USEC
A Global Energy Company

November 8, 2006
GDP 06-0052

Mr. Jack R. Strosnider
Director, Office of Nuclear Material Safety and Safeguards
Attention: Document Control Desk
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555-0001

Paducah Gaseous Diffusion Plant (PGDP)
Docket No. 70-7001, Certificate No. GDP-1
Transmittal of Revision 105 to Certification Application USEC-01

Dear Mr. Strosnider:

In accordance with 10 CFR 76, the United States Enrichment Corporation (USEC) hereby submits six copies of Revision 105 (September 20, 2006) to the USEC-01, Application for United States Nuclear Regulatory Commission Certification, Paducah Gaseous Diffusion Plant. Revision 105 incorporates changes to the Safety Analysis Report, the Emergency Plan, and the Paducah Gaseous Diffusion Plant Security Program (GDPSP).

The above changes have been reviewed in accordance with 10 CFR 76.68 and have been determined not to require prior NRC approval. Revision bars are provided in the right-hand margin to identify changes. Revision 105 was effective on September 20, 2006.

Revision 105 to the GDPSP contains certain trade secrets and commercial and financial information exempt from public disclosure pursuant to Section 1314 of the Atomic Energy Act of 1954 (AEA), as amended, and 10 CFR 2.390 and 9.17(a)(4). In accordance with 10 CFR 76.33(e) and 2.390(b), the Revision 105 changes to this plan are being submitted under separate cover (USEC letter GDP 06-0053).

Should you have any questions regarding this matter, please contact Mark Smith at (301) 564-3244. There are no new commitments contained in this submittal.

Sincerely,

S. A. Toelle

Steven A. Toelle
Director, Regulatory Affairs

USEC Inc.
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NMSS01

Enclosures:
1. Oath and Affirmation
2. USEC-01, Application for United States Nuclear Regulatory Commission Certification, Paducah Gaseous Diffusion Plant, Revision 105, Copy Numbers 1 through 6.

cc: R. DeVault (DOE)	USEC-01, Copy Numbers 641
J. Henson, NRC Region II	USEC-01, Copy Numbers 442, 664
G. Janosko, NRC HQ	(w/o)
D. Martin, NRC Project Manager – PGDP	(w/o)
M. Thomas, NRC Senior Resident Inspector – PGDP	USEC-01, Copy Number 697

Enclosure 1
GDP 06-0052

Oath and Affirmation

OATH AND AFFIRMATION

I, Steven A. Toelle, swear and affirm that I am the Director, Regulatory Affairs of the United States Enrichment Corporation (USEC), that I am authorized by USEC to sign and file with the Nuclear Regulatory Commission Revision 105 to USEC-01, Application for United States Nuclear Regulatory Commission Certification, Paducah Gaseous Diffusion Plant, as described in USEC Letter GDP 06-0052, that I am familiar with the contents thereof, and that the statements made and matters set forth therein are true and correct to the best of my knowledge, information, and belief.

S. A. Toelle

Steven A. Toelle

On this 8th day of November 2006, the person signing above personally appeared before me, is known by me to be the person whose name is subscribed to within the instrument, and acknowledged that he executed the same for the purposes therein contained.

In witness hereof I hereunto set my hand and official seal.

Rita L. Peak

Rita L. Peak, Notary Public
State of Maryland, Montgomery County
My commission expires December 1, 2009

Enclosure 2 to
GDP 06-0052

USEC-01
Application for the United States
Nuclear Regulatory Commission Certification
Paducah Gaseous Diffusion Plant
Revision 105

APPLICATION FOR NUCLEAR REGULATORY COMMISSION CERTIFICATION PADUCAH GASEOUS DIFFUSION PLANT (USEC-01) REMOVAL/INSERTION INSTRUCTIONS REVISION 105 – September 20, 2006	
Remove Pages	**Insert Pages**
VOLUME 1	
List of Effective Pages: LOEP-1/LOEP-2, LOEP-5/LOEP-6, LOEP-7/LOEP-8, LOEP-9/LOEP-10, LOEP-11/LOEP-12, LOEP-13/LOEP-14, LOEP-17/LOEP-18, LOEP-19/LOEP-20	**List of Effective Pages:** LOEP-1/LOEP-2, LOEP-5/LOEP-6, LOEP-7/LOEP-8, LOEP-9/LOEP-10, LOEP-11/LOEP-12, LOEP-13/LOEP-14, LOEP-17/LOEP-18, LOEP-19/LOEP-20
Introduction: Pages 3/4	**Introduction:** Pages 3/4
Chapter 1, Appendix A: Pages A-1/A-1a	**Chapter 1, Appendix A:** Pages A-1/A-1a
Section 3.3: Pages 3.3-9/3.3-10, 3.3-31/3.3-32, 3.3-67/3.3-68, 3.3-87/3.3-88	**Section 3.3:** Pages 3.3-9/3.3-10, 3.3-31/3.3-31a, 3.3-31b/3.3-32, 3.3-67/3.3-68, 3.3-87/3.3-88
Section 3.5: Pages 3.5-1/3.5-2,	**Section 3.5:** Pages 3.5-1/3.5-2,
Section 3.8: Pages 3.8-11/3.8-11a, 3.8-11b/3.8-12, 3.8-13/3.8-14, 3.8-15/3.8-16, 3.8-17/3.8-18, 3.8-19/3.8-20	**Section 3.8:** Pages 3.8-11/3.8-11a, 3.8-11b/3.8-12, 3.8-12a/3.8-12b, 3.8-13/3.8-13a, 3.8-13b/3.8-14, 3.8-15/3.8-16, 3.8-17/3.8-17a, 3.8-17b/3.8-18, 3.8-19/3.8-20
Section 3.13: Pages 3.13-1/3.13-2	**Section 3.13:** Pages 3.13-1/3.13-2
Section 3.15: Pages 3.15-23/3.15-24, 3.15-63/3.15-64, 3.15-95b/3.15-96, 3.15-116a/3.15-116b	**Section 3.15:** Pages 3.15-23/3.15-24, 3.15-63/3.15-64, 3.15-95b/3.15-96, 3.15-116a/3.15-116b
VOLUME 2	
Section 4.2: Pages 4.2-15/4.2-16, 4.2-19/4.2-20, 4.2-25/4.2-25a, 4.2-25b/4.2-26, 4.2-27/4.2-28, 4.2-59/4.2-60, 4.2-77/4.2-78, 4.2-79/4.2-80	**Section 4.2:** Pages 4.2-15/4.2-15a, 4.2-15b/4.2-16, 4.2-19/4.2-20, 4.2-25/4.2-25a, 4.2-25b/4.2-26, 4.2-27/4.2-28, 4.2-59/4.2-60, 4.2-77/4.2-78, 4.2-79/4.2-80
Section 4.3: Pages 4.3-95b/4.3-96, 4.3-97/4.2-98, 4.3-103/4.3-103a, 4.3-103b/4.3-103c	**Section 4.3:** Pages 4.3-95b/4.3-96, 4.3-97/4.2-98, 4.3-103/4.3-103a, 4.3-103b/4.3-103c
Section 5.2: Pages 5.2-1/5.2-2	**Section 5.2:** Pages 5.2-1/5.2-2

APPLICATION FOR NUCLEAR REGULATORY COMMISSION CERTIFICATION
PADUCAH GASEOUS DIFFUSION PLANT (USEC-01)
REMOVAL/INSERTION INSTRUCTIONS
REVISION 105 – September 20, 2006

Remove Pages	Insert Pages
Section 5.2A: Pages 5.2A-39/5.2A-40	**Section 5.2A:** Pages 5.2A-39/5.2A-40
Section 5.6: Pages 5.6-7/5.6-8	**Section 5.6:** Pages 5.6-7/5.6-8
Section 6.1: Pages 6.1-1/6.1-2, 6.1-3/6.1-4, 6.1-5/6.1-6, 6.1-7/6.1-8, 6.1-11/6.1-12, 6.1-13/6.1-14, 6.1-17/6.1-18	**Section 6.1:** Pages 6.1-1/6.1-2, 6.1-3/6.1-4, 6.1-5/6.1-6, 6.1-7/6.1-8, 6.1-11/6.1-12, 6.1-13/6.1-14, 6.1-17/6.1-18
Section 6.5: Pages 6.5-1/6.5-2	**Section 6.5:** Pages 6.5-1/6.5-2
VOLUME 3	
Emergency Plan: Pages iii/iv, 1-3/1-4, 2-3/2-4, 4-3/4-4	**Emergency Plan:** Pages iii/iv, 1-3/1-4, 2-3/2-4, 4-3/4-4

LIST OF EFFECTIVE PAGES

Pages	Revision
List of Effective Pages	
LOEP-1	105
LOEP-2	105
LOEP-3	98
LOEP-4	81
LOEP-5	105
LOEP-6	105
LOEP-7	105
LOEP-8	105
LOEP-9	105
LOEP-10	105
LOEP-11	105
LOEP-12	105
LOEP-13	81
LOEP-14	105
LOEP-15	81
LOEP-16	100
LOEP-17	105
LOEP-18	105
LOEP-19	105
LOEP-20	100
Introduction	
1	25
2	40
3	105
4	8
Table of Contents	
1	3
2	2
3	65
3a	67
3b	65
4	81
5	65
6	67
7	65
8	65
9	81
10	81
10a	81
10b	65
10c	65
10d	65
10e	89
10f	95
10g	65
10h	67
11	81
12	65
13	65
14	3
15	65
16	65
16a	81
16b	65
17	65
18	77
19	65
20	65
20a	77
20b	77
21	65
22	24
23	56
24	3
25	81
26	3
27	3
28	3
Definitions	
1	11
2	67
3	51
4	1

LIST OF EFFECTIVE PAGES

Pages	Revision	Pages	Revision
Chapter 1		2.1-10	8
		2.1-11	8
1-1	81	2.1-12	38
1-2	24	2.1-13	8
1-3	89	2.1-14	8
1-4	2	2.1-14a	60
1-5	2	2.1-14b	8
1-6	2	2.1-15	40
1-7	55	2.1-16	60
1-8	26	2.1-16a	60
1-9	26	2.1-16b	38
1-10	97	2.1-17	60
1-11	55	2.1-18	38
1-12	21	2.1-18a	85
		2.1-18b	8
Chapter 1, Appendix A		2.1-19	81
		2.1-20	81
A-1	105	2.1-21	81
A-1a	89	2.1-22	1
A-1b	54	2.1-23	1
A-2	102	2.1-24	1
A-2a	46	2.1-25	38
A-2b	46	2.1-26	1
A-3	95	2.1-27	98
A-4	95	2.1-28	1
A-5	65	2.1-28a	85
A-6	64	2.1-28b	38
A-7	81	2.1-29	1
A-8	65	2.1-30	1
A-9	46	2.1-31	81
A-10	8	2.1-32	1
		2.1-33	81
Chapter 2		2.1-34	1
2.1-1	81	2.2-1	65
2.1-2	44	2.2-2	65
2.1-3	81		
2.1-4	81		
2.1-5	81		
2.1-6	1		
2.1-7	38		
2.1-8	38		
2.1-9	40		

LIST OF EFFECTIVE PAGES

Pages	Revision	Pages	Revision
Chapter 3 (continued)		3.3-23	65
		3.3-24	67
3.2-1	81	3.3-25	65
3.2-2	80	3.3-26	65
3.2-3	95	3.3-27	65
3.2-4	65	3.3-28	89
3.2-5	65	3.3-29	84
3.2-6	65	3.3-30	65
3.2-7	72	3.3-31	105
3.2-8	67	3.3-31a	105
3.2-9	67	3.3-31b	105
3.2-10	65	3.3-32	89
3.2-11	67	3.3-33	84
3.2-11a	67	3.3-34	89
3.2-11b	67	3.3-35	84
3.2-12	65	3.3-36	65
3.2-13	65	3.3-37	65
3.2-14	65	3.3-38	65
3.2-15	65	3.3-39	65
3.2-16	65	3.3-40	65
		3.3-41	65
3.3-1	65	3.3-42	65
3.3-2	65	3.3-43	81
3.3-3	65	3.3-44	65
3.3-4	67	3.3-45	84
3.3-5	67	3.3-46	84
3.3-6	65	3.3-47	89
3.3-7	89	3.3-48	84
3.3-8	89	3.3-49	65
3.3-9	67	3.3-50	65
3.3-10	105	3.3-51	89
3.3-11	95	3.3-52	65
3.3-12	67	3.3-53	65
3.3-13	65	3.3-54	65
3.3-14	65	3.3-55	65
3.3-15	65	3.3-56	65
3.3-16	65	3.3-57	89
3.3-17	65	3.3-58	65
3.3-18	65	3.3-59	65
3.3-19	65	3.3-60	65
3.3-20	65		
3.3-21	65		
3.3-22	65		

LIST OF EFFECTIVE PAGES

Pages	Revision	Pages	Revision
Chapter 3 (continued)		3.3-101	65
		3.3-102	65
3.3-61	65	3.3-103	65
3.3-62	65	3.3-104	65
3.3-63	67	3.3-105	65
3.3-64	65	3.3-106	65
3.3-65	65	3.3-107	65
3.3-66	81	3.3-108	65
3.3-67	81	3.3-109	65
3.3-68	105	3.3-110	65
3.3-69	81	3.3-111	65
3.3-70	65	3.3-112	84
3.3-71	65	3.3-113	81
3.3-72	65	3.3-114	81
3.3-73	65	3.3-115	65
3.3-74	81	3.3-116	65
3.3-75	81	3.3-117	65
3.3-75a	81	3.3-118	65
3.3-75b	81	3.3-119	65
3.3-76	65	3.3-120	81
3.3-77	67		
3.3-78	65	3.4-1	89
3.3-79	65	3.4-2	81
3.3-80	65	3.4-2a	65
3.3-81	65	3.4-2b	65
3.3-82	65	3.4-3	65
3.3-83	65	3.4-4	95
3.3-84	65	3.4-5	65
3.3-85	65	3.4-6	89
3.3-86	65	3.4-7	81
3.3-87	105	3.4-8	65
3.3-88	65	3.4-9	89
3.3-89	95	3.4-9a	81
3.3-90	89	3.4-9b	81
3.3-91	65	3.4-10	65
3.3-92	65	3.4-11	65
3.3-93	81	3.4-12	81
3.3-94	98	3.4-13	81
3.3-95	89	3.4-13a	70
3.3-96	65	3.4-13b	70
3.3-97	65	3.4-14	70
3.3-98	65		
3.3-99	65		
3.3-100	65		

LIST OF EFFECTIVE PAGES

LIST OF EFFECTIVE PAGES

LIST OF EFFECTIVE PAGES

Pages	Revision	Pages	Revision
Chapter 3 (continued)		3.15-11	65
		3.15-12	65
3.12-1	89	3.15-13	65
3.12-2	89	3.15-14	95
3.12-3	89	3.15-14a	95
3.12-4	89	3.15-14b	95
3.12-5	65	3.15-15	81
3.12-6	81	3.15-16	81
3.12-7	65	3.15-17	81
3.12-8	65	3.15-18	81
3.12-9	65	3.15-19	84
3.12-10	65	3.15-20	65
3.12-11	65	3.15-21	84
3.12-12	81	3.15-22	84
3.12-13	67	3.15-23	65
3.12-14	65	3.15-24	105
3.12-15	81	3.15-25	81
3.12-16	65	3.15-26	65
		3.15-27	65
3.13-1	81	3.15-27a	65
3.13-2	105	3.15-27b	65
3.13-3	89	3.15-28	89
3.13-4	65	3.15-29	70
3.13-5	65	3.15-30	65
3.13-6	65	3.15-30a	65
3.13-7	65	3.15-30b	65
3.13-8	65	3.15-31	65
3.13-9	65	3.15-32	81
3.13-10	65	3.15-33	65
		3.15-34	65
3.14-1	65	3.15-35	65
3.14-2	65	3.15-36	65
		3.15-37	65
3.15-1	81	3.15-38	65
3.15-2	81	3.15-39	81
3.15-3	65	3.15-40	89
3.15-4	67		
3.15-5	65		
3.15-6	65		
3.15-7	65		
3.15-8	65		
3.15-9	65		
3.15-10	65		

LIST OF EFFECTIVE PAGES

LIST OF EFFECTIVE PAGES

Pages	Revision	Pages	Revision
Chapter 3 (continued)		3.15-130	67
3.15-97	65	3.16-1	46
3.15-98	89	3.16-2	46
3.15-99	65	3.16-3	46
3.15-100	65	3.16-4	24
3.15-101	95		
3.15-102	95	Chapter 4	
3.15-103	67		
3.15-104	65	4.1-1	65
3.15-105	65	4.1-2	65
3.15-106	65		
3.15-107	67	4.2-1	65
3.15-108	67	4.2-2	65
3.15-109	67	4.2-3	65
3.15-110	67	4.2-4	65
3.15-111	81	4.2-5	65
3.15-112	65	4.2-6	65
3.15-113	100	4.2-7	95
3.15-114	95	4.2-8	65
3.15-115	65	4.2-9	65
3.15-116	67	4.2-10	65
3.15-116a	105	4.2-11	65
3.15-116b	65	4.2-12	65
3.15-117	95	4.2-13	65
3.15-118	65	4.2-14	81
3.15-119	89	4.2-15	105
3.15-119a	84	4.2-15a	105
3.15-119b	65	4.2-15b	105
3.15-120	95	4.2-16	105
3.15-120a	100	4.2-17	65
3.15-120b	65	4.2-18	84
3.15-121	89	4.2-19	105
3.15-122	100	4.2-20	65
3.15-122a	89	4.2-21	84
3.15-122b	89	4.2-22	81
3.15-123	67	4.2-23	65
3.15-124	67	4.2-24	65
3.15-125	67		
3.15-126	67		
3.15-127	67		
3.15-128	67		
3.15-129	67		

LIST OF EFFECTIVE PAGES

LIST OF EFFECTIVE PAGES

Pages	Revision	Pages	Revision
Chapter 4 (continued)		4.3-50	65
		4.3-51	65
4.3-9	65	4.3-52	65
4.3-10	65	4.3-53	81
4.3-11	65	4.3-54	81
4.3-12	65	4.3-55	65
4.3-13	65	4.3-56	65
4.3-14	65	4.3-57	65
4.3-15	65	4.3-58	65
4.3-16	65	4.3-59	65
4.3-17	65	4.3-60	65
4.3-18	65	4.3-61	65
4.3-19	65	4.3-62	65
4.3-20	65	4.3-63	81
4.3-21	65	4.3-64	81
4.3-22	65	4.3-65	81
4.3-23	65	4.3-66	81
4.3-24	65	4.3-67	81
4.3-25	65	4.3-68	81
4.3-26	65	4.3-69	65
4.3-27	65	4.3-70	65
4.3-28	65	4.3-71	65
4.3-29	67	4.3-72	65
4.3-30	65	4.3-73	65
4.3-31	65	4.3-73a	65
4.3-32	65	4.3-73b	65
4.3-33	65	4.3-74	65
4.3-34	65	4.3-75	65
4.3-35	65	4.3-76	65
4.3-36	65	4.3-76a	65
4.3-37	65	4.3-76b	65
4.3-38	81	4.3-77	65
4.3-39	81	4.3-78	65
4.3-40	65	4.3-79	81
4.3-41	65	4.3-80	81
4.3-42	81		
4.3-43	65		
4.3-44	81		
4.3-45	65		
4.3-46	65		
4.3-47	81		
4.3-48	65		
4.3-49	81		

LIST OF EFFECTIVE PAGES

Pages	Revision	Pages	Revision
Chapter 4 (continued)		4.3-110	81
		4.3-111	81
4.3-81	65	4.3-111a	77
4.3-82	81	4.3-111b	77
4.3-83	81	4.3-111c	77
4.3-84	65	4.3-111d	77
4.3-84a	81	4.3-111e	77
4.3-84b	65	4.3-111f	81
4.3-85	81	4.3-112	65
4.3-85a	81	4.3-113	81
4.3-85b	65	4.3-113a	67
4.3-86	65	4.3-113b	67
4.3-87	65	4.3-114	77
4.3-87a	65	4.3-115	81
4.3-87b	65	4.3-116	95
4.3-88	81	4.3-117	65
4.3-89	65	4.3-118	65
4.3-90	81	4.3-119	65
4.3-91	67	4.3-120	65
4.3-91a	81	4.3-121	65
4.3-91b	67	4.3-122	65
4.3-92	81	4.3-123	65
4.3-93	81	4.3-124	65
4.3-94	95	4.3-125	65
4.3-95	95	4.3-126	95
4.3-95a	95	4.3-127	65
4.3-95b	95	4.3-128	65
4.3-96	105	4.3-129	81
4.3-97	65	4.3-130	65
4.3-98	105	4.3-131	65
4.3-99	65	4.3-132	65
4.3-100	81	4.3-132a	65
4.3-101	65	4.3-132b	65
4.3-102	95	4.3-133	65
4.3-103	95	4.3-134	65
4.3-103a	105	4.3-135	65
4.3-103b	105	4.3-136	65
4.3-103c	65	4.3-137	65
4.3-103d	81	4.3-138	67
4.3-104	65	4.3-139	65
4.3-105	65	4.3-140	65
4.3-106	81	4.3-141	65
4.3-107	65	4.3-142	65
4.3-108	65	4.3-143	65
4.3-109	65	4.3-144	65

LIST OF EFFECTIVE PAGES

LIST OF EFFECTIVE PAGES

Pages	Revision	Pages	Revision
Chapter 5 (continued)		5.3-42	2
5.3-1	63	5.4-1	95
5.3-2	63	5.4-2	100
5.3-3	63	5.4-3	65
5.3-4	95	5.4-4	65
5.3-5	44	5.4-5	100
5.3-6	44	5.4-6	65
5.3-7	95	5.4-7	100
5.3-8	44	5.4-8	100
5.3-9	81	5.4-9	95
5.3-10	44	5.4-10	89
5.3-11	44		
5.3-12	67	5.5-1	24
5.3-13	46	5.5-2	1
5.3-14	3		
5.3-15	67	5.6-1	65
5.3-16	67	5.6-2	51
5.3-17	95	5.6-3	3
5.3-18	44	5.6-4	3
5.3-19	44	5.6-5	95
5.3-20	95	5.6-6	3
5.3-21	95	5.6-7	105
5.3-22	44	5.6-8	60
5.3-23	89		
5.3-24	89	5.7-1	81
5.3-25	44	5.7-2	46
5.3-26	24	5.7-3	51
5.3-27	2	5.7-4	46
5.3-28	81	5.7-5	46
5.3-29	44	5.7-6	81
5.3-30	100	5.7-7	81
5.3-31	38	5.7-8	81
5.3-32	24	5.7-9	81
5.3-33	44	5.7-10	81
5.3-34	44	5.7-10a	81
5.3-35	44	5.7-10b	67
5.3-36	44		
5.3-37	44		
5.3-38	44		
5.3-39	2		
5.3-40	67		
5.3-41	2		

LIST OF EFFECTIVE PAGES

Pages	Revision	Pages	Revision
Chapter 5 (continued)		6.3-5	3
		6.3-6	67
5.7-11	46	6.3-7	95
5.7-11a	46	6.3-8	100
5.7-11b	46	6.3-9	67
5.7-12	46	6.3-10	3
5.7-13	46	6.3-11	81
5.7-14	81	6.3-12	46
5.7-15	81	6.3-13	46
5.7-16	81	6.3-14	24
		6.3-15	95
Chapter 6		6.3-16	24
6.1-1	57	6.4-1	81
6.1-2	105	6.4-2	81
6.1-3	105	6.4-3	100
6.1-4	105	6.4-4	81
6.1-4a	93	6.4-5	89
6.1-4b	24	6.4-6	95
6.1-5	105	6.4-7	51
6.1-6	105	6.4-8	38
6.1-7	105	6.4-9	46
6.1-8	100	6.4-10	1
6.1-9	100		
6.1-10	100	6.5-1	105
6.1-11	93	6.5-2	103
6.1-12	105	6.5-3	103
6.1-13	105	6.5-4	100
6.1-14	105	6.5-5	100
6.1-15	100	6.5-6	100
6.1-15a	44	6.5-7	2
6.1-15b	44	6.5-8	100
6.1-16	51	6.5-9	100
6.1-17	105	6.5-10	24
6.1-18	2		
6.2-1	51		
6.2-2	3		
6.3-1	100		
6.3-2	100		
6.3-3	100		
6.3-4	100		

LIST OF EFFECTIVE PAGES

Pages	Revision	Pages	Revision
Chapter 6 (continued)		6.9-13	89
		6.9-14	89
6.6-1	81	6.9-15	92
6.6-2	100	6.9-16	92
6.6-3	81	6.9-17	100
6.6-4	51	6.9-18	100
6.6-5	81	6.9-19	89
6.6-6	81	6.9-20	3
6.6-7	100		
6.6-8	3	6.10-1	95
6.6-9	51	6.10-2	2
6.6-10	95	6.10-3	2
6.6-11	81	6.10-4	3
6.6-12	65	6.10-5	3
6.6-13	81	6.10-6	2
6.6-14	100	6.10-7	95
6.6-15	81	6.10-8	95
6.6-16	100	6.10-9	46
6.6-17	68	6.10-10	1
6.6-18	46		
		6.11-1	46
6.7-1	3	6.11-2	46
6.7-2	3	6.11-3	46
6.7-3	1	6.11-4	56
6.7-4	1	6.11-5	3
		6.11-6	46
6.8-1	81	6.11-6a	46
6.8-2	81	6.11-6b	38
6.8-3	38	6.11-7	46
6.8-4	1	6.11-8	24
6.9-1	24	A-1	67
6.9-2	89	A-2	65
6.9-3	56	A-3	4
6.9-4	1	A-4	2
6.9-5	89		
6.9-6	24	B-1	3
6.9-7	89	B-2	3
6.9-8	89	B-3	4
6.9-9	89	B-4	3
6.9-10	44		
6.9-11	24		
6.9-12	89		

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Format and Content of the USEC Certification Application

The Application contains a Safety Analysis Report (SAR), Technical Safety Requirements (TSRs), and programs, plans and other documents as described above. In accordance with 10 CFR 76.35(b), the Application also includes a plan prepared and approved by DOE for achieving compliance with respect to any areas of noncompliance with the NRC's regulations identified by USEC as of the date of this Application. The Compliance Plan provides an expanded description of the areas of noncompliance, a justification for continued operation, a description of the plan of action to achieve compliance, and the schedule for completion of those actions, as applicable.

The Application is written in the present tense. The physical description of installed structures, systems and components (SSCs) in the Application is current as of June 1, 1995; except as described in Section 3.16, "Items Addressed by Compliance Plan." The programs, plans, procedures and other aspects of the facility's operations other than the SSCs are described as they will be when all Compliance Plan items are completed. Each section of the Application contains a subsection entitled "Items Addressed by Compliance Plan." This subsection describes those aspects of the program, plan or section topic that are not in full compliance with the Application. This subsection also contains a brief description of what is currently in place. Any section which does not have any related Compliance Plan states "None identified."

Appendix A

Applicable Codes, Standards, and Regulatory Guidance

This Appendix lists the various industry codes, standards, and regulatory guidance documents which have been referenced in certification correspondence. The extent to which PGDP satisfies each code, standard, and guidance document is identified below, subject to the completion of applicable actions required by the Compliance Plan.

1.0 American National Standards Institute (ANSI)

1.1 ANSI N14.1, Uranium Hexaflouride - Packaging for Transport, 2001 Edition including Addendum 1 and Addendum 3 for all cylinders.

PGDP satisfies the requirements of this standard, except for those portions superseded by Federal Regulations, with the following clarifications:

Cylinders and valves already owned and operated by PGDP that were not purchased to meet this edition of the standard - Satisfy only Sections 4, 5, 6.2.2 - 6.3.5, 7, and 8 of the standard. Cylinders purchased prior to adopting the 2001 version of the standard were manufactured to meet the version of the ANSI standard or specification committed to at the time of the placement of the purchase order.

Tinning of cylinder valve and plug threads: ANSI N14.1 - 1990 and 1995 requires the use of ASTM B32 50A, a 50/50 tin/lead solder alloy described in the 1976 and previous editions of the ASTM standard. ANSI N14.1-2001 requires the use of ASTM B32 with a minimum tin content of 45% such as alloy SN50. Cylinder valve and plug threads that were purchased to meet the 1990 or the 1995 version of the standard were tinned using a method that is conservative with respect to the 2001 version of the standard (minimum tin content of 46% versus 45%) rather than meeting the 1990 or 1995 version of the standard.

Cylinder Valve Protectors (CVPs): For 48X, 48Y and 48G cylinders, the 1990 standard requires these devices to be fabricated from ASTM A285 Grade C or A516 steel. The 2001 standard requires these devices to be fabricated from weldable carbon steel with a minimum tensile strenght of 45,000 lbs/in^2 and a maximum carbon content of 0.26%, such as ASTM A-36 steel. Likewise, the set screws are to be manufactured to specific requirements for each CVP. (Addendum 1 to ANSI N14.1-2001 also allows an alternate cylinder valve protector design.) Cylinders in use at PGDP may meet the CVP design allowed by ANSI N14.1-2001. Alternately, the CVPs for any cylinder in use at PGDP may be steel, similar in design to those specified in ANSI N14.1-1990 and 2001, and meet the intent of this standard. Set screws that are employed in these CVPs are also steel and are manufactured in accordance with the ANSI N14.1-1990 or 2001 design, a derivative of this design, or a grade 5 bolt.

None of the Model 48HX cylinders in use by USEC were manufactured to the ANSI N14.1-2001 standard and this model of cylinder is no longer in production. However, the 2001 version of this standard mistakenly lists the minimum volume for this cylinder as 139 ft^3 and the maximum fill limit as 26,840 pounds. Previous versions of the standard (including the 1990 revision) list the minimum volume for this cylinder type as 140 ft^3 and the maximum fill weight as 27,030 pounds. Model 48HX cylinders at PGDP will comply with the volume requirements and fill limits that are listed in the 1990 version of ANSI N14.1 and are also flowed down into the TSRs.

See SAR Sections 3.7.1, 3.7.3, 3.7.5, 3.15, and 4.3.2.

1.2 ANSI/ANS 2.8, Determining Design Basis Flooding at Power Reactor Sites, 1981 Edition

PGDP used a deterministic, probable maximum flood (PMF) analysis as outlined in Nuclear Regulatory Commission (NRC) Regulatory Guide 1.59 and in American National Standards Institute/American Nuclear Society Standard ANSI/ANS-2.8-1981 to assess the potential consequences of a major regional flood at PGDP. Further flooding analysis using probabilistic methods are not required since regional flooding is not a hazard at PGDP because the nominal, top-of-grade elevation at PGDP is above the PMF plus wind wave activity at flood stage.

For references to this standard, see SAR Section 2.4.3.

3.3.2.2.3 Cranes

The C-333 and C-337 cell floors are served by 15 permanent overhead bridge cranes per building. Each main bay has one crane for a total of 11 cranes per building. The remaining four cranes are located in mezzanine (high) bays . In addition, a small temporary bridge crane may be installed in the remaining mezzanine (high) bays. The cranes are capable of traveling the entire length of the building and each serves a portion of three units. All main bay cranes, except the center main bay crane, may be operated as single or double trolley bridge cranes. When operated as single trolley cranes, they have a 23 ton capacity; as double trolley cranes, their capacity is 36 tons. The center main bay crane is a single trolley bridge crane with a 23 ton capacity. Each mezzanine bay crane (permanent or temporary) is a single trolley bridge crane with a 15 ton capacity. When not in use, a crane is stationed over the truck alley(s) with exception of the center main bay crane, which is stationed at the building's center when not in use.

One crane in each of the "000" buildings that is normally parked over the unit bypass piping is important to safety as described in Section 3.15. The failure of either of these cranes could impact the UF_6 Primary System and initiate a large UF_6 release. The cell floor process building cranes shall not fail in a manner that will cause a large UF_6 release during the following occasions:

- Normal operation,
- Natural phenomena events with the cranes in the parked position, and
- A release of the crane controls during an evacuation event.

3.3.2.2.4 Lube Oil Storage Tank Differences

The lube oil storage (gravity supply) tanks are housed in rooms located on the building's roof. Each unit has one room located approximately at its center, and each room houses one storage tank.

3.3.2.3 C-310 Purge and Product Building

The purge cascade is located in building C-310. The functions of the purge cascade include isotopic enrichment of ^{235}U and separation of lighter molecular weight contaminant gases from the UF_6 for safe venting to the atmosphere. See Section 3.3.6 for further discussion on the functions of the purge cascade.

The C-310 building is a windowless two-story steel framed structure with reinforced concrete floors. The walls are of siding attached to the structural steel and the roof is a built-up roof over a precast steel-edge concrete deck. An enclosed bridge connects the cell floors of C-310 and C-331.

Just as in the "00" and "000" buildings, the Purge and Product Building structure of C-310 is important to safety as described in Section 3.15. This building provides a significant role in minimizing both the on-site and off-site consequences of any releases of UF_6 and ensures that the following safety functions are accomplished:

- Provide limited holdup of UF_6 releases to allow deposition of uranium and slower release rates to the atmosphere.

- Maintain structural integrity during evaluation basis natural phenomena events (i.e., earthquakes, high winds, and flooding) to the degree needed to prevent failure of the UF_6 Primary System (see Table 3.15-10 for the natural phenomena capacities of the buildings).

A small basement beneath the ACR houses electrical cabinets and provides access to an underground tunnel connecting C-300, Central Control Building; C-310; and C-331.

3.3.2.3.1 Ground Floor

The C-310 building has two floor levels, which are referred to as the cell floor and the ground or operating floor. Instrument cubicles and valve control centers are located on the ground floor in two rows running north and south. The row east of the building center line serves the odd-numbered cells and the west row serves the even-numbered cells. The booster controls are located at the south end of these cubicles. A F_2 header runs the length of the building along the inside of the east wall. This header provides F_2/N_2 from C-350, Drying Agent Storage Building, to C-331 and the sodium fluoride (NaF) trap systems in C-310 as needed. A computer room in the northwest corner of the building houses the cascade automated data processing (ADP) system mainframe. Another trap room on the north wall houses the heated NaF trap housings for the north NaF trap system, which is used to burp cylinders, and a NaF oven, which is used to prepare NaF. The south NaF trap system is located along the east wall of the ground floor. The product withdrawal room, which houses three withdrawal positions/scales for filling product and/or side withdrawal cylinder(s), is located in the northeast corner. The NaF trap system and product withdrawal systems are discussed in Section 3.4.

The ground floor also contains the ACR, which houses the assay spectrometer room, monitoring and control for the purge cascade, and showers and locker room. The lube oil system drain tank and pumps, seal exhaust pumps, withdrawal stations, the switchgear, and most of the auxiliary equipment are also on the ground floor.

3.3.2.3.2 Cell Floor

The cell floor contains the cascade equipment, which includes compressors, converters, condensers, Normetex product withdrawal pumps, tops purge pumps, and "B" booster stations.

The cell floor layout consists of ten cells, each containing six in-line stages. The 60 converters are arranged side by side, with 30 converters along each side of the building from north to south. Twelve centrifugal pumps serve each cell, two pumps per converter. Six pumps are situated along each side of the cell with three designated as "A" pumps for the enriched stream and three designated as "B" pumps for the depleted stream. Two Normetex product withdrawal pumps are installed at the north end of cell 10 and one Normetex pump is at the north end of cell 9.

Bypass piping, feed, and evacuation piping pass overhead above the cell floor through the center of the building.

The tops purge system is located in the southwest corner of the cell floor. The tops purge system consists of essentially two main parts, the tops booster station located on the cell floor and the purge equipment located directly beneath cell 2 on the ground floor. A booster station is located in the

3.3.4.6.3.3 High-High Weight Trip

The potential exists for the stress rupture of the coolant tubes or the F/S vessel due to overfilling (allowing UF_6 to bridge the tube-to-tube or tube-to-shell gap) and subsequent reheating due to expansion of the solid UF_6. Studies have shown that 11,900 lbs of UF_6 in a 10 MW vessel (compared with 18,000 lbs total capacity) is the limit without experiencing some degree of bridging; 22,400 lbs (compared with 38,000 lbs total capacity) is the comparable value for a 20 MW vessel.

For a 10 MW vessel, the high-high weight trip system is calibrated and tested to actuate when either channel of the weight monitoring system indicates a maximum of 10,000 lbs total UF_6/coolant weight (a 10 MW unit holds approximately 1,000 lbs coolant). For a 20 MW vessel, a maximum of 20,000 lbs UF_6/coolant weight initiates the trip, approximately 2,200 lbs of which is coolant. When compared to the amount of UF_6 required to initiate bridging, the weights of UF_6 required to actuate the high-high weight trip system provide a margin of more than 20% between the trip setpoint and the bridging limit.

Upon activation of the high-high weight trip system, the F/S system is automatically placed in the modified hot standby mode, which was described previously and an alarm sounds in the ACR, and a trip message appears on the operator control panel. This system is hardwired and cannot be overridden by the DPCS.

The F/S High-High Weight Trip System (see Figure 3.3-11) is important to safety as described in Section 3.15. This system is hardwired and is not part of the DPCS high-high weight trip. This system plays a role both in the prevention of a UF_6 release, and in the prevention of a criticality event.

The system prevents a UF_6 release by detecting an accumulation of excessive solid UF_6 material inside the vessel, isolating the vessel from the cascade, and transferring out of the freeze mode to prevent further accumulation. Overfilling the F/S vessel could stress the tubes and the vessel walls due to thermal expansion of the solid UF_6 during a subsequent sublime mode. The system automatically closes the inlet B-line valve that is supplying UF_6 to the F/S system upon detection of a weight greater than or equal to the system set point to prevent excessive material from accumulating inside the vessel. The required support systems to support these objectives are 120 VAC, 480 VAC, 24 VDC electric power, and plant air. Two sources of 120 VAC electric power are used for the High-High Weight Trip System. One source is supplied through a stepdown transformer from 480 VAC at the associated F/S motor control center. This supply of 120 VAC power is then used to provide power to one of the two weight measurement channels ("A-weight") and to provide power to two of the three 24 VDC power supplies that are used for relay logic in the high-high weight trip circuits. These two 24 VDC power supplies and the A-weight instrumentation are located in the primary F/S instrumentation cabinet. A second power source of 120 VAC is fed from a nearby process building lighting panel (120/208 VAC) to provide power to the other of the two weight measurement channels ("B-weight") and to provide power to the third of three 24 VDC power supplies. This third 24 VDC power supply and the B-weight instrumentation are physically located in nearby instrument enclosures. The 24 VDC power that is used for the F/S mode logic is derived from these three power supplies in such a manner that precludes failure of any one power supply from disruption of continuous power to the relay logic circuits. The 480 VAC electric power is supplied from the F/S motor control center, which is an extension of the associated cell motor control center. The 120 VAC is required for the weight measurement channels to provide an instrument signal output for comparison to the limit setting in the associated alarm/trip switch.

The 480 VAC is required for the motor operated UF_6 inlet "B" valve to close. The 24 VDC power is required for control relay contacts to close, thereby allowing 480 VAC power to be supplied to the UF_6 inlet "B" valve close contactor coil. The 480 VAC also provides power for the motor operated UF_6 return valve, which will actuate to the "Open" position. The plant air support system provides the air pressure to operate the weight control valve, the UF_6 vent valve, and the coolant bypass valve. On the recirculating cooling water (RCW) loop, the plant air support system provides the air pressure to operate the pump flow control valve, the 3-way RCW valve, and the RCW flow control valve. When the High-High Weight Trip System is actuated the plant air system opens the weight control valve and the UF_6 vent valve. This allows the UF_6 to leave the F/S vessel. The RCW 3-way valve will move to the "Open to Return" position allowing water to enter from the cascade RCW return line. If the 3-way RCW valve is not operable or available, then the RCW supply and return manual block valves may be closed to meet the requirements for the hot standby or modified hot standby operating modes. The 120 VAC, 480 VAC, and 24 VDC are support systems, which are important to safety as described in Section 3.15.

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The system also prevents a criticality event in F/S vessels that are exposed to greater than or equal to 1.0 wt % ^{235}U by closing the UF_6 inlet B-line valve upon an excessive accumulation of UF_6 in the vessel. Excessive UF_6 could cause bridging between the F/S collection tubes, which could lead to a breach of the coolant loop. The required support systems to support these objectives are 480 VAC, 120 VAC, and 24 VDC electric power as described in the previous paragraph.

All critical components of the system are "locked in" position. The term "locked in" refers to the fact that when the trip actions occurs, critical components cannot be overridden by operator action until the undesired condition has been corrected. This prevents an operator error from aggravating the undesirable condition. The critical components are maintained by the system until the process variables are again in acceptable ranges. At such time, the system can be manually reset and reverted to a specific mode of operation.

3.3.4.6.4 Freezer/Sublimer Coolant System

The F/S R-114 High Pressure Relief System is important to safety as described in Section 3.15. This system provides pressure relief to prevent overpressurizing the UF_6 Primary System thus minimizing the potential for a release of UF_6 from an overpressure failure for C-331, C-333, C-335, and C-337.

Both the 10 and 20 MW F/S installations have a closed loop coolant system consisting of a condenser/reboiler, a coolant pump, a rupture disc relief system, associated piping and valves, and, in the case of the 20 MW and "piggyback" installations, a coolant surge tank. In addition to the administrative controls in Chapter 4.0 and those controls covered by programs and plans, the following ensure safe operation of the F/S coolant systems:

- Because of the potential for a violent exothermic chemical reaction in the F/S system, administrative controls require the substitution of dry air for coolant in the F/S and cell coolant systems during the use of cell treatment gases.
- The coolant pressure in the F/S system is to be controlled below 150 psig while coolant is being charged to the F/S coolant system. This will prevent a coolant release to the environment as a result of blowing the rupture disc and relief valve.
- The manual block valve between the coolant condenser and the rupture disc will be sealed open any time the F/S coolant system is in the freeze or cold standby mode.

3.3.5.11.8.3 Air Control

Air control is the control of the direction of exhaust air and the source of supply air for the building. The majority of building supply air comes from the filter rooms through air filters. The source of air to the filter rooms is dependant on the temperature in the building and is controlled by a pneumatic thermostatic control system or is controlled manually. When the building temperature drops below the thermostatic setting, the building supply and roof exhaust dampers will shut, effectively recirculating the warm cell floor air back to the ground floor. When the building temperature rises above the thermostatic setting, the building supply and roof exhaust dampers will open, allowing the warm cell floor air to move outside. Exterior filter room dampers are covered as needed to regulate interior building temperatures.

The C-310-A ground floor area is heated by steam and outside air intake. Air is exhausted through exhausters through the outside wall. The second floor area is heated by steam. Emergency exhausters are located in the roof.

The product withdrawal stations in C-310 are equipped with exhaust hoods, an exhaust fan, and a high efficiency particulate absorption (HEPA) type filter. The air exhausted through these hoods is discharged to the atmosphere at roof level. The exhaust fan and the building ventilation fans are capable of being shut off manually from a remote location.

3.3.5.11.9 C-315 Building Ventilation System

The tails withdrawal facility is located in the three-story portion of C-315. Outside air is drawn into the building, filtered, warmed when necessary, distributed through the building, and either exhausted through roof vents or partially recirculated by components of the building ventilation system.

The function of the ventilation system in the surge tank rooms is to purge the rooms of a contaminated atmosphere in the event of a release. In this case, air is drawn in through outside dampers mounted in the walls just below the ceiling of the room. The air is then exhausted by an exhaust fan through roof vents by means of ductwork leading from the vents to air intakes near the floor.

The function of the ventilation system for the tails cylinder filling and sampling stations is primarily one of heat removal. In case of an emergency condition, each station has its own individual hood and a common exhaust fan which operates continuously. The air exhausted through these hoods is discharged to the atmosphere at roof level. For cold temperature operation, a supply fan draws air into the building through the outside dampers. It is filtered, steam-heated, and discharged into a manifold duct which carries the air to the room outlet grilles. When the outside temperature is high, the air is exhausted through exhaust dampers mounted in the outside wall. During intermediate seasons a portion of the air may be recirculated and the remainder exhausted.

The tails withdrawal stations are equipped with exhaust hoods, an exhaust fan, and a HEPA-type filter. The supply and exhaust fans are capable of being shut off manually from a remote location.

3.3.5.12 Fire Protection System

The Fire Protection System consists of automatic sprinkler systems in each of the six process buildings, C-310, C-315, C-331, C-333, C-335, and C-337. The sprinkler systems provide interior protection of the process buildings. These systems, which are wet-pipe type, are the same as found throughout industry and consist of water-filled piping with standard sprinkler heads installed in the pipes. The alarm valve within each system and all replacement components as required by NFPA 13, "Installation of Sprinkler Systems," are Underwriters Laboratories listed and/or Factory Mutual approved. The temperature ratings of the sprinkler heads vary according to the maximum expected temperature of the area in which the heads are installed. The ratings range from 160°F to 286°F in the process buildings. The highest rated heads are installed at the ceiling level on the cell floor in the C-331, C-333, C-335, and C-337 buildings.

There are wet-pipe systems installed throughout the six process buildings except for inside cell housings and surge drum rooms. The size of most buildings necessitates that more than one system be used in each building. The vast majority of systems are installed in areas not subject to freezing. However, those in areas subject to freezing (e.g., filter rooms) have an antifreeze solution maintained in the piping from the riser to the sprinkler heads.

Water is supplied to the plant buildings' fire suppression systems either by the High Pressure Fire Water System (HPFWS) or the Sanitary and Fire Water System (SFWS). The HPFWS is a grid system and supplies the sprinkler systems in the C-310, C-315, C-331, C-333, C-335, and C-337 process buildings, the C-310-A Product Withdrawal Building, the C-360, Toll Transfer and Sampling Building, the C-620 Air Compressor Room, the C-631-03 Pump House (Firewater), and the RCW blend pump houses. It also supplies the water spray systems in the RCW cooling towers. The HPFWS and the wet-pipe Sprinkler Systems in the six process buildings are important to safety as described in Section 3.15. Further descriptions of the HPFWS are located in Section 3.9. The SFWS is also a grid system and supplies fire suppression systems in other plant buildings. The SFWS is discussed in Section 3.9. The suppression systems supplied by both the HPFWS and SFWS have water flow sensing devices that are continuously monitored by the site fire alarm system.

The Fire Protection Program is described in Section 5.4.

3.3.5.13 Special Gas Treatment

When new equipment is installed or the cascade has been opened to atmosphere, a treatment comprised of a mixture of F_2 and N_2 or a mixture of F_2, N_2 and ClF_3 may be used to condition previously untreated surfaces as well as remove moisture before exposing the equipment to UF_6. Deposits of UO_2F_2 and other compounds may also be removed from equipment by exposure to these gases.

F_2 and ClF_3 gases react violently with organic and oxidizable materials and with most metals at elevated temperatures. Procedural controls are exercised over the introduction of these gases into the cascade to minimize the risk of an explosive reaction within the cascade.

3.3.6 Purge Cascade

3.3.6.1 System Description

The top cells in the PGDP cascade are called the purge cascade. The purge cascade is located in the C-310, Purge and Product Building with a portion of the product withdrawal equipment located in the C-310-A, Product Withdrawal Building (see Section 3.3.2 for a description of these buildings). The ventilation system is described in Section 3.3.5. The UF_6 process system up to the point of withdrawal will be discussed herein.

These alarms form part of the boundary of the important to safety UF_6 Release Detection System for the "00" and "000" buildings as describe in Sections 3.3.5 and 3.15.

- The auxiliary power transformer section contains a graphic layout of the unit auxiliary substations along with the electrical feeders supplying the substations. The transformer secondary breaker positions are indicated by position lights displaying whether the breakers are open or closed. Finally, a run light is provided for the transformer cooling fans to permit the ACR operator to monitor the fan operation.

3.3.7.2.3 Utilities Panel ("000" and "00" Buildings)

There are indicators and alarms on each plant utility system. Each ACR is equipped with such a panel. Both audible and visual alarms are available. The indicators and alarms are as follows:

1. RCW header low pressure
2. Plant air low pressure
3. Plant nitrogen low pressure
4. Sanitary water low pressure
5. Drying gas (DG) manifold low pressure
6. Ventilation system floor differential pressure
7. Pressure recorder for seal exhaust and area datum exhaust pressure. Alarms are actuated on high pressure.
8. Mixed Gas [nitrogen (N_2), fluorine (F_2) and chlorine trifluoride (ClF_3)] storage drum pressure recorder, with high pressure alarm (C-335 only)

The plant air low pressure and area datum exhaust pressure alarms are part of the boundary and/or support system for the important to safety Low and High Pressure Datum Systems as described in Sections 3.3.5 and 3.15.

3.3.7.2.4 Utilities Panel (C-310)

The Utilities Panel in C-310 contains controls, indicators, and alarms for the following:

1. RCW header low pressure
2. Sanitary water low pressure

3. Pressure indicator for seal exhaust and area datum exhaust pressure. Alarms are actuated on high pressure. The area datum exhaust pressure alarm forms part of the boundary for the important to safety High Pressure Datum System as described in Sections 3.3.5 and 3.15.

Other indicators/controls and their function include:

- Auxiliary substation ammeters (16) permit the ACR operator to monitor the load being placed on a particular substation.

- The lube oil (LO) system control/monitoring section is similar to the other process buildings described in Section 3.3.7.2.2.

- UF_6 Leak Detection System is similar to that described in Section 3.3.7.2.2.

3.3.7.2.5 Utilities Panel (C-315)

The Utilities Panel for C-315 contains a general alarm for the entire building and is energized for the following:

1. Motor loads - over current or under current

2. Coolant – low coolant pressure and/or high coolant temperature

3. Buffer – high buffer flow or abnormal buffer pressure

4. UF_6 Detection – loss of low voltage power to the low voltage heads

The LO system control/monitoring section contains:

1. LO supply tank emergency supply valve switch – permits the ACR operator to open, stop, or close the valve.

2. LO supply tank emergency supply valve position indicator – denotes if valve is open or closed. Both indicators are on if the valve is between the open and closed position.

3. LO supply tank drain valve switch – permits the ACR operator to open the valve (must be reset at the drain tank). The position indicators show the valve's open or closed position. Both lights are on if the valve is between the open and closed position.

4. LO pump trip relays reset button – Allows ACR operator to restart a LO pump that has been shut down by C-300.

5. LO pump run/off indicators – indicate if the particular pump is in the "run" or "off" position.

6. LO pump start/stop switches (pistol-grip switches) – allow each LO pump, if hand/auto switch is in the "hand" position, to be started.

3.5 UF_6 TAILS WITHDRAWAL FACILITY

Withdrawal of UF_6 tails, normally 0.2% to 0.47% ^{235}U, from the enrichment cascade is accomplished with a compression and liquefaction system. The tails withdrawal facility is housed in the C-315 Surge and Waste Building. A temporary storage yard for tails cylinders is served by semi-gantry cranes. The Tail Withdrawal Facility Structure is important to safety and is discussed in Section 3.3.

The two primary purposes of C-315 are to provide a cascade surge volume consisting of two Hortonspheres (normally, one on-stream and one off-stream) and to compress and condense the tails UF_6 to permit withdrawal through the withdrawal system (see Figure 3.5-1). The surge volume of the Hortonspheres helps control cascade inventory fluctuations.

These two functions are accomplished by routing the "B"-stream from the bottom of the cascade in the C-331 Process Building (via one or both of two low-speed compressors if necessary) to the on-stream Hortonsphere as well as using the suction of the Normetex pumps or high-speed compressors. At lower withdrawal rates, a low-speed compressor may not be required. One or more of the three Normetex pumps operate in parallel and discharge to the UF_6 condensing system. Two high-speed compressors in C-315 that are maintained in standby can be used in lieu of the Normetex pumps. The flow through the Normetex pumps is normally controlled by each pumps suction control valve. The process gas is returned from the on-stream Hortonsphere via control valves to the bottom of the cascade in C-331 as the "A"-stream. Since the on-stream Hortonsphere floats on the discharge of the low-speed compressors, it provides a surge volume for changes in tails withdrawal as well as flows to and from the cascade. When the high-speed compressors are used, the Hortonspheres do not float on the low-speed compressor discharge but are still on line. Compressor shaft seals are equipped with special sealing and buffering systems to prevent leakage.

The UF_6 from either the Normetex pumps or high-speed compressors is piped to a condenser, where the gas is cooled to form UF_6 liquid. The liquid UF_6 flows by gravity into a tails storage cylinder at one of the four cylinder filling positions. Accumulators are located in the liquid withdrawal line to provide staging of liquid UF_6 during withdrawal interruptions. The accumulators float on the discharge of the UF_6 condenser. During filling, the cylinders rest on scale carts positioned over scales at each station. The scales provide a weight readout and an adjustable audible alarm to alert the operator when that fill limit has almost been reached. Before filling a cylinder, an accountability weight is established so that, in the event of an overfill, evacuation of the excess UF_6 can be performed with the cylinder in the drain position. After a cylinder has been filled with tails material, it is carefully transported outside by the use of the air-operated scale cart. It is then lifted by a crane and carefully transported to the temporary storage area for tails cylinders where it remains until its contents have cooled and solidified (five-day cooldown period for 10- or 14-ton cylinders).

An additional function of C-315 supports transfer of UF_6 directly from a vaporizer in a feed facility to the withdrawl equipment in C-315. Assays of material transferred by this method must be less than 1.0 wt.% ^{235}U. This type of transfer operation is typically performed to move material from one type cylinder to another type cylinder.

The following sections discuss components or systems associated with the tails withdrawal system. Included are structures, systems, and components (SSCs) important to safety which are discussed in more detail.

3.5.1 UF_6 Withdrawal Primary System

The UF_6 Withdrawal Primary System (i.e., valves, equipment containing UF_6, and piping) is considered the primary means of confinement for UF_6 and includes both a UF_6 gas system and a UF_6 liquid system. The gaseous UF_6 system provides a confinement boundary for UF_6. The liquid UF_6 system provides a pressure boundary and a transfer of UF_6 in the liquid state. The system is important to safety as described in Section 3.15.

Compressors, aftercoolers, condensers, accumulators, manifolds, and associated piping and valves are enclosed in heated housings and/or are heated independently. They are maintained at a temperature necessary to prevent UF_6 solidification. The components of the UF_6 Withdrawal Primary System are discussed in the following sections.

3.5.1.1 Normetex Pumps

Normetex pumps are used to compress the gaseous UF_6 withdrawal stream for liquefaction. Three Normetex pumps are installed on the second floor of C-315. The Normetex pumps are operated with one or more running in parallel, taking a suction from the header supplied by the low-speed compressors or from the B stream from C-331 and discharging to one or more UF_6 condensers, which are also operated in parallel. Additionally, the No. 3 Normetex pump has alternate suction and discharge valves that enable compression from a separate source. This could allow withdrawal at a second assay value. However, a second assay is not normally withdrawn in C-315. This alternate piping allows the pump to be used as an evacuation pump for operations such as evacuating the off-stream Hortonsphere.

The Normetex pump uses a fixed and a moving spiral vane. The moving vane has an eccentric motion causing "pockets" between the vanes to open and close to compress the gas and move it from the inlet to the discharge of the pump. This design permits compression of UF_6 without the use of dynamic seals between the process and atmosphere. There are two motors associated with the Normetex pump that are used to drive the spiral vane. These motors are referred to as the vacuum pump motors.

The UF_6 enters the pump through fine mesh inlet gas filters designed to prevent any foreign material entry that might increase the wear of the vanes. A suction control valve regulates the amount of flow through the pump by controlling the suction pressure. The pump discharge is then routed to one or more of the three UF_6 condensers. A buffered expansion joint is installed between the pump and the discharge block valve on the outlet line.

The pump is lubricated and cooled by oil. An oil heater and oil cooler are used as necessary to maintain the desired oil temperature. The upper oil temperature limit prevents expansion of the vanes to prevent rubbing, while the lower oil temperature prevents formation of solid or liquid UF_6.

A simplified flow diagram for the tails withdrawal facility showing the location of the Normetex pumps in the process flow is provided as Figure 3.5-1. Figure 3.5-2 shows a typical Normetex pump and its UF_6 Detection system. This safety system is discussed in Section 3.5.2.1.1.1.

pump, the slurry transfer pump, and the filtrate pump will trip. Should the liquid level reach the second level switch, a visual and audible alarm will sound. The slurry transfer pump recirculates solution in the precipitation tanks. Sodium hydroxide is used to precipitate the uranium. The NaOH solution is blended with the uranium solution by recirculating the contents of the precipitation tanks using the slurry pump and valving the mixing tank to the venturi eductor on the solution recirculation line. The mixing tank can also be used to receive uranium solutions from other facilities, such as C-710, or solutions drained from C-409 during maintenance or sampling.

After the solution has been thoroughly mixed by recycling the solution, the pH of the solution is checked. Nitric acid is available at the dissolvers to add acid if the pH is above 2.0. This nitric acid addition is performed in an similar manner to the acidification process at the acidifying tanks.

Precipitate (sludge) generated by the NaOH system is stored in 5.5 gallon drums. The slurry transfer pump then transfers the remaining solution to the rotary vacuum precipitation system.

The rotary vacuum precipitation system consists of a rotary drum filter, filtrate receiver, vacuum pump, mist eliminator, silencer-separator, precoat tank, mixer and pump, and a filtrate transfer pump.

The silencer-separator separates condensate from the vacuum pump discharge and decreases the sound level emitted from the system. The precoat tank is designed to mix precoat material (diatomaceous earth) into a slurry prior to applying the coating to the rotary vacuum filter. This precoat mixture is pumped to the top of the rotary drum unit. The filtrate pump takes suction from the filtrate receiver and discharges it back to the precipitation tanks or to the filtrate tanks.

A series of eight filtrate tanks are used to collect the filtered solution from the rotary vacuum filter. All eight tanks are used as one set of tanks. One of the tanks is equipped with a liquid level sensor. Should the liquid level reach the level switch, a visual and audible alarm will sound. The filtrate transfer pump takes suction from the filtrate tanks and discharges it either back to the filtrate tanks or to a portable tank. When the filtrate sample has been analyzed and results received, the tank contents are pumped to a portable tank or other storage system for proper disposition.

All storage, acidifying, precipitation, and filtrate tanks share a common overflow and vent line. If a tank should overflow, the overflow is discharged onto the stainless steel floor pan. The vent line exhausts to the floor pan.

3.8.2.2.3 Filtrate Monitoring

The filtrate receiver tank utilizes two level monitoring systems to control the level of solution in the filtrate receiver tank and minimize the risk of a criticality accident due to excessive volume. Solution is pulled into the filtrate receiver tank via a vacuum pump from the system and pumped out to other holding tanks using a filtrate pump. The vacuum pump is required to be operational prior to introducing solution into the system and must be operational to introduce solution into the filtrate receiver tank. One set of the level controls is used to start and stop the filtrate pump based upon the amount of solution in the filtrate receiver tank and is used for normal system control. This system provides for low level, high level, and high-high level alarms and functions to start the filtrate pump on a high level condition and shuts the filtrate pump down on a low level condition. In addition, another set of instrumentation is used to monitor the level of solution in the tank and provide another high-high level sensor to detect the condition and shutdown the vacuum pump. Shutting down the vacuum pump stops the flow of solution into the filtrate pump.

Both level control systems use 120-volt AC power supplied from a 480/120-volt control transformer. The 480-volt supply for this monitoring system is the same as for the pumps associated with the system. Loss of either the 480-volt or 120-volt power will result in shutdown of the system.

The filtrate monitors are important to safety as described in Table 3.15-3.

3.8.3 Fluorine System

The fluorine system primarily consists of C-410-K, C-410-D, and the distribution piping, valves, and instrumentation (see Figure 3.8-1). Fluorine is purchased as a 20% fluorine/80% nitrogen molar mixture and it is delivered to PGDP in DOT-approved multi-tube trailers. A full DOT-approved trailer nominally contains 1800 lbs of fluorine at 2000 psig that is distributed in eight separate tubes (i.e., nominally 225 lbs of fluorine per tube). One nominally full and one nominally empty (i.e., heeled) multi-tube trailer may be stored in both the C-745-A and C-745-B storage yards. When needed, a full multi-tube trailer is moved to C-410-K, Fluorine Facility, where the gas pressure is reduced to defined levels and is then fed to the storage tanks or the pressure reducing manifolds in C-410-D (Fluorine Storage Building). The pressure of the gas mixture is further reduced at the C-410-D pressure reducing manifolds then fed to the fluorine distribution header for distribution to other plant locations. Fluorine is distributed from C-410-D as needed through a piping system to the Purge and Product Building (C-310), the Process Buildings (C-331, C-333, C-335, and C-337), and the Drying Agent Storage Building (C-350). The amount of fluorine stored in C-745-A/C-745-B storage yards and the C-410-D/C-410-K complex exceeds the threshold quantity for fluorine defined in 29 CFR 1910.119, Appendix A. Therefore, the design and operation of these facilities require the implementation of elements for process safety management identified in this regulation.

This section addresses only the receipt, storage and distribution of F_2 to the above buildings. The utilization of F_2 is addressed in Sections 3.3.4 and 3.3.5. The F_2 System is important to safety as described in

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Section 3.15. In addition to the administrative controls in Chapter 4.0 and those controls covered by programs and plans, the administrative controls described in Section 3.8.7.1 for F_2 storage, transport, connection and disconnection ensure safe operation. Additional administrative controls associated with F_2 distribution are described in Section 3.8.7.2.

3.8.3.1 C-410-K Fluorine Building

The C-410-K building is located just west of the C-410-D Fluorine Storage Facility. The single-story building has a center wall with roll-up door that divides the building into two sections. The west end is open on the sides and end. The east end is enclosed, insulated, and heated. When fluorine is needed, a multi-tube trailer is installed for use in C-410-K. Each trailer tube is equipped with an isolation valve that is connected to a manifold. A pigtail (i.e., a flexible hose) is used to connect the trailer manifold to the system piping in the west end of C-410-K. This piping connects to the pressure reducing manifold located in the enclosed portion of C-410-K. Administrative controls identified in Section 3.8.7.2 restrict the number of tubes that may be valved open to the trailer manifold to limit the amount of fluorine that could be released due to a pigtail failure. The gas pressure is reduced to a nominal 130 psig at the C-410-K pressure reducing manifold and is then either transferred to the storage tanks or to the F_2 distribution header pressure reducing manifold in C-410-D. The ambient atmosphere in C-410-K is monitored and an alarm is activated if the F_2 concentration exceeds specified limits.

The pressure reducing manifold regulators in C-410-K are housed in a ventilated enclosure. Isolation valves in this manifold will automatically close and an alarm is activated if the F_2 concentration in the enclosure's ventilation exhaust exceeds specified limits. Pneumatically operated valves in the manifold will also automatically close if pressure exceeds specified limits during tube feeding or heeling operations. During tube feeding operations, pneumatically controlled valves will automatically close and an alarm is activated if pressure down stream of the pressure reducing manifold (i.e., on the C-410-K process side) exceeds specified limits or if the up stream piping experiences a rapid pressure drop that exceeds specified limits. The high pressure control protects down stream equipment from a potential pressure regulation control failure during tube feed operations and the rapid pressure drop control minimizes the release that could result from a pigtail/connection failure. During tube heeling operations, the feeding pressure regulation controls are bypassed. However, a control valve in the bypass line will not open unless the pressure up stream of the valve (i.e., on the multi-tube trailer side) is below a specified pressure. This control ensures that only low pressure tubes can be valved in to the process system during tube heeling operations. Isolation valves will automatically close and an alarm is activated if the down steam pressure is higher than the up stream pressure. This control minimizes back feed if a pigtail/connection failure occurs during heeling operations. If these control valves fail during operation, system equipment is protected by a pressure relief system on the low pressure side of the pressure reducing manifold. The pressure relief system is rated for a pressure of 165 psig and it is piped to vent excess pressure to the elevated stack upon activation.

3.8.3.2 C-410-D Fluorine Storage Facility

Fluorine is transferred to the C-410-D distribution header either from the C-410-D storage tanks or from the C-410-K multi-tube trailer. The C-410-D Fluorine Storage Building contains three tanks (nominal 1,000 ft^3 capacity each) used to store a mixture of 20% F_2 and 80 % N_2 (molar). The tanks are ASME code-stamped and are rated for a maximum working pressure of 165 psig at 250°F. Each tank is equipped with a pressure relief system rated for a differential pressure of 165 psig. Upon activation, the C-410-D tank pressure relief system will vent excess system pressure to the C-410 stack. The pressure in the C-410-D storage tanks and piping is maintained up to a nominal 130 psig during normal operation. The ambient atmosphere in C-410-D is monitored and an alarm is activated if the F_2 concentration exceeds specified limits.

The fluorine distribution header in C-410-D is supported by two pressure reducing manifolds. The manifold regulators are housed in separate ventilated enclosures. One manifold is typically bypassed while the other is used to regulate the pressure of the fluorine distribution header to a nominal 5 psig. Isolation valves in these manifolds will automatically close and an alarm is activated if the F_2 concentration in the enclosures' ventilation exhaust exceeds specified limits. Pneumatically operated isolation valves in the pressure reducing manifolds automatically close if the pressure in the fluorine distribution header exceeds specified limits. The low-pressure portion of the distribution line is equipped with a pressure relief system that is rated at 50 psig. Upon activation, this pressure relief system will vent excess pressure to the C-410 stack. The pressure relief system on the low pressure side of the fluorine distribution line protects down stream equipment should the pressure reducing manifolds on the fluorine distribution header fail.

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3.8.3.3 Fluorine Distribution Piping

A F_2 mixture at approximately 5 psig is routed from C-410-D to use points in C-310, C-331, C-333, C-335, C-337, and C-350 by piping constructed of F_2 and ClF_3 compatible materials as described in Section 3.3.4. Normally, a header located outside of the tie-line housing is used as the F_2 header, but the piping discussed for ClF_3 distribution in Section 3.8.4.2 may also be used for F_2 distribution.

3.8.3.4 Key Instrumentation

The Fluorine System contains the following key instrumentation, controls, and alarms:

- Ambient F_2 levels in the C-410-D building are monitored by an F_2 sensor. If the concentration exceeds the setpoint, the sensor activates an alarm at the control panel in the C-410-K and C-400 buildings, and the system activates visual and audible alarms at C-410-D.
- Ambient F_2 levels in the C-410-K building are monitored by an F_2 sensor. If the F_2 concentration exceeds the sensor setpoint, the detection system alarms at the control panel in C-410-K and remotely in C-400, and the system activates building visual and audible alarms in C-410-K.
- F_2 sensors are used to monitor the exhaust from both ventilated enclosures housing the pressure reducing regulators in C-410-D. Isolation valves in these manifolds automatically close if the F_2 concentration in the enclosures' ventilation exhaust exceeds specified limits. The detection system also activates an alarm at the control panel in C-410-K and remotely in C-400, and the system activates local building visual and audible alarms in C-410-D.
- An F_2 sensor is used to monitor the exhaust from the ventilated enclosure housing the pressure reducing regulators in C-410-K. Isolation valves in this manifold automatically close if the F_2 concentration in the enclosure's ventilation exhaust exceeds specified limits. The detection system also activates an alarm at the control panels in C-410 K and remotely in C-400, and the system activates building visual and audible alarms in C-410-K.
- Pressure sensors monitor the operation of the C-410-D and C-410-K pressure reducing manifolds. If the pressure exceeds specified limits, the system automatically closes isolation valves and an alarm is activated at the control panel in C-410-K and remotely in C-400.
- The piping between the rupture disks in the pressure relief system used on the storage tanks and the distribution header in C-410-D are monitored. A reading above atmospheric would indicate rupture disk leakage.

- The pressure relief system used with the C-410-K pressure reducing manifold includes a rupture disc plus a pressure relief valve that, upon activation, will reset at a specified pressure. The piping between the rupture disk and the pressure relief valve is monitored. A reading above atmospheric pressure would indicate rupture disk leakage.
- 120VAC supplies power to the C-410-D and C-410-K F_2 release detection and alarm systems.

The high pressure relief systems and the fluorine detection alarms identified in this list represent the equipment important to safety associated with the Fluorine System as addressed in SAR Section 3.15.8.

3.8.4 Chlorine Trifluoride System

Liquid chlorine trifluoride (ClF_3) is delivered to the site in cylinders that meet DOT specifications. These cylinders are stored in C-745-B. The cylinders are transferred as needed to the C-350, Drying Agent Storage Building. There the liquid begins to vaporize and the ClF_3 gas is fed into the C-350 $ClF_3/N_2/F_2$ (mixed gas) storage tank which is used to provide mixed gas to the distribution piping. This piping permits the controlled flow of the mixed gas to the buildings for cell treatment on an as-needed basis.

This section addresses only the receipt, storage, and distribution of ClF_3 to the buildings. The utilization of ClF_3 is addressed in Section 3.3.5. In addition to the administrative controls in Chapter 4.0 and those controls covered by programs and plans, the administrative controls described in Section 3.8.7.1 for ClF_3 storage, transport, connection and disconnection ensure safe operation. Additional administrative controls associated with ClF_3 distribution are described in Section 3.8.7.2.

The ClF_3 Systems consist of C-745-B, the ClF_3 charging facilities, the mixed gas storage tanks, and the distribution piping.

ClF_3 is restricted to less than the threshold quantity established by 29 CFR 1910.119, Appendix A. Administrative controls further limit the amount of ClF_3 at any one location to less than 1000 lbs.

3.8.4.1 C-350 Drying Agent Storage Building

The C-350 building is located in the central plant area, south of the C-335, Process Building. The main section of the building houses the east mixed gas storage tank (mixture of ClF_3, N_2 and F_2), the north extension houses the ClF_3 charging cabinet and cylinder storage area, and an adjacent structure houses the west mixed gas storage tank (Mixture of ClF_3, N_2 and F_2). See Figure 3.8-2.

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The north extension of the C-350 building houses the ClF_3 charging stand. The stand consists of a steel charging cabinet designed to house a single ClF_3 cylinder, a cylinder scale, manifold piping, a pigtail for a ClF_3 cylinder connection, an HF detection sensor, and a ventilation duct. The cabinet is equipped with a viewing window. A mechanism is attached to the cylinder valve during tank charging operations that allows the valve to be manually operated from outside of the building. The charging cabinet scale indicates the liquid ClF_3 quantity in the feed cylinder. Normally, a cylinder containing up to approximately 160-lb of liquid ClF_3 is connected to the pigtail. The connected cylinder is secured to the cabinet by a metal band and a valve retainer to prevent the cylinder or cylinder valve from turning when the cylinder valve is operated. The ClF_3 cylinder valve is closed when charging is complete. Spare cylinders, as well as empties, are secured to the building wall.

From the feed cylinder on the charging stand, gaseous ClF_3 flows to the east and west mixed gas storage tanks. The charging stand scale indicates the quantity in the cylinder. A F_2/N_2 mixture from the F_2 System header is added to the tanks to produce mixed gas. Each tank has a nominal capacity of 2,000 ft^3. The maximum allowable working pressure for the east tank is 16 psig at 200°F and for the west tank is 15 psig at 300°F. Tank operating pressure is maintained below atmospheric pressure. During charging operations, gas flow into the tanks is normally controlled locally from the C-350 building using manual valves. However, flow to the tanks is automatically isolated by closure of F_2/N_2 and ClF_3 charging valves when either tank setpoint pressure is reached. Tank pressure during charging operations is monitored locally and in the C-335 building ACR.

The west portion of the north extension houses the ClF_3 cylinder storage racks and the ClF_3 leak detection panel. Administrative controls dictate that a maximum of 2 full and 4 empty cylinders are stored in C-350.

HF detectors are located in each room to detect leaks. HF detectors are acceptable for this purpose because the fluorine in the gas compounds combines rapidly with moisture in the air to form HF as a reaction product.

The Conditioning Gas Feed System within C-350 provides monitoring and control of mixed gas and fluorine pressures during storage and distribution and is important to safety as described in Section 3.15 (see Figure 3.8-2). The Conditioning Gas Feed System contains the following key instrumentation, controls, and alarms:

- A continuous record of the pressure in the east and west mixed gas storage tanks (mixture of ClF_3, F_2 and N_2) is maintained in the C-335 building ACR.

- If either storage tank reaches its high pressure setpoint, audible and visual alarms in the C-335 building ACR are actuated.

- If either storage tank reaches its high-high pressure setpoint, visual alarms are actuated in the C-350 building.

- High-high pressure in either the east or west mixed gas storage tank (F_2, ClF_3 and N_2 mixture) isolates the affected tank from the ClF_3 and F_2/N_2 supplies by initiating closure of control valves

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- If ambient concentrations of HF in the C-350 building exceed the setpoint, HF detectors actuate audible and visual alarms locally, in the C-335 building ACR, and at the C-300,Central Control Building.

120VAC supplies power to the HF detection system and associated alarms and to the 24VDC power supply. 24VDC supplies power to the leak detector sensors and to detection panel lights.

3.8.4.2 Mixed Gas Distribution System

Mixed gas at below atmospheric pressure is routed from C-350 to use points in C-310, C-331, and C-335 by piping constructed of F_2 and ClF_3 compatible materials as listed in Section 3.3.4. Two distribution pipes connect these facilities to the storage tank manifolds in C-350. Cross-connect valving permits transfer of mixed gas through either of these headers. Additional piping between C-331 and the C-333, Process Building and between C-335 and the C-337, Process Building permits routing of mixed gas to the "000" buildings.

3.8.5 Nitric Acid

Nitric acid (HNO_3) is used in the various cleaning operations conducted at the C-400 building as discussed in Section 3.8.1. Receipt, storage, and transfer of HNO_3 at C-400 is discussed below.

3.8.5.1 Nitric Acid Receipt and Storage

The C-400 nitric acid system consists of an outside storage tank, an inside storage (day) tank, and piping and valves required for the receipt and transfer of nitric acid.

The C-407 Nitric Acid Storage Tank is located near C-400. Overpressure protection is provided by a relief valve. A concrete dike with an acid resistant coating surrounds the tank.

3.8.5.2 Nitric Acid Transfer

From the storage tank, nitric acid can be transferred to the day tank located in the C-400 cleaning building.

The day tank supplies acid to the C-400 uranium precipitation dissolver systems. Overpressure protection is provided by a relief valve. A concrete dike surrounds the day tank.

The tank also contains a level probe which will cause lights on a local panel to energize, reflecting the tank's acid level. The high level indicating light is electrically interlocked with the transfer pump such that when the light energizes, the acid transfer will automatically shut off and an audible alarm will sound.

Transfer of acid from the day tank is accomplished by applying dry air pressure to the tank. Acid is first transferred to a metering tank through the C-400 building distribution system. Dry air pressure is then applied to the metering tank to transfer acid to the dissolvers.

If the acid transferring system is not in service, then addition of nitric acid to the dissolvers can be made by adding nitric acid from portable containers into the dissolvers. In addition, nitric acid may be transferred in portable containers to various locations within C-400 to be utilized as a decontamination agent as necessary.

3.8.6 Miscellaneous Operations

Miscellaneous operations conducted at C-400 include safety equipment cleaning and laundry. Pressure transmitter cleaning capability is provided in C-409.

3.8.6.1 Safety Equipment Cleaning

A separate area in the C-400 building is devoted to the cleaning and inspection of safety equipment. A washer, electric tumble dryer, oven-type dryer, and hand tables are used to clean gloves, boots, protective suits, respirator face pieces, and other gear.

3.8.6.2 Laundry

The C-400 laundry washes protective clothing and towels from changehouses located throughout the plant. Soiled mops from the janitorial service are also cleaned in the facility.

Also included as part of the laundry facility is a sewing room where clothing is mended.

After drying, the cleaned items are monitored as required and returned to their respective locations within the plant.

3.8.6.3 C-409 Pressure Transmitter Cleaning

A transmitter is cleaned by pumping distilled water through it and collecting the wastewater. The water is recirculated through the system until the conductivity of the water flowing out of the transmitter is acceptable. The water is forced through the transmitters by the use of a small pump. The water washes the uranium and other materials out of the internal cavity into the collection cylinders. The conductivity of the water is measured to determine when the transmitters are cleaned.

3.8.7 Administrative Controls

3.8.7.1 Administrative Controls – Toxic Gas Storage/Transport/Connect/Disconnect

Note: The hazards addressed by these Administrative Controls are F_2, Cl_2, and ClF_3.

1. DOT – approved valve covers are in place on Cl_2 and ClF_3 cylinders or containers during storage and on-site transport operations. Valve covers may be removed for leak testing and connections to process piping.

2. Only cylinder or tube trailer pigtails that have been inspected, approved, and tagged by a qualified inspector shall be used for above atmospheric pressure operation.

3. Cylinder or tube trailer connections shall be leak tested before placing a cylinder or tube in service.

4. Lines shall be purged and evacuated or approved controls established prior to opening the primary system to prevent personnel exposure.

5. Any on-site personnel who could be exposed to the release should detect the release via smell or sight. This material at low concentrations is very irritating to the human senses. Therefore, detection should be easily accomplished.

6. Upon detection of a significant release of toxic gas, immediate evacuation is required to minimize exposure and notification of the release to emergency response personnel.

7. Operator training shall provide for proper handling of the applicable toxic gas as well as notification of any releases to emergency response personnel should a major release of toxic gas occur.

8. Chlorine vacuum regulators are periodically replaced according to a preventive maintenance schedule.

9. One nominally full and one nominally empty (i.e., heeled) multi-tube trailer may be stored in both the C-745-A and C-745-B storage yards.

10. If the F_2/N_2 multi-tube trailer is equipped with wrench-operated isolation valves, then these valves are operated with a torque wrench to prevent over-torquing.

3.8.7.2 Administrative Controls – Toxic Gas Distribution Process

Fluorine (F_2)

1. All replacement gaskets, flanges, and valves are cleaned prior to admitting any F_2 to remove foreign material that may react with the F_2.

2. Preconditioning of replacement equipment is required to minimize failures of the primary system due to reactions with the gas.

3. Valving line-ups are required to reposition the F_2 block valves and the Lockout/Tagout program provides administrative controls to prevent inadvertent opening of the system.

4. Two operational personnel are required during valving in of tubes.

5. Operating procedures restrict the number of tubes that can be valved open to the common trailer manifold to the equivalent of one full tube. For the purposes of this control, the phrase "equalent of one full tube" means less than or equal to 250 lbs of F_2. This weight limit encompasses a single tube that contains approximately a 10% overfill from the nominal tube operating pressure. Multiple tubes can be valved open to the common trailer manifold (e.g., during heeling operations) provided the combined fluorine inventory of the opened tubes does not exceed the "equivalent of one full tube" limit.

Chlorine Trifluoride (ClF_3)

1. All replacement gaskets, flanges, and valves are cleaned prior to admitting any ClF_3, F_2 or mixed gases to remove foreign material that may react with these gases.

2. Preconditioning of replacement equipment is required to minimize failures of the primary system due to reactions with the gas.

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3. Valving line-ups are required to reposition the ClF_3, F2 or mixed gases block valves and the Lockout/Tagout program provides administrative controls to prevent inadvertent opening of the system.

4. Two operational personnel are required during cylinder changes.

5. Operator training shall provide for proper handling of the applicable toxic gas as well as notification of any releases to emergency response personnel should a major release of toxic gas occur.

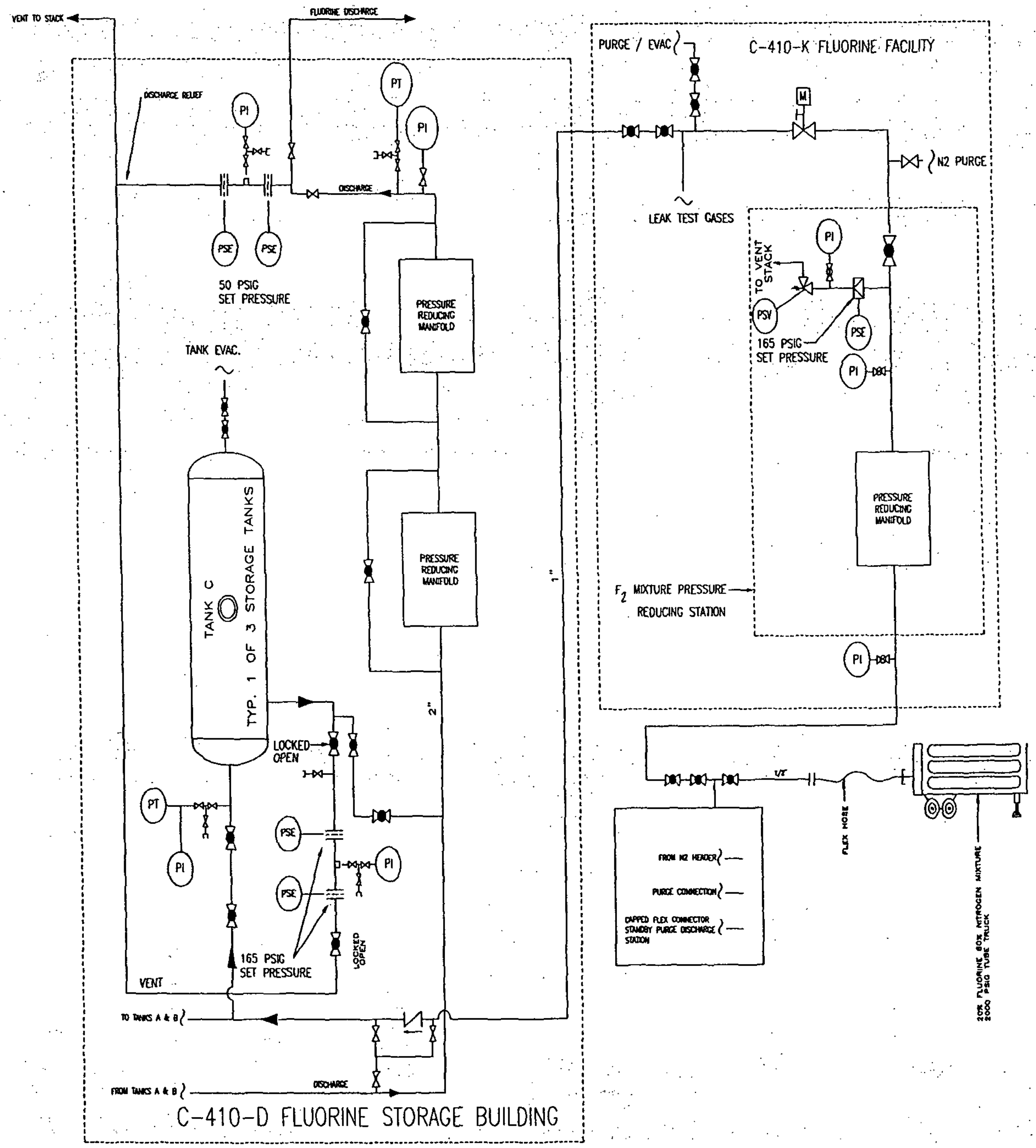

Figure 3.8-1. Fluorine System

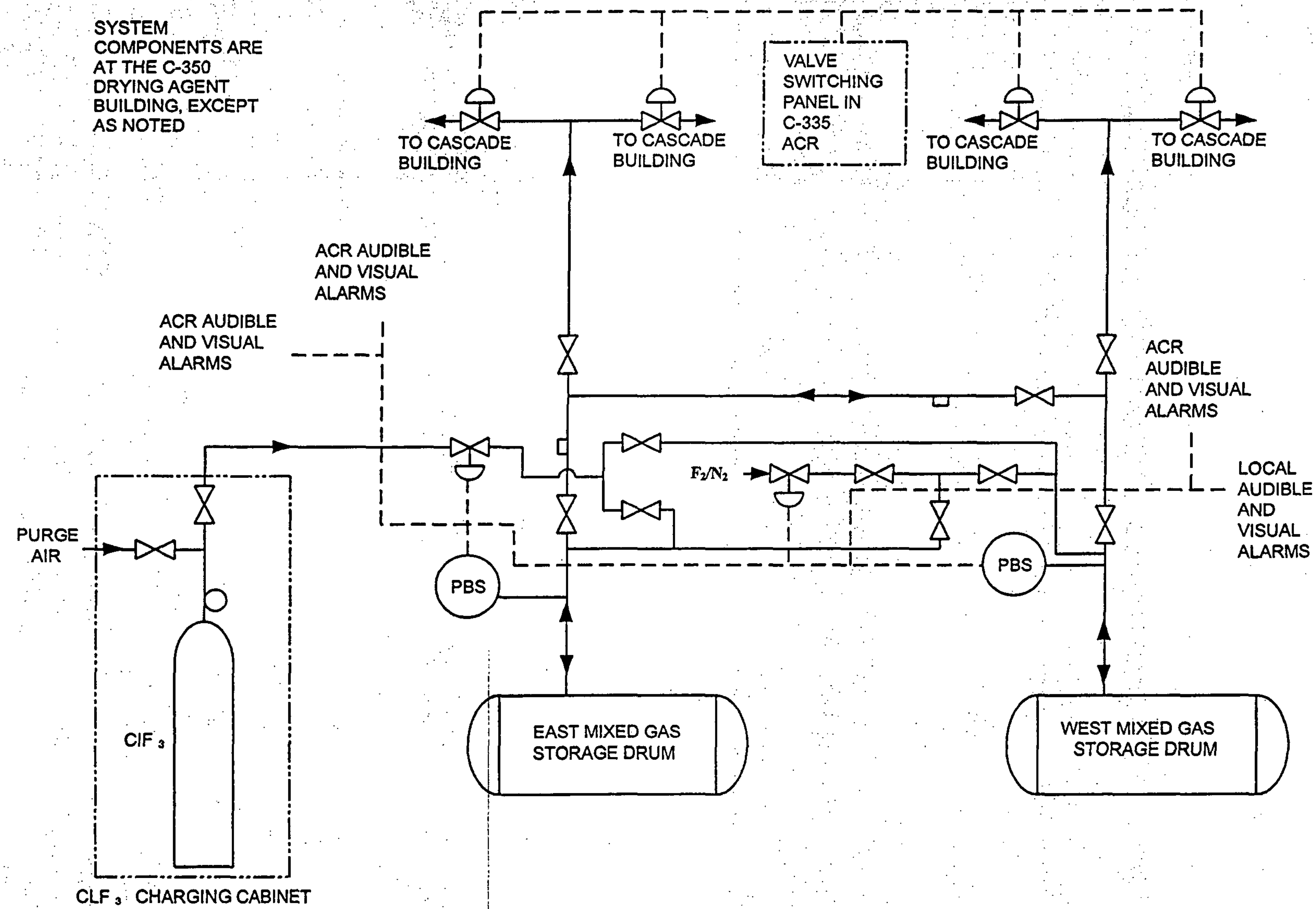

Figure 3.8-2. Conditioning Gas Feed System

3.13 MAINTENANCE

Enrichment Plant Maintenance supports Operations by providing planning, estimating, and safe and reliable performance of preventive, predictive, and corrective maintenance and support services on plant facilities and equipment. Scheduling and coordinating for maintenance is performed by Scheduling. Maintenance and Scheduling units are described in Sections 6.1 and 6.4.

The machine shops fabricate, modify, and repair plant process and auxiliary equipment. Machine, welding, and metal working facilities and services are provided to meet the needs of plant operation. The welding facility includes an x-ray machine to aid in weld inspections. Expert services are provided for sheet metal, cranes and elevators, repairs to valves, pumps and compressors, high-efficiency particulate filter maintenance, and heating, ventilation and air conditioning.

The electrical and instrument shops provide motor repair, electrical relay work and testing, radiation instrument calibration, pneumatic instrumentation work, fabricating electrical equipment and systems, maintaining telephone and alarm systems, and calibrating measurement and testing equipment (M&TE) and other instrumentation.

Facility maintenance ensures upkeep and facility improvements to the plant site including painting, capital upgrades, roads and grounds, mobile equipment management and repairs, custodial services, asbestos abatement, carpentry, material erection, UF_6 cylinder handling, locksmithing, and heavy equipment operation.

The materials management program includes general materials receiving, warehousing, shipping, trafficking, and control to support enrichment operations and plant-site related activities. Inventories are maintained to assure timely availability of parts, tools, equipment, and general inventory to meet plant needs. GDP Procurement and Materials controls the low bay area of C-720 related with shipping/receiving and stores.

Additional maintenance program information can be found in Section 6.4.

3.13.1 Maintenance Facilities

The primary maintenance facility is C-720. This building is divided into a low-bay stores area, a high-bay maintenance area, and a mezzanine level with offices and work areas for administrative support personnel, and is serviced by north and south truck alleys. The stores area provides storage room for material and supplies necessary to maintain operations that are not specifically provided elsewhere. The maintenance area has space for shops to fabricate and repair equipment used in the enrichment process. Several different types of jib and overhead cranes support maintenance activities in the C-720 shops.

Another major maintenance facility is the C-724-A, Carpenter Shop Annex and C-724-B, Carpenter Shop. This building houses the carpenter shop, and sign and paint shops.

The C-750, Garage and Appurtenant Structures is also an important maintenance facility at PGDP. It is a typical fully equipped garage facility providing areas to service and maintain plant automotive and heavy equipment. Hazardous materials associated with the garage are typical industrial materials. Equipment with fixed contamination may also be handled at this facility.

Buildings C-720, Maintenance and Stores Building and Appurtenant Structures, C-720-A, Compressor Shop Addition, C-720-B, Machine Shop Addition, C-720-C, Converter Shop Addition, and C-720-K, Instrument Shop Addition are important to safety and are required to maintain structural integrity during evaluation basis natural phenomenon events (earthquake, high winds, and flooding). The boundary definitions for these buildings are described in Table 3.15-2.

3.13.2 Maintenance Activities

3.13.2.1 Normetex Pump Maintenance

Normetex pumps are periodically removed from service and transported to C-720 for maintenance. The maintenance of the Normetex pumps involves replacement of the pump parts, an overhaul of the pump bearings and shaft, an evacuation test, and an operational test. Since parts may be contaminated, they are disposed of accordingly.

3.13.2.2 Section Deleted

3.13.2.3 Process Motor Repair

Process motor repairs are performed in C-720. The process motor repair area is designed to repair electrical motors and, occasionally, transformers from various areas of the plant.

Due to the limited knowledge regarding the amount of uranium on the motors, all incoming motors are surveyed before arrival in C-720. Motor disassembly takes place in this area. Minor servicing of the motor includes brake work and bearings replacement. Major work includes more thorough disassembly of the motor, such as separation of the stator and rotor.

3.13.2.4 C-720 General Machining

As process equipment in the cascade fails or for other reasons needs repair or routine maintenance, it is moved to C-720 for general machining and repair. This equipment may be contaminated with enriched an accident but cannot directly result in exceeding off-site EGs, the high-pressure relief systems are classified as AQ.

3.15.3.4.5 Boundary

The AQ boundaries of the high-pressure relief systems are defined in Table 3.15-2.

3.15.3.5 Freezer/Sublimers High-High Weight Trip System

3.15.3.5.1 Safety Function

The F/S high-high weight trip system detects an accumulation of excessive solid UF_6 material inside the F/S vessel, isolates the vessel from the cascade and transfers out of the freeze operating mode to prevent further accumulation.

3.15.3.5.2 Functional Requirements

The F/S high-high weight trip system shall automatically close the B-line that is supplying UF_6 to the F/S system upon detection of a weight greater than or equal to the system set point to prevent excessive material from accumulating inside the F/S vessel.

3.15.3.5.3 System Evaluation

The F/S high-high weight trip system was evaluated to assess its ability to accomplish the required safety functions. In addition, a qualitative fault tree analysis was performed to determine the system capability to accomplish the safety functions. The results of these analyses are provided in this section.

The high-high weight trip system consists of three load (weight) cells mounted in the F/S vessel supports. Two separate instrument channels sum these three measurements to determine the total weight of the F/S vessel contents (R-114 coolant and UF_6). These weight measurements are compared to setpoints and if the setpoints are exceeded, the F/S vessel is isolated from the cascade B-Line and the F/S system is placed in a modified hot standby mode. Either action terminates the continued UF_6 accumulation in the vessel.

The high-high weight trip system requires 480 VAC, 120 VAC and 24 VDC electric power to perform its primary safety action, the isolation of the cascade B-Line.

Safety function analysis. The safety function of the system is to prevent excessive UF_6 from freezing in the vessel during the freeze mode of operation. Overfilling the F/S vessel could stress the tubes and the vessel walls due to thermal expansion of the solid UF_6 during a subsequent sublime mode. Rupture of the vessel violates the UF_6 primary system integrity and could allow a release of UF_6. Limiting the amount of material inside the vessel assures that solid UF_6 will not bridge the space between the tubes or between the tubes and the vessel wall. An analysis was conducted to determine the maximum amounts of UF_6 which could be frozen in the F/S vessels while preventing bridging of solid UF_6 between tubes or between tubes and the vessel walls. These maximum amounts of UF_6 material are 11,900 lb

(5398 kg) of UF_6 for the 10-MW F/S vessels and 22,400 lb (10,161 kg) of UF_6 for the 20-MW F/S vessels. The system trip set points are established below these maximum amounts (with additional margin for any material that continues to enter the vessel during the time required for the B-line valve to close) to ensure bridging cannot occur. The current system settings and instrument setpoints ensure the maximum net weight of UF_6 and coolant does not exceed 10,000 lb in any 10-MW F/S vessel or 20,000 lb in any 20-MW vessel. Based on the analysis above, the system can accomplish the required safety functions.

Qualitative fault tree analysis. In addition to the safety function analysis, a qualitative fault tree analysis was performed in accordance with Section 4.3.1.1.3. The analysis identifies the components that are required to function for the system to accomplish its safety functions. Although not required for the safety function, the diesel generators will provide backup power to trip the system and close the B-line block valve if normal AC power is lost. The fault tree analysis indicated that the equipment and its configuration can accomplish the function of isolating the F/S vessel from the B-line supply. Even if the system fails to trip or the B-line does not close the UF_6 primary system integrity would not fail unless the F/S was placed in the sublime mode. The failures that would prevent the system from tripping would also prevent the system from being placed in the sublime mode. The safety function analysis above indicates that the actuation of the system at the trip set point will prevent the accumulation of excessive UF_6 material in the F/S vessel. Thus, the system can accomplish the required functional requirements.

3.15.3.5.4 System Classification

The F/S high-high weight trip system prevents the overfilling and the potentially resulting rupture of the F/S vessel. Prevention of this accident prevents exposure of on-site personnel to UF_6. The F/S high-high weight trip system is classified as AQ on this basis.

The freezer/sublimer high-high weight trip system is identified as an NCS AEF for F/Ss exposed to greater than or equal to 1.0 wt. % ^{235}U and, thus, is classified as an AQ-NCS system (See Section 3.15.10.1.4).

3.15.3.5.5 Boundary

The AQ and AQ-NCS boundaries of the freezer/sublimer high-high weight trip system are defined in Tables 3.15-2 and 3.15-3, respectively.

3.15.3.6 Motor Load Indicators

3.15.3.6.1 Safety Function

The motor load indicators shall provide an indication of significant changes in compressor motor loads (e.g., surging of the compressors and the compressor motors).

3.15.3.6.2 Functional Requirements

The motor load indicators shall provide an indication of large changes in the compressor motor loads for:

3.15.8.1.1 Chemical Safety Function

The non-radiological chemical systems are required to perform the following chemical safety functions:

- Maintain integrity to the process, which minimizes the potential for releasing toxic gas into the atmosphere.
- Ensure that the fluorine primary system is relieved on high pressure to minimize the potential for a failure of the primary system integrity.
- Detect releases from the primary system and provide an alarm indication of the release.

3.15.8.1.2 Functional Requirements

The non-radiological chemical systems shall be designed and maintained for the intended service. The fluorine distribution system shall have pressure relief available on the low pressure side of the C-410-K multi-tube trailer pressure reducing station, the C-410-D storage tanks, and the fluorine distribution header in C-410-D. These systems shall actuate at or below the MAWP of the part with the lowest MAWP in the associated section of the fluorine distribution system. These systems discharge to an elevated stack upon activation. The toxic gas leakage detection system shall be designed to provide alarm indications upon detection of releases from the primary system.

3.15.8.1.3 System Evaluation

The non-radiological chemical systems are required to prevent releases of toxic gas to the atmosphere during normal operations. This safety function is accomplished by retaining system integrity during normal operations and upset events. The design requirements ensure that the primary systems can withstand the operating conditions assumed in the accident analysis and are appropriate for the chemical being used.

Primary ClF_3 system integrity is protected by maintaining tank pressure to less than atmospheric pressure. This minimizes the potential for a release of Mixed Gas from the storage tanks at the C-350 drying agent storage building. The ClF_3 is vaporized into the C-350 Mixed Gas storage tank which is used for controlled flow of the Mixed Gas. A release of Mixed Gas or F_2/N_2 from a ruptured primary system could result in an uncontrolled release at ground level.

The fluorine primary system integrity is protected by a pressure relief system available on the low pressure side of the C-410-K tube trailer pressure reducing station, the C-410-D storage tanks, and the fluorine distribution header in C-410-D. These relief systems vent to the elevated stack upon activation. A release of fluorine from a ruptured primary system could result in an uncontrolled release at ground level.

Toxic gas detectors are located in areas where a significant release of toxic gas could occur. The required safety action is to detect a release and provide indications of the release. The safety action is accomplished by having detectors appropriate to the toxic gas present (chlorine, fluorine, etc.) and providing both audible and visible alarm indications. The system provides on-site protection for personnel by detecting a release and alerting personnel to immediately evacuate the area.

3.15.8.1.4 System Classification

The non-radiological chemical systems are required to:

- Provide primary system integrity during normal operation for the toxic gas distribution process to minimize the consequences to on-site personnel from releases of toxic gases from the process (e.g., distribution system breaches).
- Minimize the potential for failure of the primary system integrity and provide protection for on-site personnel during pressure increase events;
- Detect a toxic gas release and provide alarm for personnel in the immediate vicinity of the release.

The non-radiological chemical systems are classified as AQ systems.

3.15.8.1.5 Boundary

The AQ boundaries for the non-radiological chemical systems are defined in Table 3.15-2.

3.15.9 Building Structures and Confinement

3.15.9.1 Process Buildings

The process buildings house the UF_6 primary systems including the feed facilities, enrichment and purge cascades, withdrawal facilities, and the toll transfer and sampling facility. These buildings include the enrichment process buildings (C-310, C-310-A, C-315, C-331, C-333, C-335, and C-337), the feed buildings (C-333-A, and C-337-A), and the toll transfer and sampling facility (C-360).

3.15.9.1.1 Safety Function

The process buildings provide a significant role in minimizing both the on-site and off-site releases of UF_6 and ensure that the following safety functions are accomplished:

- Provide limited holdup of UF6 releases to allow deposition of uranium and slower release rates to atmosphere (cascade facilities and withdrawal facilities only), and;
- Maintain structural integrity during evaluation basis natural phenomena events (i.e., earthquakes, high winds, and flooding) to the degree needed to prevent failure of the UF6 primary system.

3.15.9.1.2 Functional Requirements

The functional requirements are no different than the safety function.

3.15.9.1.3 System Evaluation

Process buildings C-310, C-310-A, C-315, C-331, C-333, C-335, and C-337 are the structural facilities housing the operations associated with the enrichment and purge cascade facilities and the

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Table 3.15-2. Boundary Definition for AQ Structures, Systems, and Components (continued).

System	Facility	Boundary Definition	Support Systems
R-114 Coolant Overpressure Control System, Freezer/Sublimer UF_6 High Pressure Relief System, R-114 Coolant Overpressure Control System in the Withdrawal Process (Section 3.15.3.4, and 3.15.4.6)	C-310 C-315 C-331 C-333 C-335 C-337	1. Rupture disks 2. Manual block valve between the equipment being protected and the rupture disc or between the rupture disc and a low pressure relief path. 3. Piping from the rupture disc either back to the equipment being protected or to a transition to a larger pipe. 4. Diffusers (if applicable)	No support systems are required.
Freezer/Sublimer High-High Weight Trip System (Section 3.15.3.5 and 3.15.10.1.4)	C-331 C-333 C-335 C-337	The Freezer/Sublimer High-High Weight Trip System boundary includes: 1. F/S High-High Weight Detection System (independent of the DPCS High-High Weight Trip) 2. Interconnecting circuitry 3. Motor operated UF_6 inlet valve including 480 VAC breaker 4. Motor operated UF_6 return valve 5. Air operated weight control valve 6. Air operated UF_6 vent valve 7. Air operated R-114 bypass valve On the RCW loop, the boundary includes: 1. Air operated 3-way RCW valve 2. Associated circuitry to position the valve	480 VAC power - Required for motor operated 'B' valves to close. 120 VAC power - Required for weight measurement channels (A & B) to provide instrument signal outputs for comparison to trip limit settings. 24 VDC power - Required for control relay contacts to initiate 480 VAC power to be supplied to motor operated 'B' valve close contactor coil. Plant Air - Required for repositioning of various valves.
Motor Load Indicators (Section 3.15.3.6, and 3.15.4.4)	C-315 C-331 C-333 C-335 C-337	1. Motor load indicators (ammeters) for each enrichment cascade compressor motor in the ACR 2. Total cell motor load indicators for each enrichment cascade cell in the CCF 3. C-315 tails withdrawal high speed compressor motor load indicators (ammeters) in the C-315 and C-331 ACR 4. Associated current transformers 5. Cabling connecting ACR and CCF indicators to compressor motor AC power buses	No support systems are required.

Table 3.15-2. Boundary Definition for AQ Structures, Systems, and Components (continued).

System	Facility	Boundary Definition	Support Systems
ClF_3 System (Section 3.15.8)	C-350	The ClF_3, F_2, and Mixed Gas distribution piping including the flexible connections, piping, and valves, and tanks. The instrumentation that controls the tank pressures to less than atmospheric pressure. The HF detectors and associated alarms. 120 VAC and 24 VDC power from the HF detection and alarm system back to the first breaker.	120 VAC and 24 VDC power for the HF detection and alarm system
F_2 System (Section 3.15.8)	C-310 C-331 C-333 C-335 C-337 C-350 C-410-D C-410-K C-745-A C-745-B	The F_2 system boundary includes the following: 1. The primary system integrity of distribution equipment that operates at above atmospheric pressure a. storage tanks b. flexible pigtail connecting the multi-tube trailer to the C-410-K pressure reducing station c. manifold d. valves e. piping and tubing f. rupture discs g. relief valve 2. Fluorine leak detectors and associated alarms for the: a. C-410-D and C-410-K ambient areas b. C-410-D and C-410-K pressure reducing manifolds 3. 120 VAC and 24 VDC power for the fluorine release detection and alarm system back to the first breaker.	120 VAC and 24 VDC power for the fluorine release detection and alarm systems

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4.2.6.3.1 Initiating Events

Table 4.2-11 summarizes the initiating events identified in the hazard analyses for each of the groups identified in Table 4.2-9. The initiating events are arranged according to the affected parameter of interest (e.g., criticality control, external event, pressure increase, primary system integrity). Table 4.2-11 provides a summary of the accidents postulated in the PrHA. For example, the event "autoclave steam control valve fails open" can result in a pressure increase in a UF_6 cylinder located in an autoclave. This event is an anticipated event (AE) that could result in significant off-site radiological and nonradiological consequences if no mitigation is provided. Because this event could result in the PSOA threshold being exceeded, a PSOA is required to provide additional analysis of this specific event. The initiating events that can exceed PSOA thresholds are indicated in Table 4.2-11. These events were evaluated to determine which ones result in the most limiting accidents as described in the applicable sections below. The table shows the initiating events and frequency category, indicates whether the PSOA threshold could be exceeded, and identifies which events are limiting events.

4.2.6.3.2 Threshold Analysis

Based on the initiating events identified, a set of release scenarios was developed for the different types of facilities to bound the range of possible releases. Some of these events were not considered credible but were evaluated to provide input to the hazard analysis consequence categorization. These scenarios were used, along with operational experience and engineering judgment, to assign consequence categories (Table 4.2-4) for the various events. The threshold analysis scenarios delineated here may not reflect the exact, more specific, scenarios and supporting analyses that were developed for the accident analyses presented in SAR Section 4.3. A brief description of the scenarios is provided here; a summary of the threshold analysis results is provided in Table 4.2-12.

Open valve on a solid cylinder. The scenario of an open valve on a solid cylinder involves a cylinder containing solid UF_6 at its triple point. This consideration maximizes the amount of UF_6 released from a cylinder in the solid state. It was conservatively assumed that all of the gaseous UF_6 present in the cylinder [about 60 lb (27 kg)] would be released. However, only about 20 lbs (9.5 kg) of gaseous UF_6 would be released prior to the cylinder reaching atmospheric pressure. Because this conservative amount is small relative to all of the other cases, this release was judged not to have any off-site impact, and no dispersion study was performed for this case.

Open valve on a liquid-filled cylinder, 6 o'clock position. In the scenario of an open valve on a liquid-filled cylinder, 6 o'clock position, the cylinder is in a horizontal position with the valve pointing down. The UF_6 is released as a liquid that flashes to a mixture of vapor and solid at atmospheric pressure.

Open valve on a liquid-filled cylinder, 12 o'clock position. In the scenario of an open valve on a liquid-filled cylinder, 12 o'clock position, the cylinder is in a horizontal position with the valve pointing up. Two scenarios were analyzed: (1) the liquid level is above the valve location, resulting in an initial release of liquid UF_6 that flashes to a vapor and solid mixture at atmospheric pressure followed by a pure vapor release and (2) the liquid level is below the valve location, resulting in a release of only vapor.

Broken pigtail during parent-daughter transfer. The scenario of a broken pigtail during parent-daughter transfer occurs during a transfer of liquid UF_6 from a 48X parent cylinder to a 30B daughter cylinder. Both cylinders are horizontal and contain UF_6 at 235°F. The parent cylinder valve is in the 6 o'clock position and the daughter cylinder valve in the 12 o'clock position. The liquid level in the daughter cylinder is assumed to be below the valve opening. Therefore, the release from the parent cylinder consists of a mixture of vapor and solid UF_6 flashing, whereas the release from the daughter cylinder is only pure vapor.

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Broken pigtail during withdrawal. The scenario of a broken pigtail during withdrawal involves a broken pigtail in the line from the accumulator to the cylinder. Liquid UF_6 from the accumulator escapes through the broken pigtail, flashing to a mixture of vapor and solid at atmospheric pressure. Simultaneously, there is a vapor release from the cylinder, which has a liquid level below the break. Two scenarios are assumed: (1) both vessels remain open to the ruptured pigtail for the full duration of the release and (2) the accumulator valve is closed after 1 min of liquid release. The vapor from these releases is assumed to exit the process building through open bay doors.

Broken withdrawal compressor discharge. The scenario of broken withdrawal compressor discharge involves a continuous vapor flow from the compressor and a flashing liquid release from the condenser/accumulator until it is empty. The compressor discharge is located in the process building; therefore, the vapor must pass through the building ventilation system. This provides some holdup time, some dilution, and some uranyl fluoride (UO_2F_2) deposition. The UF_6 completely reacts within the building, and the undeposited material is vented at the process building roof.

B-line failure at maximum power. The scenario of B-line failure at maximum power assumes a circumferential break of the B-line with the highest flow rate in the process buildings. The UF_6 reacts with the moist air and forms UO_2F_2 and hydrogen fluoride (HF). The analysis modeled the release from the building and subsequent dispersion. The analysis of the flow from the line continues until the guideline values are reached at the site boundary.

Release from an isolated cell. The scenario of release from an isolated cell involves an isolated cascade cell with the maximum inventory of UF_6. The evaluation for this case assumed that the cell coolant system ruptured into the primary system and caused an overpressurization, resulting in a release of the cell contents into the process building. The UF_6 reacts with the moist air and forms UO_2F_2 and HF. The analysis modeled the release from the building and subsequent dispersion.

Tie-line failure at maximum power. The scenario of tie-line failure at maximum power assumes a circumferential break of the tie-line with the highest flow rate from the process buildings. The consequences were evaluated to determine whether this type of failure could have off-site impact. The UF_6 reacts with the moist air and forms UO_2F_2 and HF. The analysis modeled the release from the line and subsequent dispersion. The analysis of the flow from the line was conservatively assumed to continue until the guideline values are reached at the site boundary.

The analysis did not identify any initiator other than natural pheonomena related events for the failure of the tie lines outside the process buildings. For a tie line failure due to natural phenomena, see the external events analysis in Section 4.3.2.5. All other process related gaseous releases were considered bounded by the large release of gaseous UF_6 to atmosphere evaluated in Section 4.3.2.1.7. Therefore, this event type was not considered further.

separated out in a cold trap and in chemical traps (sodium fluoride and alumina) while the coolant is either vented to the atmosphere or reclaimed for re-use. The UF_6 is then sublimed to surge drums and returned to the cascade.

The Toxic Gas Distribution Process includes the distribution of ClF_3 and F_2/N_2 mixture within the C-310, C-331, C-333, C-337 and C-335 process buildings.

4.2.6.4.2 Hazards

The hazardous materials in the Cascade Facilities Group were reviewed to determine which needed to be evaluated in the PrHA and PSOA. The results of this review are indicated in Table 4.2-9. All the hazardous materials, except those indicated in the table, were characterized as being standard industrial hazards that are commonly found in industrial facilities. These were screened out from further analysis in the PrHA because the amounts of the material are insufficient to cause any significant local health effects. These hazards are adequately controlled by site administrative programs and plans, and no additional analysis was required.

The energy sources identified in the hazards analysis that have the potential for causing releases of hazardous materials are (1) steam energy used to heat the building, (2) electrical energy, (3) chemical energy from the reaction between UF_6 and a coolant/oxidant, (4) potential energy associated with the process building cranes and the lifting of heavy equipment, (5) kinetic energy associated with the process gas compressors and the various types of vehicles, (6) flammable materials (7) combustible materials (e.g., lube, hydraulic oil), and (8) compressed gases (e.g., coolant, nitrogen).

The Enrichment and Purge Cascade Facilities were categorized as Hazard Category 2 nuclear facilities because they contain quantities of the ^{235}U component of the UF_6 sufficient to exceed the threshold quantity for Hazard Category 2 in Table A.1 of DOE-STD-1027-92.

4.2.6.4.3 Parameters of Concern

The first step of the principle hazard evaluation was to identify potential initiating events associated with the Cascade Facilities Group to identify the process parameters that, if changed, could result in a release of the hazard that could exceed the screening thresholds for either PrHA or PSOA. The process parameter changes that could lead to a release of the hazards are (1) a temperature change in the primary system that exceeds the primary system temperature limits, (2) a pressure change in the primary system that exceeds the primary system pressure limits, (3) a failure in the primary system integrity, and (4) a loss of criticality safety controls.

Based on the groupings described, four process parameters should be addressed for each operating condition to ensure that potential types of events are considered in the hazard analysis. The potential ways of releasing hazardous materials that are caused by things such as energy sources and natural phenomena were evaluated for each operating mode to determine whether they might cause a change in one of the four process parameters. Table 4.2-11 summarizes the different initiating events by parameter. These events were developed by considering operational history, operator input, and systematic evaluations.

The first step of the hazard evaluation associated with the shutdown scenarios was to identify the specific scenarios to be evaluated. The scenarios chosen for the evaluation included:

- Prompt total shutdown of a cell or multiple cells, a unit or multiple units, a partial building or complete building or multiple buildings with UF_6 inventory.
- Controlled shutdown of multiple cells, a unit or multiple units, a partial building or complete building or multiple buildings with UF_6 inventory.
- Controlled shutdown of multiple cells, a unit or multiple units, a partial building or complete building or multiple buildings following UF_6 evacuation.
- Shutdown of C-310 purge gas removal capability

The evaluation developed failure modes and effects analyses to identify failures that could initiate these scenarios and then analyzed the bounding initiating events via event trees to identify the range of potential scenario outcomes.

4.2.6.4.4 Summary of Results

As indicated in Table 4.2-11, the events considered for the Cascade Facilities Group included a wide range of process-related events, external events, shutdown scenarios, and controls for minimizing the potential risks. A brief summary of the hazard analyses are presented below for each process.

4.2.6.4.4.1. Enrichment Cascade

Table 4.2-11 identifies all of the events associated with the Enrichment Cascade Process that were considered in the hazard analyses. Thirteen of these events were identified as having the potential to exceed the PSOA threshold, with only one of these (stage control valve closure) not being a limiting event (Table 4.2-11). The controls identified as being AQ are described in Section 3.15. These controls were identified as playing an important role in minimizing potential exposure for on-site personnel, but none were identified as being required to protect the off-site public (Section 4.3.2). The primary administrative control identified for this process is to limit operating pressures for the cascade auxiliary equipment that processes UF_6. This equipment is maintained below atmospheric pressure to minimize releases of UF_6 should a failure in the primary system occur. In addition to the auxiliary equipment, a large portion of the Enrichment Cascade Process is also operated below atmospheric pressure. These portions of the cascade were not considered to have the potential to exceed the PSOA threshold except where the stage control valve closure event or the B-stream block valve closure event could still cause the pressures to increase above atmospheric pressure. In these cases, the PrHA does not postulate that a catastrophic rupture will occur due to the extended period of time to detect and mitigate the event. However, limited UF_6 releases (see Section 4.3.2.1.4) are possible during the transient due to the pressure increase. The remaining controls identified for the enrichment cascade process are adequately addressed by the programs and plans described in SAR Chapters 5 and 6 and Volume 3 of the Application.

4.2.6.4.4.2. Purge Cascade

The Purge Cascade Process is similar to the Enrichment Cascade Process (i.e., same type of equipment and initiators) but does not have any significant inventory of hazardous material that could

4.2.6.5.4.4. Cylinder Storage and Handling

Table 4.2-11 identifies all of the events associated with the Cylinder Storage and Handling Process that were considered in the hazard analyses. Only two were identified as having the potential to exceed the PSOA threshold (Table 4.2-11). The controls identified as being AQ are described in Section 3.15. These controls were identified as playing an important role in minimizing the potential exposure for on-site personnel, but none were identified as being required to protect the off-site public (Section 4.3.2). The primary administrative control for these facilities is not allowing any liquid UF_6 (in 2.5-ton cylinders and larger) to be handled outside the feed, withdrawal, and cylinder storage and handling processes described above. Other administrative controls for the Cylinder Storage and Handling Process include controls for the prevention of criticality so that no alarm coverage can be justified. These controls include the following requirements in addition to any controls described in Section 5.2:

- Cylinders containing $UF_6 \geq$ 1 wt % ^{235}U are inspected within one week of movement.
- Cylinders containing $UF_6 \geq$ 1 wt % ^{235}U are inspected every 4-years for abnormal corrosion products on the cylinder valve, cylinder plug, or cylinder wall.
- Cylinders containing $UF_6 \geq$ 1 wt % ^{235}U are spaced such that inspection can detect degradation of the integrity of the cylinder wall, valve, or plug.
- Cylinders containing $UF_6 \geq$ 1 wt % ^{235}U are stored off the ground in saddles that preclude rolling of the stored cylinders.
- Cylinders containing $UF_6 \geq$ 1 wt % ^{235}U are inspected for damage following occurrence of an evaluation basis earthquake at the site.
- Cylinders, which are discovered not to meet the inspection criteria, are handled commensurate with the observed damage.

In addition, the following administrative controls were identified for minimizing the potential for release of UF_6 during cylinder handling operations:

- Only approved cylinder handling equipment with qualified operators shall be used for the purpose of maneuvering UF_6 cylinders or other heavy loads.
- Cylinder handling equipment will be inspected (once per day when the equipment is used) to detect visible defects before it is used for lifting heavy loads.

If a breached cylinder containing UF_6 enriched to $\geq$ 1.0 wt. % ^{235}U is discovered during handling or inspection, the plant shift superintendent will be notified immediately so that appropriate action can be initiated. The cylinder will be covered within 2 hours to prevent entry of precipitation or water from any source, and repairs will be effected in accordance with directions from nuclear criticality safety. Water will not be sprayed on a cylinder, which has been breached; however, CO_2 may be sprayed on the area of the breach to allow for patching. Personnel involved in the handling or repair of breached cylinders will be equipped with personal alarming dosimeters while working in close proximity to the affected cylinder (if the cylinder is not in an area with CAAS coverage).

The remaining controls identified for this process are adequately addressed by the programs and plans described in SAR Chapters 5 and 6 and Volume 3 of the Application.

4.2.6.6 Toxic Gas Storage and Distribution Group

The Toxic Gas Storage and Distribution Group consists of facilities with large storage volumes and/or distribution lines containing the following toxic chemicals:

- Fluorine.
- Chlorine.
- Chlorine trifluoride.

The facilities and the applicable hazards that are associated with this group are indicated in Table 4.2-9. These facilities were not considered to be complex in their operation and control systems. Therefore the primary method of performing the hazard analysis was an operational review combined

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with the What If method to evaluate potential initiating events and consequences. The following discussion summarizes the results of the hazard evaluation for the hazards in these facilities.

4.2.6.6.1 Processes Definitions

As indicated above, the Toxic Gas Storage and Distribution Group is limited to the processes on the site that contain significant quantities of the hazards listed. These processes are located in various facilities. However, this analysis is limited to the primary storage locations and the distribution systems not associated with another facility. Table 4.2-9 lists the facilities associated with this group.

4.2.6.6.2 Hazards

As indicated above, analysis of the Toxic Gas Storage and Distribution Group is limited to the hazards listed. Other hazards located in these facilities (e.g., sulfuric acid) were evaluated with these processes, but any hazards identified were considered standard industrial hazards.

The energy sources that could be associated with these processes that have the potential for causing releases of the hazardous materials are (1) electrical energy, (2) chemical energy from the reactivity of the potential hazards, (3) potential energy associated with the cranes and the lifting of heavy equipment (e.g., cylinders, containers), (4) kinetic energy associated with the various types of vehicles, (5) flammable materials, (6) combustible materials, and (7) compressed gases (e.g., ClF_3).

These facilities did not contain any radiological material and therefore were not categorized according to DOE-STD-1027-92.

4.2.6.6.3 Parameters of Concern

The first step in identifying potential initiating events associated with the Toxic Gas Storage and Distribution Group was to identify the process parameters that, if changed, could result in a release of the hazard that could exceed the screening thresholds for either the PrHA or PSOA. The process parameter changes that could lead to a release of toxic material are (1) a concentration increase, (2) external event, (3) a flow increase, (4) pressure decrease, (5) pressure increase that exceeds primary system pressure limits, and (6) a failure of the primary system integrity.

Based on the groupings described, six process parameters should be addressed for each operating condition to ensure that potential types of events are considered in the hazard analysis. The potential ways of releasing hazardous materials that are caused by things such as energy sources and natural phenomena were evaluated for each operating mode to determine whether they might cause a change in one of the five process parameters. Table 4.2-11 summarizes the different initiating events by parameter. These events were developed by considering operational history, operator input, and systematic evaluations.

4.2.6.6.4 Summary of Results

As indicated in Table 4.2-11, the events considered for the Toxic Gas Storage and Distribution Group included a wide range of process-related events, external events, and controls for minimizing potential risks.

The six different parameter changes were reviewed for this hazard analysis. Table 4.2-11 identifies all of the events associated with the Toxic Gas Distribution Process that were considered in the hazard analyses. Twelve were identified as having the potential to exceed the PSOA threshold, with five of these being considered limiting events (Table 4.2-11). However, consistent with 10CFR76.85, because these events do not cause a release of radioactive materials, no further discussion is provided in this SAR. The administrative controls for this process are adequately addressed by the programs and plans described in SAR Chapters 5 and 6 and Volume 3 of the Application, with special emphasis on the Chemical Safety Program [which includes the Process Safety Management (PSM) Program]. The controls identified as being AQ are described in Section 3.15. Application of the PSM is based on the requirements and is not necessarily applicable to all of these processes.

4.2.6.7 Miscellaneous Waste Storage and Handling Facilities Group

The facilities and the applicable hazards that are associated with the Miscellaneous Waste Storage and Handling Facilities Group are indicated in Table 4.2-9. In addition to the facilities that are presently dedicated to storing waste materials, several staging, temporary, and long-term storage areas are also located in different facilities. Therefore, this section addresses typical waste storage and handling operations for different waste classifications. Specific analyses were performed for each facility and are documented in the PrHAs. However, the analyses were considered to be generic in their application regardless of where the waste is stored. Therefore, specific facilities will not be addressed in this section. These facilities were not considered to be complex in their operation and control systems. Therefore, the primary method of performing the hazard analysis was an operational review combined with the What If method to evaluate potential initiating events and consequences. The following discussion summarizes the results of the hazard evaluation for the hazards in these facilities.

4.2.6.7.1 Processes Definitions

As indicated above, the Miscellaneous Waste Storage and Handling Facilities Group is limited to the processes on the site that are used for the storage and handling of waste. These processes are located in various facilities. However, this analysis is limited to the primary storage locations. Table 4.2-9 lists the facilities associated with this group.

4.2.6.7.2 Hazards

The hazardous materials in the Miscellaneous Waste Storage and Handling Facilities Group were reviewed to determine which needed to be evaluated in the PrHA and PSOA. The results of this review are indicated in Table 4.2-9. All the hazardous materials, except those indicated in the table, were characterized as being standard industrial hazards that are commonly found in industrial facilities. These were screened out from further analysis in the PrHA because the amounts of the material are insufficient to cause any significant local health effects. These hazards are adequately controlled by site administrative programs and plans, and no additional analysis was required.

The energy sources that could be associated with these processes that have the potential for causing releases of the hazardous materials are (1) electrical energy, (2) chemical energy from the reactivity of the potential hazards, (3) potential energy associated with the cranes and the lifting of heavy equipment (e.g., containers), (4) kinetic energy associated with the various types of vehicles, (5) flammable materials, and (6) combustible materials.

Facilities in this group were categorized as Hazard Category 2 nuclear facilities if they contained more than 700 g of fissionable material and if the following conditions were met:

- A nuclear criticality safety approval [NCSA (see Section 5.2)] is required for the facility in accordance with plant procedures.
- The NCSA establishes essential restrictions to control the fissionable material within the facility (i.e., controls to prevent entry of material into the facility do not meet this restriction) based on the operations to be performed in the facility.
- The restrictions established by the NCSA are not surveillance items associated with ensuring that the facility never exceeds the allowable limits (e.g., so many grams of ^{235}U per container) that need no controls within the facility.
- There is no documented exemption for requiring criticality accident alarm system (CAAS) coverage to the area.

Fissionable material is defined as any material in which a self-sustaining, neutron-induced fission chain reaction can occur. Nearly all the fissions in such a chain reaction are of the fissionable nuclides (e.g., ^{233}U, ^{235}U, or ^{239}Pu) contained in the fissionable material. The remaining facilities containing contaminated waste were categorized as indicated in Table 4.2-7. All categorization was performed in accordance with DOE-STD-1027-92.

4.2.6.7.3 Parameters of Concern

The first step in identifying potential initiating events associated with the Miscellaneous Waste Storage and Handling Facilities Group was to identify the process parameters that, if changed, could result in a release of the hazard that could exceed the screening thresholds for either the PrHA or PSOA. The process parameter changes that could lead to a release of the hazards are (1) a failure in the primary system integrity, (2) exposure to radionuclides, and (3) loss of criticality safety controls.

Based on the groupings described, three process parameters should be addressed for each operating condition to ensure that potential types of events are considered in the hazard analysis. The potential ways of releasing hazardous materials that are caused by things such as energy sources and natural phenomena were evaluated for each operating mode to determine whether they might cause a change in one of the three process parameters. Table 4.2-11 summarizes the different initiating events by parameter. These events were developed by considering operational history, operator input, and systematic evaluations.

Table 4.2-9. Hazards in Facilities Exceeding PrHA Thresholds. (continued)

Facility group/processes evaluated/hazards/facilities

Chemical facilities

C-350 Drying agent storage processes

Hazards exceeding the PrHA threshold

Chlorine trifluoride (ClF_3)

Fluorine (F_2)

Facilities associated with process

C-350 Drying Agent Storage Building

C-410-D Fluorine storage building processes

Hazards exceeding the PrHA threshold

Fluorine (F_2)

Facilities associated with process

C-410-D F2 Storage Building

C-410-K Fluorine storage building processes

Hazards exceeding the PrHA threshold

Fluorine (F_2)

Facilities associated with process

C-410-K Fluorine Building

C-611 Water treatment processes

Hazards exceeding the PrHA threshold

Chlorine

Facilities associated with process

C-611-B Head House

C-611-S Corrosion Inhibitor Building

C-615 Sewage treatment plant processes

Hazards exceeding the PrHA threshold

Chlorine

Facilities associated with process

C-615-C Control Building

C-616 Waste water treatment plant processes

Hazards exceeding the PrHA threshold

Sulfuric acid (Fire only)

Facilities associated with process

C-616-G Sulfuric Acid Tank

Continued.

Table 4.2-9. Hazards in Facilities Exceeding PrHA Thresholds. (continued)

Facility group/processes evaluated/hazards/facilities

C-631, 633, 635, 637 RCW pump house processes

Hazards exceeding the PrHA threshold

Sulfuric acid (Fire only)

Chlorine

Facilities associated with process

C-631-01 Pump House

C-633-1 Pump House

C-635-1 Pump House and Piping

C-637-1 Pump House

C-742-B Storage processes

Hazards exceeding the PrHA threshold

Chlorine trifluoride (ClF_3)

Facilities associated with process

C-710-A Gas Cylinder Storage Building

C-742-B ClF3 Cylinder Storage

C-745-A Storage processes

Hazards exceeding the PrHA threshold

Chlorine

Fluorine (F_2)

Facilities associated with process

C-745-A Cylinder Storage Yard

C-745-B Storage processes

Hazards exceeding the PrHA threshold

Fluorine (F_2)

Chlorine Trifluoride (ClF_3)

Facilities associated with process

C-745-B Cylinder Storage Yard

Continued.

Table 4.2-11. Initiating Events. (continued)

Facility group/parameter/event/applicable process descriptions	Event frequency	Exceeds PSOA threshold?	Limiting event?
Chemical facilities			
Concentration Increase			
WHAT IF THE GASES ARE MIXED IMPROPERLY			
C-350 Drying agent storage processes	Anticipated event	No	No
WHAT IF THERE ARE CONTAMINANTS IN THE FLUORINE SYSTEM			
C-410-D Fluorine storage building processes	Anticipated event	Yes	No
C-410-K Fluorine storage building processes	Anticipated event	Yes	No
WHAT IF THERE ARE CONTAMINANTS IN THE SULFURIC ACID TANK			
C-616 Waste water treatment plant processes	Evaluation basis event	No	No
External Event			
WHAT IF THERE IS A LARGE FIRE			
C-410-K Fluorine storage building processes	Evaluation basis event	Yes	Yes
C-611 Water treatment plant processes	Evaluation basis event	Yes	Yes
C-615 Sewage treatment plant processes	Evaluation basis event	Yes	Yes
C-616 Waste water treatment plant processes	Evaluation basis event	Yes	Yes
C-631, 633, 635, 637 RCW pump house processes	Evaluation basis event	Yes	Yes
Toxic gas storage and distribution process	Evaluation basis event	Yes	Yes
Flow Increase			
WHAT IF THERE IS MISDIRECTED FLOW OF ClF_3 AND/OR F_2/N_2			
C-350 Drying agent storage processes	Anticipated event	No	No
WHAT IF THERE IS MISDIRECTED FLOW OF F_2/N_2			
C-410-K Fluorine storage building processes	Anticipated event	No	No
Pressure Decrease			
WHAT IF THE PRESSURE IN THE MIX TANK IS TOO LOW			
C-350 Drying agent storage processes	Anticipated event	No	No

Continued.

Table 4.2-11. Initiating Events. (continued)

Facility group/parameter/event/applicable process descriptions	Event frequency	Exceeds PSOA threshold?	Limiting event?
Pressure Increase			
WHAT IF THE ClF_3-F_2/N_2 *MIXING TANK IS OVERPRESSURIZED*			
C-350 Drying agent storage processes	Anticipated event	No	No
WHAT IF THE F_2/N_2 *TANK IS OVERPRESSURIZED*			
C-410-D Fluorine storage building processes	Evaluation basis event	No	No
Primary System Integrity			
LARGE RELEASE OF CHLORINE			
C-611 Water treatment plant processes	Evaluation basis event	Yes	Yes
C-615 Sewage treatment plant processes	Evaluation basis event	Yes	Yes
C-631, 633, 635, 637 RCW pump house processes	Evaluation basis event	Yes	Yes
Toxic gas storage and distribution process	Evaluation basis event	Yes	Yes
C-745-A Storage processes	Evaluation basis event	Yes	Yes
RELEASE OF ClF_3 *AND/OR* F_2/N_2 *FROM A DAMAGED STORAGE TANK AT C-350*			
C-350 Drying agent storage processes	Evaluation basis event	Yes	No
Toxic gas storage and distribution process	Evaluation basis event	Yes	No
C-742-B Storage processes	Evaluation basis event	Yes	No
C-745-A Storage processes	Evaluation basis event	Yes	No
C-745-B Storage processes	Evaluation basis event	Yes	No
RELEASE OF ClF_3 *FROM A LINE*			
C-350 Drying agent storage processes	Evaluation basis event	Yes	Yes
Toxic gas storage and distribution process	Evaluation basis event	Yes	Yes
RELEASE OF F_2/N_2 *FROM A LINE AT THE STORAGE TANK AT C-410-D*			
Toxic gas storage and distribution process	Evaluation basis event	Yes	Yes
RELEASE OF F_2/N_2 *FROM THE DISTRIBUTION HEADER*			
C-410-D Fluorine storage building processes	Evaluation basis event	Yes	No
C-410-K Fluorine storage building processes	Evaluation basis event	Yes	No
Toxic gas storage and distribution process	Evaluation basis event	Yes	No
RELEASE OF F_2/N_2 *THROUGH THE RUPTURE DISKS AT C-410-D OR C-410-K*			
Toxic gas storage and distribution process	Evaluation basis event	Yes	No

Continued.

Table 4.2-11. Initiating Events. (continued)

Facility group/parameter/event/applicable process descriptions	Event frequency	Exceeds PSOA threshold?	Limiting event?
WHAT IF A ClF_3 CYLINDER VALVE LEAKS DURING CYLINDER HANDLING AND PIGTAIL CONNECTION			
C-350 Drying agent storage processes	Anticipated event	No	No
WHAT IF AN ClF_3 CYLINDER LEAKS			
C-742-B Storage processes	Anticipated event	No	No
C-745-B Storage processes	Anticipated event	No	No
WHAT IF THERE IS A RELEASE OF F_2N_2 FROM A HIGH PRESSURE MULTITUBE TRAILER OR PIGTAIL			
C-410-K Fluorine storage building processes	Anticipated event	Yes	Yes
C-745-A Storage processes	Anticipated event	Yes	No
C-745-B Storage processes	Anticipated event	Yes	No
WHAT IF THERE IS A LEAK IN THE CHLORINE EQUIPMENT			
C-611 Water treatment plant processes	Anticipated event	No	No
C-615 Sewage treatment plant processes	Anticipated event	No	No
C-631, 633, 635, 637 RCW pump house processes	Anticipated event	No	No
WHAT IF A CHLORINE CONTAINER LEAKS			
C-611 Water treatment plant processes	Anticipated event	No	No
C-745 Storage processes	Anticipated event	No	No
WHAT IF THERE IS A LEAK IN THE ClF_3 OR FLUORINE SYSTEM			
C-350 Drying agent storage processes	Anticipated event	Yes	No
WHAT IF THERE IS A LEAK IN THE FLUORINE DISTRIBUTION LINE			
C-410-D Fluorine storage building processes	Anticipated event	Yes	No
WHAT IF THERE IS A LEAK IN THE FLUORINE SYSTEM			
C-410-K Fluorine storage building processes	Anticipated event	Yes	No
WHAT IF THERE IS A LEAK IN THE F_2/N_2 STORAGE TANK OR SUPPLY SYSTEM			
C-410-D Fluorine storage building processes	Anticipated event	No	No
C-410-K Fluorine storage building processes	Anticipated event	Yes	No
WHAT IF THERE IS A LEAK IN THE SULFURIC ACID SYSTEM			
C-616 Waste water treatment plant processes	Anticipated event	No	No
C-631, 633, 635, 637 RCW pump house processes	Anticipated event	No	No

Continued.

Table 4.2-11. Initiating Events. (continued)

Facility group/parameter/event/applicable process descriptions	Event frequency	Exceeds PSOA threshold?	Limiting event?
WHAT IF THERE IS A RUPTURE IN THE SULFURIC ACID SYSTEM			
C-616 Waste water treatment plant processes	Evaluation basis event	No	No
C-631, 633, 635, 637 RCW pump house processes	Evaluation basis event	No	No
WHAT IF THERE IS MOISTURE INSIDE A STORAGE TANK			
C-350 Drying agent storage processes	Anticipated event	No	No
Miscellaneous waste storage and handling facilities			
Criticality Control Loss			
WHAT IF THERE IS A CRITICALITY			
C-746-Q1 Fissile Storage Processes	Evaluation basis event	Yes	Yes
Waste storage/handling processes	Evaluation basis event	Yes	Yes
External Event			
WHAT IF THERE IS A LARGE FIRE			
C-727 90-day Mixed waste storage processes	Evaluation basis event	Yes	Yes
C-746-Q1 Fissile Storage Processes	Evaluation basis event	No	No
Waste storage/handling processes	Evaluation basis event	Yes	Yes
Excessive Exposure to Radiation			
WHAT IF THERE IS A BUILDUP OF EXCESS RADIONUCLIDES (E.G., TC-99)			
Waste storage/handling processes	Anticipated event	No	No
Primary System Integrity			
WHAT IF THERE IS A LEAK IN ONE OR MORE OF THE STORAGE CONTAINERS			
C-727 90-day Mixed waste storage processes	Anticipated event	No	No
C-746-Q1 Fissile Storage Processes	Anticipated event	No	No
Waste storage/handling processes	Anticipated event	No	No
WHAT IF THERE IS A RUPTURE OF ONE OR MORE OF THE STORAGE CONTAINERS			
C-727 90-day Mixed waste storage processes	Anticipated event	No	No
Waste storage/handling processes	Anticipated event	No	No

Continued.

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b. Source-Term Analysis

The analysis for a parent-daughter transfer release simulates an accidental release of UF_6 from a postulated pigtail failure just after a 48X daughter cylinder has been filled to 21,030 lb (i.e., the maximum fill limit allowed for shipping a 48X cylinder per ANSIN14.1) from a 48Y parent cylinder that originally contained 28,600 lb (i.e., a previously allowed maximum fill limit for in-plant storage in a 48Y cylinder). Thus, this analysis assumes the 48Y parent cylinder contains 7,630 lb and the 48X daughter cylinder contains 21,030 lb at the time of the postulated pigtail failure during transfer operations. Initial temperature in both cylinders is 240°F (116°C), which is controlled by the autoclave steam pressure control system. Liquid UF_6 exits the parent through a valve in the 6 o'clock position and moves through a pigtail pipe [0.745 in. (1.89 cm) inside diameter] to a 15-ft-long (4.6-m) transfer pipe [1 in. (2.54 cm) inside diameter] and then into another pigtail pipe [0.745 in. (1.89 cm) inside diameter] before entering the valve at the 12 o'clock position of the daughter cylinder. The daughter has been filled to the maximum fill limit per ANSI N14.1, but no valves have been closed. At this point, the pigtail becomes disconnected from the valve on the daughter cylinder. This causes a release from the parent cylinder via the transfer piping and from the daughter cylinder through the cylinder valve. Releases from both the parent and daughter cylinders are assumed to last for 45 seconds before isolation [i.e., before the valves are closed by the UF_6 release detection system in the basement transfer room (Zones 4)].

A similar type of release can occur in the laboratory should a piping failure occur during sampling operations. In this scenario the release from the process piping is also assumed to continue for 45 seconds until it is isolated by the UF_6 release detection system in the laboratory (Zone 1). However, the release associated with a pigtail failure in the basement of C-360 is considered the bounding release due to the amount of material that may be released from the parent and daughter cylinders. The release associated with a pigtail failure in the basement of C-360 is evaluated further in the following.

Liquid UF_6 exits the parent cylinder at 240°F (116°C) and 87.9 psia (0.61 MPa), about 6 atm. The release rate from the end of the transfer piping is 7.26 lb/s (3.29 kg/s). The length of transfer piping between the parent cylinder and the release point has a noticeable effect on reducing the atmospheric release rate. Upon release, the liquid UF_6 flashes to a mixture of 62 percent vapor [4.50 lb/s (2.04 kg/s)] and 38 percent solid [2.76 lb/s (1.25 kg/s)], and the temperature is assumed to be lowered to 134°F (56.6°C), the temperature at which vapor and solid forms of UF_6 are in equilibrium at 1 atm.

Some liquid UF_6 exits the daughter cylinder through the valve in the 12 o'clock position and passes through the attached cylinder valve before being released. Because the level of liquid UF_6 is slightly above the valve opening of the daughter cylinder, releases from the daughter are initially in the liquid form and then in the vapor state. The liquid is released at an average rate of 8.58 lbs/s (3.89 kg/s) at an average temperature of 240°F (116°C) and a pressure of 87.9 psia (0.61 MPa). Total UF_6 released during the initial 45 seconds is 326.7 lb (148.2 kg) from the parent cylinder and 385.9 lb (175.5 kg) from the daughter cylinder.

Another variation in the above scenario is for the receiving cylinder not to be isolable because of disconnection from the pigtail at the cylinder connection. The parent cylinder will still be isolated within the 45 seconds, but the receiving cylinder will continue to release its contents until emergency personnel plug the cylinder or the amount is exhausted. This is further discussed below as variations of the baseline scenario. An additional variation in the above scenario is analyzed in Section 4.3.2.2.10.1 to analyze the addition of technetium traps in the transfer operation.

c. Consequence Analysis

The consequence analysis is divided into three sections. The first subsection details the baseline scenario that estimates conservative (i.e., reasonable upper-bound) consequences from a UF_6 release associated with a postulated accident during transfer from a parent cylinder to a daughter cylinder, including release of material from both the parent and daughter cylinders for 45 seconds before isolation. After the baseline scenario, the second subsection discusses the effects of varying input parameters from those used in the baseline scenario. The final subsection discusses the uncertainties in the analysis that have not been quantified. Effects of varying surface roughness and initial deposition of solid UF_6 are the same as those discussed in Section 4.3.2.2.15.

Baseline scenario. Parameters that define the base scenario for the parent/daughter release are listed in Table 4.3-6. This scenario includes adverse meteorological conditions (i.e., conditions resulting in high-consequence estimates), consisting of a stable atmosphere and a low wind speed [Pasquill-Gifford stability class F and a wind speed of 1 m/s (2 mph), or simply F1]. These conditions occur at PGDP 8.4 percent of the time on an annual basis (averaged over the 5-yr period 1988-1992, inclusive).

An ambient air temperature of 40°F (4.4°C) was selected for these simulations because that temperature results in relatively high consequence estimates compared to other temperatures that occur under F1 conditions. Lower ambient temperatures [to 30°F (-1°C)] were also evaluated and indicated marginally higher consequences. However, lower temperatures introduce condensation mechanisms for which there is less confidence in model results. Therefore, 40°F (4.4°C) is the lowest ambient temperature used in this analysis. During 1992, ambient temperatures were greater than 40°F (4.4°C) about 85 percent of the time.

An ambient relative humidity of 70 percent was selected for the baseline scenario because it is a typical relative humidity for a stable atmosphere with low wind speeds at PGDP. During 1992, the median relative humidity under F1 conditions was 65 percent. Higher relative humidities (e.g., 90 percent) would result in only minimally higher consequence estimates because the corresponding increase in specific humidity (the humidity expressed as the number of grams of water vapor per kilogram of moist air) at 40°F (4.4°C) is small. The maximum relative humidity under F1 in 1992 was 90 percent. The maximum specific humidity (100 percent relative humidity) associated with an ambient air temperature of 40°F (4.4°C) is 5.5 g of water vapor per kilogram of moist air. Twenty percent of that amount (the difference between 70 percent and 90 percent relative humidity) is 1.1 g of water vapor per kilogram of air. This slight difference in water vapor available for UF_6 hydrolysis reactions would result in virtually no change in downwind consequence estimates.

The value of f_A accounts for the in-building mixing of the released UF_6 in the transfer building, and with increasing f_A values, the amount of UF_6 that reacts in the building increases (see Section 4.3.2.3.4). Values of f_A were calculated using the plume cross-sectional area at the point when all of the solid UF_6 in the plume has completely sublimated to UF_6. The cross-sectional area of the plume is a function of the release and meteorological conditions. For the baseline scenario, in-building mixing is assumed to be minimal, with a low f_A value calculated to be 0.055.

The UF_6 MIXER model was used to predict downwind consequences from the parent-daughter transfer release. Figures 4.3-17 through 4.3-19 show estimated downwind consequences associated with the baseline scenario. Note that the baseline scenario (stable atmosphere and a low wind speed [Pasquill-Gifford stability class F and wind speed of 1 m/s, or simply F1]) is represented by the top curve in these figures. The other two curves are for different meteorological conditions and are discussed below. Calculated values of the consequence parameters were compared to EBE guidelines values for uranium (25 rem for U radiological toxicity, and 30 mg U intake for U chemical toxicity), and to the Emergency Response Planning Guidelines (ERPG-2) for HF (20 ppm for 1-hour).

Table 4.3-7 lists specific consequence estimates at the nearest site boundary (1000 m), 1 mile (1600 m), and 5 miles (8050 m) downwind from the postulated release point. The postulated release point is assumed to be located outside the eastern entrance of the toll transfer and sampling facility (Building C-360). The nearest site boundary is located about 0.62 mile (1000 m) to the east of the postulated release point. Consequence estimates are less than their respective guidelines at the nearest site boundary. These consequences are significantly less than those for the dropped cylinder event (see Section 4.3.2.2.15).

Effects of varying scenario parameters on consequence estimates. The following parameters were varied to obtain some uncertainty estimates and provide some characterization of the range of potential consequences: (1) the duration of release from the daughter cylinder, (2) meteorological conditions, (3) the initial in-building mixing [indicated by the fractional area of the leeward side of building that is covered by the exiting plume (f_A)], and (4) the building wake effects on plume dispersion. The results provide perspective for interpreting the baseline scenario. The consequences presented in this section are either more probable, providing a lower-bound estimate of potential consequences, or less probable, providing a worst-case estimate of potential consequences. For the duration of release, fractional area, and building wake discussions, consequence estimate comparisons are not shown for radioactive dose and HF exposure because these estimates display the same general trend as the uranium chemical toxicity dose and are generally less than their respective guideline values.

Duration of release from the daughter cylinder — The baseline scenario assumes that the daughter cylinder valve would be isolated (closed) in 45 seconds. If the daughter cylinder valve does not isolate, then the release duration may be as long as 30 min (1800 s). The 48Y parent cylinder contains 7,630 lb and the 48X daughter cylinder contains 21,030 lb at 240°F at the time of the postulated pigtail failure. The 48Y parent cylinder releases 307.2 lb of liquid UF_6 in the 45-second period before isolation while the 48X daughter cylinder releases 5,583.1 lb of UF_6 liquid and vapor in a 30-minute period, which results in a total of 5,890.3 lb of UF_6 released during the initial 30-minute period after the postulated pigtail failure. The 45-second release period for the parent cylinder and the 240°F operating temperatures were evaluated in this scenario to bound transfer operations at both PGDP and PORTS. In Figure 4.3-20, consequence estimates are higher with the longer duration release from the daughter cylinder. The uranium chemical toxicity dose exceeds the guidelines up to about 2.9 miles (4700 m), while the HF toxicity dose exceeds the guideline up to about 3 miles (5000 m).

Meteorological conditions — Consequence estimates were made for two additional meteorological conditions to compare with the baseline scenario. The compared meteorological conditions included: (1) typical conditions that do not provide favorable or unfavorable consequence estimates [represented by neutral atmospheric stability (Pasquill-Gifford stability class equal to D) and moderate wind speeds (4 m/s = 9 mph)] and (2) typical conditions that provide relatively low-consequence estimates [represented by a slightly unstable atmosphere (Pasquill-Gifford stability class equal to C) with moderate wind speeds (4 m/s)]. These representative meteorological conditions were chosen based on a screening analysis performed using the simple Gaussian plume equation.

Table 4.3-10 shows the results of this screening analysis, where normalized concentration values (concentration, χ, divided by the source-term, Q, therefore called χ/Q values) were calculated at a downwind distance of 0.62 mile (1 km), assuming that the source was at ground level and that plume constituents were not reactive. The values of χ/Q in Table 4.3-10 are ordered such that values near the top of the table represent more favorable dispersion conditions and values near the bottom represent less favorable dispersion conditions.

The most frequently occurring meteorological condition at PGDP is D4 (stability class D, neutral, and a wind speed of 4 m/s), which occurred 14.9 percent of the time on an annual basis. As shown in

- Design featurens of the C-337-A jet station barrier frame – maintain primary system integrity (EGs 1 and 2); and
- UF_6 cylinder handling cranes – design features minimize probability of heavy load drop events – maintain primary system integrity (EGs 1 and 2)
- Operator training for required actions—closure of isolation valves to terminate release (C-333A and C-337A only) and evacuation of the area (EGs 1, 2, and 6 only).

Based on the above essential controls, the resulting important to safety SSCs and TSRs are as follows:

- The autoclave steam pressure control system, autoclave manual isolation system, UF_6 release detection system Zones 1 and 4 (C-360) UF_6 cylinder handling cranes, C-337-A jet station barrier frame, UF_6 cylinders, pigtails, primary system piping outside the autoclave, liquid UF_6 cylinder handling equipment (i.e., scale carts), cylinder scale cart movement prevention system (C-360 only), and the autoclave primary containment system (C-360 only) are identified as important to safety SCCs. See Section 3.15 for details including safety classification.
- TSRs are provided for the autoclave steam pressure control system, autoclave manual isolation system, UF_6 release detection (zones 1 and 4) system, Scale cart movement prevention system, UF_6 cylinders, UF_6 cylinder handling cranes, C-337-A jet station barrier frame, and administrative requirements for procedures and training of workers for prevention of pigtail/line failure and evacuation actions.

4.3.2.2.10.1 Line Failure in the C-360 Basement Transfer Room When Technetium Traps are in Operation

a. <u>Scenario Description</u>

This scenario is a variation of the pigtail /line failure outside autoclave scenario analyzed in Section 4.3.2.2.10. The analysis in Section 4.3.2.2.10 is very conservative, as the source term and consequence analyses were presented to bound both the Portsmouth and Paducah GDPs. The model does not truly represent either PGDP or Portsmouth. The most conservative assumptions for each facility were combined into a model that would bound the accident for both plants. Hence, the highest source term from both plants was used in the consequence analyses to develop the most conservative results for both plants. The main difference in these two scenarios is the location of the postulated break. Transfer operation with the Tc traps does not invalidate any aspect of the pigtail /line failure outside autoclave scenario. The analysis in Section 4.3.2.2.10 still conservatively bounds a release from the transfer pigtail even with the Tc traps in operation.

This scenario for the Tc traps is specific to PGDP and therefore the inputs to the analyses (piping runs, valves, elbows, valve closure times, modeling of the transfer room release and distance to site boundary, etc.) are more accurate and precise. To ensure product cylinders meet customer specifications, technetium (Tc) traps have been installed in the C-360 basement transfer room. When needed, these traps can be valved in to allow the liquid UF_6 being transferred from a parent cylinder to a daughter cylinder, to pass through the traps to filter out ^{99}Tc. There are two banks of traps, with four traps in each bank.

Only one bank will be used at any given time. Although the traps and associated piping are made of Monel, and the piping and traps are welded in place, there exists the possibility that a bank of traps will have to be cut out if the MgF_2 becomes saturated with ^{99}Tc and needs to be replaced. Although a rupture of the Monel piping is expected to be extremely unlikely during transfer operations, due to the possibility of the lines being cut and rewelded, it is postulated that the Monel piping fails just down stream from a bank of traps. This event was classified in the EBE frequency category because of the extremely low probability of a piping failure.

The parent cylinder is assumed to be a 48X cylinder filled with liquid UF_6 at 235 °F, the maximum allowed temperature which corresponds to the autoclave steam pressure control limit of 8 psig. For a slight conservatism, the parent cylinder at the time of the pipe rupture is assumed to contain the maximum allowed amount of UF_6, or 21,030 lb. The parent cylinder, with the cylinder valve at 6 o'clock position, is connected to a 0.745-in ID pigtail which in turn is connected to 1-in transfer piping, and then connected to a bank of four Tc traps. A number of manually operated valves and two automatic isolation valves are also in the flowpath to the traps. The daughter cylinder is also assumed to be a type 48X cylinder with the cylinder valve at the 12 o'clock position, and also filled to its maximum allowed amount of UF_6 (21,030) at 235 °F when the release occurs. The assumption of both cylinders full is conservative and will bound all operations including blending operations. Located in the piping near the daughter cylinder is an additional automatic isolation valve. In case of a UF_6 release in the basement transfer room, the UF_6 release detection system (Zone 4) will provide a signal to close the transfer manifold automatic isolation valves located in the piping near the parent cylinder and the transfer line block valve. The automatic isolation valves are assumed to close completely within 10 seconds of the UF_6 release detection system sensing a release. A 15-second response time is assumed for the UF_6 detectors to sense a release. Therefore, the automatic isolation valves will close within 25 seconds of the UF_6 release. After a rupture of the piping just downstream from the trap bank, the liquid UF_6 will rapidly exit out the ruptured pipe from the parent and daughter cylinders for the 25 sec period until the automatic isolation valves close. The UF_6 remaining in the traps and the piping between the parent and daughter cylinder automatic isolation valves and the break location will then exit the piping, further contributing to the total amount of UF_6 released.

The primary concern, applicable EGs, and essential safety actions associated with this event are the same as those for the Pigtail/Line Failure Outside Autoclave event.

b. <u>Source Term Analysis</u>

The PIPELEAK model was used for the parent and daughter cylinders to model the releases through the parent and daughter pigtails, and associated transfer piping/fittings. The parent 48X cylinder is assumed to be located at the autoclave that provides the longest piping run to the traps. This configuration maximizes the total amount of UF_6 released for the postulated line failure event. Line breaks during transfer from a closed autoclave can result in higher release rates. However, the larger volume of UF_6 released from the lines using the longest piping run has a larger effect on the total source-term for the event than the higher release rates for the line breaks from a closed autoclave. In the 25 sec period between pipe rupture and automatic isolation valve closure, 80.9 lb of liquid UF_6 is released from the parent cylinder. During this same 25 sec period, 105.7 lb of UF_6 is released from the daughter cylinder through the piping at the rupture location. Since the liquid level in the daughter cylinder remains above the cylinder valve, the release is in the form of liquid. There is approximately 155 ft of 1-in piping from the second parent automatic isolation valve to just down stream of the traps, including branch lines to the other autoclaves and to the surge drum. This provides 174.34 lb of liquid UF_6 that could also exit the line from the parent cylinder piping. There is approximately 45 ft of 1-in piping from the daughter automatic isolation valve to the location of the break. This provides another 51.25 lb of liquid UF_6 that could exit the line through the daughter cylinder piping. Each trap is in the shape of a small cylinder, about two ft high with a maximum inner diameter of 10.24 in. At least 33 lbs of sintered MgF_2 is placed within each trap to absorb the ^{99}Tc. After insertion of the MgF_2, each trap has approximately 0.894 ft^3 of void space in which liquid UF_6 will occupy. At a liquid temperature of 235 °F (density of 206.97 lb/ft^3), each trap could contain 185.03 lb of liquid UF_6. The four traps in the bank could contain 740.12 lb of liquid UF_6. Adding the amount of liquid UF_6 in the four traps (740.12 lb), a total of 1152.3 lb of liquid UF_6 would be released. The estimated time for the release to occur is approximately 142 seconds.

A variation in the above scenario is a piping failure coupled with multiple operator errors, failing to place the MgF_2 into each trap. Each trap could then contain 1.062 ft^3 of liquid UF_6, or 219.8 lb of liquid UF_6.

Four traps would contain 879.21 lb of liquid UF_6. In this case, the total amount of UF_6 released would be 1291.4 lb, with an estimated release time of approximately 162 seconds.

c. **Consequence Analysis**

The UF_6MIXER model was used to calculate the consequences of the UF_6 released. Figures 4.3-46 through 4.3-48 show estimated downwind consequences associated with this variation. The amount released was 1152.3 lb (522.68 kg) in a 142 sec period, providing an average release rate of 3.6809 kg/sec. The release was modeled as a liquid release, with an initial temperature of 235 °F before flashing to solid and vapor. No deposition or holdup within the transfer room was considered. As there are no large bay doors in the transfer room leading to ambient conditions outside, the exit location for the UF_6 to leave the room was assumed to be through opened personnel doors leading to the street level with ambient outside conditions, as well as through small cracks up the elevator shaft also leading to the street level. Based upon these two areas (door size and elevator shaft opening areas) and the cross sectional area of the facility's downwind side, an f_A of 0.006 was used for the calculations. A surface roughness of 0.03 m was used for the calculations, which is representative of low grass areas that would be found in a rural environment. The ambient temperature outside the building was assumed to be at 40 °F, with a relative humidity of 70%. The transfer room temperature was assumed to be at 80 °F, due to the cylinder and traps containing liquid UF_6. At these ambient conditions, three sets of meteorological conditions were examined. The baseline case at these ambient conditions was for F stability, 1 m/s wind speed (or simply F1) meteorological conditions, which normally provides the worst case consequences. Additionally, D stability, 4 m/s conditions (D4) were examined, as well as C stability, 4 m/s conditions (C4). The results show that the D4 and C4 conditions provided considerably lower consequences than F1 conditions. Table 4.3-7b provides a summary of the results for the F1 conditions. The uranium intake at the site boundary, 1050 m plant east, is 24.8 mg, while the radiological dose and HF concentration are 0.26 rem and 9.7 ppm respectively.

In the variation event discussed above where the MgF_2 had not been placed into the traps, 1291.4 lb would be released in approximately 162 seconds. For the most conservative meteorological conditions (F1), the uranium intake at 1050 m is 27.9 mg. The radiological dose and HF concentration are 0.29 rem and 10.9 ppm respectively. Figure 4.3-49 provides a comparison of the uranium intake consequences for the two cases of with and without MgF_2 in the traps under the worst case meteorological conditions.

d. **Comparison With Guidelines**

The comparison with guidelines is subdivided to address the different receptors.

Local workers in the immediate area — Workers in the immediate area of the release could be exposed to a significant uranium dose and/or HF exposure. In the event of a release, the plant see and flee policy requires personnel to evacuate the area for their own protection. The essential method of detection for workers within the transfer area is (1) visual indication of a "white smoke" (i.e., reaction products of UF_6 and moisture) or (2) the odor of HF, which is a product of the reaction of UF_6 and moisture. The visual indication or the odor of HF will provide indication of (1) the occurrence of a release and (2) the need for the workers to evacuate the area of the release.

Operational personnel in the C-360 Administrative Area — Operational personnel who can take mitigative action in the event of a UF_6 release associated with a line failure in the transfer area are located in the administrative area but would detect the event quickly because of the large release. In the event of a line failure, operator action will not be required because of the automatic actions of the UF_6 release detection system at the transfer station (Zone 4). As indicated for the local worker, immediate evacuation is required for operational personnel.

Workers outside the process buildings — The essential controls for protecting on-site personnel outside the facility are (1) detection of the release, (2) minimization of the release by initiating isolation, and (3) training of on-site personnel to evacuate areas upon detection of a release by sight or by odor. The first essential action is to detect the release of UF_6. The second essential action is accomplished by the automatic isolation to terminate the release. For the transfer area, the UF_6 release detection system (Zone 4) at the transfer station will automatically detect the release and initiate primary system isolation. If workers outside of the process buildings have received no other instructions for action to be taken (i.e., shelter in place or take cover), then the essential control for these receptors is to evacuate their areas if a release is detected by sight or by odor.

Off-site public — The off-site consequences at the site boundary of a line failure with the Tc traps being utilized in the transfer station is about 24.8 mg U. The essential controls for protecting the off-site public are isolation of the breach to minimize the UF_6 release, and ensuring that no more than one bank of Tc traps are utilized during transfer operations.

e. <u>Summary of SSCs and TSR Controls</u>

Based on the results of this analysis, the essential controls for this event are summarized as follows:

- Administrative controls to prevent line failure-maintain initial condition (normal operation, EG 5 only)
- UF_6 lines are purged and evacuated before the primary system is opened.
- Autoclave steam pressure control system-maintain initial condition (normal operation, EG 5 only)
- UF_6 release detection system (Zone 4) - closure of isolation valves to terminate release (EGs 1, 2, and 6 only)
- Operator training for required actions- evacuation of the area (EGs 1, 2, and 6 only).
- Administrative control to ensure only one bank of Tc traps is utilized during transfer operations-maintain initial condition (normal operation, EG 5 only)
- Primary system piping and equipment outside the autoclave, and the associated isolation valves-maintain primary system integrity (EGs 1, 2, and 6 only)

Based on the above essential controls, the resulting important to safety SSCs and TSRs are as follows:

- The autoclave steam pressure control system, UF_6 release detection system (Zone 4), primary system piping and equipment outside the autoclave, and associated isolation valves are identified as important to safety SSCs. See Section 3.15 for details including safety classification.

5.2 NUCLEAR CRITICALITY SAFETY

5.2.1 Introduction

USEC, as part of its application for a certificate of compliance, is required by 10 CFR 76.35(a)(7) to provide a "description of the management controls and oversight program to ensure that activities directly relevant to nuclear safety . . . are conducted in an appropriately controlled manner that ensures protection of employee and public health and safety. . . . "In addition, 10 CFR 76.89 requires USEC to maintain and operate a criticality monitoring and audible alarm system. This section describes the basic criticality prevention and briefly discusses the monitoring provisions at the Paducah GDP. Section 3.12.6 discusses the Criticality Accident Alarm System (CAAS) in detail.

5.2.2 Program Elements

The nuclear criticality safety (NCS) program as defined in this section is implemented by the plant NCS procedures. These procedures reflect the requirements related to NCS as specified in this section.

5.2.2.1 Adherence With ANSI/ANS Standards

The nuclear criticality safety program has been developed to comply with ANSI/ANS 8.1-1983, 8.7-1975 and 8.19-1984. The issues which are not in full compliance with these standards are addressed in Section 5.2.4.

5.2.2.2 Nuclear Criticality Safety Responsibilities

The General Manager has overall responsibility for NCS and approves the implementation of Nuclear Criticality Safety Approvals (NCSAs). The General Manager assigns responsibility and delegates commensurate authority to all levels of management for the implementation and oversight of the NCS Program.

The organization managers (including maintenance) are responsible for ensuring that operations involving uranium enriched to 1 wt % or higher ^{235}U and 15 g or more of ^{235}U are identified and evaluated for NCS prior to initiation of the operation. The organization managers are also responsible for ensuring NCS approvals are requested, and for ensuring implementation of the requirements contained in the approvals for these same operations.

First-line managers are responsible, in their respective operations, for ensuring that personnel are made aware of the requirements and limitations established by NCSAs either through pre-job briefings, required reading, and/or training (based on the complexity of the change). These same managers are responsible for ensuring any new fissile material operations which do not have approved NCSAs will not be performed until the necessary approvals have been obtained. First-line management is also responsible for removing fissile material handlers, who fail the test associated with the NCS training, from jobs which involve handling of fissile material.

Managers are trained in NCS and ensure all appropriate personnel (i.e., fissile material handlers) receive training as specified in the NCS procedure. This training provides personnel with the knowledge necessary to fulfill their respective NCS responsibilities. Section 6.6 discusses the training program in more detail.

The fissile material operators are responsible for conducting operations in a safe manner in compliance with operating procedures and are required to stop operations if unsafe conditions exist. Stop work and restart authority is discussed in more detail in Section 6.1.

The NCS Manager is responsible for the administration of the NCS program. This includes reviewing the overall effectiveness of the NCS program ensuring that NCS staff members are placed, trained, and qualified in accordance with written procedures and that NCS evaluations and NCS approvals are prepared and technically reviewed by qualified NCS engineers. The NCS staff members report to the NCS Manager who reports to the Engineering Manager. Nuclear Criticality Safety is independent of organizations that require NCSAs. Section 6.1 gives more details related to plant organization.

The specific qualifications for the NCS Manager are discussed in Section 6.1.

Qualified NCS Group personnel are responsible for performing the following functions: (1) providing NCSAs for fissile material operations, (2) performing facility walk-throughs of facilities which handle fissile material and advising appropriate supervision of any NCS concerns, (3) participating in investigation of incidents involving NCS and in the determination of recommendations for eliminating such incidents, (4) assisting in plant emergency preparedness planning, (5) providing support to the Plant Operations Review Committee (PORC), and (6) participating in the review of procedures which involve fissile material operations to verify NCSA commitments have been effectively flowed down into operating procedures. As does any employee, the NCS Group personnel have the authority to halt any unsafe activity.

The responsibilities of senior NCS engineers performing technical reviews of NCSEs are specified in the Nuclear Criticality Safety Evaluation (NCSE) procedure. These responsibilities are verifying sufficient information is documented to allow independent analysis, verifying credible process upsets related to criticality safety are properly identified and evaluated, verifying compliance with the double contingency principle, checking for accuracy, and verifying applicability of the calculational methods.

5.2.2.3 Process Evaluation and Approval

Each operation involving uranium enriched to 1 wt % or higher ^{235}U and 15 g or more of ^{235}U is evaluated for NCS prior to initiation. The operation and related NCS requirements are documented in an NCSA. The evaluation is documented in a NCSE. The evaluation and approval process is governed by written procedures.

In order for a criticality to be possible, multiple contingency events would need to occur simultaneously. Therefore, the double contingency principle is met and there are no AEFs identified for disassembly, decontamination, and repair of expansion joints.

6.5 Seal Change, Disassembly, and Decontamination

The seal handling operations involve removal of the contaminated seals from the cascade compressors, temporary storage, and disassembly and decontamination of the contaminated seals.

Administrative controls and passive barriers have been incorporated to prevent a criticality from occurring in the seal change, disassembly, and decontamination. Postulated accidents associated with a seal change involve the introduction of moderator into the compressor due to operator error or failure of the blow-out preventer. The primary criticality safety hazard associated with decontamination is the accumulation of unsafe quantities of uranium. Geometry, moderation, and interaction are the controls used to maintain criticality safety of this system.

In order for a criticality to be possible, multiple contingency events would need to occur simultaneously. Therefore, the double contingency principle is met and there are no AEFs identified for seal change, disassembly, and decontamination.

6.6 Maintenance of the Normetex Pump in C-720

Normetex pumps can be removed for maintenance due to equipment failure or routine maintenance. The pump will only be slightly contaminated since it is evacuated of UF_6 before it is removed from the withdrawal station. Even if the pump was not evacuated of UF_6 before removing it, the maximum UF_6 that could remain in the pump is well below a safe mass.

Administrative controls and passive barriers have been incorporated to prevent a criticality from occurring in the maintenance of Normetex pumps. Interaction is the primary control used to ensure criticality safety. Interaction between fissile material and the fissile material in the pump could make conditions favorable for a criticality. Criticality is also possible if there is uranium loading in the pump oil. The pump oil reservoir is an unfavorable geometry. A minimum spacing is required between the Normetex pump and items containing fissile material. A minimum spacing is also required between the waste drums containing fissile/potentially fissile material and any other material containing fissile/potentially fissile material. The number of waste drums which can be handled at a time in the Normetex pump maintenance area is limited.

In order for a criticality to be possible, multiple contingency events would need to occur simultaneously. Therefore, the double contingency principle is met and there are no AEFs identified for maintenance of Normetex pumps.

6.7 Process Motor Repairs

Due to the potential of uranium to be on the motors, repair of process motors will take place in either a contamination control zone or a contamination area.

Administrative controls have been incorporated to prevent a criticality from occurring in the repair of process motors. The primary criticality accident scenario is the potential accumulation of uranium material resulting from the process. Mass and enrichment are the controls used to ensure criticality safety. Uranium contaminated waste generated will be disposed of in a maximum 58-gal drum and labeled as "NCS Spacing Exempt" waste.

In order for a criticality to be possible, multiple contingency events would need to occur simultaneously. Therefore, the double contingency principle is met. There are no AEFs identified for repair of process motors.

6.8 General Machining of Contaminated Process Equipment in C-720

Process equipment is removed from the cascade if it fails or for other reasons needs repair or routine maintenance.

Administrative controls and passive barriers have been incorporated to prevent a criticality from occurring in the machining of contaminated process equipment. At the time equipment larger than favorable geometry is removed from the cascade, the mass of fissile material contained within the equipment is determined either by NDA measurement or estimated by visual inspection. The process equipment is categorized as either PEH or UH. If the analysis indicates a deposit greater than a safe mass, the equipment is categorized as PEH. See Section 1.2, Contaminated Equipment Removed from the Cascade, concerning PEH and UH handling requirements.

Potential accident scenarios involve accumulation of fissile material in unfavorable volume/geometry, machining equipment with significant contamination on a single component, or interaction between fissile material. A combination of limits on mass and interaction are used to ensure criticality safety.

In order for a criticality to be possible, multiple contingency events would need to occur simultaneously. Therefore, the double contingency principle is met and there are no AEFs identified for machining of contaminated process equipment.

6.9 Section Deleted

Uranium hexafluoride (UF_6) is the most abundant hazardous material on site. Chapter 4 provides an evaluation of accidents that involve the release of UF_6. The accident analysis considers both radiological and toxicological hazards from the UF_6 releases. The HF which evolves from a UF_6 release is considered as one of the effects of a UF_6 release and as such is addressed in Chapter 4.

5.6.13.3 Chemicals Addressed by Process Safety Management

A number of chemical processes are used at PGDP that are managed in accordance with the requirements of 29 CFR 1910.119. The PSM Program manages these hazardous chemicals in a manner that prevents impacts to workers or the public. PGDP has several chemicals on-site that are listed in the OSHA PSM standard including Cl_2, F_2, and ClF_3. Only Cl_2 and F_2 are used in amounts above the threshold quantity necessary to require implementation of the elements of the PSM standard. The facilities that are covered under PSM are listed below along with the nominal quantities present at each location.

- C-611-B Pre-chlorination Room (Cl_2) 8000 lbs.
- C-611-S Post-chlorination Room (Cl_2) 4000 lbs.
- C-631, C-635 RCW Pump Houses (Cl_2) 4000 lbs.
- C-633, C-637 RCW Pump Houses (Cl_2) 8000 lbs.
- C-745-A Cylinder Storage Yard (Cl_2) 16,000 lbs.
- C-410-D/K Complex (F_2) 2,490 lbs.
- C-745-A Cylinder storage Yard (F_2) 1,800 lbs.
- C-745-B Cylinder Storage Yard (F_2) 1,800 lbs.

In addition to the accident analysis described in Chapter 4, PSM Process Hazards Analyses (PHAs) are used to identify and manage chemical risks and impacts. Specific job-related risks and the technical and administrative control used for risk management are addressed in the PHAs.

Previously undisclosed or newly revealed chemical safety concerns identified by the PHA preparation process are processed through a 10 CFR 76.68 review for disposition of the concern. This 10 CFR 76.68 review will determine if new TSRs need to be developed.

5.6.13.4 Industrial Hygiene and Safety Program Managed Chemicals

Hazardous and toxic chemicals, not covered by the programs discussed in Sections 5.6.13.2 and 5.6.13.3, are effectively managed using industrial hygiene and safety (IHS) programs. For IHS program managed chemicals, there is no "threshold quantity" qualifier. To address these chemicals, the

IHS programs provide the necessary protective barriers and controls enabling safe use of these chemicals.

Commercial chemicals have varying toxicity and hazardous ranges and categories. Because chemicals can be used across the site in various manners, the IHS program applications to chemical safety are general in nature and based on industry accepted standards and regulatory requirements for controlling occupational exposures. To address the potential exposure risks associated with IHS program managed chemicals, PGDP uses chemical review programs, program procedures, and Material Safety Data Sheets (MSDSs). Implementation of these IHS programs provide employee protection from hazardous chemicals during daily operations and emergency response.

5.6.14 Multi-Occupancy of the PGDP Site

The creation of USEC resulted in a lease agreement with the Department of Energy (DOE). USEC leases from the DOE certain operating segments and certain support facilities of the original Gaseous Diffusion site. The remaining site sectors are used by DOE environmental restoration contractors and sub-contractors. Under article 5 of the lease, the DOE assumes liability for accidents and events caused by operations under their control. DOE has no obligation to inform USEC about hazardous chemicals under their control. DOE provides information through established communication channels regarding hazardous chemicals used by third parties present at PGDP that could impact PGDP nuclear operations.

5.6.15 Items Addressed by Compliance Plan

Section deleted.

6. ORGANIZATION AND OPERATING PROGRAMS

6.1 ORGANIZATION AND RESPONSIBILITY

Under the Energy Policy Act of 1992, the Nuclear Regulatory Commission (NRC) was required to establish a certification process to ensure that USEC complies with the standards established by NRC for the GDPs under 10 CFR Part 76. The Energy Policy Act provides that the requirement for a certificate of compliance shall be in lieu of any requirement for a license for the GDPs and that USEC shall apply for a certificate of compliance. The Act also requires that USEC and any contractor operating the GDPs for USEC provide the NRC with ready access to the facilities, personnel, and information that the NRC considers necessary to carry out its responsibilities for certification.

USEC is committed to conducting operations in a manner that protects the health and safety of workers and the public, protects the environment and provides for the common defense and security. In order to meet these commitments, as well as others required for operation of the uranium enrichment enterprise, USEC has issued an operations policy manual which contains statements of policy and procedures to guide the day-to-day business and provide direction to USEC employees. The USEC policy with respect to nuclear safety, safeguards and security states in part:

> "USEC is responsible for, and is committed to, safe operation, maintenance, modification, design, fabrication, and testing of the Portsmouth Gaseous Diffusion Plant ... and the Paducah Gaseous Diffusion Plant ... and is committed to conducting operations in a manner that protects the health and safety of workers and the public, protects the environment and provides for the common defense and security ... USEC has provided the management structure to ensure that the safety/safeguards policy is effectively implemented."

The operations organization is responsible for the safe operation of the GDP. Programs and staff organizations are established for safety, safeguards, quality, environmental and health areas and are provided with sufficient resources to support safe operation of the GDP.

USEC has established management systems with associated policies, administrative procedures, and management controls to ensure: the GDP equipment, facilities and procedures; the staff (including training and qualifications); and the programs provide for the protection of the health and safety of workers and the public, protection of the environment, and for the common defense and security. Management controls have been established to maintain the safety/safeguards basis of the GDP as described in this application. Organizations with environmental, health, safety, safeguards and quality responsibilities have been established with a reporting chain, independent from the operations organizations, to a senior manager, (Vice President, Operations, or Director, Corporate Security for Corporate Headquarters or General Manager for plant organizations).

The integration of the plant operations and the various programs and requirements is accomplished through a variety of management practices. Where frequencies are identified below, they represent current normal business practice but can be adjusted by the manager responsible for the meeting.

- Vice President, Operations, periodic officers and staff meeting, daily phone call with General Managers to discuss the overall status of the plants, problem and event reports, the daily production report, future plans, and other pertinent subjects.
- General Manager meets weekly with Plant Manager and Organization Managers to discuss issues and policy implementation.
- Monthly review of plant performance indicators.
- The Plant review and approval systems [particularly the function of the Plant Operations Review Committee (PORC)] for procedures, training, modifications/changes to the physical plant and/or plant programs as described in this application, provide for the integration of the various requirements and controls.
- Plant work permit systems provide the integration in the field of various health, safety, and environmental program requirements and hazard evaluations.

Figure 6.1-1 shows the USEC organization for operation of the GDPs. Managerial positions that have responsibilities important to safety and safeguards are described in this chapter; other managerial positions are described in those portions of the application where applicable, particularly in the Quality Assurance Program Description, Radioactive Waste Management Program Description, Emergency Plan, Fundamental Nuclear Material Control Plan, Security Plan for the Transportation of Special Nuclear Material of Low Strategic Significance, Physical Security Plan for the Protection of Special Nuclear Material of Low Strategic Significance, and the Security Plan for Classified Matter. Typically "Organization Managers" report to the Plant Manager or General Manager; "Group Managers" report to Organization Managers; and "Section Managers" report to Group Managers.

Section 6.1.1 describes the organizational commitments, relationships, responsibilities and authorities for the overall management system to assure the protection of the health and safety of the workers and the public, protection of the environment, and provide for the common defense. This section includes the qualifications, functions, responsibilities, and authorities of the positions in the organization assigned functions related to environmental, health, safety, safeguards and quality.

Section 6.1.2 describes the management controls for maintaining the environmental, health, safety, safeguards and quality programs, and the administrative systems to control relationships and interfaces between programs.

6.1.1 Organizational Commitments, Relationships, Responsibilities, and Authorities

USEC is committed to the safe operation of the GDP and has provided the management structure to ensure that the safety/safeguards policy is effectively implemented. The management structure provides for line responsibility for safe operations with sufficient staff support to develop, communicate, and provide technical programs for various environmental, health, safety, safeguards and quality areas. The organization of various support staff are provided in the description of the environmental, health, safety, safeguards and quality areas.

USEC provides direction and management of GDP operations. Policy and program direction is provided through the Director, Regulatory Affairs. The Regulatory Affairs Manager, who provides direction for the site environmental programs, and the Health and Safety Manager who provides direction for safety and health programs, have direct access to the General Manager for matters relating to those programs. These individuals are independent from day-to-day production, plant operating cost, and production scheduling considerations. Also, the Nuclear Safety and Quality Manager (located on-site) who reports to the Vice President, Operations, provides oversight and assurance that corporate policies and procedures are being followed in operation of the plant.

The General Manager directs and oversees site activities to ensure safe, reliable, and efficient operations. The Plant Manager reports to the General Manager and directs and coordinates the production plant operation in accordance with policies as reflected in plant procedures and practices. The production line organizations and related support and services organizations report to the Plant Manager and have responsibilities for implementation of safety and safeguards policies and procedures in daily operations. The on-duty PSS reports to the Shift Operations Manager and provides direction and coordination for shift operations. The Shift Operations Manager reports to the Operations Manager. The staff and support organizations report to the General Manager and provide program direction and support to the production line in implementing safety and safeguards requirements.

Personnel minimum qualifications, functions and responsibilities for key staff positions are described below. Throughout this section, equivalent technical experience means the substitution of 2 years of nuclear industry experience for each year of college up to a total of 3 years. Additionally, 30 semester hours or 45 quarter hours from an accredited college or university may be substituted for the remaining 1 year of baccalaureate education. Individuals who do not possess the formal educational requirements specified in this section or do not meet the equivalent technical experience defined above shall not be automatically eliminated where other factors provide sufficient demonstration of their abilities to fulfill the duties of a specific position. These other factors must clearly demonstrate proficiency in the technical area for which the position will be responsible, for example, a license or certification, documented completion of relevant training, or previous experience in the same position at another facility. These other factors shall be evaluated on a case-by-case basis, documented, and approved by the General Manager or appropriate Headquarters management, with the consultation of the human resources organization.

6.1.1.1 Section Deleted

6.1.1.2 Vice President, Operations

The Vice President, Operations, reports to the Senior Vice President, Uranium Enrichment.

The Vice President, Operations, has overall responsibility for safe operations of the GDPs including packaging and transportation of radioactive material. The Vice President, Operations, is authorized to direct the General Manager to take any specific action, including but not limited to, placing all or any portion of one or both GDPs in a safe condition, in order to ensure health and safety of workers and the public, protection of the environment, safeguards (nuclear material control and accountability), and to achieve or maintain compliance with applicable regulatory requirements. In addition, the Vice President,

6.1.1.3 Director, Regulatory Affairs

The Director, Regulatory Affairs, located at headquarters, reports to the Vice President, Operations.

This position has responsibility for the management of nuclear regulatory functions and the corporate policy system. This individual is also responsible for development and management of corporation-wide environmental and waste management policies. This individual is the primary day-to-day interface with the NRC Office of Nuclear Materials Safety and Safeguards (NMSS) and has overall responsibility for management of activities related to certification of the GDPs. Although this individual works closely with the General Manager and key plant personnel, he/she is independent from production, plant operating cost, and production schedule concerns, and has the authority to stop work if there is a failure to adhere to regulatory requirements within his/her area of responsibility. The plant Regulatory Affairs Manager reports to the General Manager but is governed by and must adhere to policies established by the Director, Regulatory Affairs.

This position shall have as a minimum a bachelors degree or equivalent technical experience, and four years of nuclear management experience. This individual is appointed by the Vice President, Operations.

6.1.1.4 Section Deleted

6.1.1.5 Director, Corporate Security

The Director, Corporate Security, located at headquarters, reports to the Senior Vice President, Human Resources and Administration.

This position has overall responsibility for the security of the plant site and implementation responsibility for all USEC security activities. The Director, Corporate Security is authorized to direct the plant Security Manager to take any specific action in order to ensure plant security and to achieve or maintain compliance with applicable regulatory requirements. This position is independent from production, plant operating costs, and production schedule concerns and has stop work authority if there is a failure to adhere to regulatory requirements within the security area.

This position shall have as a minimum a bachelor's degree or equivalent technical experience and four years of security management experience. This individual is appointed by the Senior Vice President, Human Resources and Administration.

6.1.1.6 Section Deleted

6.1.1.7 Nuclear Safety and Quality Manager

The Nuclear Safety and Quality Manager, located at the plant, reports to the Vice President, Operations.

The Nuclear Safety and Quality Manager has the responsibility to exercise oversight of plant operations to ensure that the health and safety of the public and workers are adequately protected, to ensure compliance with safety, safeguards, and quality requirements, and to ensure implementation of policies, procedures and management expectations. The Nuclear Safety and Quality Manager is also responsible for nuclear material control and accountability and quality control, including receipt inspection of material and inspection of other selected safety-related activities.

The Nuclear Safety and Quality Manager is independent from production, plant operating cost, and production schedule concerns, and has authority to shut down operations and/or stop work when necessary to ensure protection of public and worker health and safety and provide for common defense and security and to ensure regulatory or quality compliance. This manager has access to all information at the site related to safety, safeguards and quality. This manager interacts directly with the General Manager, other managers, and key plant personnel and participates, as desired, in any evaluations or discussions related to safety, safeguards and quality. This manager informs the Vice President, Operations and the General Manager about safety, safeguards, and quality issues and compliance. This manager manages the Nuclear Safety and Quality Office and directs plant quality assurance functions involving audits and oversight of plant operations as well as a nuclear safety assurance function.

The Nuclear Safety and Quality Manager primarily works the office shift, but periodically observes plant operations performed on backshifts. This manager is on-call and is notified by the Plant Shift Superintendent's office of reportable events per plant procedures. This notification occurs on all shifts.

The Nuclear Safety and Quality Manager shall have as a minimum a technical degree and 15 years nuclear experience with 3 years of management experience in quality assurance, nuclear safety oversight, engineering and technical support, or regulatory affairs. Either the Nuclear Safety and Quality Manager or a management position responsible for quality assurance that reports to the Nuclear Safety and Quality Manager shall have a minimum of one year quality assurance experience or one year experience implementing quality assurance program requirements.

The Nuclear Safety and Quality Manager is appointed by the Vice President, Operations.

6.1.1.8 Section Deleted

6.1.1.9 General Manager

The General Manager reports to the Vice President, Operations.

The General Manager is responsible for the safe operation of the plant, for compliance with all applicable NRC regulatory requirements, and for adherence to applicable policies. The General Manager is responsible for production, training, procedures, emergency management, fire services, medical services, records management and document control, engineering, transportation, materials handling and storage, shared site programs, and occupational, environmental, and nuclear safety.

Day-to-day authority and accountability for production, production support, training, procedures, fire services, records management and document control activities is assigned to the Plant Manager. The General Manager has responsibility for the primary day-to-day interface with NRC on matters of adequate safety/safeguards and regulatory compliance, and may delegate responsibility for that interface to the Regulatory Affairs Manager.

The General Manager has shut down and stop work authority for all or any portion of the plant (leased facilities). The General Manager shall be responsible to authorize restart of shutdown operations and must obtain concurrence of the Vice President, Operations, for any operations that were directed to be shut down by the Vice President, Operations or by the Nuclear Safety and Quality Manager.

The General Manager shall have as a minimum a bachelors degree in engineering or the physical sciences or equivalent technical experience, six years of nuclear experience, and six years of management experience (which may be concurrent with the nuclear experience).

The General Manager is appointed by the Vice President, Operations.

6.1.1.10 Plant Manager

The Plant Manager reports to the General Manager.

The Plant Manager is responsible for the day-to-day production activities at the site including operations, maintenance, work control process, training, procedures, fire services, records management and document control, and production support. The Plant Manager shall be responsible for authorization of restart of shutdown operations but must seek concurrence from the General Manager for any operation that was shutdown by the General Manager, the Vice President, Operations or the Nuclear Safety and Quality Manager.

The Plant Manager is authorized to direct the security resources assigned to plant security by the Security Manager, as necessary, to ensure safe operation of the plant. In addition, the Plant Manager has stop work authority with respect to security operations.

The Plant Manager shall have as a minimum a bachelors degree in engineering or the physical sciences or equivalent technical experience, six years of nuclear experience, and six years of management experience (which may be concurrent with the nuclear experience).

The Plant Manager is appointed by the General Manager with concurrence by the Vice President, Operations.

6.1.1.11 Operations Manager

The Operations Manager reports to the Plant Manager.

The Operations Manager is responsible for the operation of the enrichment cascade, plant utilities, chemical services, feed and product facilities, shift operations, waste management, and fire services. This includes activities such as ensuring the correct and safe operation of the UF_6 processes; proper receipt, storage, handling and on-site transportation of UF_6; providing electric power, steam, compressed air, nitrogen, plant and sanitary water, waste water treatment for the cascade and support facilities; and providing chemical cleaning, waste handling, and

The Shift Operations Manager shall have as a minimum a bachelors degree or equivalent technical experience and four years nuclear experience, with at least six months at a GDP.

The Shift Operations Manager is appointed by the Operations Manager with concurrence by the Plant Manager, General Manager, and the Vice President, Operations.

6.1.1.17 Plant Shift Superintendent

The Plant Shift Superintendent reports to the Shift Operations Manager.

As the senior manager on shift, the Plant Shift Superintendent represents the General Manager and has the authority and responsibility to make decisions as necessary to ensure safe operations, including stopping work and placing the plant in a safe condition. The Plant Shift Superintendent is responsible for accumulation and dissemination of information regarding plant activities, serving as or designating the incident commander during plant emergencies and making notification of events.

The Plant Shift Superintendent is authorized to stop operations when system operability or the overall safety of operations is in question. The Plant Shift Superintendent is also authorized to initiate restart after shutdown for non-routine reasons. For shutdowns that are directed by the Vice President, Operations; Nuclear Safety and Quality Manager; the General Manager, or the Plant Manager; the Plant Shift Superintendent may authorize restart only after obtaining the approval of the Plant Manager (who will in turn obtain the necessary concurrence as described in Section 6.1.1.9).

The Plant Shift Superintendent shall have as a minimum a bachelors degree in engineering or the physical sciences or equivalent technical experience and 4 years experience at a GDP, or a high school diploma plus 12 years experience at a GDP.

The Plant Shift Superintendent is appointed by the Shift Operations Manager with concurrence by the Operations Manager, Plant Manager, and General Manager.

6.1.1.18 Engineering Manager

The Engineering Manager reports to the General Manager.

The Engineering Manager is responsible for engineering activities in support of operations, including project management, design, fabrication, and construction of plant modifications; systems engineering; nuclear criticality safety; nuclear safety (including implementation of the unreviewed safety question determination program and conducting assessments of program implementation); and the configuration management program. The Engineering Manager has stop work authority for any activity that would be or is in violation of the plant safety basis, the Technical Safety Requirements, or the requirements and assumptions of the accident analyses.

The Engineering Manager is the design authority for radioactive material packaging and transportation structures, systems, and components. As such, the Engineering Manager is responsible for the following:

1. Evaluation of supplier's technical capabilities and approval of technical dispositions, and technical evaluation of supplier-generated nonconforming material, equipment, or services.

2. Providing measures which ensure the proper selection, application, methods of acceptance, and use of commercial grade items when applicable.

3. Specifying requirements for handling, storage, shipping, cleaning, packaging, and on-site movement of S.C. items in specifications, drawings, instruction, procedures, procurement documents, and/or other appropriate documents.

4. Determining applicable special processes, providing technical requirements, review, and concurrence for special process procedures including the utilization and application of nondestructive examination procedures.

5. Providing technical criteria for testing and the evaluation and resolution of test deficiencies.

6. Providing documented technical justification for nonconforming items dispositioned "use-as-is" or "repair" and ensuring as-built records reflect accepted deviations as required.

The Engineering Manager shall have as a minimum a bachelors degree in engineering or the physical sciences and four years of nuclear experience with at least six months in a gaseous diffusion plant.

The Engineering Manager is appointed by the General Manager with concurrence by the Vice President, Operations.

6.1.1.19 Nuclear Criticality Safety Manager

The Nuclear Criticality Safety Manager reports to the Engineering Manager.

The Nuclear Criticality Safety Manager is responsible for developing and implementing the nuclear criticality safety program for the facility. These duties include technical oversight of nuclear criticality safety; nuclear criticality safety training; evaluation and approval of current and proposed changes to process conditions, equipment, and procedures involving fissile material operations; and conducting assessments of program implementation. The Nuclear Criticality Safety Manager has direct access to the General Manager concerning nuclear criticality safety matters and has stop work authority for any activity that could cause a criticality concern.

The Nuclear Criticality Safety Manager shall have as a minimum a bachelors degree in engineering or physical sciences, and four years nuclear criticality experience or nuclear engineering experience (e.g., core load design, fuel design, reactor engineering) with at least six months at a uranium processing facility where nuclear criticality safety was practiced.

The Nuclear Criticality Safety Manager is appointed by the Engineering Manager with concurrence by the General Manager.

6.1.1.20 GDP Procurement and Materials Manager

The GDP Procurement and Materials Manager is responsible for packaging and transportation and for receipt, delivery, storage, control, and on-site movement of packaging and transportation SSCs and hazardous chemicals under his cognizance to the point of issuance. This manager interacts directly with the General Manager, other managers and key plant personnel and participates as desired in any discussions related to procurement and materials management. The GDP Procurement and Materials Manager is appointed by and reports to the USEC Director of Procurement and Materials.

6.1.1.21 Selection Deleted

6.1.1.22 Security Manager

The Security Manager reports to the Director, Corporate Security.

The Security Manager is responsible for plant police services and security. The Security Manager reports directly to the Director, Corporate Security on matters of plant security operations and administration such as policies, training, staffing, personnel management, budgeting, etc. The Security Manager has stop work authority for activities not being conducted in accordance with applicable regulatory requirements. The Plant Manager is authorized to direct the security resources assigned to plant security by the Security Manager, as necessary, to ensure safe operation of the plant.

The Security Manager shall have as a minimum a bachelors degree or equivalent technical experience and four years security experience or four years nuclear experience.

The Security Manager is appointed by the Director, Corporate Security with concurrence by the Senior Vice President, Human Resources and Administration.

6.1.1.23 Fire Chief

The Fire Chief reports to the Shift Operations Manager and is governed by, and must adhere to, policies established by the General Manager.

The Fire Chief is responsible for plant fire services and has stop work authority for activities not being conducted in accordance with applicable fire protection requirements. The Fire Chief is the senior site fire protection officer.

The Fire Chief shall have as a minimum a bachelors degree or equivalent technical experience, four years of fire protection experience, and 6 months of nuclear experience.

The Fire Chief is appointed by the Operations Manager with concurrence by the Plant Manager and the General Manager.

6.1.1.24 Customer Service & Product Scheduling Manager

The Customer Service & Product Scheduling Manager reports to the Plant Manager.

The Customer Service & Product Scheduling Manager is responsible for the management of groups and personnel in several significant functions for customer order filling. The Customer Service & Product Scheduling Manager also serves as USEC's primary point of contact with the DOT and implements applicable NCS controls for Customer Service & Product Scheduling field activities.

The Customer Service & Product Scheduling Manager shall have as a minimum a bachelors degree in engineering or the physical sciences or equivalent technical experience, four years of management experience and five years of nuclear experience with at least six months in a gaseous diffusion plant.

The Customer Service & Product Scheduling Manager is appointed by the Plant Manager with concurrence by the General Manager and Vice President, Operations.

6.1.1.25 Regulatory Affairs Manager

The Regulatory Affairs Manager reports to the General Manager. The Regulatory Affairs Manager is governed by and must adhere to policies established by the Director, Regulatory Affairs.

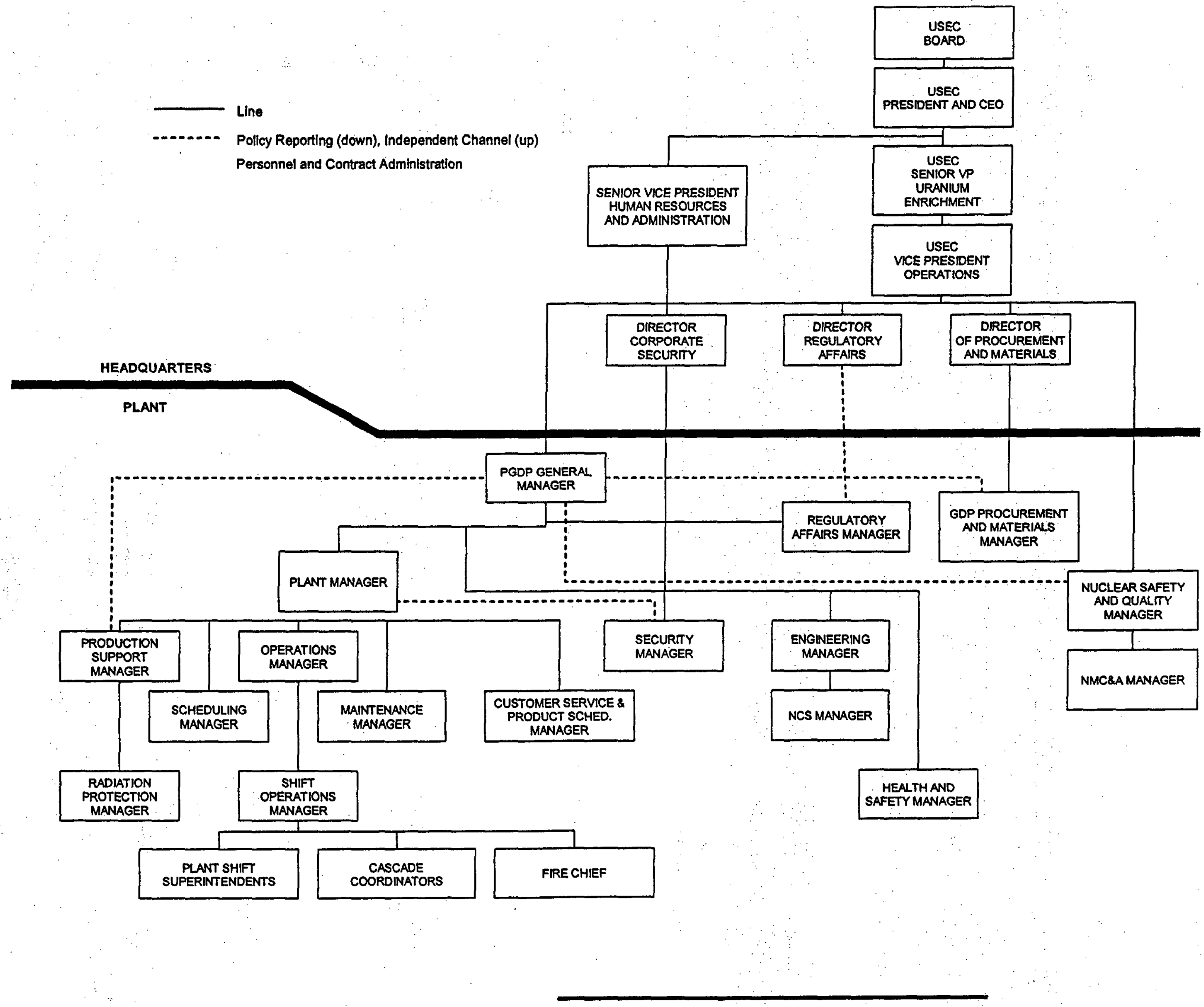

Figure 6.1-1. Uranium enrichment facilities organization chart.

Figure 6.1-2 deleted

6.5 OPERATIONS

This section describes personnel, practices, and key facilities associated with the continued operation of PGDP.

The site is large enough to provide a considerable buffer between the enrichment process and our rural neighbors. Plant operations are continuous with coordination of operations performed by the Plant Shift Superintendent (PSS) from a central control facility. The plant is protected on a continuous basis by fire services and security forces. Each significant building is equipped with fire alarms and water sprinklers as discussed in SAR Section 5.4.1.1. Emergency mutual assistance exercises are conducted biennially with the emergency forces of the state and of the surrounding communities.

There is a public warning system to alert neighbors in the event of any plant problem that might affect them. Spill control measures are in effect for all continuous liquid effluent discharge points. More information on waterborne effluent control is contained in SAR Section 5.1. There are also internal impoundment structures, spill control equipment, and monitoring stations with alarms. The principal toxic gases on the site are the uranium hexafluoride process gas, fluorine, chlorine trifluoride, chlorine, and hydrogen fluoride. Liquid hazardous chemicals include oil, nitric acid, sulfuric acid, and a variety of other chemicals in smaller amounts.

The plant is normally in one of three modes of operation, from a safety perspective.

Normal Operations

Most of the time is spent in normal operations; in this mode the following conditions apply:

- Operations are proceeding within expected parameters with no safety impacts from deviations,
- Technical Safety Requirements (TSRs) are in effect,
- Routine effluents or emissions are within permits and certificate conditions with no significant impact to the public or environment, and
- Personnel exposures are below 10 CFR 20 limits and OSHA requirements.

Off-normal (but not emergency) Operations

Occasionally, process upsets and/or equipment failures occur which result in "off-normal" conditions within localized areas of the plant; these "off-normal" modes are as follows:

- Small releases of UF_6 or other toxic gases (such as F_2, HF, ClF_3, Cl_2) that result in evacuation of the immediate area and monitoring for reentry, but do not affect other areas of operations of the plant and have no impact off site;
- Occupational safety injuries and/or illnesses with a response required to render aid or transport to the plant or off site medical facility;

- Small fires that are quickly extinguished;

- Unexpected radiological contamination that requires reporting of plant areas or additional employee protective measures.

These "off normal" conditions are managed by the PSS from the C-300 Plant Control Facility with involvement by plant shift emergency response and/or health physics personnel. It may involve call-in of Health and Safety personnel.

Emergency Operations

The third mode is an emergency, as described in the Emergency Plan, which involves an "Alert" or "Site Area Emergency" declaration and activation of the Emergency Operations Center.

The remainder of this section provides an overview of the major operating areas of PGDP with a brief discussion of the safety and safeguards risks and the controls and operational surveillances in place to manage these risks. A description of the plant and plant operations is provided in detail in Chapter 3; a detailed accident analysis and discussion of risks associated with plant operations is provided in Chapter 4.

6.5.1 Shift Operations

The gaseous diffusion process operates continuously. To support this continuous operation, a work force is required 24-hours per day.

The PGDP work force is divided into two primary groups, a day shift (management, support staff, service groups) working primarily Monday through Friday, and shifts that provide continuous coverage of plant operations. The day shift provides the administrative support, activities such as design and fabrication where continuation is not time constrained, procedure development, classroom training, planning, and preventive maintenance. Most of the plant staff is assigned to the day shift.

The shift organization has the prime responsibility for continued plant operation and the evolutions, exchange of information, and response to abnormal and unusual conditions necessary to ensure safe and efficient plant operation. Typical activities of the shift include provide oversight and direction for all plant operations, monitor systems and equipment for proper performance, conduct routine back shift maintenance and emergency equipment repair, prepare equipment for day shift repair/preventative maintenance functions, and respond to emergency situations.

Operational activities of the plant are controlled by the Plant Shift Superintendent (PSS) whose normal watch station is in the C-300 Central Control Facility (CCF). The PSS reports directly to the Shift Operations Manager. Upon recognition of an emergency, the PSS or other qualified individual responds to the scene as Incident Commander. The PSS serves as Crisis Manager during a classified emergency (Alert or Site Area Emergency) until relieved by a manager designated in the emergency line of executive succession when the Emergency Operations Center becomes operational. Emergency command and control is described in the Emergency Plan.

The CCF is the hub of the plant operational activity. The overall UF_6 enrichment process is monitored at this location. Key plant operations can be performed remotely from the CCF, key alarm systems are monitored, and plant communications systems as well as off-site communications capabilities

EMERGENCY PLAN
LIST OF EFFECTIVE PAGES

Pages	Revision	Pages	Revision
iii	105	2-4	2
iv	103	2-5	2
v	38	2-6	3
vi	103		
vii	8	3-1	46
viii	51	3-2	83
ix	51	3-3	8
x	21	3-4	8
xi	51	3-5	60
xii	2	3-6	1
1-1	60	4-1	100
1-2	81	4-2	100
1-3	105	4-3	105
1-4	2	4-4	103
1-5	84	4-5	51
1-6	2	4-6	68
1-7	81	4-7	2
1-8	60	4-8	60
1-9	26	4-9	60
1-10	26	4-10	1
1-11	26	4-11	21
1-12	1	4-12	3
1-13	1		
1-14	1	5-1	103
1-15	21	5-2	8
1-16	1	5-3	8
1-17	98	5-4	2
1-18	1	5-5	2
1-18a	85	5-6	73
1-18b	38	5-7	24
1-19	2	5-8	21
1-20	1	5-9	2
1-21	2	5-10	44
1-22	1	5-11	44
1-23	14	5-12	1
1-24	1	5-13	8
		5-14	1
2-1	2		
2-2	2	6-1	51
2-3	105	6-2	51
		6-3	98

EMERGENCY PLAN - LIST OF EFFECTIVE PAGES (Continued)

- Fluorine (F_2) is a poisonous gas and oxidizer that is used to passivate metal surfaces prior to exposure to UF_6 and for cell treatment on an as-needed basis. F_2 is purchased and stored in multi-tube trailers that contain a high pressure gas mixture that is composed of 20 percent F_2 and 80 percent nitrogen (N_2) by moles. A multi-tube trailer nominally contains 1800 lbs of F_2 contained in 8 separately isolated tubes (i.e., nominally 225 lbs of F_2/tube) at a nominal pressure of 2000 psig. One nominally full and one nominally empty (i.e., heeled) multi-tube trailer may be stored in both the C-745-A and C-745-B storage yards. A multi-tube trailer at C-410-K and the three nominally 1000 ft^3 storage tanks in C-410-D are used to feed the F_2 distribution header in C-410-D.

- Chlorine (Cl_2) is a poisonous gas used for water and sewage treatment. An important function of the water treatment process is prechlorination for removal of disease-carrying organisms. Cl_2 is purchased and stored in 1-ton containers and 150 lb cylinders. One-ton chlorine containers are used in building C-611 water treatment plant (6 total containers) and in buildings C-631, C-633, C-635, and C-637 water treatment pump houses and appurtenant structures (12 cylinders total). Eight one-ton containers are normally stored in the C-745-A cylinder storage yard. The quantity of chlorine kept at C-615 is administratively controlled below the 29 CFR 1910.119, Appendix A, process threshold quantity. A maximum of six 150-lb cylinders are stored and used at the building C-615 sewage treatment plant.

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1.2 DESCRIPTION OF FACILITY AND SITE

The Paducah Gaseous Diffusion Plant is located at latitude 37°06′49″ N. and longitude 88°47′39″ W. measured at the center of the plant, on a 3,423-acre tract in McCracken County, Kentucky. The site is generally in a rural area and was previously part of the Kentucky Ordnance Works. Approximately 2079 acres of the site are leased to the Kentucky Department of Fish and Wildlife Resources. The largest cities within a 50-mile radius are Paducah, Kentucky, located approximately 12 miles to the east, and Cape Girardeau, Missouri, located approximately 40 miles to the west. Portions of 28 counties are located within a 50-mile radius of the plant. Of the 28, 11 are in Kentucky, 4 are in Missouri, 10 are in Illinois, and 3 are in Tennessee. Figure 1-1 shows the regional area surrounding PGDP. The general location is an area of low relief with elevations predominantly below 500 ft. The region contains many rivers and streams. The largest rivers in the area are the Mississippi to the west, the Ohio to the north, and the Tennessee and the Cumberland to the east. The plant site and surrounding area elevations vary from 290 ft above sea level at the Ohio River to 380 ft above sea level at the plant site 3.6 miles away. The average slope of 23.7 ft/mile is typical of both the immediate vicinity and the region south of the Ohio River.

There are no institutional or residential structures within the plant property, nor are any military installations located near the site. DOE is engaged in numerous activities related to decommissioning and decontamination both within the fenced plant protected area and on the surrounding DOE reservation.

Roadways within the fenced, limited access or protected area of the plant consist of approximately 23 miles of paved surface. Several paved roads branch to the periphery of the plant area. Water Works Road extends from the southwestern corner of the secured area west to the water treatment plant. The plant access road extends from the main plant entrance to Kentucky Highway 1154 (Woodville Road), which in turn connects with U.S. 60. One intersection exists on the plant entrance road. At this location, South Acid Road leads to the west, and Dykes Road wraps around the eastern side of the plant. Dykes Road and McCaw Road, which enters the area from the east, are access routes for shipments to and from the toll enrichment facility, C-360.

Rail is a means used for cylinder movements and coal shipments. The existing rail system is approximately 17 miles in length. The rail spur enters the site west of C-720 and branches to several areas inside the fence. With the exception of the metals plant (C-340) and the water treatment plant (C-611), all the process buildings and most of the support facilities have direct rail service.

No rivers or major streams traverse the plant area. However, two small tributaries of the Ohio River, Little Bayou Creek on the east and Big Bayou Creek on the west, provide surface drainage from the PGDP site. These creeks have little flow other than treated effluents from the plant except during the wetter months of the year. The two streams join north of the site and discharge to the Ohio River. An extensive system of dikes and inverted pipe dams are in place to contain on-site spills of hazardous substances that might otherwise enter these waterways. Cooling water for plant processes is taken from the Ohio River and discharged through Big Bayou Creek.

PGDP is situated on a fenced 748-acre (limited access area) site, which is part of the 3422.95-acre DOE reservation as shown in Figures 1-2 and 1-3. More than 115 buildings and structures are located at PGDP accounting for a cumulative gross floor area of 8,183,718 ft^2. Process buildings C-333 and C-337 contain the most space, each having a gross area of 2,130,120 ft^2. Figure 1-3 shows the plant layout at PGDP. The plant includes six major process buildings, a series of electrical switchyards, storage areas, cooling towers, a steam plant, a water treatment plant, a sewage disposal plant, a pollution abatement facility, service and maintenance buildings, and facilities for administration, medical, fire, and security.

The plant contains four large process buildings, which are referred to as the cascade buildings. These are designated C-331, C-333, C-335, and C-337. Two small buildings, C-310 and C-315, are referred to as the purge and product withdrawal building and the surge and waste building, respectively. Some of the instruments and controls in these buildings are duplicated in the C-300 Central Control Facility (CCF). This facility also contains the Emergency Operations Center (EOC) and the headquarters of the Plant Shift Superintendent (PSS). A description of the cascade/process buildings and key support buildings is as follows:

The four main process buildings are grouped in two pairs, C-331 and C-333 and C-335 and C-337, which are located in the eastern portion of the plant site. Such a grouping permits easy connection of the multitude of overhead and underground piping and service lines required between the process buildings. The purpose of the process buildings is to house the equipment and much of the support systems necessary for the isotopic separation of uranium. Buildings C-331 and C-335 are essentially identical, as are C-333 and C-337.

2.1.4 HNO_3 Release

Nitric acid is stored in the C-400 area and is used for miscellaneous chemical operations and maintenance activities. Nitric acid is volatile and corrosive. In the worst-case scenario, serious injuries or fatalities could occur on-site, sheltering citizens in the path of the plume would greatly mitigate the consequences at the DOE reservation boundary, and beyond.

2.1.5 F_2 Release

Fluorine is delivered to C-745-A, C-745-B or C-410-K and fed to storage tanks in the C-410-D and C-350 buildings. Fluorine is used to pacify metal surfaces prior to exposure to UF_6 and for cell treatment on an as-needed basis. Fluorine is a poisonous gas and readily combines with water vapor to form HF. In the worst-case scenario, serious injuries or fatalities could occur on-site, at the DOE reservation boundary, and beyond. Sheltering citizens in the path of the plume would greatly mitigate the consequences.

2.1.6 Cl_2 Release

Chlorine is used in water and sewage treatment. One-ton chlorine containers are used in building C-611 water treatment plant and in buildings C-631, C-633, C-635, and C-637 water treatment pump houses and appurtenant structures. One-ton containers are stored in the C-745-A storage yard. Cylinders (150 lb) are stored and used at the building C-615 sewage treatment plant. A cylinder or container rupture could release Cl_2 gas, and the resulting plume could be carried off-site. In the worst-case scenario, serious injuries or fatalities could occur on-site, at the DOE reservation boundary, and beyond. Sheltering citizens in the path of the plume would greatly mitigate the consequences.

2.1.7 *Section Deleted*

2.1.8 HCl

HCl is delivered to building C-400 and stored in a 17,000 gallon tank consisting of two 8,500 gallon sections. A diluted solution of HCl (less than 30 percent) is used in the cleaning process after degreasing. Due to the volatility and corrosive nature of the material, releases could result in personal injuries or fatalities on-site, but would pose no hazard to off-site populations.

2.1.9 Other Nonradioactive Hazardous Material Releases

Other nonradioactive hazardous materials releases from off-site sources, such as highway or rail accidents, may pose a threat to the safety of personnel and impact plant operations and activities.

2.1.10 Natural Phenomena and Fire

Natural phenomena, such as earthquakes, tornadoes, severe storms, and fires, may cause varying degrees of damage to the plant. These also may result in a nuclear criticality or hazardous material release or potential for release as described earlier in this section.

2.1.11 Security-Related Events

Security-related events, such as bomb threats, civil disturbances, extortion, and hostage taking, could also result in personal injuries or fatalities to on- and off-site personnel.

2.2 DETECTION OF ACCIDENTS AND OTHER EMERGENCIES

The CCF is located in Building C-300, which also houses the PSS, cascade coordinator, and operators. Its function is to monitor, coordinate, or control critical plant processes, power distribution, utilities, communications, plant alarm systems, and emergency operations.

Area Control Rooms (ACRs) in the major process buildings, C-331, C-333, C-335, and C-337, permit operators to monitor process equipment, make changes in operations, and take corrective action to mitigate abnormal operating conditions. In addition to the ACR, most areas in the process buildings have process monitoring panels that provide audible and visual alarms.

Systems are designed to ensure that the consequences of a major malfunction are mitigated prior to any adverse effect on the plant population and the general public. These include UF_6 detection equipment and associated alarms, a criticality accident alarm system (CAAS), automatic sprinkler systems, various chemical detectors, and other alarm systems. Operations personnel stationed locally, in the ACRs, and in the CCF continuously observe alarm systems. Descriptions follow of the various alarms and detection methods for the hazards that have been analyzed.

Personnel within the protected area fence report emergencies and emergency requests for assistance to the CCF in Building C-300 by plant radio or telephone as described in EPIPs. This reporting mechanism is also available to DOE contractor personnel located anywhere on the DOE reservation, as provided for in a separate site agreement.

2.2.1 Nuclear Criticality

Previous plant analyses show the risk associated with inadvertent criticality is extremely low. Although considered to be very unlikely, analyses of possible criticality incidents reveal that both a fast-burst type reaction and a low-power incident have little effect on personnel except those in the immediate vicinity of the incident.

Criticality alarms are installed in facilities containing fissile material as described in Section 5.2 of the SAR. The criticality detection system consists of locator clusters and an alarm system. When a criticality accident alarm activates, a radiation alarm is generated, which actuates building local horns and

4.1.12 Nuclear Safety and Quality Manager

The Nuclear Safety and Quality Manager is responsible for implementing and directing independent assessments, quality control, nuclear material control and accountability, and nuclear safety assurance.

4.1.13 Section Deleted

4.1.14 On-Duty PSS

As the senior manager on shift, the on-duty PSS represents the General Manager and managers and has the authority and responsibility to make decisions as necessary to ensure safe operation, including stopping work and placing the plant in a safe condition.

The on-duty PSS is responsible for making proper notification in regard to abnormal plant conditions, determining the severity of the event, declaring an emergency, and initiating appropriate response. The on-duty PSS may respond to an incident scene as the on-scene incident commander or dispatch other qualified individual in this capacity. The on-duty PSS is the crisis manager until relieved by a member of management designated in the emergency line of executive succession.

4.1.15 Section deleted.

4.1.16 GDP Procurement and Materials Manager

The GDP Procurement and Materials Manager is responsible for managing the projects, programs, and the activities related to packaging and transportation, material control, stores, shipping and receiving, and property disposition.

4.1.17 Nuclear Criticality Safety Manager

The Nuclear Criticality Safety Manager is responsible for implementing the nuclear criticality safety program. This position reports to the Engineering Manager.

4.1.18 Scheduling Manager

The Scheduling Manager is responsible for production maintenance work scheduling.

4.2 ON-SITE EMERGENCY RESPONSE ORGANIZATION

The Emergency Response Organization (ERO) is responsible for taking immediate mitigative and corrective actions to minimize the consequences of an incident to workers, public health and safety, and the environment. The ERO is staffed with trained personnel who respond to events and are required to participate in formal training, drills, and exercises. The incident type and severity dictate the level of ERO activation.

The ERO has the following specific functions and responsibilities, depending on the incident and level of response needed to mitigate the problem: event categorization, determination of emergency class, notification, protective action recommendations, management and decision making, control of on-site emergency activities, consequence assessment, protective actions, medical support, public information, activation and coordination of on-site response resources, security, communications, administrative support, and coordination and liaison with off-site support and response organizations.

The ERO is divided into functional groups as follows:

1. Plant Emergency Squad,
2. EOC cadre, and
3. Joint Public Information Center (JPIC).

Members of these groups are assigned to on-scene response locations and emergency response centers, such as the EOC. Emergency assignments correspond as closely as possible to daily duties. Primary and alternate personnel are assigned to the ERO positions. Assignments are updated periodically. Management ERO positions in each group provide oversight and final authority in the group's decision-making process.

4.2.1 Direction and Coordination

The initial ERO consists of the plant emergency squad with the PSS, or other qualified individual as incident commander (IC) at the scene. Upon classification of the emergency as an Alert or SAE, the PSS becomes the CM and maintains overall control of the plant during the emergency until relieved. When the EOC is operational, a manager designated in the emergency line of executive succession relieves the PSS as CM and the overall control of the emergency shifts from the PSS to the CM.

The PSS conducts transition and turnover of command and control authority and responsibility of the CM function in a formal manner by use of specially developed procedural checklists and, if possible, face-to-face briefings. A primary and alternates are identified for the CM.

The order of succession for the CM position is identified in an EPIP and includes the following:

1. PSS
2. General Manager
3. Plant Manager
4. Others as designated by the General Manager and trained and qualified as CM