 Building.

3.0 FINAL HAZARD CATEGORIZATION

In developing a hazard categorization, the DOE-STD-1027-92 standard allows for either direct use of the inventory values in Attachment 1 (DOE 1992); or, an alternate method for facilities initially classified as Hazard Category 2, by using a credible release fraction. Both approaches are used for the categorization of the 3712 Building (FSS). The remainder of the fuel storage buildings were also reviewed and the lowest allowable hazard category has been identified for each.

3.1 3712 BUILDING HAZARD CATEGORY

3.1.1 DIRECT APPLICATION OF INVENTORY VALUES

An initial hazard categorization was performed as identified in DOE-STD-1027-92 (Section 3 and Attachment 1, DOE 1992). The building inventory at risk (Table 2-1), is compared to Category 2 TQs (Table A.1, DOE 1992), for individual radionuclides in Table 3.1.1-1.

Table 3.1.1-1. 3712 Building Inventory at Risk Compared to Category 2 Threshold Quantities (DOE 1992).

RADIONUCLIDE	3712 BUILDING INVENTORY (Ci)	CATEGORY 2 TQ (Ci)	EXCEEDS CATEGORY 2 TQ
Uranium-234	650.8	2.2 E+02	YES
Uranium-235	30.3	2.4 E+02	NO
Uranium-236	52.7	5.5 E+01	NO
Uranium-238	392.7	2.4 E+02	YES
Technetium-99	190.7	3.8 E+06	NO

Since some of the radionuclides exceed the Category 2 TQs, this would initially categorized the FSS as a Category 2 Nuclear Facility.

The sum of the ratios of the quantity of each material to the Category 2 TQs was also calculated (as identified in Attachment 1, DOE 1992).

$$\sum_{i=1}^{j} \frac{Inventory\ Quantity\ of\ Isotope_i}{Category\ 2\ Threshold\ Quantity\ of\ Isotope_i} > 1$$

Table 3.1.1-2. Summation of 3712 Building Inventory Quantity to Category 2 Threshold Quantity.

RADIONUCLIDE	3712 BUILDING INVENTORY (Ci)	CATEGORY 2 TQ (Ci)	INVENTORY QUANTITY/ CATEGORY 2 TQ
Uranium-234	650.8	2.2 E+02	2.96
Uranium-235	30.3	2.4 E+02	0.13
Uranium-236	52.7	5.5 E+01	0.96
Uranium-238	392.7	2.4 E+02	1.64
Technetium-99	190.7	3.8 E+06	5.02 E-05
			5.69 > 1

The sum of the isotopic inventory quantity to the Category 2 TQ ratio is greater than 1 (5.69 > 1). This method also declares the FSS to be initially categorized as a Category 2 Nuclear Facility.

3.1.2 CREDIBLE RELEASE FRACTION

A hazard categorization determination was also calculated using a credible release fraction that is significantly different than the one used in DOE-STD-1027-92. The airborne release fraction used in generating the Category 2 TQ values (DOE 1992) for uranium is 1.0 E-03. Based on a study (Huang 1995), a more realistic release fraction for the FSS (3712 Building) is conservatively shown as 1.45 E-04, which can be used to generate new TQs.

The more realistic release fraction of 1.45 E-04, was developed in the hazard classification study (Huang 1995) and is based on uranium metal experiments and a large size difference between the uranium used in the experiments and that contained in the FSS.

These data were based on experiments done by Mishima in 1966 in which a piece of uranium 5.72 cm (2.25 in.) in diameter by 3.81 cm (1.5 in.) tall weighing 1770 g was burned (also Mahoney, et al., 1990). The size piece used in the experiments is considerably smaller than the uranium stored in the FSS. The FSS stores two sizes of cylindrical hollow billets with nominal dimensions

of 13.59 cm (5.35 in.) O.D., 3.43 cm (1.35 in.) I.D., by 48 cm (18.9 in.) long; and 17.7 cm (6.97 in.) O.D., 6.35-7.11 cm (2.5-2.8 in.) I.D., by 48.26 cm (19 in.) long. Therefore, it is considered conservative to use the aerosol release fraction of 1.45 E-04 associated with the Mishima (Mishima 1966) data.

The release fraction used for the FSS is significantly different than the one identified in DOE-STD-1027-92 and; therefore, can be used to establish a new threshold inventory value for Category 2. The DOE-STD-1027-92 standard states, ". . . the threshold inventory values for Category 2 in Table A.1 may be divided by the ratio of the maximum potential release fraction to that found on Page A-9" (DOE 1992). The Category 2 threshold inventory value for the individual nuclides is listed in Table 3.1.2-1. The release fraction found on Page A-9 (DOE 1992) is 1.0 E-03 (solid/powder/liquid), and the ratio of the maximum potential release fraction to that found on Page A-9 is 0.145 (1.45 E-04/1.0 E-03).

Example:

$$2.2E{+}02 \div \frac{1.45E{-}04}{1.0E{-}03} = 1.52E{+}03$$

The recalculated Category 2 threshold inventory values for the individual isotopes are listed in Table 3.1.2-1, along with the FSS inventory quantity for each radionuclide.

Table 3.1.2-1. 3712 Building Inventory Compared to Recalculated Category 2 Threshold Quantity Values.

RADIONUCLIDE	CATEGORY 2 TQ (Ci)*	RECALCULATED CATEGORY 2 TQ (Ci)**	3712 BUILDING INVENTORY (Ci)
Uranium-234	2.2 E+02	1.52 E+03	650.8
Uranium-235	2.4 E+02	1.65 E+03	30.3
Uranium-236	5.5 E+01	3.79 E+02	52.7
Uranium-238	2.4 E+02	1.65 E+03	392.7
Technetium-99	3.8 E+06	2.62 E+07	190.7

*Taken from DOE 1992.
**Category 2 TQs/Release Fraction Ratio (.145).

As shown in Table 3.1.2-1, the FSS radionuclides are below the recalculated values for a Category 2 facility, which would categorize the FSS as a Category 3 Nuclear Facility.

The sum of the ratios of the quantity of each material to the recalculated Category 2 TQs was calculated and the result is shown in Table 3.1.2-2.

$$\sum_{i=1}^{j} \frac{\text{Inventory Quantity of Isotope}_i}{\text{Recalculated Category 2 TQ of Isotope}_i} < 1$$

Table 3.1.2-2. Summation of 3712 Building Inventory Quantity to Recalculated Category 2 Threshold Quantity.

RADIONUCLIDE	3712 BUILDING INVENTORY (Ci)	RECALCULATED CATEGORY 2 TQ (Ci)	INVENTORY QUANTITY/ RECAL CATEGORY 2 TQ
Uranium-234	650.8	1.52 E+03	4.28 E-01
Uranium-235	30.3	1.65 E+03	1.84 E-02
Uranium-236	52.7	3.79 E+02	1.39 E-01
Uranium-238	392.7	1.65 E+03	2.38 E-01
Technetium-99	190.7	2.62 E+07	7.28 E-06
			8.23 E-01 < 1

As shown in Table 3.1.2-2, the sum of the isotopic inventory quantity to the recalculated Category 2 TQ ratio is less than 1 (8.23 E-01 < 1). This method also declares the FSS hazard category as a Category 3 Nuclear Facility.

3.2 OTHER BUILDING HAZARD CATEGORIES

3.2.1 3716 BUILDING

Table 3.2.1-1, contains the quantities of the individual isotopes for the 3716 Building. This inventory is considered to be the inventory at risk for the building.

Table 3.2.1-1. Radiological Source Term for the 3716 Building.

RADIONUCLIDE	COMPOSITION	1 MTU QUANTITY (Ci)	3716 BUILDING INVENTORY (Ci)
Uranium-234	0.009 wt%	5.8 E-01	145.0
Uranium-235	1.25 wt%	2.7 E-02	6.75
Uranium-236	0.069 wt%	4.7 E-02	11.75
Uranium-238	98.67 wt%	3.5 E-01	87.5
Technetium-99	10 ppm	1.7 E-01	42.5
Total U + ^{99}Tc	100.00 wt%	~1.0	293.5*

*Based on 250 MTU capacity for the 3716 Building.

The DOE-STD-1027-92 provides that the Table 1.A threshold values (DOE 1992) may be divided by the ratio of facility specific release fraction (see Section 3.1.2) to the release fraction that is a basis for the table, or:

$$2.2E{+}02 \div \frac{1.45E{-}04}{1.0E{-}03} = 1.52E{+}03$$

The recalculated Category 2 threshold inventory values for the individual isotopes are listed in Table 3.2.1-2, along with the 3716 Building radionuclide inventory.

Table 3.2.1-2. 3716 Building Inventory Compared to Recalculated Category 2 Threshold Quantity Values.

RADIONUCLIDE	CATEGORY 2 TQ (Ci)*	RECALCULATED CATEGORY 2 TQ (Ci)**	3716 BUILDING INVENTORY (Ci)
Uranium-234	2.2 E+02	1.52 E+03	145.0
Uranium-235	2.4 E+02	1.65 E+03	6.75
Uranium-236	5.5 E+01	3.79 E+02	11.75
Uranium-238	2.4 E+02	1.65 E+03	87.5
Technetium-99	3.8 E+06	2.62 E+07	42.5

*Taken from DOE 1992.
**Category 2 TQs/Release Fraction Ratio (.145).

As shown in Table 3.2.1-2, the 3716 Building radionuclides are below the recalculated values for a Category 2 facility and also below the Category 2 TQs as they are found in DOE-STD-1027-92, which would categorize the 3716 Building as a Category 3 Nuclear Facility.

The sum of the ratios of the quantity of each material to the recalculated Category 2 TQs was calculated and the result is shown in Table 3.2.1-3.

$$\sum_{i=1}^{j} \frac{Inventory\ Quantity\ of\ Isotope_i}{Recalculated\ Category\ 2\ TQ\ of\ Isotope_i} < 1$$

As shown in Table 3.2.1-3, the sum of the isotopic inventory quantity to the recalculated Category 2 TQ ratio is less than 1 (1.83 E-01 < 1). This method also declares the 3716 Building hazard category as a Category 3 Nuclear Facility.

Table 3.2.1-3. Summation of 3716 Building Inventory Quantity to Recalculated Category 2 Threshold Quantity.

RADIONUCLIDE	3716 BUILDING INVENTORY (Ci)	RECALCULATED CATEGORY 2 TQ (Ci)	INVENTORY QUANTITY/ RECAL CATEGORY 2 TQ
Uranium-234	145.0	1.52 E+03	9.54 E-02
Uranium-235	6.75	1.65 E+03	4.09 E-03
Uranium-236	11.75	3.79 E+02	3.10 E-02
Uranium-238	87.5	1.65 E+03	5.30 E-02
Technetium-99	42.5	2.62 E+07	1.62 E-06
			1.83 E-01 < 1

3.2.2 303-A, 303-B, 303-E, AND 303-G BUILDINGS

Table 3.2.2-1, contains the quantities of the individual isotopes for the 303-A, 303-B, 303-E, and 303-G Buildings. This inventory is considered to be the inventory at risk for these buildings.

Table 3.2.2-1. Radiological Source Term for the 303-A, 303-B, 303-E, and 303-G Buildings.

RADIONUCLIDE	COMPOSITION	1 MTU QUANTITY (Ci)	303A,B,E,G BUILDING INVENTORY (Ci)
Uranium-234	0.009 wt%	5.8 E-01	232.0
Uranium-235	1.25 wt%	2.7 E-02	10.8
Uranium-236	0.069 wt%	4.7 E-02	18.8
Uranium-238	98.67 wt%	3.5 E-01	140.0
Technetium-99	10 ppm	1.7 E-01	68.0
Total U + ^{99}Tc	100.00 wt%	~1.0	469.6*

*Based on 400 MTU capacity for the 303-A, 303-B, 303-E, and 303-G Buildings.

The DOE-STD-1027-92 provides that the Table 1.A threshold values (DOE 1992) may be divided by the ratio of facility specific release fraction (see Section 3.1.2) to the release fraction that is a basis for the table, or:

$$2.2E{+}02 \div \frac{1.45E{-}04}{1.0E{-}03} \approx 1.52E{+}03$$

The recalculated Category 2 threshold inventory values for the individual isotopes are listed in Table 3.2.2-2, along with the 303-A, 303-B, 303-E, and 303-G Buildings radionuclide inventory.

Table 3.2.2-2. 303-A, 303-B, 303-E, and 303-G Building Inventory Compared to Recalculated Category 2 Threshold Quantity Values.

RADIONUCLIDE	CATEGORY 2 TQ (Ci)*	RECALCULATED CATEGORY 2 TQ (Ci)**	303A,B,E,G BUILDING INVENTORY (Ci)
Uranium-234	2.2 E+02	1.52 E+03	232.0
Uranium-235	2.4 E+02	1.65 E+03	10.8
Uranium-236	5.5 E+01	3.79 E+02	18.8
Uranium-238	2.4 E+02	1.65 E+03	140.0
Technetium-99	3.8 E+06	2.62 E+07	68.0

*Taken from DOE 1992.
**Category 3 TQs/Release Fraction Ratio (.145).

As shown in Table 3.2.2-2, the 303-A, 303-B, 303-E, and 303-G Buildings radionuclides are below the recalculated values for a Category 2 facility and also below the Category TQs as they are found in DOE-STD-1027-92, which would categorize these buildings as a Category 3 Nuclear Facility.

The sum of the ratios of the quantity of each material to the recalculated Category 2 TQs was calculated and the result is shown in Table 3.2.2-3.

$$\sum_{i=1}^{j} \frac{Inventory\ Quantity\ of\ Isotope_i}{Recalculated\ Category\ 2\ TQ\ of\ Isotope_i} < 1$$

As shown in Table 3.2.2-3, the sum of the isotopic inventory quantity to the recalculated Category 2 TQ ratio is less than 1 (2.94 E-01 < 1). This method also declares the hazard category for the 303-A, 303-B, 303-E, and 303-G Buildings as a Category 3 Nuclear Facility.

Table 3.2.2-3. Summation of 303-A, 303-B, 303-E, and 303-G Building Inventory Quantity to Recalculated Category 2 Threshold Quantity.

RADIONUCLIDE	303A,B,E,G BLDG INVENTORY (Ci)	RECALCULATED CATEGORY 2 TQ (Ci)	INVENTORY QUANTITY/ RECAL CATEGORY 3 TQ
Uranium-234	232.0	1.52 E+03	1.53 E-01
Uranium-235	10.8	1.65 E+03	6.55 E-03
Uranium-236	18.8	3.79 E+02	4.96 E-02
Uranium-238	140.0	1.65 E+03	8.48 E-02
Technetium-99	68.0	2.62 E+07	2.60 E-06
			2.94 E-01 < 1

3.2.3 303-K/3707-G BUILDING

Table 3.2.3-1, contains the quantities of the individual isotopes for the 303-K/3707-G Building. This building contains ThO_2 in addition to the uranium inventory. This inventory is considered to be the inventory at risk for the building.

Table 3.2.3-1. Radiological Source Term for the 303-K/3707-G Building.

RADIONUCLIDE	COMPOSITION	1 MTU QUANTITY (Ci)	303K/3707G BUILDING INVENTORY (Ci)
Uranium-234	0.009 wt%	5.8 E-01	2.9
Uranium-235	1.25 wt%	2.7 E-02	0.14
Uranium-236	0.069 wt%	4.7 E-02	0.24
Uranium-238	98.67 wt%	3.5 E-01	1.75
Technetium-99	10 ppm	1.7 E-01	0.85
Total U + ^{99}Tc	100.00 wt%	~1.0	5.88*
Thorium-232	--	--	0.052

*Based on 5 MTU capacity for the 303-K/3707-G Building.

Table 3.2.3-2 contains the recalculated Category 3 TQs using a facility specific release fraction (see Section 3.1.2), compared with the building radionuclide inventory for the maximum capacity of 5 MTU.

Example:

$$4.2E{+}00 \div \frac{1.45E{-}04}{1.0E{-}03} = 2.89E{+}01$$

Table 3.2.3-2. 303-K/3707-G Building Inventory Compared to Recalculated Category 3 Threshold Quantity Values.

RADIONUCLIDE	CATEGORY 3 TQ (Ci)*	RECALCULATED CATEGORY 3 TQ (Ci)**	303K,3707G BUILDING INVENTORY (Ci)
Uranium-234	4.2 E+00	2.89 E+01	2.9
Uranium-235	4.2 E+00	2.89 E+01	0.14
Uranium-236	5.5 E+01***	3.79 E+02	0.24
Uranium-238	4.2 E+00	2.89 E+01	1.75
Technetium-99	1.7 E+03	1.17 E+04	0.85
Thorium-232	1.0 E-01	3.13 E-01	0.052

*Taken from DOE 1992.
**Category 3 TQs/Release Fraction Ratio (1.45 E-04).
***Category 2, Category 3 not available.

As shown in Table 3.2.3-2, the 303-K/3707-G Building radionuclides are below the recalculated values for a Category 3 facility and also below the Category 3 TQs as they are found in DOE-STD-1027-92, which would categorize the 303-K/3707-G Building as a Radiological Facility.

The sum of the ratios of the quantity of each material to the recalculated Category 3 TQs was calculated and the result is shown in Table 3.2.3-3.

$$\sum_{i=1}^{j} \frac{Inventory\ Quantity\ of\ Isotope_i}{Recalculated\ Category\ 3\ TQ\ of\ Isotope_i} < 1$$

Table 3.2.3-3. Summation of 303-K/3707-G Building Inventory Quantity to Recalculated Category 3 Threshold Quantity.

RADIONUCLIDE	303K/3707G BLDG INVENTORY (Ci)	RECALCULATED CATEGORY 3 TQ (Ci)	INVENTORY QUANTITY/ RECAL CATEGORY 3 TQ
Uranium-234	2.9	2.89 E+01	1.00 E-01
Uranium-235	0.14	2.89 E+01	4.84 E-03
Uranium-236	0.24	3.79 E+02	6.33 E-04
Uranium-238	1.75	2.89 E+01	6.06 E-02
Technetium-99	0.85	1.17 E+04	7.27 E-05
Thorium-232	0.052	6.90 E-01	7.53 E-02
			2.41 E-01 < 1

As shown in Table 3.2.3-3, the sum of the isotopic inventory quantity to the recalculated Category 3 TQ ratio is less than 1 (2.41 E-01 < 1). This method also declares the hazard category for the 303-K/3707-G Building as a Radiological Facility as determined by the previous comparison method.

4.0 REFERENCES

DOE, 1992, *Hazard Categorization and Accident Analysis Techniques for Compliance with DOE Order 5480.23, Nuclear Safety Analysis Reports* DOE-STD-1027-92, U.S. Department of Energy, Washington, D.C.

WHC-CM-4-46, *Safety Analysis Manual*, Chapter 4.0, "Hazard Classification," Westinghouse Hanford Company, Richland, Washington.

Huang, C. H., 1995, *Hazard Classification for 300 Area N Reactor Fuel Fabrication and Storage Facility*, WHC-SD-NR-HC-004, Rev 0, Westinghouse Hanford Company, Richland, Washington.

Johnson, D. J., 1994, *Accident Safety Analysis for 300 Area N Reactor Fuel Fabrication and Storage Facility*, WHC-SD-NR-RA-003, Rev 0, Westinghouse Hanford Company, Richland, Washington.

Mahoney, L. A., J. Mishima, and R. G. Stuart, 1990, *Assessment of the Basis for Modeling Releases from Plutonium Oxidation*, WHC-SD-NR-ER-084 REV 0, Westinghouse Hanford Company, Richland, Washington.

Mishima, J., 1966, *Plutonium Release Studies II. Release From Ignited, Bulk Metallic Pieces*, BNWL-357, Pacific Northwest Laboratory, Richland, Washington.

DISTRIBUTION SHEET

To	From	Page 1 of 1
Distribution	M. W. Benecke	Date 02/12/97
Project Title/Work Order		EDT No. 142437
Facility Stabilization/K35F2		ECN No. N/A

Name	MSIN	Text With All Attach.	Text Only	Attach./ Appendix Only	EDT/ECN Only
M. W. Benecke	L6-26	x			
J. R. Brehm	A2-25	x			
J. M. Bishop	L6-26	x			
R. J. Cash	S7-14	x			
A. M. Horner	L6-57	x			
E. J. Krejci	B1-19	x			
I. L. Metcalf	L6-26	x			
A. L. Ramble	T5-54	x			
J. A. Remaize	L6-26	x			
M. E. Riste	N2-11	x			
K. E. Schwartz	L6-26	x			
Central Files	A3-88	x			

THIS PAGE INTENTIONALLY
LEFT BLANK