70-7002

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JAMES H. MILLER
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April 15, 1997

Dr. Carl J. Paperiello
Director, Office of Nuclear Material
Safety and Safeguards
Attention: Document Control Desk
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555-0001

SERIAL: GDP 97-0058

Portsmouth Gaseous Diffusion Plant (PORTS)
Docket No. 70-7002
1997 Annual Update to Certification Application

Dear Dr. Paperiello:

In accordance with 10 CFR 76.68(b), the United States Enrichment Corporation (USEC) hereby submits twenty (20) copies of the 1997 Annual Update to the certification application documents for the Portsmouth, Ohio Gaseous Diffusion Plant. The 1997 Annual Update includes the following documents:

- Revision 8, April 15, 1997, to USEC-02, Application for United States Nuclear Regulatory Commission Certification, Portsmouth Gaseous Diffusion Plant.

- Revision 4, April 15, 1997 to DOE/ORO-2027, Plan for Achieving Compliance with NRC Regulations at the Portsmouth Gaseous Diffusion Plant (Compliance Plan).

The 1997 Annual Update includes changes to the Certification Application and the Compliance Plan that were implemented during the period August 13, 1996 to March 2, 1997. Revision bars are provided in the right-hand margin to identify changes. Copies of the 10 CFR 76.68(a) evaluations for these changes are available at the site for review.

Revision 8 of the Fundamental Nuclear Materials Control Plan and Transportation Security Plan, and Revision 4 of Issue A.4 of the Compliance Plan, contain certain trade secrets and commercial and

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financial information exempt from public disclosure pursuant to Section 1314 of the Atomic Energy Act of 1954 (AEA), as amended, and 10 CFR 2.790 and 9.17(a)(4). In accordance with 10 CFR 76.33(e) and 2.790(b), the 1997 Annual Update to these plans is being submitted under separate cover (USEC Letter GDP97-0059).

The Physical Protection Plan and Classified Matter Protection Plan, prepared pursuant to 10 CFR 76.35(j), contain National Security Information and/or Restricted Data. These documents are also considered to be proprietary commercial and financial information pursuant to 10 CFR 2.790(d)(1). In accordance with 10 CFR 76.33(e), 2.790(b), 95.37, and 95.39, Revision 8 to these plans are being submitted under separate cover (USEC Letter GDP97-0060).

Should you have any questions or comments on the 1997 Annual Update, please call me at (301) 564-3309 or Steve Routh at (301) 564-3251.

Sincerely,

James H. Miller
Vice President, Production

Attachments:

1. USEC-02, Application for United States Nuclear Regulatory Commission Certification, Portsmouth Gaseous Diffusion Plant, Revision 8, Copy Numbers 1 through 20
2. DOE/ORO-2027, Plan for Achieving Compliance with NRC Regulations at the Portsmouth Gaseous Diffusion Plant, Revision 4, 20 copies

cc:	NRC Region III Office	USEC-02 Copy Nos. 21, 172
	NRC Resident Inspector - PGDP	USEC-02 Copy No. 22
	NRC Resident Inspector - PORTS	USEC-02 Copy No. 23
	Mr. Joe W. Parks (DOE)	USEC-02 Copy Nos. 24 through 28

OATH AND AFFIRMATION

I, James H. Miller, swear and affirm that I am Vice President, Production, of the United States Enrichment Corporation (USEC), that I am authorized by USEC to sign and file with the Nuclear Regulatory Commission the 1997 Annual Update (Revision 8, April 15, 1997, to USEC-02, Application for United States Nuclear Regulatory Commission Certification, Portsmouth Gaseous Diffusion Plant; Revision 4, April 15, 1997, to DOE/ORO-2027, Plan for Achieving Compliance with NRC Regulations at the Portsmouth Gaseous Diffusion Plant), 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.

James H. Miller

Subscribed to before me on this 15 day of April, 1997.

Bernice R. Lawson

Notary Public

BERNICE R. LAWSON
NOTARY PUBLIC STATE OF MARYLAND
Certificate filed in Montgomery County
Commission Expires August 1, 1997

LIST OF EFFECTIVE PAGES - VOLUME 1 LIST OF EFFECTIVE PAGES

INTRODUCTION - LIST OF EFFECTIVE PAGES

VOLUME 1 TABLE OF CONTENTS - LIST OF EFFECTIVE PAGES

Pages	Revision	Pages	Revision
i	3	xviii	4
ii	3	xix	3
iii	3	xx	3
iv	3	xxi	3
v	3	xxii	3
vi	3	xxiii	3
vii	4	xxiv	3
viii	3	xxv	3
ix	3	xxvi	3
x	3	xxvii	3
xi	3	xxviii	3
xii	3	xxix	3
xiii	3	xxx	3
xiv	3	xxxi	3
xv	3	xxxii	3
xvi	3		
xvii	3		

DEFINITIONS - LIST OF EFFECTIVE PAGES

Pages	Revision	Pages	Revision
1	2		
2	2		
3	3		
4	1		

CHAPTER 1 LIST OF EFFECTIVE PAGES

CHAPTER 2 LIST OF EFFECTIVE PAGES

Pages	Revision
2.1-1	1
2.1-2	8
2.1-3	3
2.1-3a	3
2.1-3b	2
2.1-4	1
2.1-5	1
2.1-6	1
2.1-7	2
2.1-8	1
2.1-9	1
2.1-10	1
2.1-11	8
2.1-12	1
2.1-13	8
2.1-14	8
2.1-15	8
2.1-15a	8
2.1-15b	8
2.1-16	8
2.1-17	8
2.1-18	8
2.1-19	8
2.1-20	8
2.1-20a	8
2.1-20b	8
2.1-21	1
2.1-22	1
2.1-23	1
2.1-24	1
2.1-25	1
2.1-26	1
2.2-1	1
2.2-2	1
2.3-1	1
2.3-2	1
2.3-3	1
2.3-4	1
2.3-5	2
2.3-6	1
2.3-7	1
2.3-8	1
2.3-9	1
2.3-10	1
2.3-11	1
2.3-12	1
2.3-13	1
2.3-14	1
2.3-15	1
2.3-16	1
2.3-17	1
2.3-18	1
2.3-19	1
2.3-20	1
2.4-1	1
2.4-2	1
2.4-3	1
2.4-4	1
2.4-5	1
2.4-6	1
2.4-7	1
2.4-8	1
2.4-9	1
2.4-10	1
2.4-11	1
2.4-12	1
2.4-13	1
2.4-14	1
2.4-15	1
2.4-16	1
2.4-17	1
2.4-18	1
2.4-19	1
2.4-20	1
2.4-21	1
2.4-22	1
2.5-1	1
2.5-2	1
2.5-3	1
2.5-4	1

LIST OF EFFECTIVE PAGES (Continued)

Pages	Revision
2.5-5	1
2.5-6	1
2.5-7	1
2.5-8	1
2.5-9	1
2.5-10	1
2.5-11	1
2.5-12	1
2.5-13	1
2.5-14	1
2.5-15	1
2.5-16	1
2.5-17	1
2.5-18	1
2.5-19	1
2.5-20	1
2.5-21	1
2.5-22	1
2.6-1	2
2.6-2	1
2.6-3	1
2.6-4	1
2.6-5	1
2.6-7	1
2.6-8	1
2.6-9	1
2.6-10	1
2.6-11	1
2.6-12	1
2.6-13	1
2.6-14	1
2.6-15	1
2.6-16	1
2.6-17	1
2.6-18	1
2.6-19	1

Pages	Revision
2.6-20	1
2.6-21	1
2.6-22	1
2.6-23	1
2.6-24	2
2.6-25	2
2.6-26	1
2.6-27	1
2.6-28	1
2.7-1	3
2.7-2	1
2.8-1	1
2.8-2	1
2.8-3	1
2.8-4	1
2.8-5	1
2.8-6	1

CHAPTER 3 LIST OF EFFECTIVE PAGES

LIST OF EFFECTIVE PAGES (Continued)

LIST OF EFFECTIVE PAGES (Continued)

Pages	Revision	Pages	Revision
3.1-147	1	3.1-189	3
3.1-148	1	3.1-190	3
3.1-149	3	3.1-191	8
3.1-150	3	3.1-192	1
3.1-151	1	3.1.193	1
3.1-152	1	3.1-194	1
3.1-153	1	3.1-195	1
3.1-154	1	3.1-196	1
3.1-155	1	3.1-197	8
3.1-156	1	3.1-198	1
3.1-157	1	3.1-199	1
3.1-158	1	3.1-200	1
3.1-159	1	3.1-201	8
3.1-160	1	3.1-202	1
3.1-161	3	3.1-203	1
3.1-162	1	3.1-204	1
3.1-163	1	3.1-205	1
3.1-164	1	3.1-206	1
3.1-165	1	3.1-207	1
3.1-166	1	3.1-208	1
3.1-167	1	3.1-209	1
3.1-168	1	3.1-210	1
3.1-169	1	3.1-211	1
3.1-170	1	3.1-212	1
3.1-171	1	3.1-213	1
3.1-172	3	3.1-214	1
3.1-173	2	3.1-215	1
3.1-174	1	3.1-216	1
3.1-175	1	3.1-217	1
3.1-176	1	3.1-218	1
3.1-177	1	3.1-219	1
3.1-178	1	3.1-220	1
3.1-179	1	3.1-221	1
3.1-180	1	3.1-222	1
3.1-181	1	3.1-223	1
3.1-182	1	3.1-224	1
3.1-183	1	3.1-225	1
3.1-184	1	3.1-226	1
3.1-185	1	3.1-227	1
3.1-186	1	3.1-228	1
3.1-187	3	3.1-229	1
3.1-188	1	3.1-230	1

LIST OF EFFECTIVE PAGES (Continued)

Pages	Revision	Pages	Revision
3.1-231	1	3.1-273	1
3.1-232	1	3.1-274	1
3.1-233	1	3.1-275	1
3.1-234	1	3.1-276	1
3.1-235	1	3.1.277	1
3.1-236	1	3.1-278	1
3.1-237	1	3.1-279	1
3.1-238	1	3.1-280	1
3.1-239	1	3.1-281	1
3.1-240	1	3.1-282	1
3.1-241	1	3.1-283	1
3.1-242	1	3.1-284	1
3.1-243	1	3.1-285	1
3.1-244	1	3.1-286	1
3.1-245	1	3.1-287	1
3.1-246	1	3.1-288	1
3.1-247	1	3.1-289	1
3.1-248	1	3.1-290	1
3.1-249	1	3.1-291	1
3.1-250	1	3.1-292	1
3.1-251	1	3.1-293	1
3.1-252	1	3.1-294	1
3.1-253	1	3.1-295	1
3.1-254	1	3.1-296	1
3.1-255	1	3.1-297	1
3.1-256	1	3.1-298	1
3.1-257	1	3.1-299	1
3.1-258	1	3.1-300	1
3.1-259	1	3.1-301	1
3.1-260	1	3.1-302	1
3.1-261	1	3.1-303	1
3.1-262	1	3.1-304	1
3.1-263	1	3.1-305	1
3.1-264	1	3.1-306	1
3.1-265	1	3.1-307	1
3.1-266	1	3.1-308	1
3.1-267	1	3.1-309	1
3.1-268	1	3.1-310	1
3.1-269	1	3.1-311	1
3.1-270	1	3.1-312	1
3.1-271	1	3.1-313	1
3.1-272	1	3.1-314	1

LIST OF EFFECTIVE PAGES (Continued)

Pages	Revision	Pages	Revision
3.1-315	1	3.2-7	1
3.1-316	1	3.2-8	3
3.1-317	1	3.2-9	1
3.1-318	1	3.2-10	1
3.1-319	1	3.2-11	1
3.1-320	1	3.2-12	1
3.1-321	1	3.2-13	3
3.1-322	1	3.2-14	3
3.1-323	1	3.2-15	1
3.1-324	1	3.2-16	1
3.1-325	1	3.2-17	8
3.1-326	1	3.2-17a	8
3.1-327	1	3.2-17b	8
3.1-328	1	3.2-18	1
3.1-329	8	3.2-19	2
3.1-330	1	3.2-20	1
3.1-331	1	3.2-21	1
3.1-332	1	3.2-22	3
3.1-333	1	3.2-23	1
3.1-334	1	3.2-24	1
3.1-335	1	3.2-25	1
3.1-336	1	3.2-26	1
3.1-337	1	3.2-27	1
3.1-338	1	3.2-28	1
3.1-339	1	3.2-29	1
3.1-340	1	3.2-30	1
3.1-341	1	3.2-31	1
3.1-342	1	3.2-32	2
3.1-343	1	3.2-32	1
3.1-344	1	3.2-33	1
3.1-345	1	3.2-34	1
3.1-346	1	3.2-35	3
3.1-347	1	3.2-36	3
3.1-348	1	3.2-37	3
3.1-349	1	3.2-38	8
3.1-350	1	3.2-39	3
3.2-1	1	3.2-40	3
3.2-2	1	3.2-41	3
3.2-3	1	3.2-42	3
3.2-4	1	3.2-43	3
3.2-5	1	3.2-44	3
3.2-6	1	3.2-45	1
		3.2-46	1
		3.2-47	1

LIST OF EFFECTIVE PAGES (Continued)

LIST OF EFFECTIVE PAGES (Continued)

LIST OF EFFECTIVE PAGES (Continued)

LIST OF EFFECTIVE PAGES (Continued)

Pages	Revision	Pages	Revision
3.4-44	1	3.4-86	1
3.4-45	1	3.4-87	1
3.4-46	1	3.4-88	1
3.4-47	8	3.4-89	1
3.4-48	8	3.4-90	1
3.4-49	8	3.4-91	1
3.4-50	2	3.4-92	1
3.4-51	8	3.4-93	1
3.4-52	3	3.4-94	1
3.4-53	1	3.4-95	1
3.4-54	1	3.4-96	1
3.4-55	1	3.4-97	1
3.4-56	1	3.4-98	1
3.4-57	1	3.4-99	1
3.4-58	1	3.4-100	1
3.4-59	1	3.4-101	1
3.4-60	1	3.4-102	1
3.4-61	1	3.4-103	1
3.4-62	1	3.4-104	1
3.4-63	1	3.4-105	1
3.4-64	1	3.4-106	1
3.4-65	1	3.4-107	1
3.4-66	1	3.4-108	1
3.4-67	1	3.4-109	1
3.4-68	1	3.4-110	1
3.4-69	3	3.4-111	1
3.4-70	1	3.4-112	1
3.4-71	3	3.4-113	8
3.4-72	1	3.4-114	1
3.4-73	1	3.4-115	1
3.4-74	1	3.4-116	1
3.4-75	1	3.4-117	1
3.4-76	1	3.4-118	1
3.4-77	3	3.4-119	1
3.4-78	1	3.4-120	1
3.4-79	1	3.5-1	1
3.4-80	1	3.5-2	3
3.4-81	1	3.5-3	1
3.4-82	1	3.5-4	1
3.4-83	1	3.5-5	3
3.4-84	1	3.5-6	1
3.4-85	1	3.5-7	1

LIST OF EFFECTIVE PAGES (Continued)

Pages	Revision	Pages	Revision
3.5-8	2	3.5-50	1
3.5-9	1	3.5-51	2
3.5-10	3	3.5-52	2
3.5-11	3	3.5-53	2
3.5-12	3	3.5-54	3
3.5-13	3	3.5-55	3
3.5-14	1	3.5-56	2
3.5-15	3	3.5-57	1
3.5-16	3	3.5-58	1
3.5-17	3	3.5-58a	3
3.5-18	2	3.5-58b	3
3.5-19	3	3.5-59	1
3.5-20	[illegible]	3.5-60	1
3.5-21	[illegible]	3.5-61	1
3.5-22	[illegible]	3.5-62	1
3.5-23	1	3.5-63	1
3.5-24	1	3.5-64	1
3.5-25	1	3.5-65	1
3.5-26	1	3.5-66	1
3.5-27	2	3.6-1	1
3.5-28	2	3.6-2	1
3.5-29	2	3.6-3	1
3.5-30	1	3.6-4	1
3.5-31	3	3.6-5	2
3.5-32	2	3.6-6	3
3.5-33	3	3.6-7	3
3.5-34	3	3.6-8	2
3.5-34a	3	3.6-9	2
3.5-34b	3	3.6-10	1
3.5-35	2	3.6-11	3
3.5-36	2	3.6-12	3
3.5-37	2	3.6-13	1
3.5-38	2	3.6-14	1
3.5-39	1	3.6-15	1
3.5-40	1	3.6-16	1
3.5-41	2	3.6-17	1
3.5-42	2	3.6-18	1
3.5-43	3	3.6-19	1
3.5-44	3	3.6-20	2
3.5-45	3	3.6-21	1
3.5-46	1	3.6-22	2
3.5-47	1	3.6-23	1
3.5-48	8	3.6-24	1
3.5-49	1	3.6-25	1

LIST OF EFFECTIVE PAGES (Continued)

Pages	Revision	Pages	Revision
3.6-26	1	3.6-68	1
3.6-27	1	3.7-1	8
3.6-28	1	3.7-1a	8
3.6-29	1	3.7-1b	8
3.6-30	1	3.7-2	3
3.6-31	1	3.7-3	3
3.6-32	3	3.7-4	3
3.6-33	1	A-1	3
3.6-34	1	A-2	3
3.6-35	1	A-3	3
3.6-36	1	A-4	3
3.6-37	1	A-5	3
3.6-38	1	A-6	3
3.6-39	1	A-7	4
3.6-40	1	A-8	3
3.6-41	1	A-9	3
3.6-42	1	A-10	3
3.6-43	1		
3.6-44	1		
3.6-45	1		
3.6-46	1		
3.6-47	1		
3.6-48	1		
3.6-49	1		
3.6-50	1		
3.6-51	1		
3.6-52	1		
3.6-53	1		
3.6-54	1		
3.6-55	1		
3.6-56	1		
3.6-57	1		
3.6-58	1		
3.6-59	1		
3.6-60	1		
3.6-61	1		
3.6-62	1		
3.6-63	1		
3.6-64	1		
3.6-65	1		
3.6-66	1		
3.6-67	1		

LIST OF EFFECTIVE PAGES - VOLUME 2 LIST OF EFFECTIVE PAGES

Pages	Revision	Pages	Revision
i	8	xvi	8
ii	4	xvii	8
iii	4	xviii	8
iv	8	xix	8
v	4	xx	8
vi	8	xxi	8
vii	8	xxii	4
viii	8	xxiii	4
ix	4	xxiv	4
x	8	xxv	8
xi	4	xxvi	8
xii	8	xxvii	8
xiii	4	xxviii	8
xiv	8		
xv	8		

VOLUME 2 TABLE OF CONTENTS LIST OF EFFECTIVE PAGES

Pages	Revision	Pages	Revision
i	3	xviii	4
ii	3	xix	3
iii	3	xx	3
iv	3	xxi	3
v	3	xxii	3
vi	3	xxiii	3
vii	4	xxiv	3
viii	3	xxv	3
ix	3	xxvi	3
x	3	xxvii	3
xi	3	xxviii	3
xii	3	xxix	3
xiii	3	xxx	3
xiv	3	xxxi	3
xv	3	xxxii	3
xvi	3		
xvii	3		

CHAPTER 3 LIST OF EFFECTIVE PAGES (Continued)

Pages	Revision
3.8-1	3
3.8-2	3
3.8-3	3
3.8-4	3
3.8-5	3
3.8-6	3
3.8-7	3
3.8-8	3
3.8-9	3
3.8-10	3
3.8-11	3
3.8-12	3
3.8-13	3
3.8-14	3
3.8-15	3
3.8-16	3
3.8-17	3
3.8-18	3
3.8-19	3
3.8-20	3
3.8-21	3
3.8-22	3
3.8-23	3
3.8-24	3
3.8-25	3
3.8-26	3
3.8-27	3
3.8-28	3
3.8-29	3
3.8-30	3
3.8-31	3
3.8-32	3
3.8-33	3
3.8-34	3
3.8-35	3
3.8-36	3
3.8-37	3
3.8-38	3
3.8-39	3
3.8-40	3
3.8-41	3
3.8-42	3
3.8-43	8
3.8-44	3
3.8-45	3
3.8-46	3
3.8-47	3
3.8-48	3
3.8-49	3
3.8-50	3
3.8-51	3
3.8-52	3
3.8-53	3
3.8-54	3
3.8-55	3
3.8-56	3
3.8-57	3
3.8-58	3
3.8-59	3
3.8-60	3
3.8-61	3
3.8-62	3
3.8-63	3
3.8-64	3
3.9-1	3
3.9-2	4
3.9-3	4
3.9-4	4
3.9-5	4
3.9-6	4

CHAPTER 4 LIST OF EFFECTIVE PAGES

Pages	Revision
4.0-1	2
4.0-2	1
4.0-3	1
4.0-4	1
4.1-1	3
4.1-2	3
4.1-3	1
4.1-4	1
4.1-5	1
4.1-6	8
4.1-7	1
4.1-8	1
4.1-9	1
4.1-10	1
4.1-11	8
4.1-12	1
4.1-13	1
4.1-14	1
4.1-15	1
4.1-16	1
4.1-17	3
4.1-18	3
4.1-19	3
4.1-20	3
4.1-21	3
4.1-22	3
4.1-23	3
4.1-24	3
4.1-25	3
4.1-26	3
4.1-27	3
4.1-28	3
4.1-29	3
4.1-30	3
4.1-31	3
4.1-32	8
4.1-33	8
4.1-34	3
4.1-35	3
4.1-36	3
4.1-37	3
4.1-38	3
4.1-39	3
4.1-40	3
4.1-41	3
4.1-42	3
4.1-43	3
4.1-44	3
4.1-45	3
4.1-46	3
4.1-47	3
4.1-48	3
4.1-49	3
4.1-50	3
4.1-51	3
4.1-52	3
4.1-53	3
4.1-54	3
4.1-55	3
4.1-56	8
4.1-57	3
4.1-58	3
4.1-59	3
4.1-60	3
4.1-61	3
4.1-62	3
4.1-63	3
4.1-64	3
4.1-65	3
4.1-66	3
4.1-67	3
4.1-68	3
4.1-68a	3
4-1-68b	3
4.1-68c	3
4.1-68d	3

LIST OF EFFECTIVE PAGES (Continued)

LIST OF EFFECTIVE PAGES (Continued)

Pages	Revision	Pages	Revision
4.2-50	1	4.3-16	3
4.2-51	1	4.3-17	1
4.2-52	1	4.3-18	2
4.2-53	1	4.3-19	1
4.2-54	1	4.3-20	1
4.2-55	1	4.3-21	1
4.2-56	1	4.3-22	4
4.2-57	2	4.3-23	4
4.2-58	2	4.3-24	2
4.2-59	1	4.3-25	1
4.2-60	1	4.3-26	1
4.2-61	2	4.3-27	2
4.2-62	1	4.3-28	1
4.2-63	1	4.3-29	1
4.2-64	1	4.3-30	1
4.2-65	1	4.3-31	1
4.2-66	1	4.3-32	1
4.2-67	2	4.3-33	1
4.2-68	2	4.3-34	1
4.2-69	1	4.3-35	3
4.2-70	1	4.3-36	1
4.2-71	2	4.3-37	1
4.2-72	1	4.3-38	1
4.2-73	1	4.4-1	3
4.2-74	1	4.4-2	3
4.2-75	1	4.4-3	1
4.2-76	1	4.4-4	1
4.3-1	1	4.4-5	1
4.3-2	1	4.4-6	1
4.3-3	1	4.4-7	1
4.3-4	2	4.4-8	8
4.3-5	1	4.4-9	8
4.3-6	1	4.4-10	1
4.3-7	1	4.5-1	3
4.3-8	3	4.5-2	3
4.3-9	1	4.5-3	3
4.3-10	1	4.5-4	3
4.3-11	1	4.5-5	1
4.3-12	1	4.5-6	1
4.3-13	1	4.5-7	1
4.3-14	1	4.5-8	1
4.3-15	3	4.5-9	1

LIST OF EFFECTIVE PAGES (Continued)

Pages	Revision	Pages	Revision
4.5-10	1	A-6	1
4.6-1	3	A-7	1
4.6-2	1	A-8	1
4.6-3	1	A-9	1
4.6-4	1	A-10	1
4.6-5	1	A-11	1
4.6-6	1	A-12	1
4.6-7	3	A-13	2
4.6-8	1	A-14	1
4.6-9	1	A-15	1
4.6-10	1	A-16	1
4.6-11	1	A-17	1
4.6-12	1	A-18	1
4.6-13	1	A-19	1
4.6-14	1	A-20	1
4.6-15	2	A-21	1
4.6-16	1	A-22	1
4.6-17	1	A-23	1
4.6-18	1	A-24	1
4.6-19	1	A-25	2
4.6-20	2	A-26	1
4.6-21	1	A-27	1
4.6-22	1	A-28	1
4.6-23	1	A-29	1
4.6-24	1	A-30	1
4.6-25	1	B-1	1
4.6-26	1	B-2	1
4.6-27	1	B-3	1
4.6-28	1	B-4	1
4.6-29	1	B-5	1
4.6-30	1	B-6	1
4.7-1	1	B-7	1
4.7-2	2	B-8	1
4.7-3	2	B-9	1
4.7-4	2	B-10	1
4.8-1	4	B-11	1
4.8-2	1	B-12	1
A-1	1	B-13	1
A-2	1	B-14	1
A-3	1	B-15	1
A-4	1	B-16	1
A-5	1	B-17	1

LIST OF EFFECTIVE PAGES (Continued)

Pages	Revision	Pages	Revision
B-18	1	C-22	1
B-19	1	C-23	1
B-20	1	C-24	1
B-21	1	C-25	1
B-22	1	C-26	1
B-23	1	C-27	1
B-24	1	C-28	1
B-25	1	C-29	1
B-26	1	C-30	1
B-27	1	C-31	1
B-28	1	C-32	1
B-29	1	C-33	1
B-30	1	C-34	1
B-31	1	C-35	1
B-32	1	C-36	1
B-33	1	C-37	1
B-34	1	C-38	1
B-35	1	C-39	1
B-36	1	C-40	1
B-37	1	C-41	1
B-38	1	C-42	1
C-1	1	C-43	3
C-2	1	C-44	1
C-3	1	C-45	2
C-4	1	C-46	1
C-5	1	C-47	1
C-6	1	C-48	1
C-7	1	C-49	1
C-8	1	C-50	1
C-9	1	C-51	1
C-10	1	C-52	1
C-11	1	C-53	1
C-12	1	C-54	1
C-13	1	C-55	1
C-14	1	C-56	1
C-15	1	C-57	1
C-16	1	C-58	1
C-17	3	C-59	1
C-18	1	C-60	1
C-19	1	C-61	2
C-20	1	C-62	1
C-21	1	C-63	1

LIST OF EFFECTIVE PAGES (Continued)

CHAPTER 5 LIST OF EFFECTIVE PAGES

Pages	Revision	Pages	Revision
5.1-1	2	5.1-42	1
5.1-2	2	5.1-43	1
5.1-3	2	5.1-44	1
5.1-4	2	5.1-45	1
5.1-5	2	5.1-46	1
5.1-6	2	5.1-47	1
5.1-7	2	5.1-48	1
5.1-8	2	5.1-49	1
5.1-9	2	5.1-50	1
5.1-10	2	5.1-51	1
5.1-11	2	5.1-52	1
5.1-12	2	5.1-53	[illegible]
5.1-13	2	5.1-54	1
5.1-14	1	5.1-55	1
5.1-15	1	5.1-56	1
5.1-16	1	5.1-57	1
5.1-17	1	5.1-58	1
5.1-18	1	5.1-59	1
5.1-19	1	5.1-60	1
5.1-20	1	5.1-61	1
5.1-21	1	5.1-62	1
5.1-22	1	5.2-1	2
5.1-23	3	5.2-2	2
5.1-24	1	5.2-3	2
5.1-25	1	5.2-4	3
5.1-26	1	5.2-5	3
5.1-27	1	5.2-6	3
5.1-28	1	5.2-6a	3
5.1-29	1	5.2-6b	3
5.1-30	1	5.2-7	2
5.1-31	1	5.2-8	2
5.1-32	1	5.2-9	4
5.1-33	1	5.2-10	4
5.1-34	1	5.2-11	2
5.1-35	1	5.2-12	2
5.1-36	1	5.2-13	2
5.1-37	1	5.2-14	4
5.1-38	1	5.2-15	4
5.1-39	1	5.2-16	3
5.1-40	1	5.2-17	8
5.1-41	1	5.2-18	2
		5.2-19	2
		5.2-20	2

LIST OF EFFECTIVE PAGES (Continued)

Pages	Revision	Pages	Revision
5.2-21	2	5.4-2	3
5.2-22	1	5.4-3	3
5.3-1	3	5.4-4	3
5.3-2	3	5.4-5	3
5.3-3	4	5.4-6	3
5.3-4	3	5.4-7	3
5.3-5	4	5.4-8	3
5.3-6	3	5.4-9	3
5.3-7	8	5.4-10	3
5.3-8	3	5.5-1	1
5.3-9	4	5.5-2	1
5.3-10	4	5.6-1	3
5.3-11	3	5.6-2	3
5.3-12	3	5.6-3	3
5.3-13	3	5.6-4	3
5.3-14	3	5.6-5	3
5.3-15	3	5.6-6	3
5.3-16	3	5.6-7	3
5.3-17	3	5.6-8	3
5.3-18	3	5.6-9	3
5.3-19	3	5.6-10	1
5.3-20	8	5.7-1	3
5.3-20a	8	5.7-2	3
5.3-20b	8	5.7-3	1
5.3-21	3	5.7-4	2
5.3-22	3	5.7-5	2
5.3-23	3	5.7-6	2
5.3-24	3	5.7-7	2
5.3-25	3	5.7-8	3
5.3-26	3	5.7-9	2
5.3-27	3	5.7-10	2
5.3-28	3	5.7-11	1
5.3-29	2	5.7-12	1
5.3-30	2	5.7-13	1
5.3-31	2	5.7-14	1
5.3-32	3	5.7-15	1
5.3-33	2	5.7-16	1
5.3-34	2	5.7-17	1
5.3-35	3	5.7-18	1
5.3-36	2	5.7-19	1
5.3-37	2	5.7-20	1
5.3-38	2	5.7-21	1
5.3-39	2	5.7-22	1
5.3-40	2	5.7-23	1
5-4-1	3	5.7-24	1

CHAPTER 6 LIST OF EFFECTIVE PAGES

Pages	Revision
6.1-1	4
6.1-2	4
6.1-3	8
6.1-4	2
6.1-5	3
6.1-6	2
6.1-7	3
6.1-8	8
6.1-9	3
6.1-10	8
6.1-11	8
6.1-12	8
6.1-13	3
6.1-14	3
6.1-15	3
6.1-16	8
6.1-17	2
6.1-18	2
6.2-1	3
6.2-2	2
6.3-1	2
6.3-2	2
6.3-3	2
6.3-4	2
6.3-5	3
6.3-6	3
6.3-7	3
6.3-8	3
6.3-9	3
6.3-10	3
6.3-11	3
6.3-12	3
6.3-13	3
6.3-14	3
6.3-15	2
6.3-16	2
6.4-1	3
6.4-2	3
6.4-3	3
6.4-4	3
6.4-5	3
6.4-6	3
6.4-7	3
6.4-8	3
6.4-9	2
6.4-10	2
6.5-1	3
6.5-2	3
6.5-3	2
6.5-4	2
6.5-5	3
6.5-6	3
6.5-7	8
6.5-8	8
6.5-9	2
6.5-10	2
6.5-11	2
6.5-12	3
6.5-13	4
6.5-14	3
6.6-1	3
6.6-2	3
6.6-3	3
6.6-4	3
6.6-5	3
6.6-6	3
6.6-7	3
6.6-8	3
6.6-9	3
6.6-10	3
6.6-11	3

LIST OF EFFECTIVE PAGES (Continued)

Pages	Revision
6.6-12	3
6.6-13	3
6.6-14	3
6.6-15	3
6.6-16	8
6.6-17	3
6.6-18	8
6.6-19	3
6.6-20	3
6.7-1	3
6.7-2	2
6.7-3	2
6.7-4	1
6.8-1	3
6.8-2	3
6.8-3	2
6.8-4	2
6.9-1	3
6.9-2	2
6.9-3	4
6.9-4	1
6.9-5	3
6.9-6	3
6.9-7	3
6.9-8	3
6.9-9	3
6.9-10	3
6.9-11	3
6.9-12	3
6.9-13	3
6.9-14	3
6.9-15	3
6.9-16	3
6.9-17	3
6.9-18	3
6.9-19	3
6.9-20	3
6.10-1	2
6.10-2	8
6.10-3	2

Pages	Revision
6.10-4	3
6.10-5	3
6.10-6	2
6.10-7	2
6.10-8	2
6.10-9	2
6.10-10	1
6.11-1	3
6.11-2	4
6.11-3	4
6.11-4	3
6.11-5	3
6.11-6	3
6.11-7	3
6.11-8	3
A-1	4
A-2	3
A-3	4
A-4	2
B-1	3
B-2	3
B-3	4
B-4	3

5. Circuitry associated with the local alarm.

Note: This system is fail safe upon loss of the electrical support system.

3.8.1.8 X-700. X-710, X-720, X-760, and XT-847 Q Boundary Definitions

3.8.1.8.1 Facility Criticality Accident Alarm System

Q Function

The Criticality Accident Alarm System monitors the facilities for a nuclear criticality and alarms notifying personnel that immediate evacuation must occur. An electrical support system failure is oacked up by rechargeable battery packs, which will support the system for a minimum of 8 hours, and the loss will result in a trouble alarm. The portion of this system which alarms notifying the general population outside the immediate vicinity is controlled as AQ under Section 3.8.2.23.

See Section 3.6.2 for a description of the system.

Boundary

The Criticality Accident Alarm System boundary includes the following:

1. Radiation detection cluster unit;

2. N_2 Strombos horn;

3. N_2 supply;

4. Associated N_2 piping and tubing; and

5. Circuitry associated with the local alarm.

Note: This system is fail safe upon loss of the electrical support system.

8.1.9 Liquid UF_6 Cylinder Q Boundary Definition

3.8.1.9.1 UF_6 Cylinders

Q Function

Cylinders utilized to contain UF_6 have been designed, built and tested to ANSI N14.1 (subject to the clarifications in Chapter 1, Appendix A) and a prescribed minimum volume specified in USEC-651. This ensures safe containment of UF_6 throughout the enrichment process, including transport, sampling, feeding, filling, and storage and prevent a release of liquid UF_6. The issue of fail safe is not applicable to this system.

The 1S and 2S cylinders are not included as Q due to their small size. These cylinders are classified AQ.

See Section 3.2.1 for a description of the system.

<u>**Boundary**</u>

The UF_6 cylinder boundary includes the following:

1. Cylinder;

2. Cylinder valve; and

3. Cylinder plug

Notes: a. The valve protector is AQ, see Section 3.8.2.20.

b. No support systems are required.

3.8.2 AQ Boundary Definitions

This section describes the AQ SSCs at PORTS. The AQ function and boundary of each of these SSCs are described in the following paragraphs.

3.8.2.1 Nuclear Criticality Safety SSCs

<u>**AQ Function**</u>

These SSCs are those identified in NCSAs/NCSEs as required to meet the double contingency principle.

See Section 5.2.

<u>**Boundary**</u>

The identification of SSCs will include a list of the NCS SSCs and the associated support systems required to meet the double contingency principle.

3.8.2.2 UF_6 Process Piping and Equipment

<u>**AQ Function**</u>

UF_6 process piping and equipment provides a containment boundary for UF_6 during the enrichment process.

Case C-3 UF$_6$ Freeze-out in Piping Elbows and B-Line Drops

1. The steam heaters in the bypass housing fail in X-333 or X-330 or the electrical heaters in the bypass housing fail in X-326, without being detected by operating personnel.

2. UF$_6$ may begin solidifying in volumes where there are stagnant pockets of gas. (The time required for solidification will depend upon the pressure and initial temperature.) The freeze-outtemperatures in the X-333 piping may be as high as 140°F and the freeze-out temperature in X-25-7 will be as low as 50°F.

3. Gas will continue to flow through the piping. This reduces the probability of UF$_6$ freeze-out even though there is a heater failure. Freezeout in a line with UF$_6$ flow will create a restriction and a reduction in gas flow, and this will be detected by the cell data.

4. The process gas piping is sized for a non-favorable geometry for criticality at specified cascade conditions in all cascade equipment containing high assay U-235.

5. Radiation checks are made periodically in order to locate any deposits which may accumulate in piping elbows and B-line drops.

6. The probability of a criticality in piping elbows and B-line drops is extremely low due to non-favorable geometry, heater reliability, criticality monitoring, pressure monitoring, and the absence of moderation.

Case C-4 UF$_6$ Freeze-out in the Building Tie-Lines

1. Both the A- and B-streams are boosted in pressure between the X-330 and X-333 Buildings. Only the A-stream is boosted between the X-330 and X-326 Buildings. The failure of the heaters in the tie line housing could result in the freeze-out of UF$_6$, especially in lines to the X-326 Building.

   The probability of a freeze-out while gas is flowing through the pipe is low.

2. The freeze-out of UF$_6$ will result in a restriction in gas flow between the buildings. A reduction in gas flow will cause a lower-than-normal motor load in the first stage upstream of the restriction.

3. The approximate temperature required for freeze-out in the X-330 and X-333 tie-lines is 130°F while the temperature required for freeze-out between X-330 and X-326 is approximately 100°F.

4. If the tie-line housing temperature decreases below 164°F between X-330 and X-333, or 158°F between X-330 and X-326, corrections can be made by production personnel.

5. The probability of criticality in the building tie-lines is reduced to an extremely low level by piping geometry, combined with absence of a moderator, monitoring by operating personnel, and the low temperature alarm which sounds in the affected ACR.

Case C-5 Wet-Air Inleakage

1. Wet air can enter the cascade through expansion joints, flanges, compressor seals, welds, etc.

2. The water in wet air reacts with UF_6 to form UO_2F_2, HF and possibly intermediate compounds (e.g., $U_3O_5F_8$). In this case, all of the water vapor will react and cause a solid mass of UO_2F_2 to deposit in the gas stream immediately after the inleakage point if the air contains any water. (As long as the gas flows, the UO_2F_2 will be dry and water will not serve as a moderator unless the conditions become stagnant.)

3. The UO_2F_2 deposits on the piping, converter shell, barrier tube-sheet, and barrier.

4. The deposit buildup will continue if undetected because, as the wet air leaks into the system, UF_6 is always flowing past the source and is available for the chemical reaction to continue.

5. The introduction of air into the cascade can be detected on the line recorders. The line recorders will show an increase in nitrogen, oxygen, and possibly HF readings. (A total of three line recorders normally can be valved into the top stage of any cell in the cascade. Inleakage can be verified by a cross-check using these instruments.)

6. Wet-air inleakage into the cascade will be detected by the line recorders and, in extreme cases, by compressor surging.

7. The leaking equipment will be isolated from the rest of the cascade and the necessary repairs made by Maintenance personnel.

8. The probability of criticality in the cascade as the result of wet-air inleakage is extremely low.

To make up for the loss of light gases from the shutdown cells in X-326, the Top Purge air bleed was installed. This system utilizes plant air which is normally at a dew point of -100°F with an alarm if the header dew point gets to -60°F. Since the "dry" air has some moisture content, the water will react with the UF_6 or moderate an existing deposit. To prevent the accumulation of an unsafe mass and to prevent moderating a deposit, the following controls are used:

1) Control of the UF_6 front is maintained such that it remains downstream of Cell X-25-7-19. If control of the front is lost, the air bleed flow and surge drum bleedback will be stopped until the front is recovered, deposit surveys are conducted, and deposit removal, if necessary, is completed.

2) If dew point control is lost on the dry air system, air bleed flow and surge drum bleedback will be stopped until the system is repaired, the air bleed cell and surrounding

During the early history of the plant, incidents occurred as the result of barrier unplugging treatment with ClF_3; a change in procedures used during these treatments has eliminated the occurrences from this source.

It is important to keep all cascade temperatures below the solidus temperature (melting point 1070°F.) of the aluminum components in the cell. A sequence of events could be initiated which would begin at normal control temperatures, such as closing the recycle valve on an offstream cell equipped with axial compressors or a compressor overheating which might occur due to any of several reasons. (Some of these reasons could be coolant system failure, operator error, etc.) The increased temperature will cause metal expansion, resulting in friction heat and melting of aluminum. The aluminum will react with uranium hexafluoride resulting in rapid reaction, intense heat and the formation of a uranium-containing solid. The accumulation of enough solid uranium to form a critical mass is an extremely low probability.

An exothermic reaction in the cascade could also open the coolant system or the UF_6 system to the atmosphere and result in the formation of UO_2F_2. UO_2F_2 is a solid which plugs the pores in the barrier. This reduces cascade efficiency and, if the inleakage is allowed to continue, will cause compressors to surge and make continued operation impossible. Inleakage of this type may be the result of broken instrument lines, failed compressor seals, leaking compressor flanges, failed expansion joints, broken welds, etc. These leaks usually result in plugging the barrier in two or three stages of a cell. The permeability of the first stage in the series will be lower with each succeeding stage having a higher permeability.

To recover barrier permeability, a cell is taken off stream, all UF_6 is removed and a ClF_3-F_2 mixture is introduced. The ClF_3 reacts with the UO_2F_2; and converts this solid uranium compound back to gaseous UF_6. In the first 10 years of plant operation, cells were treated with ClF_3 under a procedure which could have resulted in exothermic reactions. These reactions could have been initiated by the by-products of the original ClF_3-UO_2F_2 reaction. The results of such a reaction would be intense heat in the form of hot spots which would cause the melting of aluminum and the explosive reaction of UF_6 and aluminum. This was the most likely cause of exothermic reactions in process cells until the operating procedures were changed. The procedure changes strictly control the following:

1. The introduction of nitrogen and limiting the amount of ClF_3 introduced into a cell.

2. Removing all liquid coolant and evacuating the coolant system to limit the amount of coolant available for a reaction if there were a coolant leak. The vacuum requirement for the X-27 and X-29 size equipment is between 18 and 30 inches Hg. The larger equipment has no specific requirement other than taking the system below atmosphere so that any pools of liquid will vaporize and be removed.

3. Monitoring of the cell with an infrared analyzer or lab samples to detect any coolant or fluorocarbons which would indicate a coolant leak or oil in the cell.

4. Operator being present at the cell instrument panel and continuous monitoring of cell pressure and temperature conditions. The contents of the cell are dumped to surge drums if a stage temperature reaches 280°F.

5. Sampling the cell to assure presence of free ClF_3 and avoid the formation of the more reactive Cl_2 which may react with the aluminum in the cell to form $AlCl_3$. (See Section 4.1.1.9.2 for the oxidizing

effects of ClF_3.) The probability of an exothermic reaction in a cell during ClF_3 treatment has been reduced to low levels because of improved procedures.

4.1.1.2.3 Analyses of Hypothetical Criticality Accidents

Battelle Columbus Laboratories, under contract to Goodyear Atomic Corporation performed a number of analyses for the X-326 Building, using the AIREK code, which were felt to be representative of different types of criticality accidents that could be hypothesized in different areas of the Portsmouth Gaseous Diffusion Plant. This analysis is included in this report as Appendix C. Four of these accidents involve a variety of water/uranium mixtures ranging from dry to predominantly aqueous. Analyses are performed for two different enrichments. Although the four analyses were performed for a specific hypothetical accident geometry associated with air or water entry into a compressor, these analyses are representative of other accidents involving similar equipment.

The type of excursion which is assumed to occur in the first three analyses is one in which a X-326 compressor containing a mixture of UO_2F_2-H_2O near criticality is lying on its back. A sprinkler head sprays water into the openings at a rate of 0.45 gallons/ft^2/min into an open area of about 3.14 ft to give an addition rate of water of 1.41 gallons/minute or 89.4 grams/second.

In the fourth analysis it was assumed that moisture was slowly leaking into an operating compressor at a rate sufficient to add 4.5 kilograms of uranium/day (and 58 grams of water/day to a mixture of UO_2F_2-H_2O with an assumed moisture content characterized by H/U = 0.33. Brief descriptions of these analyses have been extracted from Appendix C and are contained in Paragraphs 4.1.1.2.3.1 through 4.1.1.2.3.4.

The potential exists for a low power (slow cooker) criticality in the X-326 Process Building and the X-705 Building.

Hypothetical calculations have been made for excursions in the X-330 and X-333 Buildings using the generic isodose plots developed by Union Carbide Corporation - Nuclear Division.

All the hypothetical excursions discussed in this section are of sufficient magnitude to actuate the radiation alarms.

After analyzing the hypothetical excursions for each of the process buildings, formulas obtained from NRC Regulatory Guide 3.34, Revision 1, were used to provide a conservative estimate of doses resulting from a nuclear criticality. All three methods were then compared.

4.1.1.2.3.1 Accumulation in Process Equipment With Low H/U and Low Enrichment

Refer to Paragraph C.1.3.2.1, Appendix C.

Criticality for 10 percent enrichment occurs at an H/U ratio of 12.4 with a uranium mass of 406.5 pounds as UO_2F_2 as shown in Figure C.1-4, Appendix C. The reactivity insertion rate determined from the KENO calculations is 0.00195 k_{eff} per pound of water. From the assumed sprinkler water inflow of

expansion joints on CUP cells are double bellows and buffered.) The amount of UF_6 released could be as much as 10,000 pounds. At subatmospheric operations the probability of the pressure exceeding the 25 psia cell test pressure is reduced, consequently, the probability of a rupture or release is greatly reduced.

The cell could be shutdown and isolated 180 seconds after the occurrence of the initiating events (assuming 15 to 30 seconds for operator response, i.e. trip the cell, and 150 additional seconds for closure of the cell block valves). A UF_6 release is possible if the cell is isolated in 180 seconds but the release would be smaller.

The probability of this incident occurring is extremely low. The consequences of such an incident would be considered low. The probability and consequence results in this scenario being an extremely low risk.

Case R-5 Cell Instrument Line Freeze-out on High-Pressure Cells

1. The cell cubicles (LCC) are maintained within a temperature range of 220°F-240°F to prevent UF_6 freeze-out in the instrument lines. The cubicle temperatures are checked each shift and, if the temperatures are too low, the heater thermostat setting is increased or the heaters are replaced. If the operator observes that instrument line freeze-out is probable, each stage control valve will be placed in manual operation which will control the pressures at the approximate target values.

2. The freeze-out of UF_6 in the high-side instrument lines will result in a low-pressure signal being sent to the stage DBM.

3. The low-pressure signal may be sent to only one stage or to all stages in the cell, resulting in the stage control valves closing. The stage control valves may close until only 20 percent of the B-stream flow reaches the next downstream compressor. The valve may "slam" closed, resulting in a double stage load in less than 5 seconds.

4. The indications in the ACR will be high and low ammeter readings and fluctuations, due to compressor surge.

5. The ACR operator may signal the unit operator or send another unit operator to correct the problem. In an extreme case, the cell will be tripped by the ACR or PCF operator. The most probable course of events is compressor surging, extreme motor load and pressure, and immediate compressor deblade which would prevent the release. The operator may not have time to act.

6. The high pressure possible in this type incident may cause the release of UF_6 through the seals or possibly a ruptured expansion joint.

7. If this incident is allowed to proceed to conclusion, as much as 10,000 pounds of UF_6 could be released through a 192-square-inch rupture. (Only an insignificant amount of UF_6 would be released at subatmospheric operations, thus eliminating the risk.)

The probability of this scenario being initiated is very high, but its probability of reaching conclusion and allowing the release of UF_6 is extremely low due to the number of failures required. The consequences of such an incident would be considered low. The risk is extremely low. (The conclusion of this scenario is identical to R-4.)

Group Three - Explosions

Case R-6 Treatment Gas Explosion Within the UF_6 System

There are chemicals (R-114, F_2, ClF_3) within the Uranium Enrichment System which will explode if the right quantities and conditions are present. The three most likely locations that the proper conditions can be created is within the Purge Cascade, within cells undergoing cell treatments and within isotopic cascade cells located behind Cascade splits or cells with extensive plugging, that is, secondary fronts. Within the Cascade, these conditions are prevented by administrative controls which eliminate known heat sources (i.e. rubbing compressors); control the installation and removal of Cascade splits; identify and remove cells with extensive plugging and basically avoid the creation of explosive combination/concentrations of these gases. The Cascade is continually monitored for R-114 concentration, while the introduction of F_2 and ClF_3 to the Cascade is strictly controlled.

The F_2 and ClF_3 concentrations (oxidants) are maintained below prescribed levels and the cascade is monitored by line recorders to detect R-114 inleakage which could result in an explosive mixture. Experiments have shown that a mixture of R-114 and F_2 at sufficient quantities in the presence of an ignition source will explode at cascade pressure. The maximum mole percent of oxidants is too low to be measured at any point in the cascade, except at the Purge Cascade vent.

Within the Top Purge Cascade oxidants are controlled by administratively controlling the addition of oxidants to the cascade. A safe bleedback rate is calculated based on the cascade lights upflow and the contents of the surge durm being planned for bleedback to the cascade.

The reaction of UF_6 with aluminum is not in itself a rapid reaction; however, such a reaction could open the R-114 system and initiate the inleakage of coolant into the UF_6 system. (The supplemental coolers in CUP cells are constructed of aluminum.)

Pyrophoric powder forms in the cascade by the erosion of aluminum or iron which is exposed to the UF_6 gas stream. Iron is exposed to the UF_6 gas stream in spots where the nickel coating has been removed from the iron equipment surfaces.

The pyrophoric powder will accumulate on the barrier, tube sheet faces, cooler fins, etc. Heating the pyrophoric powder to certain temperatures and continued fast heating, may result in the ignition of the powder, resulting in the barrier, and possibly the aluminum cooler tubes, being burned and ruptured. This may then result in introducing R-114 into the enrichment system and the release of UF_6 (5 to 10 pounds) to the atmosphere.

An explosion which ruptures containment vessels would blow open the cell housing door and lift the covers. The covers may settle into place or completely blow away, depending on the intensity of the explosion. (The cell covers are not attached to the rest of the housing.)

This incident is most likely to occur in the X-25 size equipment where lights at the top of the cascade tend to concentrate and release 5 to 10 pounds of UF_6. The probability of this type of explosion occurring is extremely low and the consequences of such an incident would be negligible. The risk is extremely low.

Due to the suspension of HEU production, a significant number of cells were shutdown in X-326. To make up for the loss of inleakage of light molecular weight gases, an air bleed system was installed in the Top Purge. The Top Purge Air bleed was originally designed to monitor and control the concentration of oxidants in the Top Purge but was never made totally operational. This was based on the fact the Cascade never entered an operating mode of uncontrolled dumping of oxidants as envisioned in the design and the fact the Top Purge Air Bleed control system would introduce an additional swing in the existing Top Purge vent control system.

As part of the HEU Suspension Project, a new method of treating cells was developed called inverse recycle. This method creates a relatively flat gradient concentration of treatment gases by routing the A-stream from the top of the cell to the B-stream. Since the gradient is flat throughout the cell, additional amounts of treatment gas can be utilized while still maintaining the concentration limits in a stage. Like in normal cell treatments the sources and existence of R-114 in the cell is eliminated prior to the introduction of oxidants, while the disposal of these gases to the Cascade are administratively controlled through existing procedures.

To minimize the potential for a treatment gas explosion using inverse recycle, the following controls are used:

1) Cells are treated individually and no more than four cells are treated at any one time. Adjacent cells cannot be treated at the same time.

2) The increase in treatment gas during inverse recycle cell treatment is limited to 70% for the second and subsequent treatments.

3) The ratio of ClF_3 to F_2 is maintained to that utilized for normal cell treatments.

4) the treatment gas concentration at any point in the cell will be no more than currently experienced in normal cell treatments.

Group Four - Operator Error

Case R-7 Heavy Equipment Drop from an Overhead Crane

In all units of the cascade, overhead cranes are used to move heavy equipment (i.e., converters, compressors, and valves) over cells which are in operation. Since plant start-up to the present time, more than 25,000 lifts of compressors, converters, and stage control valves have been made over cascade cells. (Coolant condensers are lifted over UF_6 piping and cells in the X-333 Building only.) The only failure that occurred during these lifts resulted In the dropping of a 9500-size condenser to the second floor of the X-330 Building. (This one drop was from block and tackle and not from a crane.) The condenser penetrated the concrete cell floor and a portion of it protruded through the floor.

Because of the numerous crane operations, there is a possibility of dropping the heavy equipment and rupturing the process piping. Such an event would cause a massive wet-air inleakage in all cells operating below atmospheric pressure, and within a short period of time may cause a UF_6 release. This would include all cells in the X-326 Building, and all X-29 and most of the X-31 cells in the X-330 Building. Fifty or more cells in the X-333 Building may be operating above atmospheric pressure and the dropping of heavy equipment on the B-stream of one of these cells and no mitigation could result in a UF_6 release.

Due to the large quantity of UF_6 that could be released by dropping heavy cascade equipment on UF_6 lines, no heavy equipment is moved over these lines without personnel on the cell floor being in communication with the ACR operator. This means that the maintenance front line manager or production front line manager will maintain visual contact with the equipment being lifted and direct communications with the ACR operator. The ACR operator will be positioned to stop the motors on all cells and piping directly beneath the pathway of the equipment being moved. Then in case of equipment drop the cell motors beneath the crane can be stopped by the operator in less than 15 seconds or a maximum of 30 seconds. Immediate reduction of pressures to subatmospheric should limit the UF_6 release to less than 4,000 pounds.

When comparing above atmospheric and subatmospheric operation, no significant quantity of UF_6 would be released at the lower pressure.

The ventilation system may be shut down during a release. The normal pressure difference between inside and outside is zero. (Individually fitted gas masks are stored near the ACRs and are available if further evacuation is necessary. Also, further evacuation will be through the tunnels and outside of the release area.)

The probability of dropping heavy equipment on process piping is low and the consequences are low. The risk is extremely low.

b. Broken welds
c. Instrument lines
d. Massive seal failure
e. Valve inadvertently left open

The accumulation of the critical UO_2F_2 mass is prevented by radiation monitoring, purge rate monitoring and cell readings.

A criticality would be detected as in Case C-14. The probability of the scenario occurring is extremely low.

Case C-16 Moderated Solid Mass (UF_6 or UO_2F_2)

This scenario assumes that a mass of uranium compound has accumulated as in Cases R-14 and R-15. Assuming that water is the moderator, there are two sources: the RCW system and the sprinkler system.

a. Moderation and criticality by water from th. RCW system would require a leaking condenser tube and the accumulation of water in the stage cooler tubes, plus a UF_6 mass of 965 pounds UF_6 in the cooler.

b. The sprinkler system could contribute to a criticality of being actuated into an open vessel containing a uranium compound.

This scenario is prevented or mitigated by:

a. Controlling the R-114 pressure in the condenser higher than the RCW pressure.

b. The R-114 levels are monitored and recorded daily.

c. Excess water in the R-114 system will cause the cell to overheat.

d. Equipment is evacuated and purged before being removed from the cascade. After removal, the equipment is covered to prevent water from accumulating in an open vessel.

Due to the multiple failures and errors associated with this scenario, the probability of occurrence is placed in the extremely low category.

Another scenario for a criticality of a moderated solid mass is from the buffering of cells shutdown due to HEU suspension. The shutdown cells have the potential for having significant deposits. Moderator in this scenario can be either water, from wet air inleakage or cooler leaks, or oil from the lube oil system.

To prevent the deposit from being moderated, the following controls are used:

1) A UF_6 negative ($<$ 10 ppm UF_6) is obtained prior to buffering the cell;

2) The RCW side heat exchanger is drained;

3) R-114 remains in the heat exchanger at least at normal inventory until treatment is commenced/completed.

4) The lube oil cell block valve is closed;

5) Each cell is isolated;

6) The blowout preventers on the compressors are actuated except those utilized to buffer the cell;

7) All buffered cells not cleared by NDA monitoring are monitored manually at least weekly.

8) The cell is buffered at 0.1 to 1.5 psi above atmospheric pressure.

9) If cell pressures are found to be outside of the range specified in 8, cell pressure shall be returned to the specified range within 1 week.

4.1.2.3.2 Consequences of a Criticality in the Purge Cascade

The magnitude of a criticality in the purge cascade would be no greater than that described for high-assay events in Section 4.1.1.2. A criticality in the purge cascades would affect personnel near the source with no effect off plantsite as described in Section 4.1.1.2 and Appendix C. The consequences are considered to be medium and the risk is considered to be extremely low.

4.1.2.4 Toxic Material Releases From the Purge Cascades

At the present operating conditions, both purge cascades contain approximately 135 pounds UF_6 and 99 percent of this material is in cell X-25-7-2 (Side Purge). The probability of releasing a large amount of UF_6 to the atmosphere from this source is extremely low.

The most probable cause for releasing UF_6 from the purge cascades is operator error, such as:

a. Overpressuring a cell while obtaining a negative for maintenance and forcing UF_6 out the compressor seals.

b. Failure to obtain a representative sample when sampling a cell for a UF_6 negative, thus releasing material when the system is opened.

c. Misvalving the UF_6 around the booster station directly to the air jets.

d. Stage cooler failure and the massive release of R-114 into the UF_6 system forcing UF_6 out the seals.

buildings.

In the absence of any exterior constraining fencing, the employees would leave the building through the nearest door, i.e., either west or east, move directly away from X-345, and, at a distance about half way between X-345 and the adjacent buildings, then turn south. The constraining security fence, however, forces then to turn south immediately upon leaving the building, thereby forcing them to stay close to the building as they move south. Those who leave the building by way of the west doors, therefore, are exposed to additional radiation (decay gamma) as they approach and pass the site of the reaction. In addition, their evacuation from the area is hindered by the gravel path and rotogate at the corner of the building, both of which slow the egress.

The greatest constraint-imposed radiation doses would be those received by employees "E" and "C." In the absence of constraints, employee "E" would receive a prompt dose of 0.40 rems and a decay gamma dose of 0.23 rems while leaving the area; employee "C" would receive a prompt dose of 2.54 rems and a decay gamma dose of 0.26 rems. If constrained by the security fence, the comparable decay gamma doses during egress from the area would be 6.68 rems and 6.53 rems, respectively. For employee "E" the total dose would be 0.63 rems if not constrained by the fence, or 7.08 rems if constrained. For employee "C" the total doses would be 2.80 rems if not constrained and 9.07 rems it constrained. A person inside the load-out doors would receive a prompt dose of 1.5 rems and a decay gamma dose of 0.1 rems while leaving the building.

It is not expected that any of the airborne radioactive reaction products would be discharged from the building during the time the employees are making their escape because the exhaust fans will be shut down by the radiation release alarm and the motorized louvers in the air inlets and the fans will close. This action will isolate the vaults and prevent any additional radiation from this source.

Although the constraint imposed by the security fence would result in larger radiation doses, in no case would that radiation dose produce any directly observable health effects in the employees.

The probability of a criticality accident occurring from an accidental geometry change in the X-345 is extremely low. The consequences are considered medium. The risk is extremely low.

<u>Case C-24a Criticality from Water Intrusion</u>

The probability of a nuclear criticality accident occurring from an accidental water intrusion in the X-345 SNM Storage Facility is extremely low. Material stored in either storage vault is below floor level in individual receptacles. Each receptacle has a securely fastened lid. Each lid has a gasket to resist the entry of liquids into the receptacle. The presence and use of liquids anticipated inside the vault areas is limited to battery electrolyte in the cylinder handling device and small amounts of water which may be required for decontamination purposes. The exterior inlet air louvers which supply make-up to the vaults have been equipped with water eliminators designed to resist entry of water during severe wind-driven rainstorms such as tornadoes. Leakage of water into the building is possible. Several modifications have been made to prevent such water intrusion. These modifications included metal siding on the outside walls, fiberglass pans under the exhaust fans, baffles in the intake hoods, rubber gasket seals around the exit doors, and angle-iron diking around

the inside perimeter of the vaults.

In addition all the employees working in the X-345 vaults have been trained to shut off the water valve in case of a water pipe break.

An accident scenario is assumed in which water enters a receptacle. The water mixes with oxide from a breached container, resulting in a critical reaction. This generates a single radiation burst of about 6×10^{17} fissions, blowing the receptacle cover off and spreading the reaction products in the vault. At the time of the accident, employees are stationed as shown in Figure 4.2-2. The radiation triggers the alarm clusters in X-345 and in all the adjacent buildings. An employee standing about 10 feet from the source receives 5000 rems and death may result within a few hours. The other employees evacuate the building as in Case C-24.

An employee working in the central area and about 60 feet from the source could receive a prompt dose of about 45 rems and a decay gamma dose of about 2 rems while leaving the area.

As in Case C-24, the presence of the security fence does not result in radiation exposures that would produce observable health effects. The probability of this accident is extremely low. The consequences are medium. The risk is extremely low.

Case C-24b Delta Barrier Accident

An accident scenario is assumed in which the fuel tank of a van is hit by the inadvertent raising of a Delta barrier at the fence entrance of X-345. The van that delivers VHE carries the cylinders in a geometrically safe configuration and individually secured.

Three cases are examined:

1) The van is overturned.

   The cylinders in the van will not be loosened from their position because they are secured. The driver and his co-worker will suffer minor injuries. Release of UF_6 or criticality is not expected from this accident.

   The probability of such an accident is extremely low and the consequences low. Therefore, the risk associated with this scenario is extremely low.

2) The van catches on fire.

   The Delta barrier strikes the fuel tank and ruptures it. Gasoline from the tank is spilled on the ground and is ignited by spark. The fire department will extinguish the fire using manual suppression methods. The heat from the fire causes temperature rise in the cylinders. A release may occur. The potential for criticality is considered very low.

   The probability for this accident is extremely low. The consequences are considered medium.

not contain enough HF to prevent safe evacuation of personnel from the building. The one exception to this would be the mobile equipment operator who might be injured and unable to make an escape.

The probability of a large fire in the facility which could result in a rupture of the stored cylinders is extremely low. In the event of an uncontrolled fire, the personnel would evacuate the building long before the HF would become a hazard.

4.4.7.2 Release of Fluorine from the Fluorine Generation, Storage, and Distribution Systems

The hazards associated with fluorine are considered standard industrial hazards which are routinely encountered in other chemical industries. Of the F_2 releases identified in Table 4.4.7-1, only the release at the HF vaporizer and the release from a storage tank are considered large enough to have potential off-site consequences. Natural phenomena (an earthquake of greater than 0.05g acceleration or a direct hit by a tornado) were the only identified initiating events for a release from the F_2 Storage Tanks. Because these natural phenomena are not considered credible initiating events, a release from a storage tank will not be considered a credible accident and will not be discussed further. The remaining releases are small and will have no off-site consequences. On-site personnel in the immediate area of the releases and unable to escape the immediate area could receive fatal doses of F_2. However, no other significant on-site consequences are expected.

4.4.7.3 Mitigation of HF/F_2 Releases

4.4.7.3.1 <u>Written Procedures</u>

The PORTS has a number of emergency operating procedures in effect which provide guidelines for containment of HF releases.

Implementation of these operating procedures could possibly prevent complete evaporation of large HF releases and releases inside buildings or not otherwise exposed to sunlight and warm temperatures.

4.4.7.4 Risk Assessment for Operating the HF/F_2 Systems

Although accidents have been identified which can potentially result in on-site fatalities, the hazards associated with the operation of the HF/F_2 Systems are not unique to uranium enrichment facilities and are no greater than those normally found in other chemical industries. The overall risk of operating these systems is considered low.

Table 4.4.7-1 Postulated HF/F_2 Accidents for the HF Feed System

	Accident	Estimated Release (Pounds)	Initiating Event(s)	Probability
1.	Release of HF due to Cylinder Valve failure	850	Equipement Failure Operator Error	Low
2.	Release of HF due to Pigtail failure	850	Equipment Failure Operator Error	Low
3.	Release of HF due to HF Sensor failure	850	Equipment Failure	Low
4.	Release of HF due to Temp/Pressure Control failure	850	Equipment Failure	Low
5.	Release of HF at the HF Vaporizer	1700 HF 155 F_2	Operator Error Equipment Failure Earthquake H_2/Air Explosion	Low
6	Fluorine Release in the Trap or Cell Room as the Result of Equipment Damage	90 F_2*	Mobile Equipment Impact	Low*
7.	Fluorine Release Caused by H_2/F_2 Explosion	10 F_2	H_2/F_2 Explosion	Extremely Low
8.	Fluorine Release from the F_2 Distribution system	90 F_2	Equipment Failure Vehicle Impact Earthquake	Low
9.	Fluorine Release from the X-342 B Storage Facility	300 F_2	Earthquake Tornado	Extremely Low

* The probability of this accident was changed to "low" based on, 1.) restrictions on the use of mobile equipment in the cell/trap room during routine operation of the fluorine generators, 2.) restrictions on maintenance work in the cell/trap room during operation of the fluorine generators, (allowances for maintenance will be done on a case by case basis using the lockout/tagout procedures), 3.) The inspection program for the vessels (surge drum and storage tanks) is to include inspection of the piping and components of the fluorine generation system.

The estimated release was originally considered to be 10#s of F_2 due to the mitigative actions of the "Q" system which would isolate the leak in approximately one minute. However, since the "Q" system does not sense any breaks no credit for automatic action can be taken, therefore the estimated release was raised to 90#s based on the release potential as identified in the HF/F_2 Systems Safety Study.

4.4 REFERENCES

1. Stone, A. A., Craumer, R. L., Rockhold, D. E., and Taylor, F. L. Jr., Investigation of a break in the 48-inch Raw Water Line, GAT-958 (CONFIDENTIAL), Goodyear Atomic Corporation, Piketon, Ohio, November 15, 1978.

2. Zielenbach, W. J., et al., Risk Assessment for Operation of the Anhydrous Hydrogen Fluoride Facility, Battelle Columbus Laboratories, Columbus, Ohio, February 29, 1980.

3. HF/F_2 Systems Safety Study, GAT-988.

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5.2.4.1 Meeting the Double Contingency Principle

In Subsection 5.2.2.3 of this SAR, PORTS commits to meeting the double contingency principle. For some operations, double contingency is met by having a control over a parameter and by crediting an unlikely, independent, and concurrent change in process condition as the second contingency. Although the use of this approach provides adequate safety, there are some specific cases where design changes will be made to strengthen the NCS controls, using passive and active engineered controls, or to strengthen the reliability of the NCS controls.

5.2.4.2 Adhering To ANSI/ANS Standards

In Subsection 5.2.2.1, PORTS commits to adhering to the ANSI standards ANSI/ANS-8.1, ANSI-N16.5/ANS-8.7, and ANSI/ANS-8.19 (as clarified in Chapter 1, Appendix A). A compliance assessment performed for these standards has shown that various requirements and recommendations from these standards are not currently reflected in Criticality Safety section or plant procedures in use at PORTS. However, all of the identified requirements and recommendations are met in practice, and are generally reflected either in design specifications, training manuals, NCSAs/NCSEs, or other plant documentation. As a result of the compliance assessment, numerous updates have been suggested to documents and procedures.

With respect to ANSI/ANS-8.1, the compliance assessment identified the following as items to be added to the plant NCS procedures or to Criticality Safety section procedures, even though they are currently met in practice:

- The General Manager has overall responsibility for NCS
- Management is as responsible for NCS as for production, development, research, and other functions
- Nuclear Safety is organizationally independent of organizations performing operations that require NCS evaluations
- Management establishes the criteria to be satisfied by NCS controls
- A margin in the correlating parameter is prescribed that is sufficient to ensure subcriticality, and this margin includes allowances for uncertainty in the bias and for uncertainty due to extensions in the area(s) of applicability
- Care is exercised to determine the conditions that result in the maximum k_{eff}
- Values for nuclear properties such as cross sections are consistent with experimental measurements of these properties
- The written report of the validation of a calculational method states the area(s) of applicability, and states the bias and the prescribed margin of subcriticality over the area(s) of applicability (among other things)

With respect to ANSI-N16.5/ANS-8.7, the compliance assessment identified the following as items to be added to plant procedure(s) or to Criticality Safety section procedures, even though they are currently met in practice:

- Storage facilities and structures are designed, fabricated, and maintained in accordance with good engineering practices
- The design of storage structures tends to preclude unacceptable arrangements or configurations, thereby reducing reliance on administrative controls
- Shelving is sturdy and noncombustible
- Storage areas are maintained essentially free of combustible materials
- A fire protection system is installed where the presence of significant quantities of combustibles cannot be avoided
- Containers of fissile materials in areas with sprinkler systems are designed to prevent accumulation of water
- Good housekeeping is incorporated as an important part of NCS practices

With respect to ANSI/ANS-8.19, the compliance assessment identified the following as items to be added to plant procedure(s) or to Criticality Safety section procedures, even though they are currently met in practice:

- Management accepts overall responsibility for safety of operations
- Each manager accepts responsibility for safety of operations under his/her control
- Each manager provides training and requires that personnel under his/her oversight have an understanding of procedures and safety considerations such that they may be expected to perform their functions without undue risk
- Managers develop or participate in the development of written procedures applicable to the operations under their control
- The staff consults with knowledgeable individuals to obtain technical assistance as needed
- The staff maintains familiarity with all operations within the organization requiring NCS controls
- Procedures are organized and presented for convenient use by operators, and they are free

contaminated areas, a survey is performed to ensure that contamination is not spread around plant site.

2. Feed, product, and depleted uranium cylinders, which are routinely transported inside the site boundary between facility locations and/or storage areas at the facility, are readily identifiable due to their size and unique construction, and are not routinely labeled as radioactive material. UF_6 cylinders are constantly attended by qualified Radiological Workers during movement.

5.3.1.8 HP Technician Training and Qualification

Training and qualification of HP Technicians and their immediate managers address routine operations and focus on recognizing and handling situations involving both routine and changing radiological conditions.

HP Technician qualification consists of the standardized core course training material[b], facility-specific information, on-the-job training, and passing a final comprehensive written examination and a final oral examination. The training program ensures personnel are proficient in radiation measurements, characterization of radiological conditions, release monitoring, and personnel monitoring. Formal remediation protocols have been established.

Entry-level prerequisites are established to ensure that HP Technicians meet minimum standards for physical condition and education. Task qualification for entry level positions may be used until formal training is completed.

Following initial qualification, HP Technicians are requalified every 2 years. The requalification process requires successful completion of comprehensive written and oral examinations. Personnel who maintain qualifications as HP Technicians satisfy the requirements of Radiological Worker training.

HP Technician Managers shall maintain qualifications as HP Technicians and participate in continuing radiological training programs. HP Technician Managers are requalified every 2 years through a written examination and oral examination.

The HP training programs shall be delivered consistent with the training procedures. Training is used to develop the skills necessary to perform assigned work in a competent manner. The training consists of initial, on-the-job, and continuing training. Instructors will meet the minimum qualifications required by Section 6.6.4.

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[b] HP Technician course curriculum training modules are listed in Table 5.3-11.

5.3.2 Personnel Exposure Control and Measurement

5.3.2.1 Administrative Control Levels

An Administrative Control Level (ACL) at PORTS of 0.5 rem per year Total Effective Dose Equivalent (TEDE) per person has been established for radiological workers. If an individual exceeds 50 percent of the ACL during a calendar quarter or the ACL in the calendar year, an evaluation is performed by the RP Manager for approval by the General Manager. The evaluation is performed to determine the types of activities that may have contributed to the worker's exposure. This may include, but is not limited to, procedural reviews, work practices, work locations, and job assignments.

Depending upon the conclusions of the evaluation, the individual may be allowed to continue radiological work, however work restrictions may be imposed on individuals whose exposure exceeds published ACLs. Approval for continued work is documented in the evaluation as described in the preceding paragraph which requires approval by the General Manager. Investigations to determine cause, assess the exposure, and document the results are specified by procedure.

5.3.2.2 Radiation Exposure

Both NRC and DOE regulated sources of radiation and radioactive material are interspersed at PORTS. There is also a frequent moving of personnel from a USEC contractor or sub-contractor staff to a DOE contractor or sub-contractor staff. Individual sub-contractors may move back and forth repeatedly during the year. This situation makes separation of personnel exposure between NRC and DOE regulated sources impracticable. However, the low cumulative exposures for the site make it feasible not to separate the exposures for personnel being monitored under the USEC certificate.

In order to comply with the personnel monitoring requirements of 10 CFR 20.1502 and the reporting requirements of 10 CFR 19.13, 20.2106 and 20.2206 within the purposes and scopes stated in 10 CFR 19.1, 19.2, 20.1001 and 20.1002, PORTS provides qualified individuals with NVLAP-accredited dosimeters (TLD) and tracks personnel exposure regardless of whether the exposure is from and NRC or DOE regulated source. This applies to internal as well as external exposure. Whenever worker notification is required by 10 CFR 19.13, the individual's "total exposure" while on the Portsmouth site is reported without differentiating between exposure from NRC regulated sources and DOE regulated sources.

To comply with the reporting requirements of 10 CFR 20.2206, PORTS submits an annual report of personnel monitoring information to the Radiation Exposure Information Reporting System (REIRS) Project Manager based on the personnel exposure data base. Dose reports are completed as required for monitored personnel. This applies to internal as well as external dose.

The occupational exposure received by USEC employees, subcontractors, and visitors shall not exceed the 10 CFR 20 Subpart C limits. USEC requires current year exposure history of any occupational worker prior to entry into a Restricted Area where exposure can, or is likely to, exceed 10 percent of the 10 CFR 20 Subpart C annual limit. Personnel declaring pregnancy are advised to keep

5.3.3 Contamination Control

5.3.3.1 Areas Restricted for Purposes of Radiological Control

Radiological control is provided by controlling access to areas or facilities where radioactive material may be encountered and by requiring that each person who enters those areas or facilities receives the appropriate level of radiological worker training[d]. Access and departure requirements are specified by procedure. Radiological posting is used to alert personnel to the presence of radiation and radioactive materials, aid in minimizing exposures, and prevent the spread of contamination. Where contamination is present, contamination controls are implemented.

Controlled Areas

The Controlled Area is an area outside the restricted area but inside the reservation boundary established such that access can be limited for any reason. The controlled area allows access for members of the general public and radiological workers. Occupationally exposed workers within the controlled area require, as a minimum, General Employee Radiological Training.

Restricted Areas

Each restricted area is conspicuously identified. Unescorted access to Restricted Areas requires, as a minimum, the successful completion of the appropriate level of radiological worker training and a personnel monitoring device (TLD). Depending upon the type and extent (or amount) of radioactive material present, Restricted Areas are further identified as RMAs, CCZs, Fixed Contamination Areas, Soil Contamination Areas, CAs, HCAs, ARAs, RAs, or HRAs.

The Restricted Areas at PORTS are predominately confined to production and process support facilities. The support facilities include decontamination, feed and withdrawal, and maintenance facilities that perform work on process equipment that contains radioactive material. Other areas identified as Restricted Areas include UF_6 cylinder storage, onsite laboratories, and radioactive material storage areas.

The restricted areas at PORTS have been identified and documented through the site radiological characterization program. As conditions warrant, Restricted Areas have been established to protect personnel from radiological hazards.

Radioactive Material Areas

Areas or rooms that contain an amount of radioactive material exceeding 10 times the quantity specified in Appendix C to 10 CFR 20.1001-20.2401 for the material are conspicuously posted "Caution Radioactive Material." As noted in Section 5.3.1, RMAs located within other posted radiological areas

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[d] Personnel are trained commensurate with the hazard per 10 CFR 19; details concerning Visitor Orientation, General Employee Training, and Radiological Worker Training programs are described in Section 6.6.

are not required to be posted as "Radioactive Material Area" since a higher level of control is already required.

Contamination Control Zones

CCZs provide a boundary to minimize the spread of contamination. CCZs are areas where removable contamination levels are maintained less than the levels specified in Table 5.3-2, but where discrete instances of contamination are likely to be encountered due to the physical size or historical operation of the facility. CCZs are conspicuously posted "Caution, Contamination Control Zone."

Unescorted access to CCZs requires, as a minimum, the successful completion of the appropriate level of Radiological Worker training and a personnel monitoring device (TLD). Equipment and material are monitored prior to exit from CCZs. Personnel exiting CCZs are required to monitor themselves for contamination at the boundary control station prior to exiting, except as noted in Section 5.3.3.5.

The process building cell floors at PORTS are posted as CCZs. Except for discrete locations, contamination levels are less than those stated in Table 5.3-2. Due to the unique nature of this posting, access to cell floor CCZs will be controlled by a RWP. When work is planned that has the potential to cause contamination levels to exceed those in Table 5.3-2 the area is posted as a CA, HCA or ARA as appropriate. This work is controlled by a RWP as described in Section 5.3.1.6.

In the event that large areas of removable contamination are identified on accessible surfaces exceeding the levels specified in Table 5.3-2, the area will be re-posted as a CA or HCA and actions taken to locate the source of contamination. If access is required to the area, decontamination of the area is initiated as soon as practicable with consideration of ALARA principles.

Fixed Contamination Area

Areas with removable contamination levels below Table 5.3-2 values but with surfaces exceeding the values of Table 5.3-2 for total contamination will be controlled as Fixed Contamination Areas (FCA). If the radiation levels exceed 0.05 mrem/hr at 1 meter the area will be posted as a "Fixed Contamination Area."

Soil Contamination Areas

If surveys of soil surfaces conducted in USEC controlled spaces, indicate surface contamination greater than the total contmination levels shown in Table 5.3-2 the area is posted as required by aproved procedures. Prior to and during excavation, surveys are taken of the sub-surface soil to determine extent of contamination. These soil contamination areas are typically a legacy of past DOE operations and considered DOE waste. USEC will not remediate legacy soil contamination areas unless excavation is required in conjunction with a USEC project.

Contamination Areas

CAs are areas where removable contamination level averaged over an area of approximately 1 square meter has been identified as being greater than the levels specified in Table 5.3-2, but not greater than 100 times the levels in Table 5.3-2. CAs are conspicuously posted "Caution, Contamination Area" and personnel access is subject to RWP requirements. Unescorted access to CAs requires, as a minimum,

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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 Corporation and Plant management systems provide for line responsibility for safe operations with sufficient staff support to develop, communicate, and provide technical programs for various E&H and SS&Q areas. The organization of various support staff are provided in the description of the E&H and SS&Q areas.

USEC provides direction and management of GDP operations from the President and Chief Executive Officer (CEO) through the Executive Vice President, Operations, the Vice President, Production, and the General Managers. Additionally, policy and program direction of E&H and SS&Q programs is provided through the Nuclear Regulatory Assurance and Policy Manager, the Safety and Health Assurance and Policy Manager, and the Environmental Assurance and Policy Manager for their respective areas. These managers are independent from day-to-day production, plant operating cost, and production scheduling considerations. Also, the Safety, Safeguards and Quality Manager (located onsite) who reports to the Executive Vice President, Operations, provides USEC 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 Enrichment Plant Manager reports to the General Manager and directs and coordinates the production plant operation in accordance with USEC policies as reflected in plant procedures and practices. The production line organizations (Operations, Production Support, Maintenance and Work Control) report to the Enrichment Plant Manager and have responsibilities for implementation of USEC safety and safeguards policies and procedures in daily operations. The on-duty PSS reports to the Operations Manager and provides direction and coordination for shift operations. The staff and support organizations (Engineering, Training and Procedures, Environmental, Safety and Health, Site and Facilities Support, Materials Management, and Nuclear Regulatory Affairs) report to the General Manager and provide program direction and support to the production line in implementing safety and safeguards requirements. Finally, administrative organizations (Administrative Support, and Special Programs and Planning) report to the General Manager and provide the services required to support the overall plant operations.

USEC is responsible for safe operation of the GDPs. The operating and maintenance contract between USEC and LMUS affirms the authorities necessary to ensure continued safe operation of the GDPs. USEC approves the management structure and key positions, the assignment of individuals to key positions, qualifications for key positions, and responsibilities and authorities for key positions. Through its onsite presence, contractual authorities, organization and personnel, and management controls, USEC ensures that activities at the GDPs are adequately controlled, that applicable NRC regulatory requirements are met, that the public and worker health and safety are protected, that the environment is protected, and that the common defense is provided for.

Personnel minimum qualifications, functions and responsibilities for key staff positions are described below:

6.1.1.1 Executive Vice President, Operations

The Executive Vice President, Operations, reports to the President and Chief Executive Officer (CEO).

The Executive Vice President, Operations, has overall responsibility for safe operations of the GDPs. The Executive 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 and security, and to achieve or maintain compliance with applicable regulatory requirements. In addition, the Executive Vice President, Operations, must concur with the decision of the General Manager to restart any operation that was directed to be shut down by the Executive Vice President, Operations, or by the Safety, Safeguards and Quality Manager.

The Executive Vice President, Operations, shall have as a minimum a bachelors degree or equivalent technical experience[1], 10 years of management experience, and 6 years of nuclear experience (which may be concurrent with the management experience).

The Executive Vice President, Operations, is appointed by the USEC Board of Directors.

6.1.1.2 Vice President, Production

The Vice President, Production, reports to the Executive Vice President, Operations.

The Vice President, Production, has overall responsibility for all activities within the production organization, including the functions of operations, maintenance, plant support, engineering, transportation, materials handling and storage, and industrial, radiological, and nuclear safety.

The Vice President, Production, shall have shut down authority for any aspect of operation at either plant. In addition, the Vice President, Production must concur with the decision of the General Manager to restart any operation that was directed to be shut down by the Vice President, Production.

The Vice President, Production, shall have as a minimum a bachelors degree in engineering or the physical sciences or equivalent technical experience, 6 years nuclear experience, and 6 years management experience (which may be concurrent with the nuclear experience).

The Vice President, Production, is appointed by the USEC Board of Directors.

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[1] 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 60 quarter hours from an accredited college or university may be substituted for 1 year of baccalaureate education.

The Safety, Safeguards 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 Safety, Safeguards and Quality Manager, or a management position responsible for quality assurance that reports to the Safety, Safeguards and Quality Manager, shall have a minimum of 1 year quality assurance experience or 1 year experience implementing quality assurance program requirements.

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

6.1.1.7 President, Lockheed Martin Utility Services, Inc.

The President, LMUS, has corporate responsibility within LMUS for the USEC/LMUS operating & maintenance contract for the GDPs. The President, LMUS is responsible for providing the services described by the contract to USEC, through the Vice President, Production.

The President, LMUS, is appointed by the President of Lockheed Martin Energy and Environmental with concurrence by the President and CEO, USEC.

6.1.1.8 General Manager

The General Manager reports to the Vice President, Production, and administratively to the President, LMUS.

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 and procedures, site and facilities support, engineering, transportation, materials handling and storage, and occupational, environmental and nuclear safety. Day-to-day authority and accountability for production and production support activities is assigned to the Enrichment 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 Nuclear 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 shut down operations and must obtain concurrence of (1) the Vice President, Production, for any operations that were directed to be shut down by the Vice President, Production; and (2) the Executive Vice President, Operations, for any operations that were directed to be shut down by the Executive Vice President, Operations, or by the Safety, Safeguards and Quality Manager.

The General Manager shall have as a minimum a bachelors degree in engineering or the physical sciences or equivalent technical experience, 6 years of nuclear experience, and 6 years of management experience (which may be concurrent with the nuclear experience).

The General Manager is appointed by the President, LMUS with concurrence by the Vice President, Production, and the Executive Vice President, Operations.

6.1.1.9 Enrichment Plant Manager

The Enrichment Plant Manager reports to the General Manager.

The Enrichment Plant Manager is responsible for the day-to-day production activities at the site including operations, maintenance, work control, and production support (which includes radiation protection, quality control, laboratory analysis, and waste management). The Enrichment 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, Production, the Executive Vice President, Operations, or the Safety, Safeguards and Quality Manager.

The Enrichment Plant Manager shall have as a minimum a bachelors degree in engineering or the physical sciences or equivalent technical experience, 6 years of nuclear experience, and 6 years of management experience (which may be concurrent with the nuclear experience).

The Enrichment Plant Manager is appointed by the General Manager, with concurrence by the President, LMUS and the Vice President, Production.

6.1.1.10 Operations Manager

The Operations Manager reports to the Enrichment Plant Manager.

The Operations Manager is responsible for the operations of the enrichment cascade, plant utilities, chemical services, feed and product facilities and shift operations. This includes activities such as ensuring the correct and safe operation of the UF_6 processes; proper receipt, storage, handling and onsite transportation of UF_6; providing electric power, steam, compressed air, nitrogen, plant and sanitary water, and waste water treatment for the cascade and support facilities; and providing chemical cleaning and decontamination services. In the absence of the General Manager and Enrichment Plant Manager, the Operations Manager may be delegated the responsibilities and authorities of the General Manager and/or the Enrichment Plant Manager. This manager shall have the authority to stop work and/or shut down operations in any part of the operation for which he/she has responsibility.

The Operations Manager shall have as a minimum a bachelors degree in engineering or the physical sciences or equivalent technical experience, and 4 years of nuclear experience with at least 6 months in a gaseous diffusion plant.

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

6.1.1.11 Maintenance Manager

The Maintenance Manager reports to the Enrichment Plant Manager.

The Maintenance Manager is responsible for safe, reliable, and cost-effective performance of preventive, predictive, and corrective maintenance on production facilities and equipment. This includes troubleshooting, maintenance of logs and records, interfacing with work control to initiate, screen,

evaluate, prioritize, and plan maintenance work, and coordinating shop maintenance in direct support of production equipment and buildings. The manager shall have the authority to stop work and/or shut down operations in any part of the operation for which he/she has responsibility.

The Maintenance Manager shall have as a minimum a bachelors degree in engineering or the physical sciences or equivalent technical experience, and 4 years of nuclear experience with at least 6 months in a gaseous diffusion plant.

The Maintenance Manager is appointed by the Enrichment Plant Manager with concurrence by the General Manager and by the Vice President, Production.

6.1.1.12 Production Support Manager

The Production Support Manager reports to the Enrichment Plant Manager.

The Production Support Manager is responsible for the technical functions in direct support of production activities. This includes the radiation protection program, laboratory operations, quality control, and waste management services. Quality control in this case means the inspection of modifications, new construction, and maintenance tasks as well as receipt inspection of material and inspection of plant equipment for conformance with applicable codes as described in procedures. This manager shall have the authority to stop work and/or shutdown operations in any part of the operation for which he/she has responsibility.

The Production Support Manager shall have as a minimum a bachelors degree in engineering or the physical sciences or equivalent technical experience, and 4 years of nuclear experience with at least 6 months in a gaseous diffusion plant.

The Production Support Manager is appointed by the Enrichment Plant Manager with concurrence by the General Manager and the Vice President, Production.

6.1.1.13 Radiation Protection Manager

The Radiation Protection Manager reports to the Production Support Manager.

The Radiation Protection Manager is responsible for the implementation, maintenance, and effectiveness of the health physics and radiation protection programs. These duties include training personnel in the use of radiological program support equipment, controlling radiation exposure of personnel, determining the radiological status of the facility, determining the need for issuing and closing out radiation work permits, and conducting the radiological occupational monitoring program. The Radiation Protection Manager has direct access to the General Manager and the Enrichment Plant Manager concerning radiation protection matters and has stop work authority for activities not being conducted in accordance with radiation protection requirements and policies.

The Radiation Protection Manager shall have as a minimum a bachelors degree in engineering, health physics, radiation protection, or the physical sciences or equivalent technical experience, and 4 years experience in radiation protection including 6 months at a uranium processing facility.

The Radiation Protection Manager is appointed by the Production Support Manager with concurrence by the Enrichment Plant Manager and General Manager.

6.1.1.14 Work Control Manager

The Work Control Manager reports to the Enrichment Plant Manager.

The Work Control Manager is responsible for production maintenance work planning and scheduling. This includes managing daily work control activities, developing an integrated work schedule, and coordinating development of work control guidelines.

The Work Control Manager shall have as a minimum a bachelors degree in engineering or the physical sciences or equivalent technical experience, and 4 years of nuclear experience with at least 6 months in a gaseous diffusion plant.

The Work Control Manager is appointed by the Enrichment Plant Manager with concurrence by the General Manager and the Vice President, Production.

6.1.1.15 Shift Operations Manager

The Shift Operations Manager reports to the Operations Manager.

The Shift Operations manager coordinates the activities of the Plant Shift Superintendents and provides technical and administrative support.

The Shift Operations Manager shall have as a minimum a bachelors degree or equivalent technical experience, and 4 years nuclear experience with at least 6 months at a GDP.

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

6.1.1.16 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 an incident commander during plant emergencies, and making notification of events.

The PSS is authorized to stop operations when system operability or the overall safety of operations is in question. The PSS is also authorized to initiate restart after shut down for non-routine reasons. For shutdowns that are directed by the Executive Vice President, Operations; Vice President, Production; Safety, Safeguards and Quality Manager; the General Manager, or the Enrichment Plant

Manager; the PSS may authorize restart only after obtaining the approval of the Enrichment 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 Enrichment Plant Manager and General Manager.

6.1.1.17 Environmental, Safety and Health Manager

The Environmental, Safety and Health Manager reports to the General Manager. The Environmental, Safety and Health Manager is governed by, and must adhere to policies established by the Environmental Assurance and Policy Manager, and the Safety and Health Assurance and Policy Manager. As delegated by these managers, the Environmental, Safety and Health Manager is responsible for establishing and implementing the environmental monitoring program described in Section 5.1, the site environmental protection programs, and the industrial and chemical safety programs at the facility. This includes activities associated with environmental compliance, occupational safety and health, industrial safety, chemical safety, and industrial hygiene. The Environmental, Safety and Health Manager has stop work and shut down authority for activities that could cause environmental, safety and health concerns.

The Environmental, Safety and Health Manager shall have as a minimum a bachelors degree in engineering or safety disciplines, the physical sciences or environmental disciplines, or equivalent technical experience, and 4 years nuclear experience with at least 6 months at a gaseous diffusion plant.

The Environmental, Safety and Health Manager is appointed by the General Manager with concurrence by the Environmental Assurance and Policy Manager, and the Safety and Health Assurance and Policy 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 design, fabrication, and construction of non-project plant modifications or additions; systems and reliability engineering (including interface with Maintenance regarding predictive and preventive maintenance); nuclear safety (which includes nuclear criticality safety and safety analysis); and the configuration management program.

The Engineering Manager shall have as a minimum a bachelors degree in engineering or the physical sciences and 4 years of nuclear experience with at least 6 months in a gaseous diffusion plant.

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

6.1.1.19 Nuclear Safety Manager

The Nuclear Safety Manager reports to the Engineering Manager.

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

The Nuclear Safety Manager shall have as a minimum a bachelors degree in engineering or the physical sciences or equivalent technical experience, and 4 years nuclear safety experience including 6 months at a uranium processing facility where nuclear criticality safety was practiced.

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

6.1.1.20 Site and Facilities Support Manager

The Site and Facilities Support Manager reports to the General Manager and is governed by, and must adhere to, policies established by the Safety and Health Assurance and Policy Manager.

The Site and Facilities Support Manager is responsible for plant fire and police services, security, Emergency Management, non-production related facility maintenance, and shared site programs. This includes responsibility for project management, construction, and coordination of large project plant modifications or additions. The Site and Facilities Support Manager has stop work authority for activities not being conducted in accordance with applicable regulatory requirements.

The Site and Facilities Support Manager shall have as a minimum a bachelors degree or equivalent technical experience, and 4 years of nuclear experience with at least 6 months in a gaseous diffusion plant.

The Site and Facility Support Manager is appointed by the General Manager with concurrence by the Vice President, Production.

6.1.1.21 Security Manager

The Security (Group) Manager reports to the Site and Facilities Support Manager, and is governed by, and must adhere to, policies established by the Safety and Health Assurance and Policy Manager.

Safety, Safeguards and Quality Manager. From a technical perspective, the Plant Operations Review Committee (PORC) and its associated subcommittees provide the mechanism for evaluating and integrating E&H and SS&Q program elements from a plant design and program change perspective.

6.1.3 Items Addressed by Compliance Plan

This section is implemented as described with exception(s) as listed below. The listing of the exception(s) also contains a brief description of what is currently in place at the plant. The Compliance Plan provides a description of the exceptions (noncompliances), a justification for continued operation, a description of the actions to be taken to achieve compliance, and the schedule for completion of those actions.

Management Controls

USEC has not completed development and implementation of programmatic controls to ensure effective oversight and compliance with applicable NRC regulatory requirements. Through the primary vehicle of the Quality Assurance Program, applicable NRC requirements will be "flowed-down" to policies and procedures that will be approved and implemented at headquarters and at both plants. In addition, the reporting relationships, and the qualifications, functions, responsibilities, and authorities for the positions identified in Sections 6.1.1.1 through 6.1.1.25, and Figure 6.1-1 must be "flowed-down" to position descriptions.

The reporting structures at headquarters and at the plants currently exist and various policies and procedures are in place. Adequate management controls and resources are in place to safely operate the gaseous diffusion plants and to ensure the protection of the health and safety of the workers and the public, protection of the environment, and provide for the common defense.

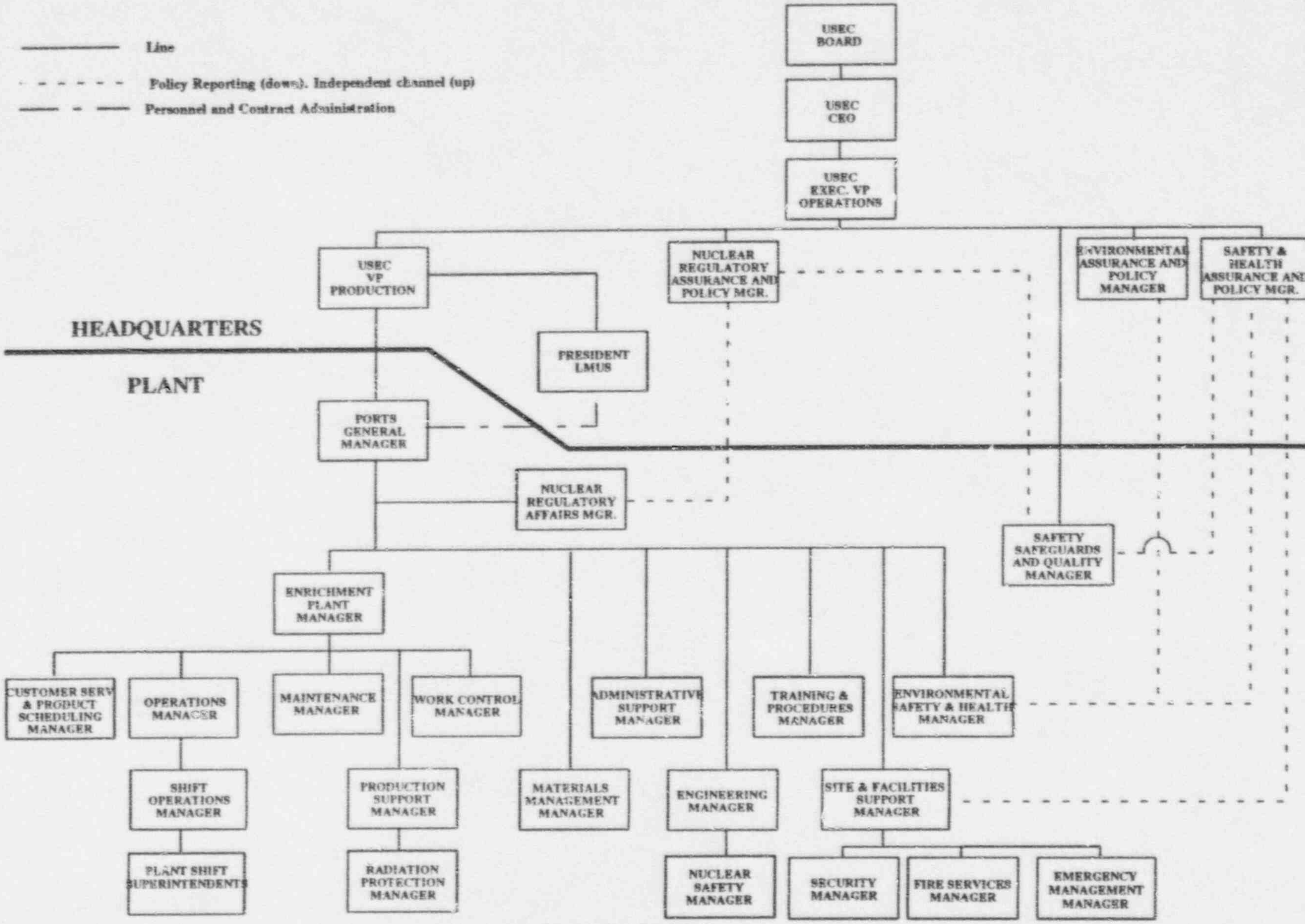

Figure 6.1-1
Uranium Enrichment Facilities Organization Chart

Each shift organization is composed of a PSS and an assistant PSS; a cascade controller (CC) who directs overall cascade activities; first-line managers for the cascade buildings, power operations, chemical operations, and utility operations, health physics technicians, Security Shift Commander, Fire Services Shift Commander, operators, security patrol officers, and firefighters. Less than this normal shift staffing is permitted for short periods with the concurrence of the PSS to allow for call-ins or other compensatory actions.

The PSS provides a direct chain of command from the Operations Manager, Enrichment Plant Manager and General Manager to the shift operating staff, and serves as the senior shift manager in directing activities and personnel. The operations line organization is accountable to the PSS for reporting plant status.

The CC provides managerial oversight, operations coordination, and assures adequate staffing for all cascade operations on a 24-hour basis. This person approves, directs, and integrates all significant cascade operational activities under the oversight of the PSS.

The remaining members of the shift organization perform the needed functions for round-the-clock operations. The assistant PSS supports the PSS in management of shift operations. The first-line managers provide management for, coordination of, and assurance of proper execution of assigned tasks. Health physics technicians provide support for 24-hour shift operations. The Security Shift Commander supervises the activities necessary to ensure the protection of plant facilities, government property, and classified information. The Fire Shift Commander supervises shift fire services work activities and responds to plant emergency events.

There are many diverse systems for operational communications. Commercial telephones, an internal plant telephone system, radio networks, a plant public address (PA) system, emergency signals, and a pager system are available to provide necessary communications in operating the plant. The PCF is the focal point for all emergency reporting and initiating of all emergency responses. A special emergency telephone network is available in the PCF. Fire alarm and sprinkler indicator systems, and criticality alarm panel, as well as numerous operational alarms are monitored. As described in the Emergency Plan, the PSS will initiate offsite notifications and plant personnel call-ins when required.

As discussed in Sections 6.8 and 6.9, a system has been developed to prescribe the identification and reporting of deficiencies for all plant activities. Reports are sent to the PCF. The PSS reviews each report to determine system operability and whether the condition is reportable. If an item is determined to be reportable the PSS makes the initial verbal notification.

6.5.2 Operations

The cascade is the UF_6 enrichment portion of the plant. The cascade is composed of three major process buildings which house two parallel enrichment cascades that share common product and tails withdrawal facilities. There are auxiliary facilities such as the recirculating water pump houses which are also under the direct control of cascade operations.

The Operations Manager is responsible for overall operations. This includes operation of cascade equipment, planning for power usage, control of feeds, product and tails material including sampling, operating plant utilities, radiological decontamination, equipment cleaning, uranium recovery, and operation of plant laundry. The Operations Manager is supported by managers in the following groups:

Shift Operations. Cascade, Chemical, Utilities, Power, and Feed and Transfer. These group managers have subordinate managers assigned to functional areas to provide oversight of the day shift operations.

The optimum cascade arrangement for specific power levels, product and tails assay levels, and feed availabilities is determined by the day shift operations staff. Recommendations for configuration are made to the Cascade Manager by the Cascade Control Manager and implemented by Cascade Utility managers in conjunction with the rotating shift organization. The rotating shift organizations follow daily instructions and work plans developed and communicated by the group managers. The cascade controller has the responsibility to change cascade related priorities should the need arise. Changes to plant priorities for activities on shift require the approval of the PSS.

The Utilities Manager, in conjunction with key building managers, provides the plant with sanitary water, chilled water, steam, air, nitrogen, and sewer services. These must be supplied on a continuous basis to meet the cascade requirements. Any outage is coordinated with customers to assure proper planning to provide temporary services as necessary.

The Power Operations Manager is responsible for managing the power supply system as well as being involved in the activities associated with power contract and power scheduling. Power systems rely on scheduled preventive maintenance activities to ensure a dependable supply. The power facilities are operated and monitored 24-hours per day and, therefore, have a shift organization which interfaces directly with the PSS.

The Chemical Operations Manager is responsible for operation of the plant laundry, nonradiological and radiological decontamination, cleaning of respiratory protection equipment, and uranium recovery.

The Feed and Transfer Manager is responsible for UF_6 cylinder handling within the plant including product cylinder shipment, and operating the plant fluorine facility.

Other organizations within the plant provide support such as supply of spare parts and equipment, handling of scrap and waste, provisions for employee safety, necessary analysis to control operation and protect the environment, provide status of equipment design, systems engineering support and design change, and administrative support. Chapter 3 provides additional detail on specific cascade equipment and support systems.

6.5.3 Deleted

6.5.4 Deleted

6.5.5 Operator Responsibility, Authority and Shift Routines

Plant operations, shift routines, and operator responsibilities at PORTS are governed by a series

Phase III provides classroom and/or OTJ training leading to task qualification on the following systems and/or equipment: Cylinder Stacking; the installation and/or repair and preventative maintenance of Compressors & Seals, Scales & Balances, Diesel Engines, Rail Cars, selected Process Valves & Pumps, Converters, Motors, Autoclaves, and UF_6 Liquid Handling Overhead Cranes. Personnel are only trained to perform tasks in their assigned duty areas.

Skill of the craft is established as a prerequisite for job selection. If an employee is classified as a journeyman, then that person has demonstrated competency of "skill-of-the-craft." If deficiencies in a journeyman's qualifications are revealed during job specific training and performance evaluations designed to measure the employee's mastery of learning objectives, then remedial training is provided on the appropriate craft fundamentals to maintain "skill-of-the-craft" expectations.

The training is designed, developed, and implemented to assist facility employees in gaining an understanding of applicable fundamentals, procedures, and practices specific to the gaseous diffusion process and facility. It is also used to develop the skills necessary to perform assigned work in a safe manner. If a task is identified to operate, maintain, or modify a specific Q system or process, then the training will be developed using SAT methodology. The training is categorized as Initial Training and Continuing Training.

6.6.6 Radiation Worker Training

Radiation Worker Training is a biennial training requirement for personnel whose job requires them to have unescorted access to radiological restricted areas. The training includes a comprehensive classroom curriculum consisting of the following, as appropriate:

- Fundamentals of atomic structure, radiological definitions, types of ionizing radiation, units of measurement, dose, and dose rate calculations;
- Biological effects of ionizing radiation including cell sensitivity and chronic and acute exposure;
- Radiation work permit applications and use;
- Radiation limits for occupational and non occupational workers as well as the general public;
- ALARA practices for protection from exposure to radiation or radioactive materials;
- Personnel Monitoring Programs in place to monitor the worker's exposure to radiation;
- Radioactive Contamination Control to minimize and control the spread of contamination;
- Radiological Postings and Controls for familiarization with the signs and postings in the work area;
- Emergencies involving radiological material and the correct response; and
- Chemical Toxicity of Soluble Uranium Compounds.

This training includes classroom examinations and practical factor examinations of the personal protective equipment, personnel monitoring, and radiation measurements, if needed. Radiation Worker

training is reviewed and approved by the Radiation Protection Manager and administered by the Portsmouth Training organization. The extent of the course material shall be commensurate with the potential for exposure.

6.6.7 Health Physics Technician Training and Qualification

Health Physics Technician Training and Qualification is administered by the central training organization in accordance with guidelines provided in the TDAG for Health Physics Technicians. It utilizes the systems approach to training (Section 6.6.3) and applies to those individuals, both plant and contractor, who will be engaged in the evaluation of radiological conditions in the nuclear facilities and the implementation of the necessary radiological safety measures as they apply to nuclear facility workers and members of the general public.

6.6.8 Fire Protection and Emergency Management Training

6.6.8.1 Emergency Management Training

Emergency Management Training is administered by Emergency Management under the direction of the Site and Facilities Support Manager. It is defined in the Portsmouth Emergency Plan (Sections 7.2 and 7.3). Training is conducted in the areas of:

- General Emergency Plan training (Section 7.2.1)
- Specialized Emergency Plan training for the Emergency Response Organization (Section 7.2.2)
- Offsite Emergency Management training (Section 7.2.3)

Emergency Management drills and exercises are conducted to develop, maintain, and test the response capabilities of personnel, facilities, equipment, and training (Section 7.3).

6.6.8.2 Fire Protection Training

Fire Protection Training is administered by Site and Facilities Support and is covered in Section 5.4.5.

Fire Services personnel are trained and equipped to handle anticipated types of emergencies. Emergency medical response personnel meet requirements for state certification as emergency medical technician (these are usually also firefighters). Qualified instructors provide a range of classroom and hands-on training to maintain standards of performance for all response personnel. Training needs are reviewed annually and the training program modified to meet identified needs. State certification requirements provide the basis for firefighter training programs. Drills are conducted quarterly, as part of the plant emergency plan.

6.6.9 Environmental, Safety and Health Training

This training is administered by the PORTS Training organization under the auspices of Environmental, Safety and Health and Nuclear Safety. It covers those environmental, worker safety and health subject areas required by applicable local, state, and federal regulations and is provided to personnel commensurate with their job assignments. A listing of the training topics is provided below. This list is updated as regulatory training requirements change.

- Hearing Conservation
- Temperature Extremes
- General Confined Space
  Authorized Entrant/Attendent
  Managers of Confined Space
  Instrumentation
  Emergency Responders
- Asbestos Awareness
- Custodial Asbestos Training
- Hazard Communication
  Job Specific Managerial
  Chemical Hazard
  Category-Specific Modules
- Lockout/Tagout
  Issuing Authority
  Authorized Employee
- Fall Protection
- Personal Safety (PPE)
- RCRA for Hazardous Waste
  Generator
- HAZWOPER
- Lead Hazards
- Managerial NCS
- Respiratory Protection

6.6.10 Subcontractor Training

The subcontractor training is determined by the Safety and Health Plan issued for each unique contract or scope of work provided by the subcontractor. This training consists of the safety and health courses or modules required to perform the work in a safe manner. Projects are designed by Site and Facilities Support in accordance with OSHA construction engineering standards, 29 CFR 1926, prior to projects going out for bids. Site and Facilities Support consults with the Safety Group and Plant Training to determine the safety and health related training required, along with site access requirements for subcontractor personnel.

6.6.11 Nuclear Criticality Safety Engineer/Specialist Training

Nuclear criticality analyst training and qualification are administered by the Criticality Safety section of the Nuclear Safety group. Training is based on ANSI/ANS-8.20-1991, "American National Standard for Nuclear Criticality Safety Training," and Criticality Safety procedures that define educational and experience prerequisites for incumbents, along with required training courses and OJT activities to be completed prior to qualification.

6.6.12 Quality Control Inspection and Independent Audit Personnel Training

The qualification and re-qualification of inspection personnel, auditors, lead auditors and nondestructive examination personnel is performed in accordance with QAP Section 2.2.4.

6.6.13 Manager Training

Manager Training is provided for those persons who manage the operations and maintenance personnel relied upon to operate, maintain, or modify Q items or SSCs identified in NCSAs required to meet the double contingency principle. The training is designed, developed, and implemented to assist facility managers in gaining an understanding of the applicable procedures and practices specific to the gaseous diffusion process and facility. Also, it is used to develop the managerial and leadership skills necessary to effectively manage personnel.

6.6.14 Cascade Controller Training

Cascade Controller Training is administered by Operations and provided to those persons who direct the overall operations of the gaseous diffusion cascade. This training is based on the systems approach to training (Section 6.6.3) and is designed, developed, and implemented to provide the Cascade Controllers an understanding of the overall integration of the process and support systems necessary to operate the GDP. Cascade Controllers also receive Manager Training (Section 6.6.13).

6.6.15 Plant Shift Superintendent Training

Plant Shift Superintendent Training is administered by the Shift Operations Manager and provided to those persons who provide managerial oversight for the daily operations of the Plant Uranium Enrichment Facility and other support activities. This training is based on the systems approach to training (Section 6.6.3) and is designed, developed, and implemented to provide the Plant Shift Superintendent an understanding of the overall integration of the processes, support systems, administrative and emergency procedures, and regulatory reporting requirements necessary to operate the GDP. Plant Shift Superintendent qualification is granted by the Operations Manager upon successful completion of training. The Plant Shift Superintendent's training program is structured into several distinct but interrelated courses that include the following:

1. Incident Command and Emergency Response
2. Occurrence Reporting; Problem Identification; Evaluation, Disposition and Regulatory Notifications
3. Technical Subjects

6.10 RECORDS MANAGEMENT AND DOCUMENT CONTROL

Introduction

Records Management and Document Control programs are established to ensure records and documents required by the QAP are appropriately managed and controlled. These programs are designed to meet the specific recordkeeping and document control requirements set forth in 10 CFR 76 and the applicable provisions of other parts of 10 CFR. These programs provide administrative controls that establish standard methods and requirements for collecting, maintaining, and disposing of records. These programs also ensure that documents are controlled and distributed in accordance with identified written requirements and authorizations. The administrative controls for the generation and revision of records and documents are contained in plant implementing procedures. The principal elements of each of the Records Management and Document Control programs and a brief description of the manner in which the functions associated with each element are performed are provided below, along with a list of the types of records that are retained for the duration of the NRC Certification of Compliance for the plant.

6.10.1 Records Management Program

The Records Management program provides direction for the handling, transmittal, storage, and retrievability of records. Records media may include microfilm, electronic (magnetic or optical), or hard copy. Records are categorized and handled in accordance with their relative importance to safety and storage needs. Special provisions are made for handling contaminated records and ensuring their inclusion in the program. Responsibility for the administration of the Records Management program rests with the Administrative Support Manager. Responsibility for Records Management program compliance rests with the group managers generating records. This program is implemented through procedures that provide guidance for the following program elements.

6.10.1.1 Legibility, Accuracy, and Completeness

Documents designated to become records shall be legible, accurate, complete, and contain an appropriate level of detail commensurate with the work being performed and the information required for that type of record.

6.10.1.2 Identification of Items and Activities

Records clearly and specifically identify the items or activities to which they apply.

6.10.1.3 Authentication

Records are authenticated or validated by the Organization Manager of the organization which originates the record, or his designee, as specified in the procedure which controls the generation and revision of these records. This is in the form of a signature and date applied to the record.

6.10.1.4 Indexing and Filing

Methods are specified for indexing, filing, and locating records within the record system to ensure the records can be retrieved in a timely manner.

6.10.1.5 Retention and Disposition

Records retention times are specified in a retention schedule. The process for disposition of records that have reached the end of their retention lifetime is specified by procedures and conforms to applicable requirements.

6.10.1.6 Corrections

Corrections to records are approved by the organization which created the record unless other organizations are specifically designated. Changes are made by clearly indicating the correction, the date of the correction and the identification of the individual making the correction.

6.10.1.7 Protection of Records

Controls are established for protection of records from deterioration, loss, damage, theft, tampering, and/or unauthorized access for the life of the record. Requirements include instructions on protection of records by the record originator until they are transferred to Administrative Support. Instructions for the protection of special record media such as radiographs, photographs, negatives, microform and magnetic media are provided to prevent damage from excessive light, stacking, electromagnetic fields, temperature, humidity, or any other condition adverse to the preservation of those records. Records which cannot be duplicated are stored in a fashion that minimizes deterioration.

6.10.1.8 Storage Requirements

Records are stored in authorized facilities or containers providing protection from fire hazards, natural disasters, environmental conditions, infestations of insects, mold, or rodents. Storage facilities are maintained to ensure continuous protection of the records. Requirements are specified for both permanent and temporary storage of records.

Permanent Storage

Records are permanently stored in facilities satisfying the following requirements:

1. Storage in 2-hour-rated containers meeting National Fire Protection Association (NFPA) 232-1986 or NFPA 232 AM-1986 or both as clarified in Chapter 1, Appendix A, or

2. Storage of duplicate copies in separate facilities that are sufficiently remote from each other to eliminate the possibility of exposure to simultaneous hazards, or

3. Storage in facilities that have the following: doors, structures, frames, and hardware that comply

LIST OF EFFECTIVE PAGES

Page	Revision	Page	Revision
iii	8	36	3
iv	1	37	3
v	3	38	3
vi	3	39	3
vii	3	40	3
viii	3	A-1	3
		A-2	3
1	3	A-3	3
2	3	A-4	3
3	3	A-5	3
4	3	A-6	3
5	3	A-7	3
6	3	A-8	3
7	3	A-9	3
8	3	A-10	3
9	3	A-11	3
10	3	A-12	3
11	3	A-13	3
12	3	A-14	3
13	3	A-15	3
14	3	A-16	3
15	3	A-17	3
16	3	A-18	3
17	3	A-19	3
18	3	A-20	3
19	3	A-21	3
20	3	A-22	3
21	3	B-1	3
22	3	B-2	3
23	3	C-1	3
24	3	C-2	3
25	3	C-3	3
26	3	C-4	3
27	8		
28	3		
29	3		
30	3		
31	3		
32	3		
33	3		
34	3		
35			

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2.12 CONTROL OF MEASURING AND TEST EQUIPMENT

2.12.1 General

A system is established for the control of measuring and test equipment (M&TE) for Q items within the scope of this QAP as described in Section 2.2. The requirements for the control of measuring and test equipment are in accordance with Basic Requirement 12 and Supplement 12S-1 of ASME NQA-1, 1989. This system establishes measures that ensure that tools, gauges, instruments, reference and transfer standards, nondestructive test equipment, and other measuring and testing devices used in activities affecting quality are properly controlled, calibrated, and adjusted at specified intervals to maintain equipment performance within required limits.

This system also establishes measures to ensure that devices and standards used for measurement, tests, and calibration activities are of the proper type, range, and accuracy. In addition, calibration control requirements are applied to permanently installed facility instrumentation which are used to verify that operating specifications or code requirements are met.

2.12.2 Responsibilities

The Maintenance Manager has the overall responsibility for the calibration control system for M&TE including plant installed process instrumentation. The calibration control system meets the requirements of this section of the QAP.

Organization/Group Managers are responsible for implementation of the calibration control system for M&TE including plant installed process instrumentation under his/her cognizance.

2.12.3 Requirements

Procedures are established for the control of M&TE to ensure the following:

1. A list of devices (and their assigned location) is established to identify those items within the calibration control system. This identification listing includes, as a minimum, the due date of the next calibration and any use limitations (when it is calibrated for limited use). Calibration controls are not necessary for rulers, tape measures, levels, and other such devices if the commercial equipment provides adequate accuracy.

2. M&TE is calibrated at specified intervals or prior to use against certified equipment having known valid relationships to nationally recognized standards. If no nationally recognized standard exists, the bases for calibration are documented.

3. When M&TE is found to be out of calibration, an evaluation is made and documented as to the validity of previous inspection and test results and of the acceptability of items previously inspected or tested. Out-of-calibration devices are tagged or segregated and are not used until recalibrated. When M&TE is consistently found to be out of calibration, it is repaired or replaced. Also,

calibrations are performed when the accuracy of the equipment is deemed suspect by personnel performing measurements and tests.

4. M&TE is properly handled and stored to maintain accuracy.

5. Records are maintained and equipment is suitably marked to indicate its calibration status.

2.13 HANDLING, STORAGE, AND SHIPPING

2.13.1 General

A system is established for the handling, shipping, and storage of Q items identified as within the scope of this QAP as described in Section 2.2. This system is in accordance with Basic Requirement 13 and Supplement 13S-1 of ASME NQA-1, 1989. This system provides the requirements for item handling, storage, and shipping, to prevent damage, loss, or deterioration.

2.13.2 Responsibilities

The Engineering Manager is responsible for specifying the requirements for handling, storage, shipping, cleaning, packaging, and on site movement of items in specifications, drawings, instructions, procedures, procurement documents, and/or other appropriate documents, in accordance with requirements of this section of the QAP.

Organization/Group Managers have the responsibility for the proper handling and on-site movement of items under their cognizance from the point of issuance through installation and use. These activities are accomplished in accordance with procedures consistent with the requirements of this section of the QAP.

The Materials Management Manager has the responsibility for the proper handling, storage, and on-site movement of items under his/her cognizance (i.e., upon receipt, during storage, and to the point of issuance). These activities are accomplished according to procedures consistent with the requirements of this section of the QAP.

The Production Support Manager is responsible for selectively verifying that items are properly handled, stored, and shipped.

2.13.3 Requirements

1. Procedures identify requirements for the handling, storage, cleaning, packaging, shipping, and preservation of items. These requirements are established during the generation of procurement, design, and shipping documents to prevent damage, loss, or deterioration. Periodic inspections are provided to verify compliance with storage requirements and to prevent deterioration;

LIST OF EFFECTIVE PAGES

Pages	Revision	Pages	Revision
5-5	2	8-1	2
5-6	2	8-2	1
5-7	2		
5-8	2	9-1	1
5-9	2	9-2	3
5-10	3		
5-11	3	10-1	2
5-12	1	10-2	1
6-1	1	A-1	3
6-2	2	A-2	3
6-3	2		
6-4	2	B-1	1
6-5	2	B-2	1
6-6	2		
6-7	2	C-1	1
6-8	3	C-2	1
7-1	3	D-1	2
7-2	3	D-2	1
7-3	3	D-3	2
7-4	3	D-4	1
7-5	3		
7-6	3	E-1	1
		E-2	1

CONTENTS

CONTENTS (Continued)

Page

4. RESPONSIBILITIES

USEC is responsible for overall direction and control of NRC-regulated activities at PORTS. USEC is also required to provide site-wide emergency response services to DOE pursuant to Appendix F of the Lease Agreement.

4.1 NORMAL FACILITY ORGANIZATION

While the Executive Vice President, Operations, is ultimately responsible for the safe operation of the plant, the General Manager is responsible for the day-to-day management and operation of the plant, including the program of emergency response services. An organizational chart showing the functional levels and reporting responsibilities is provided in Figure 4-1. The administrative and technical support personnel staffing the plant organization are normally onsite daily, Monday through Friday, holidays excluded. Plant operational personnel are on duty 24 hours per day. Descriptions of the key managers at the plant and their responsibilities are provided below.

4.1.1 General Manager

The General Manager has direct responsibility for operation of the facility in a safe, reliable, and efficient manner. The General Manager, or designee, becomes the Crisis Manager and is authorized to declare an emergency, initiate the appropriate response, and assign a Recovery Manager when emergency conditions no longer exist. (The duties and responsibilities of the Recovery Manager are addressed in Section 9.)

4.1.2 Enrichment Plant Manager

The Enrichment Plant Manager is responsible for day-to-day production activities at the site including operations, maintenance, work control, and production support. The Enrichment Plant Manager acts for the General Manager in the General Manager's absence or as directed by the General Manager.

4.1.3 Operations Manager

The Operations Manager is responsible for the operations of the enrichment cascade, plant utilities, chemical services, and feed and product facilities. This includes activities such as ensuring the correct and safe operation of the UF_6 processes; proper receipt, storage, handling and onsite transportation of UF_6; providing utilities for the cascade and support facilities; and providing chemical cleaning and decontamination services; and shift operations.

4.1.4 Production Support Manager

The Production Support Manager is responsible for technical functions in direct support of production activities. These include radiation protection, laboratory analysis services, quality control, and waste management services.

4.1.5 Maintenance Manager

The Maintenance Manager is responsible for safe, reliable, and cost-effective performance of preventive, predictive, and corrective maintenance on production facilities and equipment. This includes troubleshooting, maintenance of logs and records, interfacing with work control to inititate, screen, evaluate, prioritize, and plan maintenance work, and coordinating shop maintenance in direct support of production equipment and buildings.

4.1.6 Environmental, Safety and Health Manager

The Environmental, Safety and Health Manager is responsible for establishing and implementing the environmental monitoring program described in Section 5.1, the site environmental protection programs, and the industrial and chemical safety programs at the facility. This includes activities associated with environmental compliance, occupational safety and health, industrial safety, chemical safety, and industrial hygiene.

4.1.7 Site and Facilities Support Manager

The Site and Facilities Support Manager is responsible for emergency management, plant fire and police services, security, non-production related facility maintenance, Lockheed Martin Energy Systems shared site programs, and construction and project management.

4.1.8 Engineering Manager

The Engineering Manager is responsible for engineering activities in support of operations including design, fabrication, and construction of plant modifications or additions; systems and reliability engineering (including interface with Maintenance regarding predictive and preventive maintenance); nuclear safety (which includes nuclear criticality safety and safety analysis); and the configuration management program.

4.1.9 Administrative Support Manager

The Administrative Support Manager is responsible for human resources functions, bus ss management, and document and record management.

4.1.10 Nuclear Regulatory Affairs Manager

As delegated by the General Manager, the Nuclear Regulatory Affairs Manager is responsible for the day-to-day interface with NRC representatives on matters of regulatory compliance, event investigation and reporting, and NRC regulatory commitment management.

4.1.11 Shift Operations Manager

The Shift Operations Manager oversees the activities of the Plant Shift Superintendents and has the responsibility and authority to make decisions to assure safe operation of the plant.

4.1.12 Safety, Safeguards and Quality Manager

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

4.1.13 Emergency Management Manager

The Emergency Management Manager is responsible for ensuring that the emergency management program is designed to comply with Federal, State, and local regulations.

4.1.14 On-Duty Plant Shift Superintendent

The on-duty PSS responsibilities include operational, technical and/or environmental, safety, and health support functions to uranium enrichment operations. The on-duty PSS reports directly to the General Manager and Enrichment Plant Manager.

The on-duty PSS or designee is responsible for making proper notifications of abnormal plant conditions, declaring an emergency, and initiating appropriate response. The on-duty PSS acts as the on-scene Incident Commander and subsequently as the Crisis Manager until relieved by a member of management designated in the Emergency Line of Executive Succession.

4.1.15 Assistant Plant Shift Superintendent (APSS)

The APSS responsibilities include operational, technical and/or environmental, safety and health support functions to the plant shift operating staff. The on-duty APSS reports directly to the on-duty PSS.

The on-duty APSS may assume the responsibilities of the PSS and may function as the IC when necessary.

4.1.16 Materials Management Manager

The Materials Management Manager is responsible for managing the projects, programs, and activities of Materials Management. This includes site purchasing, packaging and transportation, material control, stores, shipping and receiving, and property disposition.

4.1.17 Deleted.

4.1.18 Deleted.

4.1.19 Deleted.

4.1.20 Deleted.

4.2 ONSITE 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 onsite emergency activities, consequence assessment, medical support, emergency public information, activation and coordination of onsite response resources, security, communications, administrative support, and coordination and liaison with offsite support and response organizations.

The ERO is divided into functional groups as follows:

1. Field ERO,
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 appropriate shift personnel with the PSS or designee as IC. Upon classification of the emergency as an Alert or SAE, the PSS or designee assumes a dual role as the CM/IC. Once the EOC is operational, the General Manager, or designee, relieves the PSS or designee as CM and the overall control of the emergency shifts from the PSS or designee to the CM. Once the CM responsibilities have been transferred from the PSS to the General Manager, the PSS or designee maintains the responsibilities of the IC at the incident scene.

The PSS or designee 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 as follows:

1. General Manager
2. Enrichment Plant Manager
3. Operations Manager
4. Engineering Manager
5. Environmental, Safety and Health Manager

6. Shift Operations Manager

Because of the importance of some emergency responsibilities, these responsibilities may be performed only by the ERO position assigned to address them. The following responsibilities are transferred when the overall responsibility for emergency response is transferred.

1. Emergency Classification — Initially this is a PSS or designee responsibility as CM. Once the EOC is operational, this responsibility is transferred from the PSS or designee to the CM in the EOC.

2. Protective Action Recommendations — Initially this is a PSS or designee responsibility as CM. Once the EOC is operational, approval of offsite protective action recommendations is transferred to the CM in the EOC.

3. Facility Activation — The PSS or designee is responsible for directing activation of the EOC. The EOC is automatically activated for Alerts and SAEs and may be selectively activated for other emergencies related to non-NRC-regulated activities.

4.2.2 Onsite Staff Emergency Assignments

4.2.2.1 Plant Field Emergency Response Organization

Upon recognition of an emergency, the PSS or designee becomes the IC, classifies the event, if applicable, determines appropriate protective action recommendations, and directs the activation of the necessary ERO components. The APSS, or designee (such as the cascade controller), is responsible for calling out the EOC staff as necessary, offsite notifications, and technical communications with offsite government authorities, as directed by the PSS or designee.

Capability for initial site-level response prior to EOC activation is provided by the following:

1. PSS or designee organization personnel,
2. Protective Force personnel,
3. Fire Services personnel,
4. Emergency squad personnel, and
5. Local emergency director.

Fire Services personnel are trained and have experience in fire fighting, HAZMAT response, health physics/radiation protection, environmental response, and emergency medical treatment. Plant emergency squad personnel are trained in basic fire fighting response. Figure 4-2 illustrates a typical plant initial on-scene ERO. In addition, shift personnel can provide support for various technical areas, such as operations and maintenance activities.

4.2.2.2 Emergency Operations Center Cadre

The Emergency Operations Center (EOC) cadre provides the external support the PSS or designee and the field ERO requires and provides information to Federal, State, and local government agencies. Specifically, the EOC cadre provides additional technical expertise in engineering, radiological/hazardous materials monitoring and assessment, logistics support, such as transportation, food, communications, materials, and supplies, and other needed services.

The EOC is the primary facility for coordinating onsite response and mitigation and offsite interface activities. Senior managers confer, provide personnel and materials, coordinate activities, and communicate with onsite and offsite personnel. A support staff serves on the EOC cadre and provides technical advice to other members of the EOC staff and to the PSS or designee.

The EOC cadre is updated by the Crisis Manager by the use of the EOC Briefing Checklist, which is part of the Emergency Operations Center Concept of Operations Procedure.

4.2.2.3 Joint Public Information Center

The Joint Public Information Center (JPIC) is activated at the declaration of an SAE or for other events that may generate significant interest from the media. This organization provides for timely information dissemination to the media and to the public regarding a plant emergency.

4.3 LOCAL OFFSITE ASSISTANCE TO FACILITY

The severity of some emergencies may warrant the use of offsite individuals, organizations, and agencies. As a result, letters of agreement (as identified in Appendix B) have been entered into with offsite groups to provide assistance in the event of an emergency. These support services encompass areas such as medical assistance, fire control, evacuation, and ambulance services. When the PSS or designee or CM determines that offsite assistance is needed, the appropriate organization is notified and assistance is requested. Properly trained members of the ERO which conduct these notifications and requests for assistance include but are not limited to the PSS or designee, APSS, and EOC Coordinator. Plant protective force personnel provide site access control and escort support for the responding offsite organizations. Necessary emergency information is provided to the responding organizations, including potential hazards associated with the incident.

The offsite emergency support organizations are described in the following subsections.

4.3.1 Medical Support

In certain instances, medical emergencies may require the transport of an injured person from the plant to an offsite medical facility. Transportation of injured persons to the medical facility is normally provided by the plant's onsite ambulance. To maintain a state of readiness the onsite ambulance is tested for operability and inspected for response capability on a daily basis.

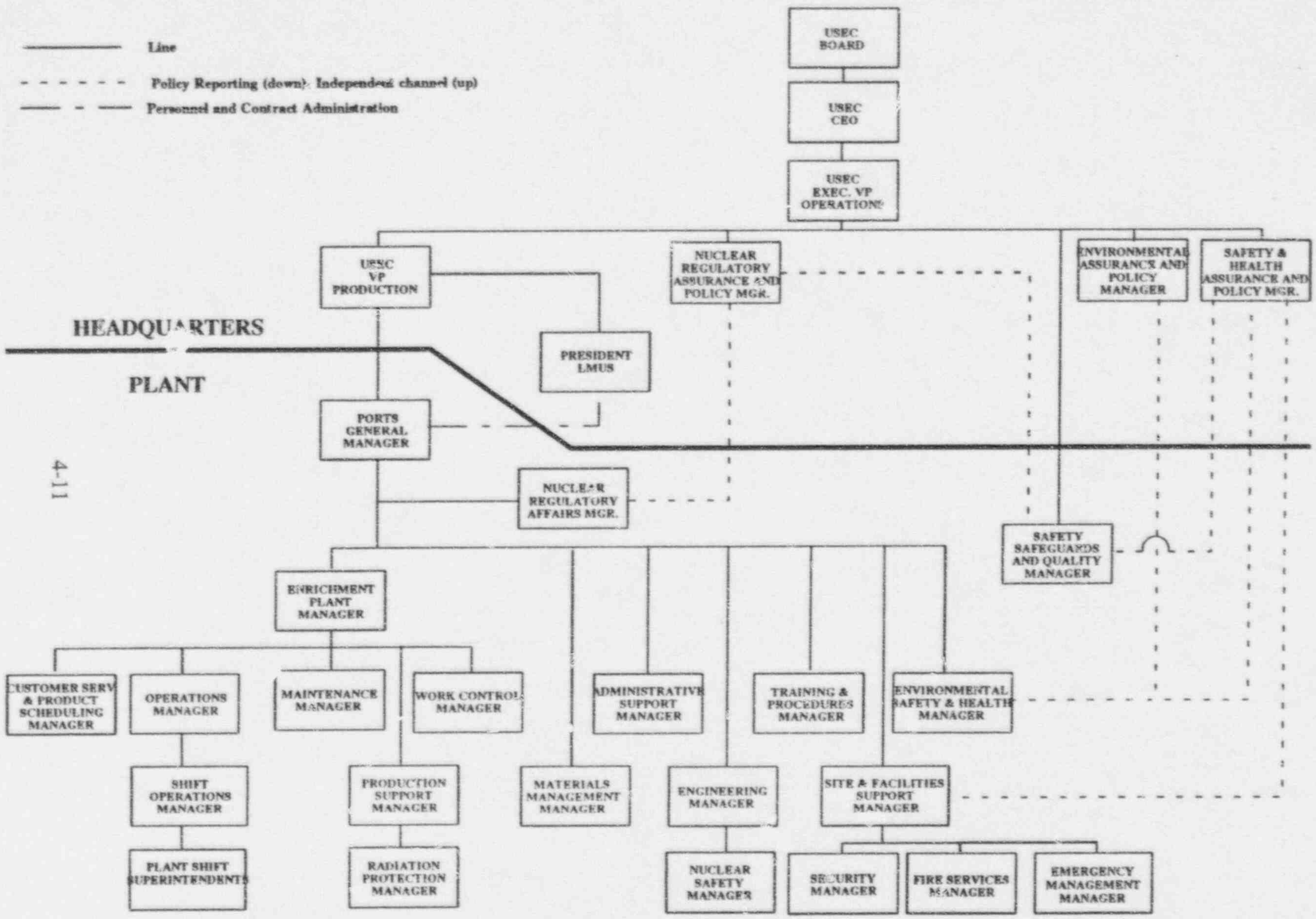

Figure 4-1 Uranium Enrichment Facilities Organization Chart

FIELD EMERGENCY RESPONSE ORGANIZATION

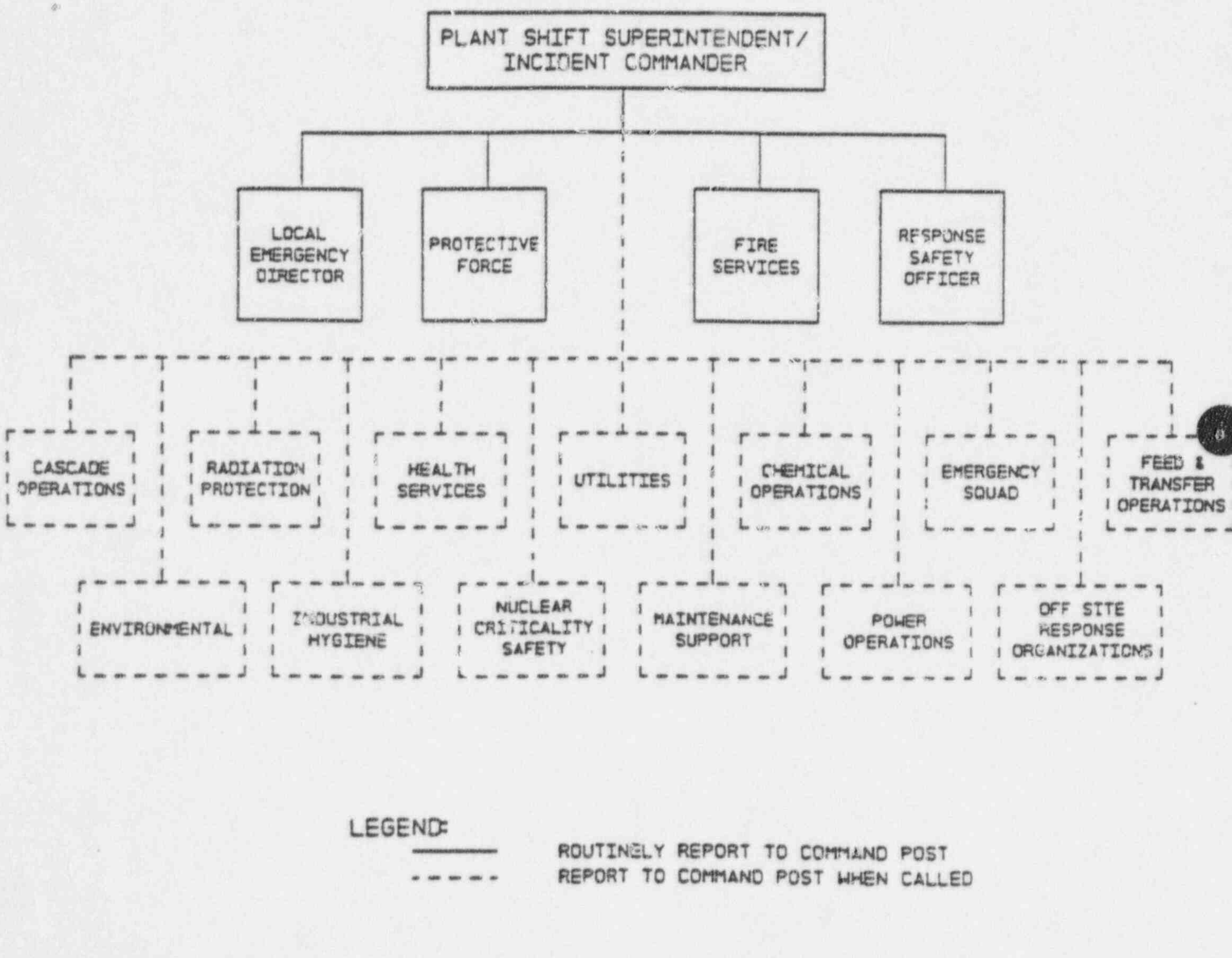

Figure 4-2. Field Emergency Response Organization.

X-705 Evaporator Heat Exchanger Modifications

REQUIREMENTS

10 CFR 76.35(a)(6)—"The application for an initial certificate of compliance must include the information identified in this section. (a) A safety analysis report which must include the following information . . . (6) A description of equipment and facilities which will be used by the Corporation to protect health and minimize danger to life or property . . ."

10 CFR 76.85—"The Corporation shall perform an analysis of potential accidents and consequences to establish the basis for limiting conditions for operation of the plant with respect to the potential for releases of radioactive material. Special attention must be directed to assurance that plant operation will be conducted in a manner to prevent or to mitigate the consequences from a reasonable spectrum of postulated accidents which include internal and external events and natural phenomena in order to ensure adequate protection of the public health and safety."

10 CFR 76.87(c)(3)—"(c) Appropriate references to established procedures and/or equipment to address each of the following safety topics must be included in technical safety requirements: . . . (3) Criticality prevention."

COMMITMENT

Source: Safety Analysis Report
3. Facility and Process Description
3.3 Uranium Recovery and Chemical Systems
3.3.1 X-705 Decontamination and Recovery Facility
3.3.1.4 Uranium Recovery
3.3.1.4.10 Solvent Extraction Process [Rev. 3, 5/31/96]

"There are three solvent extraction loops, A, B, and C, each consisting of pre-evaporators, solvent extraction columns, and post evaporators. . . .

Conductivity probes/sensors are installed on the steam condensate line from each evaporator. If a tube failure occurred or a high conductivity reading registered, an audible alarm would sound to alert the operator and automatic control valves would switch the flow from the storm sewer to a 150 gallon capacity geometrically safe storage tank located in the piping corridor underneath the recovery area. The condensate from all the evaporators collects into a common header containing an additional three (3) conductivity probes/sensors in series. If two (2) of the three (3) conductivity probes/sensors exceed preset limits, the condensate will automatically route flow to the 150 gallon capacity geometrically safe storage tank.."

DESCRIPTION OF NONCOMPLIANCE

A tube failure in either the pre- or post-uranium evaporator heat exchangers could result in concentrated uranium-bearing solution being discharged into an unfavorable geometry through the steam condensate drain piping.

Also, a tube failure coincident with a ^{235}U feed solution concentration >60% and a high feed solution level could result in uranium-bearing solution being introduced into an unfavorable geometry in the heat exchanger expansion joint.

JUSTIFICATION FOR CONTINUED OPERATION

The uranium-bearing solutions are on the tube side of the evaporator heat exchangers. The tube integrity is the first line of defense preventing uranium-bearing solutions from entering the shell side of the heat exchanger. The second line of defense to ensure uranium-bearing solutions do not enter an unfavorable geometry in the steam condensate drain piping is the administrative controls imposed by operating procedures. The operating procedures for the evaporators require the operator to sample the steam condensate prior to startup and daily during operation to verify tube integrity. If there is indication of tube degradation, the heat exchanger tubes will be inspected, and appropriate corrective actions will be taken. During steady-state operation, the steam-side pressure in the heat exchanger is higher than the tube-side pressure so that leakage will be into the process solution. During shutdown the condensate isolation valve is closed, and the upstream sample valves are opened to direct the condensate drain to geometrically favorable containers. This prevents uranium-bearing solutions from entering the steam condensate drain piping. Also, during shutdown, solution feed to the evaporator is isolated.

To satisfy the existing Nuclear Material Control and Accountability operating limit, solutions fed to the evaporators are blended down to <20% ^{235}U (to <10% ^{235}U under NRC regulations). At concentrations <60% ^{235}U, the heat exchanger expansion joint represents a favorable geometry. Operators are required by procedure to control the solution feed rate to maintain the normal solution level below the expansion joint. An alarm warns the operator if the solution in the evaporator system should reach the level of the expansion joint. This could happen due to process variations. The alarm allows the operator to take action to lower the solution level, reducing the likelihood of a nuclear criticality.

The above discussion provides justification that the plant can continue to operate safely until the evaporator heat exchangers are replaced and the steam condensate drain system instrumentation and system modifications are installed in accordance with the Plan of Action and Schedule.

PLAN OF ACTION AND SCHEDULE

1. Install instrumentation and system modifications in the steam condensate drain piping from the evaporator heat exchangers to provide double contingency for nuclear criticality safety.

2. Replace the evaporator heat exchangers to eliminate the unfavorable geometry expansion joint.

The scheduled completion date for these actions is December 31, 1996.

response to NCS deficiencies and assessment findings also continue to strengthen the NCS controls. Each new operation involving 1 wt % or higher ^{235}U and 15 grams or more ^{235}U will be evaluated, including an evaluation for double contingency, and will have complete NCSA and NCSE documentation prepared before commencing the new operation.

PLAN OF ACTION AND SCHEDULE

All new operations that require NCS approval will have properly documented and implemented NCSAs and NCSEs that have been approved in accordance with the NCS program requirements contained in the approved Certificate prior to startup. Formal NCSAs and NCSEs will be completed for all current operations involving uranium enriched to 1 wt % or higher ^{235}U and 15 grams or more ^{235}U by January 31,1997 and will be properly documented and approved in accordance with the NCS program requirements contained in the approved Certificate. The procedural changes to resolve the administrative noncompliances in the nuclear criticality safety program will be completed by November 30, 1996. All aspects of Technical Safety Requirement 3.9 implementation and its associated tentacles for NCS will be in place no later than the transition to NRC regulatory oversight.

SUMMARY OF REQUIREMENTS, COMMITMENTS, AND NONCOMPLIANCES

Issue: Nuclear Criticality Safety Approval Documents	
Code of Federal Regulations	**Part**
Title 10	76.35(a)(5), (6), and (7); 76.85; 76.87(c)(3)
Application Commitment	**Section**
Safety Analysis Report	5.2.2.3
Technical Safety Requirements	3.9.1.c, 3.11
Application Noncompliance Statement	**Section**
Safety Analysis Report	5.2.4.1, 5.2.4.2, 5.2.4.6, 5.2.4.9, 5.2.4.10, 5.2.4.11

DESCRIPTION OF NONCOMPLIANCE

There are inconsistencies between the specifications in NCSAs and the supporting implementation procedures and work-site postings. The known inconsistencies are minor ambiguities, small discrepancies in dimensions, and variances in format or location of postings.

There are also administrative aspects of the nuclear criticality safety program implementation, including those related to ANSI/ANS-8 standards, that have not yet been proceduralized or documented.

JUSTIFICATION FOR CONTINUED OPERATION

The plant's 40-year history of safe operation with fully enriched uranium demonstrates the safety of the nuclear criticality controls for uranium in the physical and chemical forms employed in the facility. Corrective actions in response to the NCS violations and assessment findings have continued to strengthen the NCS controls. With USEC production at a reduced maximum enrichment of 10 wt % ^{235}U (and the purge gas section limited to 20 wt % ^{235}U), operations designed for fully enriched ^{235}U now have increased criticality safety margins.

Some inconsistencies exist between the NCSA specifications, the implementing procedures, and the work-site postings as a legacy from earlier times when the format, content, and update practices were less formal than currently required by either DOE or NRC for NCS documentation and controls. These deviations have been and are being corrected whenever they are discovered during operations, maintenance, or walk-through and other inspections. For example, in late 1994 a verbatim-compliance walkdown review was performed of the existing NCS documentation to verify the flowdown of the NCS requirements into plant postings. The identified deviations in NCS controls (including unspecified tolerances on separation distances; missing or unclear specification limits; and missing, inconsistently worded, or out-of-date postings) were investigated, characterized, and resolved to upgrade the NCS controls. Resolution of remaining documentation deficiencies will coincide with the ongoing Nuclear Safety Upgrade initiative (and with the compliance plan issue "Nuclear Criticality Safety Approval Documents").

Some other implementation inconsistencies resulted from the process of upgrading the overall NCS posting system. After developing and revising NCSA and NCSE documentation, the procedures and postings are upgraded before the new or revised NCSAs and NCSEs are put into effect.

The results of the 1994 verbatim-compliance walkdown showed that the identified deviations between NCSA specifications and postings were minor ambiguities, small discrepancies in dimensions, or variances in format or location of postings. Based on this sampling of representative NCSAs, the risks associated with any unidentified deviations are extremely low for operations meeting the double-contingency principle because at least two independent and concurrent process changes can be accommodated before a criticality accident is possible. The operations that do not meet the double contingency principle have a similar level of assurance of safety through moderation controls and associated Technical Safety Requirements as discussed in Application section 5.2.2.3.

The NCSAs being revised under NCS document upgrade programs cover operations existing prior to July 1, 1993. The majority of the requirements are already in the procedures for the existing process operations. Verification of the NCS requirements for the upgraded NCSAs will be completed by February 28, 1997. Action statements and operating limits from the Technical Safety Requirements will be incorporated into operational procedures by the date that the NRC assumes regulatory authority for PORTS. If an administrative requirement for double contingency control is found to be missing during the verification, the procedure or checklist modification to implement such a requirement will be expedited through the procedure change process and other appropriate actions will be taken. Otherwise, formal revision of the procedures will proceed according to the procedure upgrade schedule.

Implementation of container handling and storage requirements is currently assured through the use of postings and other administrative aids. Procedural guidance for these requirements is being developed for a scheduled completion date of February 28, 1997.

PLAN OF ACTION AND SCHEDULE

A program is in place to review all NCSAs in order to identify and track the designated NCS conditions, specifications, and controls and to verify their full implementation. Particular attention is being focused on ensuring consistency between each NCSA and the operation including work-site postings. The verification program (of the roughly 150 operating procedures and 150 postings) will be completed for all current fissile material operations, prior to NRC assuming regulatory oversight of PORTS for NCSAs that need to flow into Technical Safety Requirements. Identification of the remaining NCSA requirements to be flowed-down into procedures will be completed by January 31, 1997. If an administrative requirement for double contingency controls is found to be missing during the verification, the procedure or checklist modification to implement such a requirement will be expedited through the procedure change process and other appropriate actions will be taken. Otherwise, formal revision of the procedures will proceed according to the procedures upgrade program, which is scheduled to be completed by December 31, 1997. A procedure for container handling and storage will be developed prior to February 28, 1997.

The procedural changes to resolve the administrative noncompliances in the Nuclear Criticality Safety Program (from SAR Section 5.2.4 and as identified in the Summary of Requirements and Commitments table below) will be completed by December 2, 1996.

All aspects of Technical Safety Requirement 3.9 implementation and its associated tentacles for NCS will be in place no later than the transition to NRC regulatory oversight.

The plant-wide procedure upgrade initiative will provide additional assurance of the full and proper flow-down of NCS conditions and specifications to operating procedures and postings. The compliance plan item entitled "Procedures Program" addresses the implementation of operating procedures. The scheduled completion date for the procedure upgrade initiative is December 31, 1997.

If a new or revised NCSE identifies the need for modifications to the existing plant configuration, affected activities will be curtailed and will not be restarted until either (1) the plant configuration is modified or (2) the activity is modified so that it can be performed safely in the current configuration. If the plant configuration or activity is modified, the Plant Operations

Management Controls

REQUIREMENTS

10 CFR 76.35(a)(3) and (7)—"The application for an initial certificate of compliance must include the information identified in this section. (a) A safety analysis report which must include the following information: . . . (3) The qualifications requirements, including training and experience, of the Corporation's management organization and key individuals responsible for safety in accordance with the regulations in this chapter; . . . (7) A description of the management controls and oversight program to ensure that activities directly relevant to nuclear safety and safeguards and security are conducted in an appropriately controlled manner that ensures protection of employee and public health and safety and protection of the national security interests."

10 CFR 76.93—"The Corporation shall establish, maintain, and execute a quality assurance program satisfying each of the applicable requirements of ASME NQA-1-1989, 'Quality Assurance Program Requirements for Nuclear Facilities,' or satisfying acceptable alternatives to the applicable requirements. The Corporation shall execute the criteria in a graded approach to an extent that is commensurate with the importance to safety."

COMMITMENTS

Source: Safety Analysis Report
6. Organization and Operating Programs
6.1 Organization and Responsibility [Rev. 3, 5/31/96]

USEC commits to conducting operations at PORTS 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 of the United States. USEC intends to achieve this commitment by establishing an organizational structure such that responsibility and authority for safe operations is clearly defined, and that critical safety, safeguards, security, and quality functions are established with a reporting chain to a senior manager who is independent of the production function. Further, a series of management controls and oversight have been established to ensure that activities directly relevant to nuclear safety and safeguards and security are conducted in a controlled manner that ensures the protection of employees and public health and safety and protection of national security interests.

DESCRIPTION OF NONCOMPLIANCE

USEC has not completed development and implementation of programmatic controls to ensure effective oversight and compliance with applicable NRC regulatory requirements. Those management controls that require further development and implementation include policies and directives, management systems, and administrative procedures, which have been specifically described in Chapters 5.0 and 6.0 of the Safety Analysis Report (SAR), in the Technical Safety Requirements (TSR), and in several program plans and descriptions (notably, the Emergency Plan, Quality Assurance Program, Radioactive Waste Management Program, Fundamental Nuclear Material Control Plan, and Security Plans). Specific to Section 6.1 of the Application, USEC has

identified that the integration of all health, safety, and environment and of all safeguards and security program elements can be fully evaluated, revised, and/or updated to ensure that compliance will exist upon NRC assuming regulatory oversight of the facility through the resolution of the following two compliance issues:

1. **QAP and Regulatory Requirements Flow-Down**--Not all applicable NRC-approved application commitments that fulfill the 10 CFR 76 regulatory requirements have been "flowed-down" to policies and procedures that are approved and implemented at USEC headquarters and PORTS to ensure that full compliance with these documents has been achieved. Specific NRC requirements that have not been satisfied when USEC submitted its application to the NRC have been identified by the issues submitted in this DOE Compliance Plan document.

2. **Organizational Roles, Responsibilities, Relationships, and Authorities Flow-Down**—The reporting relationships, and the qualifications, functions, responsibilities, and authorities for the following positions defined in Safety Analysis Report Sections 6.1.1.1 through 6.1.1.25 and Figure 6.1-1 have not been "flowed-down" to position descriptions:

    - Executive Vice President, Operations
    - Vice President, Production
    - Nuclear Regulatory Assurance and Policy Manager
    - Safety and Health Assurance and Policy Manager
    - Environmental Assurance and Policy Manager
    - Safety, Safeguards, and Quality Manager
    - General Manager
    - Enrichment Plant Manager
    - Operations Manager
    - Maintenance Manager
    - Production Support Manager
    - Radiation Protection Manager
    - Work Control Manager
    - Shift Operations Manager
    - Plant Shift Superintendent
    - Environmental, Safety and Health Manager
    - Engineering Manager
    - Nuclear Safety Manager
    - Site and Facilities Support Manager
    - Security Manager
    - Fire Services Manager
    - Training and Procedures Manager
    - Nuclear Regulatory Affairs Manager
    - Operations and Maintenance First-Line Managers
    - Customer Service and Product Scheduling Manager
    - Emergency Management Manager
    - Materials Management Manager
    - Administrative Support Manager

Configuration Management Program element is provided in the Compliance Plan issue entitled "Systems Approach to Training."

The above discussion regarding the ongoing efforts to develop and implement the Configuration Management Program; the establishment of the system boundaries for the liquid UF_6 systems; the identification, field verification, and documentation of the items within the system boundaries; and the current change control process provides justification that the plant can continue to operate safely until the Configuration Management Program is in place.

PLAN OF ACTION AND SCHEDULE

The actions required to complete the development and implementation of the Configuration Management Program and the schedule for completion of these actions are given here.

1. **Program Management**

- Identify and document all Q items, AQ-NCS items, and other AQ items, including system boundaries and support systems required for performance of the intended safety function, to be included in the scope of the Configuration Management Program. The scheduled completion dates for these actions are December 31, 1996, for Q items; February 28, 1997, for AQ-NCS items; and October 1, 1997, for other AQ items.

- Develop the flowdown of commitments from the Technical Safety Requirements, the Safety Analysis Report, and other plans and programs to procedures and training. The scheduled completion date for this action is in accordance with the Plan of Action and Schedule provided in the Compliance Plan issue entitled "Procedures Program."

- Incorporate new Technical Safety Requirements into the surveillance testing and administrative procedures. The procedure development and the associated training required to resolve this item will be completed according to the plan of action and schedule provided in the Compliance Plan issue entitled "Procedures Program."

2. **Design Requirements**

- Develop the baseline documentation that establishes the design requirements for all Q systems/items, including support systems required for performance of the intended safety function. The scheduled completion date for this action is December 31, 1996.

- Review all Nuclear Criticality Safety Approvals and Nuclear Criticality Safety Evaluations to identify AQ-NCS items (items which support the nuclear criticality double contingency principle); to identify and document the designated design requirements and system boundaries, including support systems required for performance of the intended safety function; and to verify the implementation of these requirements. To the extent completed, this information will be maintained and made available to the NRC, before regulatory jurisdiction, for planned inspection activities. The scheduled completion date for this action is February 28, 1997.

- Identify, document, and communicate definitive boundaries for the other AQ systems. Identify and document the design requirements for these AQ systems/items, including

- Identify, document, and communicate definitive boundaries for the other AQ systems. Identify and document the design requirements for these AQ systems/items, including support systems required for performance of the intended safety function, for which the design requirements must be known. The scheduled completion date for this action is October 1, 1997.

3. **Document Control**

- Develop improved records management and document control programs to satisfy the needs of the Configuration Management Program. Develop and implement the required procedures.

- Train appropriate plant personnel in the requirements of these programs and procedures.

The program and procedure development and associated training required to resolve this noncompliance will be completed according to the plan of action and schedule provided in the Compliance Plan issue entitled "Records Management and Document Control Programs."

4. **Change Control**

- Upgrade the four core engineering procedures that specify the requirements for the change control process to ensure the identification, technical and safety review, approval, implementation, validation, documentation, and recording of plant changes. The scheduled completion date for this action is 7/31/96.

- Train appropriate personnel to ensure proper implementation and application of these upgraded core procedures. The scheduled completion date for this action is 7/31/96.

- Develop or upgrade remaining engineering procedures that are associated with the change control process and train appropriate personnel on these new or upgraded procedures. The scheduled completion date for this action is March 31, 1997.

5. **Assessments**

- Develop procedures required to implement an assessment program to systematically evaluate the development and effective implementation of the Configuration Management Program elements and related processes.

- Train appropriate personnel to ensure proper implementation and application of these procedures.

The procedure development and the associated training required to resolve this area of noncompliance will be completed according to the plan of action and schedule provided in the Compliance Plan issue entitled "Procedures Program."

6. **Training**

- Implement a training program for plant personnel relied upon to operate, maintain, or modify the plant. Include initial training on improved or newly developed programs and

In addition, the maintenance organizations have initiated special provisions and interim commitments for the safety systems. These provisions, which are now in place and are incorporated into existing procedures, and will be incorporated into new procedures as they are developed, include the following actions.

1. A work package is prepared prior to commencement of any corrective maintenance work on safety systems. The minimum requirements of a work package for safety system maintenance include: a maintenance service request; a planning checklist; written work instructions; and a safety system data sheet, which provides verification of post-maintenance testing. Depending on the scope of the work, the package may also include equipment specific procedures or checklists and quality control inspection, nuclear criticality safety analysis, radiation protection, OSHA, or operational requirements. The composition of a work package is dependent on the maintenance to be performed and is defined in the work control procedure.

2. Systems engineers have been assigned specific responsibility for the technical aspects of designated safety systems. The systems engineers provide technical support for maintenance activities of these systems, including assistance in work package preparation, determination of post-maintenance test requirements, observation of surveillance testing, review of procedures, and input to the plant preventive maintenance program. Systems engineers are required to have an engineering education or an appropriate technical background and a basic knowledge of plant systems, principles of gaseous diffusion, administrative procedures and policies, plant layout and location of components of assigned systems, technical specifications, and in-service inspection requirements.

Interim Regulatory Commitments

The following commitments derived from the ROA requirements will remain in effect until replaced by Application commitment implementation.

1. A corrective maintenance program shall be implemented to ensure that prompt and effective maintenance is performed on malfunctioning nuclear safety systems, safeguards, and security equipment.

2. A preventive maintenance program shall be implemented to ensure the operability of nuclear safety systems, safeguards, and security equipment.

3. A documented instrument calibration program, employing standards traceable to the national standards system or to nationally accepted standards, shall be implemented for the calibration of equipment and monitoring devices necessary for the proper maintenance and operation of nuclear safety systems and safeguards equipment.

4. Controls shall be established to ensure safety systems are not disabled or diminished by planned activities.

5. Work on safety systems shall be controlled and performed with the use of approved procedures and/or work instructions. The procedures and work instructions shall be based upon established and well-recognized codes and standards in applicable areas such as welding,

electrical, piping, and instrumentation. As applicable, codes and standards shall be identified in the procedures as source references.

PLAN OF ACTION AND SCHEDULE

The actions required to complete the maintenance program are the following:

- Develop and implement a maintenance history program. The scheduled completion date for this action is September 30, 1997.

  - Develop a master equipment list for safety critical equipment.
  - Implement a new computer-based maintenance management system with the capability to collect and trend the data.

- Develop guidance for cleanliness control and measures to prevent entry of extraneous material into a closed system. The scheduled completion date for this action is July 31, 1996.

- Upgrade the current work control process to provide the committed level of planning and work package development for Q, AQ-NCS, and other AQ items. The scheduled completion dates for these actions are February 28, 1997, for AQ-NCS items; April 30, 1997, for Q items; and June 30, 1998, for other AQ items.

  - Centralize all planning and work control functions in the Work Control organization. (Complete)
  - Revise the work control procedure.
  - Develop and provide training on the upgraded work control process.

- Upgrade the preventive maintenance program to meet the commitments for greater formalism. The scheduled completion dates for these actions are February 28, 1997, for AQ-NCS items; March 31, 1997, for Q items; and June 30, 1998, for other AQ items.

  - Develop an overall performance indicator to measure preventive maintenance effectiveness.
  - Identify current preventive maintenance performed on Q, AQ-NCS, and other AQ items.
  - Revise the preventive maintenance program procedure to establish a formal mechanism to justify and document changes to Q, AQ-NCS, and other AQ item requirements.
  - Develop the technical/historical basis for use in evaluating preventive maintenance task adequacy.

- Revise the measuring and test equipment calibration program to meet the more formal requirements. The scheduled completion dates for these actions are December 31, 1996, for Q measuring and test equipment; February 28, 1997, for AQ-NCS measuring and test equipment; and December 31, 1997, for other AQ measuring and test equipment.

  - Implement procedures that define and control the overall measuring and test equipment program. (Complete)

- Develop and implement individual calibration procedures for Q, AQ-NCS, and other AQ SSCs.
- Provide training on calibration requirements to affected coordinators, managers, technicians, and users.

- Identify the procedural deficiencies for performing corrective maintenance, preventive maintenance, calibration, and surveillance testing of Q, AQ-NCS, and other AQ SSCs, and develop a composite listing of the procedures requiring revision, development, or conversion. The scheduled completion dates for these actions are October 31, 1996, for Q SSCs; January 31, 1997, for AQ-NCS SSCs; and October 31, 1997, for other AQ SSCs.

- Develop procedures and provide the associated training of appropriate personnel for the performance of surveillance tests which are required to support Technical Safety Requirements. This action will be completed prior to the NRC assuming regulatory authority.

- Revise, develop, or convert corrective maintenance, preventive maintenance, calibration, and surveillance test procedures for Q, AQ-NCS, and other AQ SSCs. The scheduled completion dates for these actions are February 28, 1997, for AQ-NCS items; March 31, 1997, for Q items; and June 30, 1998, for other AQ items.

- Develop training materials for the work control, surveillance testing, instrument calibration, and corrective and preventive maintenance procedures and provide the associated training of appropriate personnel. The scheduled completion dates for these actions are February 28, 1997, for AQ-NCS items; March 31, 1997, for Q items; and June 30, 1998, for other AQ items.

- Identify and control the vendors' manuals used for maintenance of Q equipment, including entering them into the document control and records management system. The scheduled completion date for this action is March 31, 1997.

  - Identify vendor manuals used for maintenance activities of Q equipment.
  - Verify appropriate vendors' manuals for accuracy and completeness.
  - Enter vendor manual data into the records management and document control system.

The procedure upgrades and associated training to address this area of the noncompliance will be completed in coordination with the plans and schedules set forth in the Compliance Plan issues "Procedures Program" and "Systems Approach to Training."

SUMMARY OF REQUIREMENTS, COMMITMENTS, AND NONCOMPLIANCES

Issue: Maintenance Program	
Code of Federal Regulations	**Part**
Title 10	76.87(c)(7)
Application Commitment	**Section**
Safety Analysis Report	3.5.1, 5.3.5, 5.6.5, 5.6.5.1, 5.6.5.2, 5.6.5.3, 5.7.3, 5.7.3.2, 5.7.3.4, 5.7.3.5, 6.1.1, 6.1.1.9, 6.1.1.11, 6.1.1.14, 6.1.1.20, 6.1.1.25, 6.3.5.2.3.6, 6.3.5.2.4.2, 6.3.5.4.2, 6.3.5.6, 6.3.5.7, 6.4, 6.5.7, 6.6.1, 6.6.3, 6.6.3.1, 6.6.5, 6.6.13, 6.8.2.2, 6.8.2.3, 6.8.2.4, 6.10.1.13, 6.11.1, 6.11.5, 6.11—Appendix A
Technical Safety Requirements	3.2.2.b, 3.9.1, 3.15, 3.24
Fundamental Nuclear Materials Control Plan	2.2.7, 2.6, 4.1, 4.1.1, 5.1.2, 5.2, 5.2.1, 5.2.3, 13.1
Emergency Plan	4.1.5, 7.6, 8.2
Quality Assurance Program	1-2.18, Appendix A
Application Noncompliance Statement	**Section**
Safety Analysis Report	6.4.13.1, 6.4.13.2, 6.4.13.3, 6.4.13.4, 6.4.13.5

place, the elements that are not yet fully implemented are identified in the Description of Noncompliance, above. Specific actions required to complete the program are itemized here, along with scheduled completion dates. Each item corresponds to the like-numbered item in the Description of Noncompliances section.

1. By July 31, 1996, incorporate into the Procedure Control Process procedure the SAR-6.11.4.1 criteria for use by responsible management in complying with TSR 3.9 by identifying applications requiring additional written procedures.

2. (Deleted)

3. (Deleted)

4. Document the criteria for use in determining when work must be stopped because a procedure cannot be performed as written. [Completed]

5. (Deleted)

6. By the date that the NRC assumes regulatory authority for PORTS, incorporate into the Procedure Control Process procedure the SAR-6.11.4.5 criteria for identifying procedures that TSR 3.9 requires review by the PORC.

7. (Deleted)

8. Incorporate action statements and operating limits from the Technical Safety Requirements into operational procedures by the date that the NRC assumes regulatory authority for PORTS.

9. Issue the required operational policy statements and implement new or updated procedures (including required training) to fully implement the Quality Assurance Program or other activities identified in the application in accordance with the following schedule:

Operational policy statements	Completed
Level 2, 3, and 4 AQ-NCS procedures (unless covered by item 8)	February 28, 1997
Level 2, 3, and 4 Q procedures (unless covered by item 8)	March 31, 1997*
Level 2, 3, and 4 other AQ and NS procedures	December 31, 1997*

*Refer to Issue 24 for later Maintenance Program procedure completion dates.

10. Issue analytical laboratory procedures updated to current requirements by December 31, 1997.

11. Complete all overdue Level 2, 3, and 4 AQ procedure periodic reviews by December 31, 1997.

12. The PORC will review all procedures designated as In-Hand and procedures that involve liquid UF_6 handling activities within a 5-year period after the date that the NRC assumes

regulatory authority for PORTS. This commitment pertains only to those procedures which will not otherwise be reviewed by the PORC (as required by Section 6.11.4.1), or by a PORC subcommittee, before the expiration of the 5-year period. Procedures in this scope have been, and will continue to be, reviewed by a PORC subcommittee, thereby satisfying this commitment for those specific procedures.

A

13. All aspects of TSR 3.9 implementation and its associated tentacles shall be in place no later than the date that the NRC assumes regulatory authority for PORTS. Procedures required by Technical Safety Requirement 3.9.1 shall be in place by the assumption of regulatory authority by NRC except as specified in the Compliance Plan.

4. Inspection and acceptance testing of specified items and processes shall be conducted using established performance criteria. USEC implements the requirements for inspection and acceptance testing of items and processes in the procurement, receipt inspection, and the maintenance functions. Receipt inspection is a responsibility of the Production Support Organization. The inspection process and support from the Production Support Organization are discussed in Application Section 6.4, Maintenance.

PLAN OF ACTION AND SCHEDULE

In order for the USEC quality assurance program to satisfy each of the applicable requirements of ASME NQA-1-1989 and the requirements of the QAP; procedures, instructions, and other documents providing for the implementation of the quality assurance program are required.

The required actions to complete the development and implementation of the QAP for noncompliances identified in other sections of the Application are discussed in the corresponding Compliance Plan issues. (For example, the actions required to address the Records Management noncompliance, described in Application Section 6.10, are described in PORTS Compliance Plan Issue 29 and PGDP Compliance Plan Issue 26.)

The required actions to complete the development and implementation of the quality assurance program and the schedule for completion of the actions for noncompliances described in the QAP are as follows.

1. Develop and implement procedures, including personnel training, for the scheduling and conduct of internal and supplier audits, including auditing the development, maintenance, adequacy, and effectiveness of the QAP, by December 31, 1996.

2. Develop and implement procedures, including personnel training, that define procurement, handling, and storage activities for AQ-NCS items and services by February 28, 1997; for Q items and services by March 31, 1997; and for other AQ items and services by December 31, 1997.

SUMMARY OF REQUIREMENTS, COMMITMENTS, AND NONCOMPLIANCES

Issue: Quality Assurance Program Implementation	
Code of Federal Regulations	**Part**
Title 10	76.93
Application Commitment	**Section**
Safety Analysis Report	6.4, 6.8
Quality Assurance Program	1 through 2.18, Appendixes A and C
Technical Safety Requirements	3.5
Application Noncompliance Statement	**Section**
Quality Assurance Program	Appendix B

APPLICATION FOR UNITED STATES NUCLEAR REGULATORY COMMISSION CERTIFICATION PORTSMOUTH GASEOUS DIFFUSION PLANT REMOVE/INSERT INSTRUCTIONS REVISION 8 APRIL 15, 1997	
Remove Pages	**Insert Pages**
VOLUME 1	
List of Effective Pages, pgs. i - xxviii	List of Effective Pages, pgs. i - xxviii
Chapter 1 A-1 - A-6	Chapter 1 A-1 - A-12
2.1-1/2	2.1-1/2
2.1-11/12	2.1-11/12
2.1-13 - 2.1-20	2.1-13 -2.1-15, 2.1-15a, 2.1-15b, 2.1-16 - 2.1-20, 2.1-20a, 2.1-20b
3.1-5/6, 3.1-9/10, 3.1-13/14, 3.1-19 - 3.1-22, 3.1-77/78, 3.1-89/90, 3.1-143/144, 3.1-191/1923.1-197/198, 3.1-201/202, 3.1-329/330	3.1-5/6, 3.1-9/10, 3.1-13/14, 3.1-19 - 3.1-22, 3.1-77/78, 3.1-89/90, 3.1-143/144, 3.1-191/192, 3.1-197/198, 3.1-201/202, 3.1-329/330
3.2-17/18, 3.2-37/38	3.2-17, 3.2-17a, 3.2-17b, 3.2-18, 3.2-37/38
3.3-27/28, 3.3-39/40	3.3-27/28, 3.3-39/40
3.4-47 - 3.4-52, 3.4-113/114	3.4-47 - 3.4-52, 3.4-113/114
3.5-47/48	3.5-47/48
3.7-1/2	3.7-1, 3.7-1a, 3.7-1b, 3.7-2
VOLUME 2	
List of Effective Pages, pgs. i - xxii, xxv - xxviii	List of Effective Pages, pgs. i - xxii, xxv - xxviii
3.8-43/44	3.8-43/44
4.1-5/6, 4.1-11/12, 4.1-31 - 4.1-34, 4.1-55/56	4.1-5/6, 4.1-11/12, 4.1-31 - 4.1-34, 4.1-55/56
4.2-5/6	4.2-5/6
4.4-7 - 4.4-10	4.4-7 - 4.4-10
5.2-17/18	5.2-17/18
5.3-7/5.3-8, 5.3-19/20	5.3-7/5.3-8, 5.3-19/20, 5.3-20a, 5.3-20b
6.1-3/4, 6.1-7 - 6.1-12, 6.1-15/16	6.1-3/4, 6.1-7 - 6.1-12, 6.1-15/16

Remove Pages	Insert Pages
6.5-7/8	6.5-7/8
6.6-15 - 6.6-18	6.6-15 - 6.6-18
6.10-1/2	6.10-1/2
VOLUME 3	
Quality Assurance Program Plan pgs. iii - iv, 27/28	Quality Assurance Program Plan pgs. iii - iv, 27/28
Emergency Plan pgs. i - iv, 4-1 - 4-6, 4-11/12	Emergency Plan pgs. i - iv, 4-1 - 4-6, 4-11/12
Fundamental Nuclear Materials Control Plan pgs. iii - vi, 2-7/8, 2-15/16, 8-3/4, 13-3/4	Fundamental Nuclear Materials Control Plan Transmitted under separate cover pgs. iii - vi, 2-7/8, 2-15/16, 8-3/4, 13-3/4
Transportation Security Plan pgs. 2, 10, 15, 37	Transportation Security Plan Transmitted under separate cover pgs. 2, 10, 15, 16, 37
Physical Security Plan pgs. 2, 12, 23, 24, 38	Physical Security Plan Transmitted under separate cover 2, 12, 23, 24, 38
Classified Matter Security Plan 2, 17, 21, 26, 27, 102	Classified Matter Security Plan Transmitted under separate cover 2, 17, 21, 26, 27, 102
Plan for Achieving Compliance with NRC Regulations at the Portsmouth Gaseous Diffusion Plant	
Issue A.4, Page 7/8	Issue A.4, Transmitted under separate cover Page 7/8
Issue 4, Page 1/2	Issue 4, Page 1/2
Issue 8, Page 3	Issue 8, Page 3
Issue 9, Page 3/4	Issue 9, Page 3/4
Issue 21, Page 1/2	Issue 21, Page 1/2
Issue 23, Page 5/6	Issue 23, Page 5/6
Issue 24, Page 3 - 6	Issue 24, Page 3 - 6
Issue 30, Page 9/10	Issue 30, Page 9/10
Issue 32, Page 5/6	Issue 32, Page 5/6

LIST OF EFFECTIVE PAGES - VOLUME 1 LIST OF EFFECTIVE PAGES

Pages	Revision	Pages	Revision
i	8	xvi	8
ii	4	xvii	8
iii	8	xviii	8
iv	8	xix	8
v	4	xx	8
vi	8	xxi	8
vii	8	xxii	4
viii	8	xxiii	4
ix	4	xxiv	4
x	8	xxv	8
xi	4	xxvi	8
xii	8	xxvii	8
xiii	4	xxviii	8
xiv	8		
xv	8		

INTRODUCTION - LIST OF EFFECTIVE PAGES

Pages	Revision	Pages	Revision
1	1		
2	2		
3	2		
4	2		

VOLUME 1 TABLE OF CONTENTS - LIST OF EFFECTIVE PAGES

Pages	Revision	Pages	Revision
i	3	xviii	4
ii	3	xix	3
iii	3	xx	3
iv	3	xxi	3
v	3	xxii	3
vi	3	xxiii	3
vii	4	xxiv	3
viii	3	xxv	3
ix	3	xxvi	3
x	3	xxvii	3
xi	3	xxviii	3
xii	3	xxix	3
xiii	3	xxx	3
xiv	3	xxxi	3
xv	3	xxxii	3
xvi	3		
xvii	3		

DEFINITIONS - LIST OF EFFECTIVE PAGES

Pages	Revision	Pages	Revision
1	2		
2	2		
3	3		
4	1		

CHAPTER 1 LIST OF EFFECTIVE PAGES

CHAPTER 2 LIST OF EFFECTIVE PAGES

Pages	Revision	Pages	Revision
2.1-1	1	2.3-9	1
2.1-2	8	2.3-10	1
2.1-3	3	2.3-11	1
2.1-3a	3	2.3-12	1
2.1-3b	2	2.3-13	1
2.1-4	1	2.3-14	1
2.1-5	1	2.3-15	1
2.1-6	1	2.3-16	1
2.1-7	2	2.3-17	1
2.1-8	1	2.3-18	1
2.1-9	1	2.3-19	1
2.1-10	1	2.3-20	1
2.1-11	8	2.4-1	1
2.1-12	1	2.4-2	1
2.1-13	8	2.4-3	1
2.1-14	8	2.4-4	1
2.1-15	8	2.4-5	1
2.1-15a	8	2.4-6	1
2.1-15b	8	2.4-7	1
2.1-16	8	2.4-8	1
2.1-17	8	2.4-9	1
2.1-18	8	2.4-10	1
2.1-19	8	2.4-11	1
2.1-20	8	2.4-12	1
2.1-20a	8	2.4-13	1
2.1-20b	8	2.4-14	1
2.1-21	1	2.4-15	1
2.1-22	1	2.4-16	1
2.1-23	1	2.4-17	1
2.1-24	1	2.4-18	1
2.1-25	1	2.4-19	1
2.1-26	1	2.4-20	1
2.2-1	1	2.4-21	1
2.2-2	1	2.4-22	1
2.3-1	1	2.5-1	1
2.3-2	1	2.5-2	1
2.3-3	1	2.5-3	1
2.3-4	1	2.5-4	1
2.3-5	2		
2.3-6	1		
2.3-7	1		
2.3-8	1		

LIST OF EFFECTIVE PAGES (Continued)

Pages	Revision
2.5-5	1
2.5-6	1
2.5-7	1
2.5-8	1
2.5-9	1
2.5-10	1
2.5-11	1
2.5-12	1
2.5-13	1
2.5-14	1
2.5-15	1
2.5-16	1
2.5-17	1
2.5-18	1
2.5-19	1
2.5-20	1
2.5-21	1
2.5-22	1
2.6-1	2
2.6-2	1
2.6-3	1
2.6-4	1
2.6-5	1
2.6-7	1
2.6-8	1
2.6-9	1
2.6-10	1
2.6-11	1
2.6-12	1
2.6-13	1
2.6-14	1
2.6-15	1
2.6-16	1
2.6-17	1
2.6-18	1
2.6-19	1

Pages	Revision
2.6-20	1
2.6-21	1
2.6-22	1
2.6-23	1
2.6-24	2
2.6-25	2
2.6-26	1
2.6-27	1
2.6-28	1
2.7-1	3
2.7-2	1
2.8-1	1
2 8-2	1
2.8-3	1
2.8-4	1
2.8-5	1
2.8-6	1

CHAPTER 3 LIST OF EFFECTIVE PAGES

Pages	Revision	Pages	Revision
3.0-1	1	3.1-34	3
3.0-2	1	3.1-35	1
3.1-1	1	3.1-36	1
3.1-2	1	3.1-37	1
3.1-3	1	3.1-38	1
3.1-4	1	3.1-39	1
3.1-5	8	3.1-40	1
3.1-6	1	3.1-41	1
3.1-7	1	3.1-42	1
3.1-8	1	3.1-43	1
3.1-9	8	3.1-44	1
3.1-10	1	3.1-45	1
3.1-11	1	3.1-46	1
3.1-12	1	3.1-47	4
3.1-13	8	3.1-48	2
3.1-14	8	3.1-49	1
3.1-15	1	3.1-50	1
3.1-16	1	3.1-51	1
3.1-17	1	3.1-52	1
3.1-18	1	3.1-53	1
3.1-19	1	3.1-54	1
3.1-20	8	3.1-55	1
3.1-21	1	3.1-56	1
3.1-22	8	3.1-57	2
3.1-23	1	3.1-58	1
3.1-24	3	3.1-59	2
3.1-25	1	3.1-60	3
3.1-26	3	3.1-61	2
3.1-27	1	3.1-62	1
3.1-28	1		
3.1-29	1		
3.1-30	1		
3.1-31	1		
3.1-32	1		
3.1-33	1		

LIST OF EFFECTIVE PAGES (Continued)

Pages	Revision	Pages	Revision
3.1-63	1	3.1-103	1
3.1-64	2	3.1-104	1
3.1-64a	2	3.1-105	1
3.1-64b	2	3.1-106	1
3.1-65	1	3.1-107	1
3.1-66	1	3.1-108	1
3.1-67	1	3.1.109	1
3.1-68	1	3.1-110	1
3.1-69	1	3.1-111	1
3.1-70	1	3.1-112	1
3.1-71	1	3.1-113	1
3.1-72	2	3.1-114	1
3.1-73	1	3.1-115	1
3.1-74	2	3.1-116	1
3.1-75	1	3.1-117	1
3.1-76	1	3.1-118	1
3.1-77	8	3.1-119	1
3.1-78	2	3.1-120	1
3.1-79	3	3.1-121	1
3.1-80	1	3.1-122	1
3.1-81	1	3.1-123	1
3.1-82	1	3.1-124	1
3.1-83	1	3.1-125	1
3.1-84	1	3.1-126	1
3.1-85	1	3.1-127	1
3.1-86	3	3.1-128	1
3.1-87	1	3.1-129	3
3.1-88	1	3.1-130	1
3.1-89	8	3.1-131	1
3.1-90	2	3.1-132	3
3.1-91	1	3.1-133	3
3.1-92	1	3.1-134	1
3.1-93	1	3.1-135	2
3.1-94	1	3.1-136	2
3.1-94a	3	3.1-137	1
3.1-94b	3	3.1-138	1
3.1-95	1	3.1-139	1
3.1-96	1	3.1-140	1
3.1-97	1	3.1-141	1
3.1-98	2	3.1-142	3
3.1-99	1	3.1-143	8
3.1-100	1	3.1-144	1
3.1-101	1	3.1-145	1
3.1-102	1	3.1-146	1

LIST OF EFFECTIVE PAGES (Continued)

LIST OF EFFECTIVE PAGES (Continued)

Pages	Revision	Pages	Revision
3.1-231	1	3.1-273	1
3.1-232	1	3.1-274	1
3.1-233	1	3.1-275	1
3.1-234	1	3.1-276	1
3.1-235	1	3.1.277	1
3.1-236	1	3.1-278	1
3.1-237	1	3.1-279	1
3.1-238	1	3.1-280	1
3.1-239	1	3.1-281	1
3.1-240	1	3.1-282	1
3.1-241	1	3.1-283	1
3.1-242	1	3.1-284	1
3.1-243	1	3.1-285	1
3.1-244	1	3.1-286	1
3.1-245	1	3.1-287	1
3.1-246	1	3.1-288	1
3.1-247	1	3.1-289	1
3.1-248	1	3.1-290	1
3.1-249	1	3.1-291	1
3.1-250	1	3.1-292	1
3.1-251	1	3.1-293	1
3.1-252	1	3.1-294	1
3.1-253	1	3.1-295	1
3.1-254	1	3.1-296	1
3.1-255	1	3.1-297	1
3.1-256	1	3.1-298	1
3.1-257	1	3.1-299	1
3.1-258	1	3.1-300	1
3.1-259	1	3.1-301	1
3.1-260	1	3.1-302	1
3.1-261	1	3.1-303	1
3.1-262	1	3.1-304	1
3.1-263	1	3.1-305	1
3.1-264	1	3.1-306	1
3.1-265	1	3.1-307	1
3.1-266	1	3.1-308	1
3.1-267	1	3.1-309	1
3.1-268	1	3.1-310	1
3.1-269	1	3.1-311	1
3.1-270	1	3.1-312	1
3.1-271	1	3.1-313	1
3.1-272	1	3.1-314	1

LIST OF EFFECTIVE PAGES (Continued)

Pages	Revision	Pages	Revision
3.1-315	1	3.2-7	1
3.1-316	1	3.2-8	3
3.1-317	1	3.2-9	1
3.1-318	1	3.2-10	1
3.1-319	1	3.2-11	1
3.1-320	1	3.2-12	1
3.1-321	1	3.2-13	3
3.1-322	1	3.2-14	3
3.1-323	1	3.2-15	1
3.1-324	1	3.2-16	1
3.1-325	1	3.2-17	8
3.1-326	1	3.2-17a	8
3.1-327	1	3.2-17b	8
3.1-328	1	3.2-18	1
3.1-329	8	3.2-19	2
3.1-330	1	3.2-20	1
3.1-331	1	3.2-21	1
3.1-332	1	3.2-22	3
3.1-333	1	3.2-23	1
3.1-334	1	3.2-24	1
3.1-335	1	3.2-25	1
3.1-336	1	3.2-26	1
3.1-337	1	3.2-27	1
3.1-338	1	3.2-28	1
3.1-339	1	3.2-29	1
3.1-340	1	3.2-30	1
3.1-341	1	3.2-31	1
3.1-342	1	3.2-32	2
3.1-343	1	3.2-32	1
3.1-344	1	3.2-33	1
3.1-345	1	3.2-34	1
3.1-346	1	3.2-35	3
3.1-347	1	3.2-36	3
3.1-348	1	3.2-37	3
3.1-349	1	3.2-38	8
3.1-350	1	3.2-39	3
3.2-1	1	3.2-40	3
3.2-2	1	3.2-41	3
3.2-3	1	3.2-42	3
3.2-4	1	3.2-43	3
3.2-5	1	3.2-44	3
3.2-6	1	3.2-45	1
		3.2-46	1
		3.2-47	1

LIST OF EFFECTIVE PAGES (Continued)

LIST OF EFFECTIVE PAGES (Continued)

LIST OF EFFECTIVE PAGES (Continued)

LIST OF EFFECTIVE PAGES (Continued)

Pages	Revision	Pages	Revision
3.4-44	1	3.4-86	1
3.4-45	1	3.4-87	1
3.4-46	1	3.4-88	1
3.4-47	8	3.4-89	1
3.4-48	8	3.4-90	1
3.4-49	8	3.4-91	1
3.4-50	2	3.4-92	1
3.4-51	8	3.4-93	1
3.4-52	3	3.4-94	1
3.4-53	1	3.4-95	1
3.4-54	1	3.4-96	1
3.4-55	1	3.4-97	1
3.4-56	1	3.4-98	1
3.4-57	1	3.4-99	1
3.4-58	1	3.4-100	1
3.4-59	1	3.4-101	1
3.4-60	1	3.4-102	1
3.4-61	1	3.4-103	1
3.4-62	1	3.4-104	1
3.4-63	1	3.4-105	1
3.4-64	1	3.4-106	1
3.4-65	1	3.4-107	1
3.4-66	1	3.4-108	1
3.4-67	1	3.4-109	1
3.4-68	1	3.4-110	1
3.4-69	3	3.4-111	1
3.4-70	1	3.4-112	1
3.4-71	3	3.4-113	8
3.4-72	1	3.4-114	1
3.4-73	1	3.4-115	1
3.4-74	1	3.4-116	1
3.4-75	1	3.4-117	1
3.4-76	1	3.4-118	1
3.4-77	3	3.4-119	1
3.4-78	1	3.4-120	1
3.4-79	1	3.5-1	1
3.4-80	1	3.5-2	3
3.4-81	1	3.5-3	1
3.4-82	1	3.5-4	1
3.4-83	1	3.5-5	3
3.4-84	1	3.5-6	1
3.4-85	1	3.5-7	1

LIST OF EFFECTIVE PAGES (Continued)

Pages	Revision	Pages	Revision
3.5-8	2	3.5-50	1
3.5-9	1	3.5-51	2
3.5-10	3	3.5-52	2
3.5-11	3	3.5-53	2
3.5-12	3	3.5-54	3
3.5-13	3	3.5-55	3
3.5-14	1	3.5-56	2
3.5-15	3	3.5-57	1
3.5-16	3	3.5-58	1
3.5-17	3	3.5-58a	3
3.5-18	2	3.5-58b	3
3.5-19	3	3.5-59	1
3.5-20	3	3.5-60	1
3.5-21	2	3.5-61	1
3.5-22	1	3.5-62	1
3.5-23	1	3.5-63	1
3.5-24	1	3.5-64	1
3.5-25	1	3.5-65	1
3.5-26	1	3.5-66	1
3.5-27	2	3.6-1	1
3.5-28	2	3.6-2	1
3.5-29	2	3.6-3	1
3.5-30	1	3.6-4	1
3.5-31	3	3.6-5	2
3.5-32	2	3.6-6	3
3.5-33	3	3.6-7	3
3.5-34	3	3.6-8	2
3.5-34a	3	3.6-9	2
3.5-34b	3	3.6-10	1
3.5-35	2	3.6-11	3
3.5-36	2	3.6-12	3
3.5-37	2	3.6-13	1
3.5-38	2	3.6-14	1
3.5-39	1	3.6-15	1
3.5-40	1	3.6-16	1
3.5-41	2	3.6-17	1
3.5-42	2	3.6-18	1
3.5-43	3	3.6-19	1
3.5-44	3	3.6-20	2
3.5-45	3	3.6-21	1
3.5-46	1	3.6-22	2
3.5-47	1	3.6-23	1
3.5-48	8	3.6-24	1
3.5-49	1	3.6-25	1

LIST OF EFFECTIVE PAGES (Continued)

Pages	Revision
3.6-26	1
3.6-27	1
3.6-28	1
3.6-29	1
3.6-30	1
3.6-31	1
3.6-32	3
3.6-33	1
3.6-34	1
3.6-35	1
3.6-36	1
3.6-37	1
3.6-38	1
3.6-39	1
3.6-40	1
3.6-41	1
3.6-42	1
3.6-43	1
3.6-44	1
3.6-45	1
3.6-46	1
3.6-47	1
3.6-48	1
3.6-49	1
3.6-50	1
3.6-51	1
3.6-52	1
3.6-53	1
3.6-54	1
3.6-55	1
3.6-56	1
3.6-57	1
3.6-58	1
3.6-59	1
3.6-60	1
3.6-61	1
3.6-62	1
3.6-63	1
3.6-64	1
3.6-65	1
3.6-66	1
3.6-67	1

Pages	Revision
3.6-68	1
3.7-1	8
3.7-1a	8
3.7-1b	8
3.7-2	3
3.7-3	3
3.7-4	3
A-1	3
A-2	3
A-3	3
A-4	3
A-5	3
A-6	3
A-7	4
A-8	3
A-9	3
A-10	3

LIST OF EFFECTIVE PAGES - VOLUME 2 LIST OF EFFECTIVE PAGES

Pages	Revision
i	8
ii	4
iii	4
iv	8
v	4
vi	8
vii	8
viii	8
ix	4
x	8
xi	4
xii	8
xiii	4
xiv	8
xv	8
xvi	8
xvii	8
xviii	8
xix	8
xx	8
xxi	8
xxii	4
xxiii	4
xxiv	4
xxv	8
xxvi	8
xxvii	8
xxviii	8

VOLUME 2 TABLE OF CONTENTS LIST OF EFFECTIVE PAGES

Pages	Revision
i	3
ii	3
iii	3
iv	3
v	3
vi	3
vii	4
viii	3
ix	3
x	3
xi	3
xii	3
xiii	3
xiv	3
xv	3
xvi	3
xvii	3
xviii	4
xix	3
xx	3
xxi	3
xxii	3
xxiii	3
xxiv	3
xxv	3
xxvi	3
xxvii	3
xxviii	3
xxix	3
xxx	3
xxxi	3
xxxii	3

CHAPTER 3 LIST OF EFFECTIVE PAGES (Continued)

CHAPTER 4 LIST OF EFFECTIVE PAGES

Pages	Revision	Pages	Revision
4.0-1	2	4.1-32	8
4.0-2	1	4.1-33	8
4.0-3	1	4.1-34	3
4.0-4	1	4.1-35	3
4.1-1	3	4.1-36	3
4.1-2	3	4.1-37	3
4.1-3	1	4.1-38	3
4.1-4	1	4.1-39	3
4.1-5	1	4.1-40	3
4.1-6	8	4.1-41	3
4.1-7	1	4.1-42	3
4.1-8	1	4.1-43	3
4.1-9	1	4.1-44	3
4.1-10	1	4.1-45	3
4.1-11	8	4.1-46	3
4.1-12	1	4.1-47	3
4.1-13	1	4.1-48	3
4.1-14	1	4.1-49	3
4.1-15	1	4.1-50	3
4.1-16	1	4.1-51	3
4.1-17	3	4.1-52	3
4.1-18	3	4.1-53	3
4.1-19	3	4.1-54	3
4.1-20	3	4.1-55	3
4.1-21	3	4.1-56	8
4.1-22	3	4.1-57	3
4.1-23	3	4.1-58	3
4.1-24	3	4.1-59	3
4.1-25	3	4.1-60	3
4.1-26	3	4.1-61	3
4.1-27	3	4.1-62	3
4.1-28	3	4.1-63	3
4.1-29	3	4.1-64	3
4.1-30	3	4.1-65	3
4.1-31	3	4.1-66	3
		4.1-67	3
		4.1-68	3
		4.1-68a	3
		4-1-68b	3
		4.1-68c	3
		4.1-68d	3

LIST OF EFFECTIVE PAGES (Continued)

Pages	Revision	Pages	Revision
4.1-69	3	4.2-13	1
4.1-70	1	4.2-14	2
4.1-71	1	4.2-15	2
4.1-72	1	4.2-16	1
4.1-73	1	4.2-17	1
4.1-74	1	4.2-18	1
4.1-75	1	4.2-19	2
4.1-76	1	4.2-20	1
4.1-77	1	4.2-21	1
4.1-78	1	4.2-22	1
4.1-79	1	4.2-23	2
4.1-80	1	4.2-24	1
4.1-81	1	4.2-25	2
4.1-82	1	4.2-26	2
4.1-83	1	4.2-27	3
4.1-84	1	4.2-28	3
4.1-85	1	4.2-29	3
4.1-86	1	4.2-30	3
4.1-87	1	4.2-31	3
4.1-88	1	4.2-32	3
4.1-89	1	4.2-33	3
4.1-90	1	4.2-34	3
4.1-91	1	4.2-35	3
4.1-92	1	4.2-36	3
4.1-93	1	4.2-37	3
4.1-94	1	4.2-38	3
4.1-95	1	4.2-39	3
4.1-96	1	4.2-40	3
4.1-97	1	4.2-41	3
4.1-98	1	4.2-42	3
4.1-99	1	4.2-43	3
4.1-100	1	4.2-44	3
4.2-1	2	4.2-45	3
4.2-2	1	4.2-46	3
4.2-3	3	4.2-47	3
4.2-4	2	4.2-48	3
4.2-5	1	4.2-48a	4
4.2-6	8	4.2-48b	3
4.2-7	1	4.2-48c	3
4.2-8	1	4.2-48d	3
4.2-9	3	4.2-49	1
4.2-10	1		
4.2-11	2		
4.2-12	1		

LIST OF EFFECTIVE PAGES (Continued)

Pages	Revision	Pages	Revision
4.2-50	1	4.3-16	3
4.2-51	1	4.3-17	1
4.2-52	1	4.3-18	2
4.2-53	1	4.3-19	1
4.2-54	1	4.3-20	1
4.2-55	1	4.3-21	1
4.2-56	1	4.3-22	4
4.2-57	2	4.3-23	4
4.2-58	2	4.3-24	2
4.2-59	1	4.3-25	1
4.2-60	1	4.3-26	1
4.2-61	2	4.3-27	2
4.2-62	1	4.3-28	1
4.2-63	1	4.3-29	1
4.2-64	1	4.3-30	1
4.2-65	1	4.3-31	1
4.2-66	1	4.3-32	1
4.2-67	2	4.3-33	1
4.2-68	2	4.3-34	1
4.2-69	1	4.3-35	3
4.2-70	1	4.3-36	1
4.2-71	2	4.3-37	1
4.2-72	1	4.3-38	1
4.2-73	1	4.4-1	3
4.2-74	1	4.4-2	3
4.2-75	1	4.4-3	1
4.2-76	1	4.4-4	1
4.3-1	1	4.4-5	1
4.3-2	1	4.4-6	1
4.3-3	1	4.4-7	1
4.3-4	2	4.4-8	8
4.3-5	1	4.4-9	8
4.3-6	1	4.4-10	1
4.3-7	1	4.5-1	3
4.3-8	3	4.5-2	3
4.3-9	1	4.5-3	3
4.3-10	1	4.5-4	3
4.3-11	1	4.5-5	1
4.3-12	1	4.5-6	1
4.3-13	1	4.5-7	1
4.3-14	1	4.5-8	1
4.3-15	3	4.5-9	1

LIST OF EFFECTIVE PAGES (Continued)

Pages	Revision	Pages	Revision
4.5-10	1	A-6	1
4.6-1	3	A-7	1
4.6-2	1	A-8	1
4.6-3	1	A-9	1
4.6-4	1	A-10	1
4.6-5	1	A-11	1
4.6-6	1	A-12	1
4.6-7	3	A-13	2
4.6-8	1	A-14	1
4.6-9	1	A-15	1
4.6-10	1	A-16	1
4.6-11	1	A-17	1
4.6-12	1	A-18	1
4.6-13	1	A-19	1
4.6-14	1	A-20	1
4.6-15	2	A-21	1
4.6-16	1	A-22	1
4.6-17	1	A-23	1
4.6-18	1	A-24	1
4.6-19	1	A-25	2
4.6-20	2	A-26	1
4.6-21	1	A-27	1
4.6-22	1	A-28	1
4.6-23	1	A-29	1
4.6-24	1	A-30	1
4.6-25	1	B-1	1
4.6-26	1	B-2	1
4.6-27	1	B-3	1
4.6-28	1	B-4	1
4.6-29	1	B-5	1
4.6-30	1	B-6	1
4.7-1	1	B-7	1
4.7-2	2	B-8	1
4.7-3	2	B-9	1
4.7-4	2	B-10	1
4.8-1	4	B-11	1
4.8-2	1	B-12	1
A-1	1	B-13	1
A-2	1	B-14	1
A-3	1	B-15	1
A-4	1	B-16	1
A-5	1	B-17	1

LIST OF EFFECTIVE PAGES (Continued)

Pages	Revision	Pages	Revision
B-18	1	C-22	1
B-19	1	C-23	1
B-20	1	C-24	1
B-21	1	C-25	1
B-22	1	C-26	1
B-23	1	C-27	1
B-24	1	C-28	1
B-25	1	C-29	1
B-26	1	C-30	1
B-27	1	C-31	1
B-28	1	C-32	1
B-29	1	C-33	1
B-30	1	C-34	1
B-31	1	C-35	1
B-32	1	C-36	1
B-33	1	C-37	1
B-34	1	C-38	1
B-35	1	C-39	1
B-36	1	C-40	1
B-37	1	C-41	1
B-38	1	C-42	1
C-1	1	C-43	3
C-2	1	C-44	1
C-3	1	C-45	2
C-4	1	C-46	1
C-5	1	C-47	1
C-6	1	C-48	1
C-7	1	C-49	1
C-8	1	C-50	1
C-9	1	C-51	1
C-10	1	C-52	1
C-11	1	C-53	1
C-12	1	C-54	1
C-13	1	C-55	1
C-14	1	C-56	1
C-15	1	C-57	1
C-16	1	C-58	1
C-17	3	C-59	1
C-18	1	C-60	1
C-19	1	C-61	2
C-20	1	C-62	1
C-21	1	C-63	1

LIST OF EFFECTIVE PAGES (Continued)

CHAPTER 5 LIST OF EFFECTIVE PAGES

Pages	Revision
5.1-1	2
5.1-2	2
5.1-3	2
5.1-4	2
5.1-5	2
5.1-6	2
5.1-7	2
5.1-8	2
5.1-9	2
5.1-10	2
5.1-11	2
5.1-12	2
5.1-13	2
5.1-14	1
5.1-15	1
5.1-16	1
5.1-17	1
5.1-18	1
5.1-19	1
5.1-20	1
5.1-21	1
5.1-22	1
5.1-23	3
5.1-24	1
5.1-25	1
5.1-26	1
5.1-27	1
5.1-28	1
5.1-29	1
5.1-30	1
5.1-31	1
5.1-32	1
5.1-33	1
5.1-34	1
5.1-35	1
5.1-36	1
5.1-37	1
5.1-38	1
5.1-39	1
5.1-40	1
5.1-41	1

Pages	Revision
5.1-42	1
5.1-43	1
5.1-44	1
5.1-45	1
5.1-46	1
5.1-47	1
5.1-48	1
5.1-49	1
5.1-50	1
5.1-51	1
5.1-52	1
5.1-53	1
5.1-54	1
5.1-55	1
5.1-56	1
5.1-57	1
5.1-58	1
5.1-59	1
5.1-60	1
5.1-61	1
5.1-62	1
5.2-1	2
5.2-2	2
5.2-3	2
5.2-4	3
5.2-5	3
5.2-6	3
5.2-6a	3
5.2-6b	3
5.2-7	2
5.2-8	2
5.2-9	4
5.2-10	4
5.2-11	2
5.2-12	2
5.2-13	2
5.2-14	4
5.2-15	4
5.2-16	3
5.2-17	8
5.2-18	2
5.2-19	2
5.2-20	2

LIST OF EFFECTIVE PAGES (Continued)

Pages	Revision	Pages	Revision
5.2-21	2	5.4-2	3
5.2-22	1	5.4-3	3
5.3-1	3	5.4-4	3
5.3-2	3	5.4-5	3
5.3-3	4	5.4-6	3
5.3-4	3	5.4-7	3
5.3-5	4	5.4-8	3
5.3-6	3	5.4-9	3
5.3-7	8	5.4-10	3
5.3-8	3	5.5-1	1
5.3-9	4	5.5-2	1
5.3-10	4	5.6-1	3
5.3-11	3	5.6-2	3
5.3-12	3	5.6-3	3
5.3-13	3	5.6-4	3
5.3-14	3	5.6-5	3
5.3-15	3	5.6-6	3
5.3-16	3	5.6-7	3
5.3-17	3	5.6-8	3
5.3-18	3	5.6-9	3
5.3-19	3	5.6-10	1
5.3-20	8	5.7-1	3
5.3-20a	8	5.7-2	3
5.3-20b	8	5.7-3	1
5.3-21	3	5.7-4	2
5.3-22	3	5.7-5	2
5.3-23	3	5.7-6	2
5.3-24	3	5.7-7	2
5.3-25	3	5.7-8	3
5.3-26	3	5.7-9	2
5.3-27	3	5.7-10	2
5.3-28	3	5.7-11	1
5.3-29	2	5.7-12	1
5.3-30	2	5.7-13	1
5.3-31	2	5.7-14	1
5.3-32	3	5.7-15	1
5.3-33	2	5.7-16	1
5.3-34	2	5.7-17	1
5.3-35	3	5.7-18	1
5.3-36	2	5.7-19	1
5.3-37	2	5.7-20	1
5.3-38	2	5.7-21	1
5.3-39	2	5.7-22	1
5.3-40	2	5.7-23	1
5-4-1	3	5.7-24	1

CHAPTER 6 LIST OF EFFECTIVE PAGES

LIST OF EFFECTIVE PAGES (Continued)

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 PORTS 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, 1990 Edition

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

New cylinders and associated valves - Entire standard

Cylinders and valves already owned and operated by PORTS 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 1990 were manufactured to meet the version of the ANSI standard or specification in effect at the time of the placement of the purchase order.

Section 5.2.1 - For U.S. Department of Transportation 7A Type A packaging, satisfy U.S. Department of Energy (DOE) evaluation document DOE/RL-96-57, Revision 0, Volume 1, which supersedes DOE/00053-H1.

For references to this standard, see SAR Table 3.2-1, Section 3.8.1.9.1, 4.2.3.2 - Case R-30 and Section 2.2.2 of the Packaging and Transportation Quality Assurance Program (UEO-1041).

1.2 ANSI/ANS 3.1, Selection, Qualification, and Training of Personnel for Nuclear Power Plants, 1987 Edition

PORTS satisfies only the following section of this standard:

Section 4.3.3 - The qualifications of the Radiation Protection Manager identified in SAR Section 6.1 satisfy the requirements of this section of the standard.

1.3 ANSI/ANS 3.2, Administrative Controls and Quality Assurance for the Operational Phase of Nuclear Power Plants, 1994 Edition

The extent to which PORTS satisfies the requirements of this standard is outlined in SAR Section 6.11.1 and Appendix B to SAR Section 6.11.

1.4 ANSI/ANS 6.4, Guidelines for Nuclear Analysis and Design of Concrete Radiation Shielding for Nuclear Power Plants, 1977 Edition

PORTS satisfies the requirements of this standard for the Radiation Calibration (RADCAL) facility.

For references to this standard, see SAR Section 3.5.1.6.3.2.

1.5 ANSI/ANS 8.1, Nuclear Criticality Safety in Operations With Fissionable Materials Outside Reactors, 1983 Edition

PORTS satisfies the requirements of this standard.

For references to this standard, see SAR Sections 5.2.2.1, 5.2.2.3, 5.2.3.1 - Mass, 5.2.3.1 - Concentration, 5.2.3.2, 5.2.4.2, and Table 6.9-1.

1.6 ANSI/ANS 8.3, Criticality Accident Alarm System, 1986 Edition[1]

PORTS satisfies the requirements of this standard with the following exceptions:

Section 4.4.2 - An alarm signal with a complex sound wave or modulation is not provided.

Section 4.4.4 - A limit on the sound level emitted from the signal generator is not provided.

Section 4.5.3 - Emergency power supplies for AQ and NS alarm systems are not provided. A battery backup serves as the backup power supply for the cluster and local nitrogen horn.

Section 5.3 - The CAAS is not designed to withstand seismic stresses.

Section 5.7.2 - This section recommends that the alarm trip point be more than 10 mrad/hr above normal background. PORTS uses a lower value because normal neutron background is small.

Section 6.3 - The testing frequency for the clusters is specified in the Technical Safety Requirements.

Section 6.4 - The testing frequency for the audible alarms is specified in the Technical Safety Requirements.

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[1] In describing criticality accident conditions, SAR Chapter 4 makes comparisons to ANSI/ANS 8.3, 1979 Edition. Commitments to the 1986 Edition bound these comparisons.

Section 7.1 - Posting in accordance with this section is not provided. Instructions to site personnel regarding response to alarm signals are provided in General Employee Training.

Section 7.2.3 - The testing frequency for the audible alarms is specified in the Technical Safety Requirements. Additionally, evacuation and familiarization drills are conducted in accordance with the Emergency Plan.

For references to this standard, see SAR Sections 3.6.2.2.1.1; 4.1.1.2.3.4; 4.1.1.2.3.8; 4.6.2.1.1 (1979 Edition); 4.6.2.1.2 (1979 Edition); 4.6.2.5; Chapter 4, Appendix C, C.1.3.2.4.

1.7 ANSI/ANS 8.5, Use of Borosilicate-Glass Raschig Rings as a Neutron Absorber in Solutions of Fissile Material, 1986 Edition

PORTS satisfies the following sections of this standard:

Sections 4.1, 4.3, and 4.4 - Satisfy the requirements of these sections if raschig rings are replaced. See SAR Section 5.2.3.1 - Neutron Absorption.

Sections 4.1, 6.2.3, 6.3.2, and 6.4 - Satisfy the testing requirements in these sections if a release occurs exposing existing rings to a corrosive environment. See SAR Section 5.2.3.1 - Neutron Absorption.

Section 6.1 - Satisfy the surveillance requirements in this section as described in the Technical Safety Requirements, SAR Section 5.2, and Nuclear Criticality Safety Approvals (NCSAs). The inspection for raschig rings damage described in SAR Section 5.2 is accomplished by inspecting and replacing rings when the cumulative addition would become equal to 10% of the original loading.

1.8 ANSI/ANS 8.7 (N16.5), Guide for Nuclear Criticality Safety in the Storage of Fissile Material, 1975 Edition

PORTS satisfies the requirements of this standard with the following exceptions/clarifications:

Section 4.2.6 - Fire protection systems are installed throughout the process buildings where flammable liquids are used in operating equipment. Individual cell housings do not contain fire protection systems.

Section 5.1 - PORTS does not implement the unit mass limits described in this section. Mass limits are defined in Nuclear Criticality Safety Approvals (NCSAs) and Nuclear Criticality Safety Evaluations (NCSEs).

For references to this standard, see SAR Sections 5.2.2.1 and 5.2.4.2.

1.9 ANSI/ANS 8.19, Administrative Practices for Nuclear Criticality Safety, 1984 Edition

PORTS satisfies the requirements of this standard.

For references to this standard, see SAR Sections 5.2.2.1 and 5.2.4.2.

1.10 ANSI/ANS 8.20, American National Standard for Nuclear Criticality Safety Training, 1991 Edition

PORTS satisfies the requirements of this standard.

For references to this standard, see SAR Sections 6.6.1.1, 6.6.4.2, and 6.6.11.

1.11 ANSI N13.22, Bioassay Programs for Uranium, 1995 Draft

PORTS satisfies only Section 6.1.1 of this standard regarding the calculational method for action levels for the PORTS internal dosimetry program.

For references to this standard, see SAR Section 5.3.2.3.

1.12 ANSI B30.2, Overhead and Gantry Crane Design & Inspection, 1990 Edition (including Addenda A, 1991)

PORTS satisfies the requirements of the following sections of this standard for liquid UF_6 handling cranes:

Section 2-2.1.1 - all
Section 2-2.1.2 - all
Section 2-2.1.3 - all except for paragraphs (6), (8), and (9)
Section 2-2.2.2 - only paragraphs (a), (b)(1), and (b)(4)
Section 2-2.3.1 - all
Section 2-2.4.1 - all

1.13 ANSI B30.9, Slings, 1990 Edition (including Addenda A, 1991)

PORTS satisfies the requirements of the following sections of this standard for lifting fixtures used to handle liquid UF_6 cylinders:

Section 9-1.6 - all
Section 9-2.8.1 - all
Section 9-2.8.2 - all

1.14 ANSI B30.10, Hooks, 1987 Edition (up through Addenda C, 1992)

PORTS satisfies the requirements of the following sections of this standard for lifting fixtures used to handle liquid UF_6 cylinders:

Section 10-1.2.1.1 - all
Section 10-1.2.1.2 - all
Section 10-1.2.1.3 - all

1.15 ANSI B30.20, Below the Hook Rigging Devices, 1992 Edition

PORTS satisfies the requirements of the following sections of this standard for lifting fixtures used to handle liquid UF_6 cylinders:

Section 20-1.3 - all
Section 20-1.4.1 - only paragraphs (a) and (b)

1.16 ANSI NB-23, National Board Inspection Code, 1992 Edition

PORTS satisfies the requirements of this code as described below:

Autoclave shell and head are visually inspected to section U-110.1 of this standard in accordance with Technical Safety Requirement 2.1.4.5.

PORTS utilizes Chapter V of this code as guidance to develop the inspection program for ASME pressure vessels.

1.17 ANSI N323, Radiation Protection Instrumentation Test and Calibration, 1978 Edition

PORTS satisfies the requirements of this standard except as described in SAR Section 5.3.5.

For references to this standard, see SAR Sections 3.5.1.6.3.2 and 5.3.5.

1.18 ANSI N509, Nuclear Power Plant Air Cleaning Units and Components, 1989 Edition

New and existing fixed HEPA filter systems needed to ensure compliance with release limits or to control worker radiation exposure satisfy the requirements of this standard with the following exceptions and clarifications:

Section 5.2 - Do not satisfy. No credit is taken for adsorbers.

Section 5.5 - Do not satisfy requirements for air heaters.

Section 8.0 - Quality assurance requirements for applicable systems are identified in SAR Section 3.8 and the Quality Assurance Program Description

Appendix A - Do not sample adsorbents.

Appendix B - Do not use allowable leakage guidance.

Appendix C - Do not use manifold design guidelines.

Appendix D - The manifold qualification program uses this appendix as guidance only.

For references to this standard, see SAR Section 5.1.4.

1.19 ANSI N510, Testing of Nuclear Air Treatment Systems, 1989 Edition

New and existing fixed HEPA filter systems that satisfy the requirements of ANSI N509 and are needed to ensure compliance with release limits or to control worker radiation exposure satisfy the requirements of this standard with the following exceptions and clarifications:

Section 6.0 - Only satisfy this section for new seal-welded duct systems or for connections to a system where this section has been previously applied.

Section 7.0 - Do not use guidance for monitoring frame pressure leak tests.

Existing fixed HEPA filter systems that do not satisfy the requirements of ANSI N509 will be tested using the requirements of this standard or another industry accepted standard as guidance only.

For references to this standard, see SAR Sections 5.1.4 and 5.3.2.10.

1.20 ANSI N543, General Safety Standard for Installations Using Non-Medical X-Ray and Sealed Gamma-Ray Sources, Energies up to 10 MeV, 1974 Edition

PORTS satisfies Sections 3.2, 7, and 8.1.2 of this standard for the X-710 Radiographic Facility, as they apply to Enclosed Installations.

For references to this standard, see SAR Section 3.5.2.1.5.3.

2.0 American Society of Mechanical Engineers (ASME)

2.1 ASME NQA-1, Quality Assurance Program Requirements for Nuclear Facilities, 1989 Edition

PORTS satisfies the requirements of this standard, including Basic and Supplementary Requirements, with exceptions and clarifications identified in the Quality Assurance Program Description. See also SAR Sections 6.6.12, 6.8.1 and 6.8.2 and Section 7.5 of the Emergency Plan.

2.2 ASME Boiler and Pressure Vessel Code, 1995 Edition

PORTS satisfies the following sections of this code as clarified below:

Section VIII - The following pressure vessel components and systems satisfy the requirements of Section VIII of this code for the edition in effect at the time of fabrication: freezer/sublimer; condenser/reboiler; autoclave; cell coolant condenser; nitrogen system (relief devices only); cell coolant pressure relief; ClF_3 and F_2 tanks used in X-330/X-333 and X-342, respectively; and UF_6 cylinders except that UF_6 cylinders do not have pressure relief devices.

Section IX - PORTS satisfies the requirements of Section IX for the components identified above for Section VIII.

For references to this standard, see SAR Sections 3.1.3.2.1.1, 3.1.3.2.2.1, 3.2.1.1.1, 3.2.1.3.1.2, 3.2.4.2.4, 3.4.3.4, and 3.9.6, and the basis statements for TSR Sections 2.1, 2.2, 2.5, and 2.7.

3.0 National Fire Protection Association (NFPA)

3.1 NFPA 10, Portable Fire Extinguishers, 1989 Edition

As described in SAR Section 5.4.3, the requirements of this standard were used as guidance only in determining the size, selection, and distribution of portable fire extinguishers. PORTS will satisfy the requirements of this standard for modifications to the plant except as documented and justified by the Authority Having Jurisdiction (AHJ).

For references to this standard, see SAR Sections 5.4.1 and 5.4.3.

3.2 NFPA 13, Sprinkler Systems, 1989 Edition

The requirements of this standard were used as guidance only for the design and installation of wet and dry pipe automatic sprinkler systems. In addition, the process buildings meet the definition of Ordinary Hazard Occupancies (Group 2) as stated in this standard and the fire protection system exceeds the sprinkler discharge of 0.15 gpm/sq.ft for this type of occupancy. PORTS will satisfy the requirements of this standard for modifications to the plant except as documented and justified by the AHJ.

For references to this standard, see SAR Sections 3.3.1.8.5, 3.5.1.6.3.3, 3.6.1.2.1, 3.6.1.2.1.2, 4.6.1.6, and 5.4.1, 5.4.1.1.

3.3 NFPA 15, Water Spray Systems, 1990 Edition

PORTS will satisfy the requirements of this standard for modifications to the plant except as documented and justified by the AHJ.

For references to this standard, see SAR Section 5.4.1.

3.4 NFPA 24, Private Fire Service Mains, 1992 Edition

As described in SAR Section 3.6.1.1.2.4, all underground piping for the high-pressure fire water system was installed and is maintained using the requirements of this standard for guidance only. PORTS will satisfy the requirements of this standard for modifications to the plant except as documented and justified by the AHJ.

For references to this standard, see SAR Sections 3.6.1.1.2.4 and 5.4.1.

3.5 NFPA 30, Flammable Liquids, 1990 Edition

As identified in SAR Table 3.5.3-3, aboveground storage tanks were installed using the requirements of this standard for guidance only. In addition, as described in SAR Section 5.4.1.1, the requirements of this standard are used as guidance only for the handling of flammable liquids. PORTS will satisfy the requirements of this standard for modifications to the plant except as documented and justified by the AHJ.

For references to this standard, see SAR Table 3.5.3-3 and Sections 5.4.1 and 5.4.1.1.

3.6 NFPA 101, Life Safety Code, 1991 Edition

PORTS uses the requirements of this standard as guidance only for the review of emergency egress paths.

For references to this standard, see SAR Section 5.4.1.2.

3.7 NFPA 214, Standard for Water Cooling Tower, 1992 Edition

As described in SAR Section 3.6.1.2.4, the deluge systems for the cooling towers were installed and are maintained using this standard as guidance only. PORTS will satisfy the requirements of this standard for modifications to these systems except as documented and justified by the AHJ.

3.8 NFPA 232 (and 232 AM), Standard for the Protection of Records, 1986 Edition

As described in SAR Section 6.10.1.8, there are several acceptable methods for the storage of permanent records. If the NFPA 232 (or 232 AM) method of storage in 2-hour-rated containers is used, any exceptions to this standard will be documented and justified by the AHJ.

4.0 NRC Regulatory Guidance

4.1 Regulatory Guide 1.59, Design Basis Floods for Nuclear Power Plants, Revision 2, 1977

The extent to which PORTS satisfies the requirements of this regulatory guide will be determined as part of the SAR Upgrade activity.

For references to this regulatory guide, see SAR Sections 2.4.3 and 2.4.3.2.

4.2 Regulatory Guide 1.109, Calculation of Annual Doses to Man from Routine Releases of Reactor Effluents for the Purpose of Evaluating Compliance with 10 CFR Part 50 Appendix I, October 1988

PORTS uses the food chain models in this standard to evaluate public radiation dose due to waterborne radioactive effluent via potable water and aquatic food pathways, as described in SAR Section 5.1.3.2.

For references to this standard, see SAR Section 5.1.3.2.

4.3 Regulatory Guide 3.34, Assumptions Used for Evaluating the Potential Radiological Consequences of Accidental Nuclear Criticality in a Uranium Fuel Fabrication Plant, Revision 1

PORTS uses formulas from this document to calculate doses from criticality accidents, as described in SAR Section 4.1. Other methods may also be used to calculate these doses.

For references to this standard, see SAR Sections 4.1.1.2.1, 4.1.1.2.3, 4.1.1.2.3.6 (and footnote), Table 4.1.1-5 (note C), Table 4.3.1-3 (footnote).

4.4 Regulatory Guide 8.13, Instructions Concerning Prenatal Radiation Exposure, Revision 2

PORTS satisfies the requirements of this standard.

For references to this standard, see SAR Section 5.3.2.2.

4.5 Bulletin 91-01, Reporting Loss of Criticality Safety Controls

PORTS satisfies the requirements of this NRC Bulletin as identified in SAR Table 6.9-1.

5.0 Other Codes, Standards, and Guidance Documents

5.1 USEC-651, Uranium Hexaflouride: A Manual of Good Handling Practices, Revision 7, January 1995

USEC-651 supersedes ORO-651, Revision 6. PORTS satisfies only the following sections of USEC-651 as clarified below:

Section 3.3 - all; cylinders with heels greater than Table 3 limits are shipped in accordance with the requirements of 49 CFR 173.

Section 5.2 - all except for paragraph 5.2.2. Not all PORTS cylinders have internal volumes measured by the manufacturer.

Section 5.3 - all

Section 5.4 - all

Section 7.1 - only the sixth paragraph

Section 10.0 - all except as follows:

First paragraph - Not all PORTS shipping cylinders meet the requirements of the most recent version of ANSI N14.1 (1990 Edition). These cylinders were manufactured prior to the date of ANSI N14.1-90. (See item 1.1, ANSI N14.1)

Fourth paragraph - Older PORTS cylinders may not have a measured volume that has been certified by the manufacturer. (See item 1.1, ANSI N14.1).

Section 13.0 - all

For references to this document, see SAR Sections 3.2.2.6 - Cylinder Change; 3.8.1.9.1; Section 4.2.3.2 - Case R-30; the basis statements for TSRs 2.1.3.8, 2.1.3.15, 2.5.3.11; and the Transportation Security Plan, Section 6.4.

5.2 NCRP 112, Calibration of Survey Instruments Used in Radiation Protection for the Assessment of Ionizing Radiation Fields and Radioactive Surface Contamination

NCRP 112 is an example of a nationally recognized guidance document that may be used to establish calibration requirements for radiological protection instruments. See SAR Section 5.3.5.

5.3 Federal Guidance Report No. 11, Limiting Values of Radionuclide Intake and Air Concentration and Dose Conversion Factors for Inhalation, Submersion, and Ingestion, undated

PORTS uses the data contained in Tables 2-1 and 2-2 of this document to calculate dose conversion factors for radionuclides of concern. This data is also used to calculate the Derived Air Concentrations (DACs) listed in SAR Table 5.3-5.

For references to this standard, see SAR Section 5.3.2.3.

5.4 SNT-TC-1A, Qualification and Requalification of Nondestructive Examination Personnel, 1980 Edition

PORTS satisfies the requirements of this standard with clarifications identified in Section 2.2.4 of the Quality Assurance Program Description.

5.5 EPA 400-R-92-001, Manual of Protective Action Guides and Protective Actions for Nuclear Incidents

PORTS satisfies the requirements of only Section 2.5 of this document.

For references to this standard, see Section 5.5.1.2 of the Emergency Plan.

5.6 ICRP-26, Internal Dose, 1977

The concepts described in this standard were used as guidance only in developing the PORTS radiation protection program described in SAR Section 5.3. PORTS is required to meet the requirements of 10 CFR 20.

For references to this standard, see SAR Section 5.3.2.3.

5.7 ICRP-30, Limits for Intakes of Radionuclides by Workers, 1978

The concepts described in this standard were used as guidance only in developing the PORTS radiation protection program described in SAR Section 5.3. PORTS is required to meet the requirements of 10 CFR 20.

For references to this standard, see SAR Chapter 4, Appendix A, Section A.2.3; Section 5.3.2.3, and Table 5.3-10.

5.8 ANSI/ISA-S67.04, Setpoints for Nuclear Safety Related Instrumentation, 1988 Edition

PORTS satisfies the requirements of this standard for setpoint calculations for Q systems.

For references to this standard, see the basis statements in TSR Sections 2.1, 2.3, and 2.6.

5.9 ASTM C787, Specification for Uranium Hexaflouride for Enrichment, 1990 Edition

PORTS satisfies the requirements of this standard as described in SAR Tables 1-3 (footnotes c and f) and 1-4 (footnote a) with the following clarification:

> Production from the cascade is considered "material-in-process" and, on occasion, may be refed to the cascade; as such, it is not covered by the feed restrictions described in this standard.

5.10 ASTM C996, Standard Specification for Uranium Enriched to less than 5% ^{235}U, 1990 Edition

PORTS satisfies the requirements of this standard as described in SAR Tables 1-3 (footnotes c and f) and 1-4 footnote a) with the following clarification:

> Production from the cascade is considered "material-in-process" and, on occasion, may be refed to the cascade; as such, it is not covered by the feed restrictions described in this standard.

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2. SITE CHARACTERISTICS OF THE PORTSMOUTH GASEOUS DIFFUSION PLANT (PORTS)

This chapter provides information on the location and site characteristics of the Portsmouth Gaseous Diffusion Plant (PORTS) as specified in 10 CFR 76.35(a)(8). The purpose is to provide a description of site characteristics needed to support the assumptions used in determining the impacts of normal operation, emergency planning, and the hazard and accident analysis contained in Chapter 4. These assumptions include the contribution of external and natural phenomena to initiation of events and the site-related assumptions used in evaluating accident consequences. This chapter includes descriptions of:

1. The location of the site and facility and its proximity to public and other facilities (Section 2.1),
2. Local population location and density (Section 2.1),
3. Nearby industrial, transportation, and military activities (Section 2.2), and
4. The historical basis for site characteristics in meteorology, hydrology, geology, and seismology (Sections 2.3 through 2.6).

2.1 GEOGRAPHY AND DEMOGRAPHY OF THE SITE

This section describes the PORTS site location and description, surrounding populations, and use of nearby land and waters.

2.1.1 Site Location

PORTS is located in rural Pike County, a sparsely populated area in south central Ohio. The facility is about 70 miles south of Columbus, Ohio, and 75 miles east of Cincinnati, Ohio, the two closest metropolitan areas. The cities of Portsmouth and Chillicothe, Ohio, are located approximately 25 miles from the facility (south and north, respectively). The location of the site, relative to major cities in Ohio, is depicted in Figure 2.1-1. Figures 2.1-2 and 2.1-3 depict the nearby communities of Piketon and Waverly, both north of PORTS, along with major highways, railways, and bodies of water.

The Scioto River Valley is 1 mile west of the facility. The Scioto River (Figure 2.1-3) is a tributary of the Ohio River, and their confluence is approximately 20 miles south of PORTS. With the exception of the Scioto River floodplain, which is farmed extensively, the area around PORTS consists of marginal farmland and forested hills.

The specific location of PORTS (i.e., a central point of the facility near the process buildings) is latitude 39°0'30" N and longitude 83°0'00" W. In Universal Transverse Mercator coordinates, this location is N 4,319,410 m and E 326,829 m (Zone 17).

2.1.2 Site Description

PORTS is located on a 3,708-acre Department of Energy (DOE) Reservation as shown in Figure 2.1-3. The plant occupies 500 acres and consists of 109 buildings. Figure 2.1-4 identifies the primary buildings at the PORTS site. As shown in this figure, the site consists of facilities and areas leased to USEC, and facilities retained by DOE (i.e., non-leased). Activities conducted within facilities leased to USEC, excluding non-leased facilities and access and egress thereto, are conducted in accordance with this Application. Also, activities conducted by USEC and its agents in areas within the perimeter road, excluding non-leased areas and access and egress thereto, will also be conducted in accordance with this Application. DOE will self-regulate DOE activities conducted in non-leased areas and leased areas in accordance with applicable DOE requirements. A listing of facilities leased to the United States Enrichment Corporation (USEC) and those facilities retained by DOE at the PORTS site are shown in Figures 2.1-5a and 2.1-5b. Some leased facilities at the site contain areas that are deleased. A listing of leased facilities is maintained onsite and will be updated on annual basis with the Safety Analysis Report (SAR) update.

2.1.2.1 Topography

South central Ohio lies in the steep to gently rolling Appalachian foothills. The elevation of the PORTS site is approximately 120 ft above the Scioto River flood plain. The site is located in the valley of a tributary of the ancient Teays River.

The predominant landform in the site area is the relatively broad, level, filled valley of a preglacial river. This valley is oriented north-to-south and is bounded on the east and west by ridges or low-lying hills. Another significant landform is the small valley formed by Little Beaver Creek, which flows in a northwesterly direction across PORTS just north and east of the main plant area.

2.1.2.2 Vegetative Cover

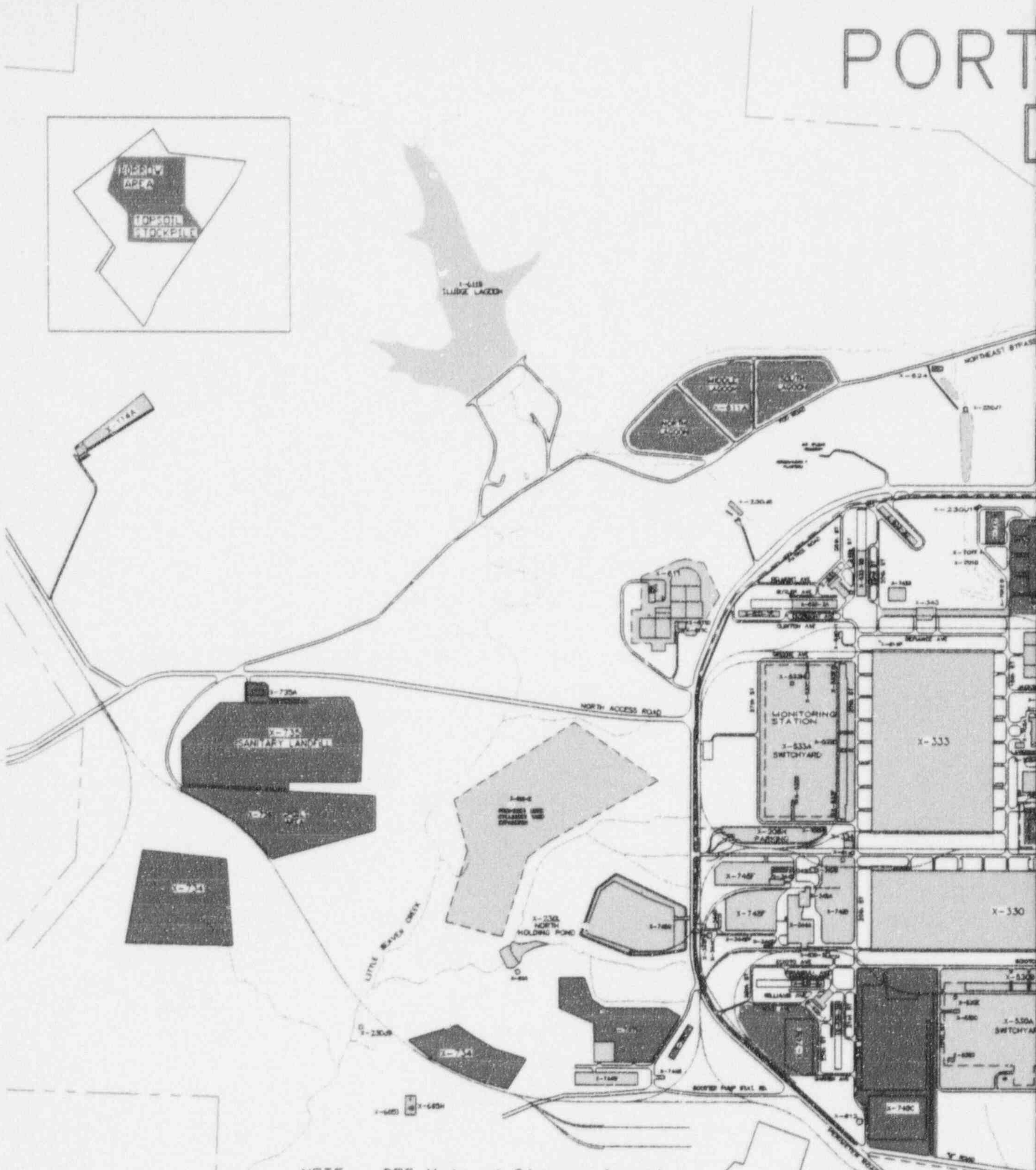
The area within the perimeter road (Figure 2.1-4) is a fully developed industrial area. As such, the grounds are maintained as lawns, and support various species of grasses and herbaceous divots. The vegetation of surrounding Pike County consists primarily of hardwood forests. Field crops constitute the other major category of vegetative cover in the surrounding area.

2.1.2.3 Onsite Transportation and Transmission Systems

No U.S. or state highways enter the PORTS reservation. Vehicular traffic can enter the reservation from all four sides through several access roads that intersect the plant's perimeter road; these roads are shown in Figure 2.1-4.

The Seaboard System Railway, Inc. (CSX), provides rail access to the PORTS site. This CSX line intersects rail lines supported by CSX and Norfolk and Southern Railway (N&S).

Although PORTS once maintained a landing strip for air transportation, the strip is now obstructed with earthen berms. The southern end of the landing strip is maintained as a helicopter pad. The shift supervisor coordinates helicopter approaches to ensure they do not fly over process buildings



NOTE: DOE Material Storage Areas's (DMSAs) are indentified on the following plant drawings:

CX-761-1040-A
CX-761-1115-A
CX-761-1116-A
CX-761-1116-A
CX-761-1118-A
CX-761-1120-A
CX-761-1123-A
CX-761-1124-A

LEGEND

	FACILITIES LEASED TO USEC
	FACILITIES RETAINED BY DOE
ROADS AND RAILROADS	LEASED TO USEC

FIGURE 2.1-4 PORTS Site

SMOUTH GASEOUS DIFFUSION PLANT

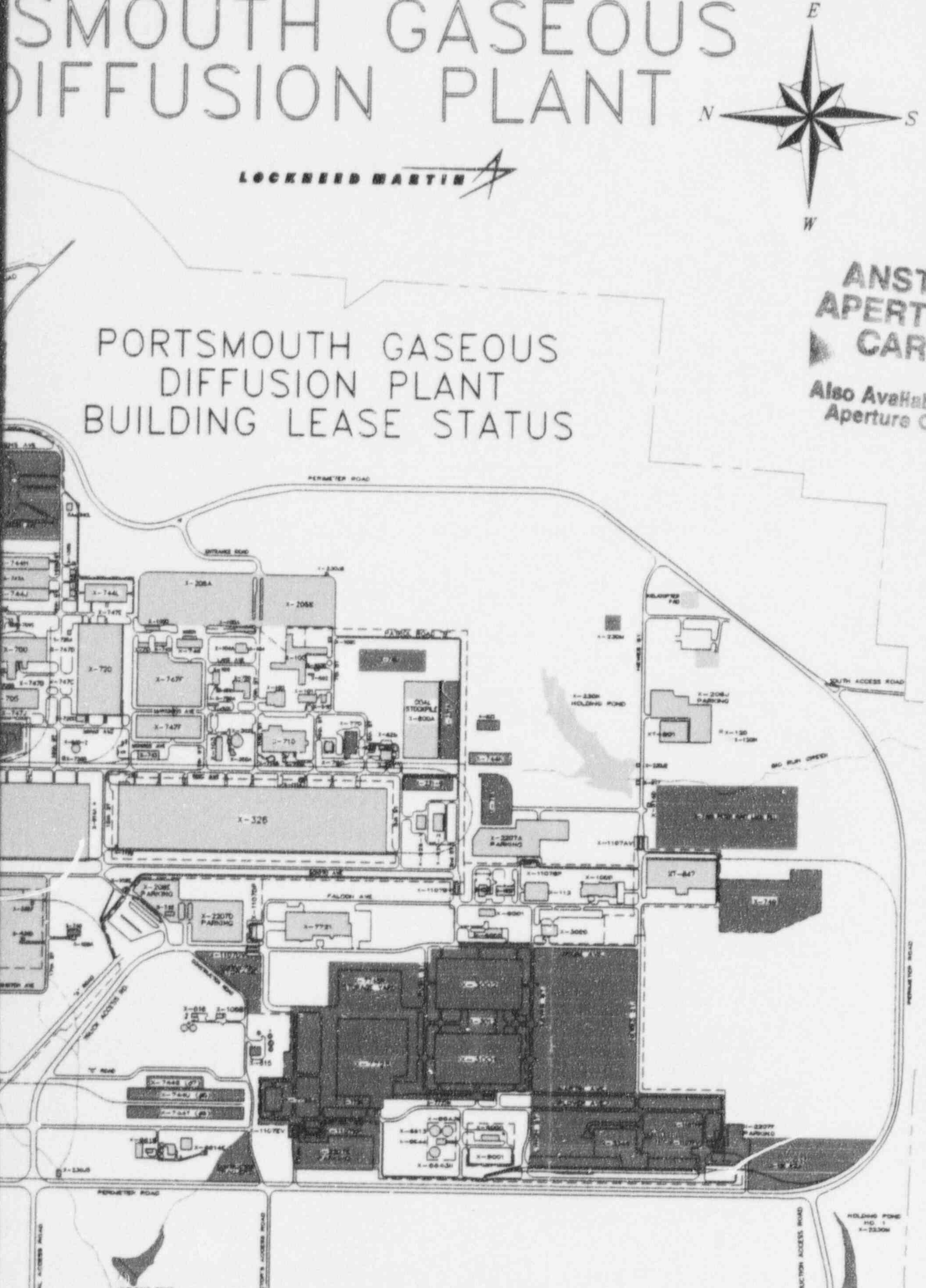
LOCKHEED MARTIN

SAR – PORTS
Rev. 8

ANSTEC APERTURE CARD

Also Available on Aperture Card

PORTSMOUTH GASEOUS DIFFUSION PLANT BUILDING LEASE STATUS



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Facility Number	Facility Description	Facility Number	Facility Description
X-100	Administration Building	X-605	Sanitary Water Control House
X-100B	Air Conditioning Equipment Building	X-605A	Sanitary Water Wells
X-100L	Environmental Control Trailer	X-605H	Booster Pump House and Appurtenances
X-101	Health Services	X-605I	Chlorinator Building
X-102	Cafeteria	X-605J	Diesel Generator Building
X-103	Aux. Office Building	X-608	Raw Water Pump House
X-104	Guard Headquarters	X-608A	Raw Water Wells (1 to 4)
X-104A	Indoor Firing Range	X-608B	Raw Water Wells (5 to 15)
X-105	Electronic Maintenance Building	X-611	Water Treatment Plant and Appurtenances
X-106	Tactical Response Building	X-611B	Sludge Lagoon
X-106B	Fire Training Building	X-611C	Filter Building
X-108A	South Portal and Shelter	X-611D	Recarbonization Instrument Building
X-108B	North Portal and Shelter	X-612	Elevated Water Tank
X-108E	Construction Portal	X-614A	Sewage Pumping Station
X-108H	Pike Avenue Portal	X-614B	Sewage Lift Station
X-109A	Personnel Monitoring Station	X-614D	South Sewage Lift Station
X-109B	Personnel Monitoring Station	X-614P	Northeast Sewage Lift Station
X-109C	Personnel Monitoring Station	X-616	Liquid Effluent Control Facility
X-111A	SNM Monitoring Portal (X-326)	X-617	South PH Control Facility
X-111B	SNM Monitoring Portal (NW X-326)	X-618	North Holding Pond Storage Building
X-112	Data Processing Building	X-621	Coal Pile Runoff Treatment Facility
X-114A	Outdoor Firing Range		

Figure 2.1-5a. Facilities leased to USEC at PORTS site (per agreement dated July 1, 1993).

Note: This list (facilities leased to USEC) excludes certain DOE Material Storage Areas (DMSAs) within selected facilities which have been retained by DOE. See supplement to Exhibit A of the Lease Agreement which distinguishes DMSAs for PGDP and PORTS and plant drawings CX-761-1115-A, CX-761-1116-A, and CX-761-1118-A.

Facility Number	Facility Description	Facility Number	Facility Description
X-120H	Meteorological Tower	X-626-1	Recirculating Water Pump House
X-200	Site Prep, Grading, Landscaping	X-626-2	Cooling Tower
X-201	Land and Land Rights	X-630-1	Recirculating Water Pump House
X-202	Roads	X-630-2A	Cooling Tower
X-204	Railroad and Railroad Overpass	X-630-2B	Cooling Tower
X-206A	Main Parking Lot (N)	X-630-3	Acid Handling Station
X-206B	Main Parking Lot (S)	X-633-1	Recirculating Water Pump House
X-206E	Construction Parking	X-633-2A	Cooling Tower
X-206H	Pike Avenue Parking Lot	X-633-2B	Cooling Tower
X-206J	South Office Parking Lot	X-633-2C	Cooling Tower
X-208	Security Fence	X-633-2D	Cooling Tower
		X-640-1	Firewater Pump House
X-210	Sidewalks	X-640-2	Elevated Water Tank
X-215A	Electrical Distribution to Process Buildings	X-700	Converter Shop and Cleaning Building
X-215B	Electrical Distribution to Other Areas	X-700A	Air Conditioning Equipment Building
X-215C	Exterior Lighting	X-701A	Lime House
X-215D	Electric Power Tunnel	X-701D	Water Deionization Building
X-220A	Instrumentation Tunnels	X-705	Decontamination Building (Note)
X-220B1	Process Instrumentation Lines	X-705D	Heating Booster Pump Building
X-220B2	Carrier Communication Systems	X-710	Technical Services Building
X-220B3	Water Supply Telemetering Lines	X-710A	Technical Services Gas Manifold Shed
X-220C	Superior American Alarm System	X-710B	Explosion Test Facility
X-220D1	General Telephone	X-720	Maintenance & Stores Building
X-220D2	Process Telephone	X-720A	Maintenance and Stores Building Gas Manifold Shed

Figure 2.1-5a. (Continued)

Note: The oxide conversion area (X-705E) will not be leased.

Facility Number	Facility Description	Facility Number	Facility Description
X-220D3	Emergency Telephone System	X-720B	Radio Base Station Building
X-220E1	Evacuation Public Address System	X-720C	Paint & Oil Storage Building
X-220E2	Process Public Address System	X-721	Radiation Instrument Calibration Facility
X-220E3	Power Public Address System	X-741	Oil Drum Storage Facility
X-220F	Plant Radio System	X-742	Gas Cylinder Storage Facility
X-220G	Pneumatic Dispatch System	X-743	Lumber Storage Shed
X-220H	MuCulloh Alarm System	X-744B	Salt Storage Building
X-220J	Radiation Alarm System	X-744H	Bulk Storage Building
X-220K	Cascade Automatic Data Processing System		
X-220L	Cascade Automatic Data Processing System	X-744J	Bulk Storage Building
X-220N	Security Alarm and Surveillance System	X-744L	Stores and Maintenance
X-220P	Maintenance Work Authorization and Control System	X-744W	Surplus and Salvage Warehouse
X-220R	Public Warning Siren System	X-745B	Toll Enrichment Process Gas Yard-UEA
X-220S	Power Operations SCADA System	X-745D	Cylinder Storage Yard
X-230	Water Supply Line		
X-230A	Sanitary and Fire Water Distribution System	X-745F	North Process Gas Stockpile Yard
X-230A-3	Ambient Air Monitoring Station A-3 (South Access Road)	X-745G	DUF6 Cylinder Storage Yard
X-230-A-6	Ambient Air Monitoring Station A-6 (at Power Pole 6 in Piketon)	X-745H	DU Storage Yard (Note)
X-230-A-8	Ambient Air Monitoring Station A-8 (at Power Pole 74 Near X-735)	X-746	Materials Receiving & Inspection Building

Figure 2.1-5a. (Continued)

Note: This area (approximately 5 acres) has been identified as a potential site for DU cylinder storage for USEC.

Facility Number	Facility Description
X-230-A-9	Ambient Air Monitoring Station A-9 (at Wakefield Mound Road)
X-230-A-10	Ambient Air Monitoring Station A-10 (at Don Marquis Substation)
X-230-A-12	Ambient Air Monitoring Station A-12 (at McCorkle Road)
X-230-A-15	Ambient Air Monitoring Station A-15 (at Loop Road)
X-230-A-23	Ambient Air Monitoring Station A-23 (at Taylor Hollow and McCorkle Road)
X-230-A-24	Ambient Air Monitoring Station 24 (at Shyville Road)
X-230-A-28	Ambient Air Monitoring Station A-28 (at Camp Creek Road)
X-230-A-29	Ambient Air Monitoring Station A-29 (at West Access Road)
X-230-A-36	Ambient Air Monitoring Station A-36 (at X-611)
X-230-A-37	Ambient Air Monitoring Station A-37 (at Mount Hope Road)
X-230-A-40	Ambient Air Monitoring Station A-40 (at X-100 Penthouse)
X-230B	Sanitary Sewers
X-230C	Storm Water Sewers
X-230D	Soften Water Distribution System
X-230E	Plant Water System (Makeup to Cooling Towers)
X-230F	Raw Water Supply Lines
X-747A	Material Storage Yard
X-747B	Material Storage Yard
X-747C	Material Storage Yard
X-747D	Material Storage Yard

Figure 2.1-5a. (Continued)

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Facility Number	Facility Description	Facility Number	Facility Description
X-230G	RCW System	X-747E	Material Storage Yard
X-230H	Fire Water Distribution System	X-747F	Miscellaneous Material Storage Yard
X-230J1	Environmental Monitoring Station	X-747J	Decontamination Storage Yard
X-230J2	South Holding Pond Effluent Monitoring Station	X-748	Truck Scale Facility
X-230J3	West Environmental Monitoring Building	X-750	Mobile Equipment Maintenance Shop
X-230J4	Environmental Air Monitoring Station	X-750A	Garage Storage Building
X-230J5	West Environmental Sampling Building	X-760	Chemical Engineering Building
X-230J6	Northeast Monitoring Facility	X-1000	Administration Building
X-230J7	East Monitoring Facility (Note)	X-1007	Fire Station
X-230J8	Environmental Storage Building	X-1020	Emergency Operations Center (EOC)
X-230J9	North Environmental Sampling Station	X-1107A	Administrative Portal
X-230K	South Holding Pond	X-1107B	Interplant Portal
X-230L	North Holding Pond	X-1107BP	Admin. Portal
X-232A	Nitrogen Distribution System	X-1107D	NE Portal
X-232B	Dry Air Distribution System		
X-232C1	Tie Line No. 1 X-342 to X-330		
X-232C2	Tie Line No. 2 X-330 to X-326	X-2200	Site Preparation, Grading and Landscaping
X-232C3	Tie Line No. 3 X-330 to X-333	X-2202	Roads (GCEP)
X-232C4	Tie Line No. 4 X-326 to X-370	X-2204	GCEP Railroads
X-232C5	Tie Line No. 5 X-343 to X-333	X-2207A	GCEP Administrative Parking Lot
X-232D	Steam and Condensate System	X-2207D	Northwest Parking Lot
X-232E	Freon Distribution Lines	X-2208	Security Fence

Figure 2.1-5a. (Continued)

Note: If a RCRA closure is required in the future, DOE will be responsible for the RCRA closure. USEC will continue to be responsible for maintenance on the NPDES aspect of the facility. Discharge responsibilities after closure depend on who discharges.

Facility Number	Facility Description	Facility Number	Facility Description
X-232F	Fluorine Distribution System	X-2210	Sidewalks
X-232G	Supports For Distribution Lines	X-2215A	Underground Electrical Distribution to Process Buildings
X-240A	RCW System (Cathodic Protection)	X-2215B	Electrical Distribution to Areas Other Than Process Buildings
X-300	Plant Control Facility	X-2215C	Exterior Light Fixtures
X-300A	Process Monitoring Building	X-2220C	Fire and Supervisory Alarm System
X-300B	Plant Control Facility Carport	X-2220D	Telephone System
X-300C	Emergency Antenna	X-2220L	Classified Computer System
X-326	Process Building (Note)	X-2220N	Security Access Control and Alarm System
X-330	Process Building	X-2230A	Sanitary Water Distribution System
X-333	Process Building	X-2230B	GCEP Sanitary Sewers
X-334	Transformer Cleaning Building	X-2230C	Storm Sewers
X-342A	Feed, Vaporization Fluorine Generation Building	X-2230F	Raw Water Supply Line
X-342B	Fluorine Storage Building	X-2230G	Recirculating Water System
		X-2230H	Fire Water Distribution System
X-343	Feed, Vaporization and Sampling Facility	X-2230J	Liquid Effluent System
X-344A	UF6 Sampling Facility		
X-344B	Maintenance Storage Building		
		X-2230T	Recirculation Heating Water System
X-501	Substation	X-2232A	Nitrogen Distribution System
X-501A	Substation	X-2232B	Dry Air Distribution System
X-502	Substation	X-2232D	Steam and Condensate System
X-515	330 KV Tie Line	X-2232G	Supports for Distribution Lines

Figure 2.1-5a (Continued)

Note: The seven areas permitted to contain RCRA Waste in X-326 (2 of which are caged) and the glove box room area adjacent to East L-caged area will not be leased.

Facility Number	Facility Description	Facility Number	Facility Description
X-530A	Switch Yard	X-3000	Electronics Maintenance Building
X-530B	Switch House	X-5000	GCEP Switch House
X-530C	Test & Repair Facility	X-5001	Substation
X-530D	Oil House	X-5001A	Valve House
X-530E	Valve House	X-5001B	Oil Pumping Station
X-530F	Valve House	X-5015	HV Electrical System
X-530G	GCEP Oil Pumping Station	X-6000	GCEP Cooling Tower Pump House
X-533	Transformer Storage Pad	X-6001	Cooling Tower
X-533A	Switch Yard	X-6001A	Valve House
X-533B	Switch House	X-6609	Raw Water Wells
X-533C	Test & Repair Facility	X-6613	Sanitary Water Storage Tank
X-533D	Oil House	X-6614E	Sewage Lift Station
X-533E	Valve House	X-6614G	Sewage Lift Station
X-533F	Valve House	X-6614H	Sewage Lift Station
X-533H	Gas Reclaiming Cart Garage	X-6614J	Sewage Lift Station
X-540	Telephone Building	X-6619	Sewage Treatment Plant
X-600	Steam Plant	X-6643	Fire Water Storage Tanks #1 & #2
X-600A	Coal Pile Yard	X-6644	Fire Water Pump House
X-600B	Steam Plant Shop	X-7721	Maintenance Stores Training Building (Training)
X-600C	Ash Wash Treatment Building		
XT-801	South Office Building		
XT-847	Construction Warehouse		

Figure 2.1-5a. (Continued)

Facility Number	Facility Description	Facility Number	Facility Description
X-120	South Weather Station	X-744S	Warehouse S - Non UEA
X-208-A	Boundary Fence	X-744T	Warehouse T - Non UEA
X-208B	SNM Security Fences X-326 and X-345	X-744U	Warehouse U - Non UEA
X-230M	Clean Site NE of XT-801	X-744Y	Waste Storage Yard
X-231A	Southeast Oil Biodegradation Plot	X-745C	West Depleted Storage Yard
X-231B	Southwest Oil Biodegradation Plot	X-745E	NW DU Storage Yard
X-235	South Ground Water Collection System	X-747G	Northeast Contaminated Storage Yard
X-237	Little Beaver Ground Water Collection System	X-747H	Northwest Surplus and Scrap Yard
X-326-A L-Cage	L-Cage and Glove Box Area	X-749	South Contaminated Materials Storage Yard
X-342-C	Waste HF Neutralization Pit	X-749A	South Classified Burial Yard
X-344C	HF Storage Building	X-751	Mobile Equipment Maintenance Shop OANG
X-344D	HF Neutralization Pit	X-752	Warehouse
X-344E	Gas Ventilation Stack	X-770	Mechanical Test
X-344F	Safety Building	X-1107-E (V&P)	Northwest Vehicle and Pedestrian Portals
X-344G	Trailer For Russian Transparency, Located North of X-344-A and West of X-745F	X-1107-F (V&P)	South Vehicle and Pedestrian Portals
X-345	SNM Storage Building	X-2207-E	Northwest Parking Lot
X-611A	Lime Sludge Lagoons (North, Middle, South)	X-2207-F	South Parking Lot
X-615	Old Sewage Treatment Plant	X-2230-M	Holding Pond #1
X-622	South Ground Water Treatment Building	X-2230-N	Holding Pond #2
X-622T	Carbon Filtration (X-705 Sump Water)	X-3001	Process Building

Figure 2.1-5b. Facilities retained by DOE at PORTS site.

Facility Number	Facility Description	Facility Number	Facility Description
X-623	North Ground Water Treatment Building	X-3002	GCEP Process Building #2
X-624	Little Beaver Ground Water Treatment Facility	X-3012	Process Support Building
X-624-1	Little Beaver Groundwater Treatment Facility	X-3346	Feed and Withdrawal Facility
X-701B	Holding Pond (Drained)	X-7725	Recycle/Assembly
X-701C	Neutralization Pit and Tank	X-7725A	Waste Accountability Facility
X-701E	Neutralization Building	X-7726	Centrifuge Training and Test Facility
X-705A	Incinerator	X-7727	Interplant Transfer Corriders
X-705B	Contaminated Burnable Storage Facility	X-7745R	Recycle/Assembly Storage
X-734	Old Sanitary Landfill	X-7745S	Area South of X-3002/X-3002 Subleased To Ohio National Guard
X-735	Sanitary Landfill	Z-SWMU-QUAD-IV	Southern end of railroad spur which is used as drum storage area
X-735A	Landfill Utility Building	Z-SWMU-QUAD-IV	Chemical and petroleum containment tanks east of X-533C
X-736	West Construction Spoils Landfill	Z-SWMU-X701	Northeast oil biodegradation plot area, which was formerly used for the disposal of X-615 sludge
X-740	Waste Oil Storage Facility	Z-SWMU-X710	Inactive "hot pit" in the area of X-710 that was once used for the storage of radioactive wastewater
X-744G	Bulk Storage Building	Z-SWMU-X734A	Inactive construction spoils disposal area
X-744K	Warehouse K	Z-SWMU-X734B	Inactive construction spoils disposal area
X-744N	Warehouse N - Non UEA	Z-SWMU-X744	Retrievable waste storage area

Figure 2.1-5b (Continued)

Facility Number	Facility Description	Facility Number	Facility Description
X-744P	Warehouse P - Non UEA	Z-SWMU-XXXX	Solid Waste Management Units, as identified on Portsmouth Environmental Information Management System Drawing, printed 2/9/93.
X-744Q	Warehouse Q - Non UEA	Contractor Laydown Area	Triangular area about 3 acres northwest of X-7721, west of X-2207D, southeast of Construction Road and west of Truck Access Road
		Peter Kiewit Area	Approximately 10.5 acres located east of XT-847--does not include leased Facility X-614D
		X-120 Area	About 5 acres located south of X-2207F, bounded on the west and south by railroad and on the east by a line drawn south from the west end of X-2207F Parking Lot to the railroad and adjacent to Perimeter Road/Railroad
		LMES Contractor Trailer Area	About 2 acres located north of X-2207E and northwest of X-7725

a) Use of facility includes area necessary for ingress, egress, and proper maintenance of facility.

b) All existing and future DOE monitoring wells, piezometers, extraction wells, and borings (temporary or permanent) used for the purposes of collecting water level measurements and/or samples for physical and/or chemical analyses are the property of DOE and shall be considered nonleased facilities. The nonleased facility associated with each monitoring well, etc., will include all land within 10 feet of the well, etc. DOE/LMES and their subcontractors shall be allowed ingress to and egress from each well, piezometer, or boring location as necessary. Activities conducted in these locations, including ingress and egress, will be managed in accordance with applicable DOE requirements.

c) All existing SWMUs/AOCs are the property of DOE. DOE/LMES and their subcontractors shall be allowed ingress to and egress from each SWMU/AOC as necessary, including those that are operating.

Figure 2.1-5b (Continued)

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Withdrawals are made at the X-326 ERP Station, the X-333 LAW Station and the Tails Withdrawal Facility located in the northeast corner of the X-330 Building where the tails stream is condensed and withdrawn from the bottom surge drums. The Tails Withdrawal Facility can also be configured as a product withdrawal station.

All the feed and withdrawal facilities are described in Section 3.2.

3.1.1.1.4 Process Buildings

This section contains general descriptions of the different facilities and systems located throughout the three process buildings. Detailed descriptions of these facilities and systems are contained elsewhere in this report.

3.1.1.1.4.1 X-333 Process Building

The X-333 Process Building is 1456 feet long, 970 feet wide, and 82 feet high. The two floors have combined floor space of approximately 65 acres. The X-333 Process Building houses the largest process equipment (X-33 size).

Process Equipment

The separative or process gas equipment and associated valves and piping are located on the second, or cell floor. Figure 3.1.1.1-7 shows a typical 33 or 000 cell, in which axial-flow compressors are driven by electric motors that have been rewound to a rated capacity of 3300 or 2850 hp. For cascade optimization, the higher horsepower motors are in the middle units on the east end of the building and the lower horsepower motors are in the end units at the west end of the building.

Hydraulically operated butterfly-type control valves, located in the depleted or B-stream piping to each compressor, are used to control the interstage pressures. Cell pressures can either be maintained at a constant level over a group of cells or tapered by means of the control valves to achieve the desired operating levels.

Process gas, heated during the compression operation, is cooled by means of stage coolers that are located in each converter. Because R-114 (1,2 - dichloro 1,1,2,2 - tetrafluoroethane) is chemically stable and compatible with UF_6, it (or a similar coolant) is used as the cooling medium in the intermediate heat-transfer system. The waste heat is transferred from the coolant to a recirculating water system by means of condensers. Coolant systems are described in Section 3.1.1.2.5.

To prevent condensation or deposition of solid UF_6, cell housings and bypass housings are provided to enclose all process equipment, piping, and instrument lines that contain any process gas. Although these enclosures are not leak-tight, they will contain a large portion of any process gas outleakage that might occur inside the housing. They also aid in maintaining a suitable temperature for operational and maintenance work outside the housing.

Process gas bypass and service lines are enclosed in the cell and unit bypass housings. (See Figures 3.1.1.1-8 and 3.1.1.1-9.) Cell bypass housings, located on the cell floor, extend north to south through the X-333 Building while the unit-bypass housing extends from east to west through the center of the building. Most of the lines in these housings service all units by either direct connections or through special valving crossovers. These lines include A-stream (enriched) and B-stream (depleted), evacuation and evacuation return, and process gas feed lines. In some cases, more than one line is provided for flexibility.

Cell bypass housings extend from the unit bypass housings through the center of each unit. The piping in these housings basically includes A-lines and B-lines, an evacuation line to each cell, an evacuation return line to alternate cells, one or more feed lines, product withdrawal and vent return lines in some units, and process gas return line. Tie lines extend in a direct tie between the X-330 and X-333 Buildings in a heated housing elevated above the ground and connected into the X-330 lines near X-31-2. Block valves are provided on the unit lines to isolate the lines extending into the units and on the building lines at each unit to separate units (split the cascade). Most of the small-line block valves are manually operated; all others are motor operated. All building block valves are motor operated.

Nitrogen or dry-air buffer systems are used at appropriate places in the process gas system to prevent process gas outleakage or wet-air inleakage. Pressures in the buffer systems are kept higher than the process gas pressure to assure that leakage will be inward; provisions are made to purge the process gas (PG) from the process gas system with nitrogen or dry air. An Evacuation Booster Station (EBS), located on the cell floor approximately in the center of the building, is used in the preparation of cells and piping for maintenance. Three two-speed, AC-92K compressors, driven by 950/135-hp motors, are used to pump process gas (low-speed operation) and purge gases (high-speed operation) from the cells to the surge drum and cold recovery facility on the ground, or operating floor. The station is designed to operate with a single compressor, with any two compressors in series, or with all three compressors in series. This is described in detail in Section 3.1.1.4.

A low-assay product withdrawal facility is located in the west end of the X-333 Building. The facility is described in Section 3.2.

Two booster stations (A-booster and B-booster) are located in the X-333 Building. They are used to maintain the flow continuity between the terminal stages in this building and the initial stages in the X-330 Building. Each station is equipped with the necessary cooling systems, control valves, and instrumentation. Each station has two loops, one of which is normally in standby. The A-stream booster is used to boost the enriched stream (A-stream) from the top operating stage in X-333 Building to the first stage in the X-31 cell above the X-33 equipment. (It can be tied into Cell 1 of Unit X-31-2,3, or 4, depending on where the X-31 equipment is inserted in the cascade flow based on cascade optimization requirements).

The B-booster station, located near Cell 1 of Unit X-33-1, employs AC-92 centrifugal compressors. This station is used to boost the depleted stream (B-stream) to overcome the pressure differences between the bottom stage of the X-333 Building and the top stage of the X-31 unit just below the X-33 flow. Booster Stations are described in Section 3.1.1.4.3.

pumps; the rest of the pumps are on standby. Each vacuum pump has its own alumina trap to absorb traces of UF_6 that might get into the system in some types of seal failures. (See Section 3.1.1.6.1.)

A coolant drain, recovery, and transfer station, to serve the cell cooling systems, is located on the ground floor just south of the area control room. The system includes two 11,000-gallon drain and storage tanks, two coolant transfer pumps, two water-cooled vapor compressors, one condenser cooled by sanitary water, an exhaust pump, and associated piping. Coolant can be unloaded from rail tank cars and can be transferred to or received from the X-330 and X-326 coolant stations. The coolant station pit has a forced-air ventilation system that exhausts to the roof for safety. Instrumentation is provided to indicate pump efficiency. (See Section 3.1.1.6.7.)

Four backup diesel generators are provided to supply power for isolation of cascade equipment and necessary monitoring capabilities during power failures. They provide backup power to selected valves, lights, and such other special auxiliary equipment as seal-exhaust pumps, datum pumps, and rectifiers. The backup generators function automatically in case of failure of the auxiliary power system (either complete or partial plant failure). Each diesel generator has its own distribution system for supplying power to special equipment in two units; however, provisions have been made to cross to another system in case of diesel generator failure. The diesel generators are described in more detail in Section 3.4.1.

Also located within the building are air compressors that are part of the plant air system. They are described in the Section 3.4.4.

A large ventilation system provides the building with effective protection of equipment and with suitable ambient conditions for working personnel. Process heat from the cell floor is used to heat the operating floor during cold weather. Similar ventilation systems are used in all process buildings. These systems are described in Section 3.1.1.7.2.

A truck alley and a railroad spur track extend along the east and west sides of the X-333 Building for delivery and pickup of process equipment.

The cell floor extends over the truck alley and has hatches located under each crane bay. Heavy process equipment and motors are lifted to the cell floor for installation or storage of spares.

3.1.1.1.4.2 X-330 Process Building

The X-330 Process Building is 2176 ft long, 640 ft wide, and 66 ft high. Its two floors have a combined floor space of approximately 55 acres. It houses 6 units of X-29 size equipment (600 stages), and 5 units of X-31 size equipment (500 stages). (Refer to Figure 3.1.1.1-3.)

Process Equipment

Units X-29-1, X-31-1, and X-31-2 are in the stripping section of the cascade and are below the X-33 units in the cascade flow arrangement. Cell 10 of X-29-1 (the bottom of the cascade can

be changed to any cell between Cell 1 of X-31-1 and Cell 10 of X-29-1 as cascade economics dictate) is the bottom cell in the cascade, and the depleted B-stream from this cell becomes the "tails." This material is withdrawn at the Tails Withdrawal Facility, which is located in the northeast corner of the building.

Unit X-31-3 is the first unit above the X-33 equipment. Unit X-29-6 is the top unit but it is not onstream so the flow A-stream is sent to X-27-1 from the top cell in X-29-5, and the B-stream flow is therefore from X-27-1 to the top of X-29-5.

Physically the X-29 and X-31 compressors are about the same size; however, the converters and barrier area is less for the X-29 equipment. The internal components of the compressor differ to some degree because of the required characteristics and the differences in interstage flow. Figure 3.1.1.1-11 shows a typical cell arrangement. The X-31 motors are rated from 700 hp to 1700 hp, and the X-29 motors range from 700 hp in X-29-2 down to 400 hp in X-29-5 and X-29-6. Motor size is determined by equipment location in the cascade configuration.

Process gas bypass and service lines are enclosed in the cell and unit-bypass housings.

The interbuilding tie lines; A-lines and B-lines; evacuation lines; evacuation return lines; and the smaller service lines, such as feed, process gas return, product withdrawal, and vent return lines, are surrounded by heated housings. Motor operated block valves in each process building are controlled from the area control room and local control centers.

Unit and building auxiliaries in the X-330 Building are similar in design to those in the X-333 Building, but are the appropriate size for the X-330 equipment requirements. Discussions of these will be limited to differences from equipment in the X-333 Building.

There are two booster stations on the cell floor. The A-booster to X-333 is on the east side of the building in front of X-31-2, (Figure 3.1.1.1-3). Its function is to overcome the differences in the pressures between the top cell of X-31-2, (normally Cell 2) and the bottom cell of X-33-1 (normally Cell 1). An operating loop and a standby loop, each with an X-31 modified axial-flow compressor and associated cooling system (cooler and condenser) and with other services, are enclosed in a heated housing. Valving is provided so that the booster can pump from X-31-1, -2, and -3 to the X-333 Building. More detailed information on the booster stations is available in Section 3.1.1.4.3.

A second booster station, located in the southeast corner of the X-330 Building in front of Cell X-29-6-2, is used to boost the A stream to the X-326 Building. This station is unique in that it utilizes a modified X-29 axial-flow compressor as the first stage (two loops are provided) pumping into an AC-92 centrifugal compressor, the second stage (two loops are provided). A portion of the station discharge (flow to the X-326 Building) is recycled to the B-line from the X-326 Building because the interstage flow rates of these buildings are not equal.

The Evacuation Booster Station (EBS), which is similar to the one in the X-333 Building, is located on the east side of the building in front of X-31-5-2. As with the X-333 station, this facility can pump material from or return it to any cell in the X-330 Building by means of the evacuation and

Process Equipment

The primary differences between the X-326 process system and the systems in the X-330 and X-333 Buildings are as follows:

a. The stage compressors are centrifugal rather than axial-flow.

b. Stage control valves are used only at every third stage. This arrangement, called the "badger cluster," has two A-stream stages and one A and B (A-B) stream stage in each group of three. (Refer to Section 3.1.1.2.7.1.)

c. The gas cooler is outside the converter.

d. The A-compressors are at the A-outlet of the converter, and only compress the A-stream.

e. The A-B compressor is used at every third stage to compress both the A and B streams.

Because of the equipment sizes and economics involved, a twelve-stage, in-line, cell configuration is used (Figure 3.1.1.1-13). The same considerations were given to the unit arrangement in which 20 cells are used to establish the capacities for the unit auxiliaries. The same basic auxiliary-service designs are used in X-326 as are used in the other buildings, including such items as the building ventilation system.

There are two basic equipment sizes for interstage flows. The X-27-size converters have more barrier surface area than the X-25-size converters, and the compressor sizes and characteristics differ. Because of the badger cluster arrangement, two different compressor designs for each equipment size are required: two stages in each cluster are needed for the A-stream compression while one stage in the cluster requires a two stage A-stream and B-stream compression. The larger compressors are designated 7A and 7B, and the smaller compressors are either 8A or 9A and 8B or 9B. Even though the 8A and 8B compressors were manufactured by Fairchild Engineering Division and the 9A and 9B compressors were made by Allis-Chalmers Corporation, they are interchangeable.

There are a total of 720 stages (60 cells or 3 units) of X-27-size equipment and 1620 stages (140 cells in 7 units) of X-25-size equipment. Currently, parts of two of the X-27 units and unit X-25-7 are in service. Unit X-25-7 consists of 10 isotopic cells (120 stages) and 10 purge cells (60 stages), which provide two separate purge cascades, designated Side Purge and Top Purge (See Section 3.1.2.). All cells in Units 25-1, 2, 3, 4, 5, 6, 27-3 and part of the cells in Units 27-1, 2 are shutdown and buffered with dry air to slightly above atmospheric pressure to prevent wet air inleakage and thereby enhance moderation control of the shutdown cells.

The A-stream from the top onstream stage in X-27-1 is routed to the Side Purge, where approximately 90% of light contaminants which have entered the cascade in the cells below this point are separated from the UF_6 and purged to the atmosphere. Approximately 10% of the lights spill over and are routed back to the bottom stage of X-27-2. These lights continue up the cascade, combining with the

lights inleakage in unit X-25-7, and are purged in the Top Purge Cascade. The B-stream from X-27-2 to the top of X-27-1. The Side Purge can be supplied from any unit in the X-326 cascade, as economics dictate.

As with the other process buildings, the X-326 separation equipment is located on the cell floor. The cell enclosures are made up of panels with removable covers that allow access to equipment for maintenance. Unit and bypass housings are insulated and electrically heated.

The compressors for the Extended Range Product Station (ERP) are located at the northeast corner of the cell floor. This facility is described in Section 3.2.

Control Facilities

There are three area control rooms in the X-326 Building. Two of the three are in operation. Area Control Room 4 is located between units X-27-2 and X-27-3 on the operating floor. Basically, the same cell monitoring and control instruments and auxiliary system instrumentation are provided for Units X-27-1, X-27-2, X-27-3, and X-25-1 as for units in the other process buildings. Two line recorders are provided for each unit (1 for each 10 cells). Special panels for monitoring the extended range product station, building evacuation valve position indicators for the valves in Area 4, and the two diesel-operated backup generator control panels are located in the area control room. Annunciators and alarms are provided for systems associated with the area equipment. Units X-27-1, 2, and 3 are the only units in X-326 that have motor exhaust ducts. Area Control Room 5 is shutdown due to HEU suspension. It is located between X-25-3 and X-25-4; it has the cell and auxiliary panels and the line recorders for unused units X-25-2, X-25-3, X-25-4, and X-25-5. Controls that were in ACR 5 that are needed for plant operation have been relocated to ACR 4 or ACR 6 including buffer monitoring instrumentation for the shutdown cells.

Area Control Room 6 is in the south end of the building between Units X-25-6 and X-25-7; it has panels for the isotopic cells in Unit X-25-6 and the north side Unit of X-25-7, the purge cells in the south side of Unit X-25-7, the auxiliary panels for both units, line recorders for Units X-25-6 and X-25-7, and a slave recorder from the X-27-1B (even cells) recorder that monitors light contaminants' upflow to the side purge. Special instrumentation includes the following:

- Instrumentation for controlling and monitoring the Side and Top Purge Cascades (See Section 3.1.2).
- Space recorders to monitor the purge gases from the Side and Top Purge Cascades (See Section 3.1.2).
- Operating controls and monitoring instrumentation for the product withdrawal booster station (abandoned) (See Section 3.2).
- Instrumentation and alarms for the coolant degrader (See Section 3.1.5).
- Control panels for the two diesel-operated generators that supply emergency power to Area 6 and emergency power loads in the X-300 Building. (See Section 3.4.1).

The two stage impeller is mounted on a common shaft and gas flow is routed by the use of vanes and dividers inside the compressor. The shaft is supported by a load bearing on the drive end and a combination load-and-thrust bearing on the outboard end. The shaft is equipped with seals to prevent inleakage of atmospheric air into the process system. The shaft is also equipped with blowout preventers to allow the seal to be isolated from the process system for seal maintenance. Seals and blowout preventers will be described in the Section 3.1.1.2.3.2, "Axial Flow Compressors." See Table 3.1.1.2-2 for locations and dimensions of compressors.

The compressor is driven by an electric motor. The size of the motor is determined by whether the compressor is a type A or type B compressor, whether it is a size 7, size 8, or size 9 compressor, and where the stage is located in the cascade.

The materials of construction used for the major components of the compressors are as follows:

Part	Size 7	Sizes 8 & 9
Casing & Nozzles	Steel, nickel-plated	Steel, nickel-plated
Shaft	Steel, nickel-plated	Steel, nickel-plated
Impellers	Aluminum casting	Aluminum casting
Diffusers	Aluminum casting with aluminum vanes	Steel, nickel-plated
Bolts, Nuts, Washers	Monel and nickel plated steel	Monel and nickel-plated steel

The lube oil requirements for centrifugal compressors are as follows:

	Size 7 (gpm)	Size 8 (gpm)	Size 9 (gpm)
Load Bearing	0.7	0.7	0.7
Load and Thrust Bearing	3.5	2.7	1.5
TOTAL	4.2	3.4	2.2

The 7A compressors in the X-27 size equipment have been in operation since late 1955. Since then these compressors have performed quite well, with one exception. In the late 1950's, the compressors were found to be leaking around the flange area. Since that time when an original 7A compressor goes to shops to be rebuilt, the diffuser is machined and the flanges are replated in order to provide a better seal between the flanges and the two aluminum 0-ring gaskets. Portsmouth GDP rebuilt part of the 7A compressors with leaking flanges.

3.1.1.2.3.2 Axial Flow Compressors

Figures 3.1.1.2-7, 3.1.1.2-8, and 3.1.1.2-9, are examples of typical Axial-flow compressors used to move large volumes of gas in the cascade. These machines are larger than the centrifugal compressors and are designated as "0", "00" or "000" size. The "0" and "00" compressors are used in the X-330 Building and are approximately 150 inches long with main body diameter of 52 inches. The "000" compressor is used in the X-333 Building and is approximately 212 inches long and has a main body diameter of 76 inches.

In the axial-flow compressor, compression occurs as the gas passes through a series of fan-like blades set in the periphery of a rotating barrel or rotor. The shell surrounding the rotor also contains rows of stationary blades called the stator. Each set of blades (rotor-stators) constitutes a compression stage and many stages can be combined efficiently to achieve high pressure ratios and high gas flow rates. Gas flow is generally at a constant distance from the axis of rotation, thus the name axial flow compressor.

Portsmouth GDP completed an uprating program in 1983 which included many revisions to the axial-flow compressor in order to improve the efficiency of this machine. High efficiency is very important because of the large power consumption in "0", "00" and "000" gaseous diffusion stages. Table 3.1.1.2-3 lists the types and number of axial compressors used in stages of the PORTS Cascade. The major parts of an axial flow compressor are discussed in the following sections.

Rotor

The rotor of a "00" compressor is aluminum while the "000" has a steel rotor which is nickel-plated. Each rotor drum is of uniform diameter and has conical sockets to accept blades. The blades are arranged in two groups; the A-barrel which compresses the low pressure A-stream and the remaining blades which compress a mixture of the A- and B-stream and is called the B-barrel. The number of blade rows varies with the machine design.

Stator

The stator is a contoured aluminum casting which is made in mated halves to be bolted together around the completed rotor. Conical sockets are provided to accept the stator blades in rows alternating with the blades on the rotor.

Blades

The blades are die-cast aluminum alloy with airfoil sections designed for optimum performance for their location in the stator or rotor.

Blades in both rotor and stator vary in length according to row, with the longest blades at the A-suction, and tapering to the discharge end. Blades are installed slightly oversize and are machined or tipped to insure a very close clearance between the rotating and stationary parts after assembly.

Quality control measures are exercised to assure the quality of blades and their installation because the loss of a single blade will cause a complete deblading of the machine. Blades are checked for cracks and for tip clearance when installed.

Failure History

Compressor failures are expected. Axial compressor failure can generally be attributed to deblade caused by foreign objects entering the compressor, surging or blade fatigue. Centrifugal compressor failure is usually caused by impeller rub or overheating. Table 3.1.1.2-3 shows failure rates from 1972 through 1994.

Casings

The compressor casing is made of steel and nickel plated internally with one or more bolted flanges for ease of assembly. The casing supports the machine and provides a gas-tight seal for the rotor-stator assembly. The casing flanges have two aluminum 0-rings to provide a good sealing surface. The area between the 0-rings is buffered with dry air. (See Figure 3.1.1.2-7.)

Nozzles

At each end of the rotor, the gas streams must be turned at an angle to the machine rotor axis. The gas flow is guided by nozzles which provide a smooth transition to allow for a minimum loss of pressure.

The three nozzles, two suction and one discharge, are welded to the compressor casing. The materials of construction are cast or welded steel, nickel-plated internally.

Lubrication

Lubrication to the compressors is supplied by a continuous recirculating oil system which is described in detail in Section 3.1.1.6.3.

The nominal lube oil requirements for the axial compressors are as follows:

	X-33 Size (gpm)	X-29 & X-31 Size (gpm)
Radial load bearings on motor end	1.5	0.7
Radial load bearing on compressor	1.5	0.7
Thrust bearing	8.0	3.0
Total per compressor	11.0	4.4

Compressor Shaft Seals

The seals, which are necessary in the gaseous diffusion cascade, are special seals designed to avoid loss of uranium hexafluoride and to minimize inleakage of other gases to the cascade.

Each isotopic and purge cascade compressor requires two of these seal assemblies, the A-seal at the low pressure A-suction end and the B-seal at the higher pressure discharge end. The pressure conditions for seal operation are therefore different even for the seals on a single machine. Single-stage centrifugal compressors, such as the AC-92K and AC-38's, require only one seal per machine.

Each seal system requires feed lines of nitrogen and dry air and a seal exhaust line. The seal exhaust pressure is set above process pressure and the seal feed pressure above the seal exhaust pressure. The seals are designed so that, in the event of seal failure, N_2 and dry air are pulled into the process system rather than process gas leaking out. See Section 3.1.1.2.7.3 for a detailed description of Seal Feed and Seal Exhaust Systems instrumentation and control.

Blowout Preventer (BOP)

Each isotopic centrifugal compressor has an "A" and "B" BOP actuator. This device is to temporarily provide a seal between the process gas and the shaft seal to permit a seal to be changed on a compressor. Figure 3.1.1.2-10 shows a BOP in the actuated position. For 000 size compressors, this lever-actuated mechanism also lifts the compressor shaft approximately 0.012 inches to provide easy removal of the compressor bearings and seals. All uprated "B" BOP actuators are capped and buffered to prevent outleakage of process gas. The BOP illustrated does not permit this cap to be shown. It is installed by removing the actuating nut yoke or retainer. The cap is then screwed on the actuator assembly with the cap shoulders resting on a Teflon gasket against the compressor backplate.

3.1.1.2.4 Motors

The process motors are standard industrial equipment. A typical motor is shown in Figure 3.1.1.2-11.

There are over 4080 (process) air-cooled, squirrel cage induction motors, varying in size from 15 hp to 3300 hp and in speeds from 1200 rpm to 3600 rpm, installed in the process buildings for purpose of driving axial-flow and centrifugal compressors. However, only 2760 are in use since HEU suspension.

The bearings for these motors are sleeve-type journal bearings, mounted in the end bell housings. Oil dip rings which ride on top of the shaft and dip into a reservoir under the bearings are used to transfer oil to the bearing assembly. All motors are supplied with lubricating oil by means of recirculating gravity feed system which also cools and filters the oil.

To provide additional air cooling for the compressor motors, a system of air supply and exhaust fans create considerable air movement in the vicinity of each motor. In the X-33, X-31, X-29 and X-27

3.1.1.6.8.6 Hazardous Materials

Chlorine Trifluoride (ClF_3)

There may be as much as 1,550 pounds of ClF_3 stored in these areas at a given time. Of that amount, 360 pounds would be contained in the storage drum in gaseous form at 12.0 psia. The remaining amount is in liquid form and in cylinders chained in storage racks, which are attached to a concrete block wall.

Fluorine (F_2)

The plant F_2 header is piped into both storage areas. The X-333 utilizes a 2-inch header, while X-330 has a 1-inch header tied directly into the ClF_3 storage systems piping. A block valve (normally open) just off the plant distribution header is provided for complete isolation of the F_2 supply to the ClF_3 storage area. Two other valves (normally closed) are installed on this same F_2 supply line inside the storage drum room in order to provide double block-valve protection within the storage drum room.

Nitrogen (N_2)

Although not toxic, N_2 can displace oxygen inside an enclosure, producing an industrial hazardous condition.

There are two sources of N_2 within the ClF_3 storage systems. One is from the plant distribution header (at 10 psig) and the other is from cylinders containing as much as 2,400 psig of N_2 when full. As many as five full cylinders of N_2 may be located in this area at a given time. The cylinders are moved on the same cart used to move ClF_3 cylinders between the storage rack and the loading manifold. The cylinder valve protector cap is never removed until the cylinder has been secured in position.

Full and empty cylinders of N_2 are chained in storage racks that are bolted to the concrete-block wall of the structure. Full and empty cylinders are identified as such with tags.

3.1.1.6.8.7 Primary Confinement Systems

Storage Drum and Piping

ClF_3 and F_2 are contained within the storage drum and piping inside a room where the temperature is maintained between 80°F to 100°F to ensure that the ClF_3 remains in a gaseous state at normal storage drum operating pressure. The normal storage drum operating pressure is 12 psia, so that any leak would result in ambient air being pulled into the system. Annually, the systems are visually inspected externally by Code Inspection for defects. Where minor defects are found to exist, they may be X-rayed or checked with an ultrasonic thickness gauge. Every ten years the storage drums are opened for internal inspection. Ultrasonic thickness testing is performed every three years. The storage drum welds have been completely X-rayed for defects and corrosion.

<u>ClF_3 Cylinders</u>

The ClF_3 cylinders are vendor owned. When these cylinders are received on the plantsite, they are inspected three times before being fed into the storage system. This inspection includes inspection of the cylinder condition, hydrostatic test dates, and proper identification. Verification is made that hydrostatic testing of the cylinders has been conducted by the cylinder vendor within the past five years.

The contents of a defective cylinder are disposed of by Chemical Operations under the direction of Environmental Compliance and Industrial Safety personnel.

<u>Nitrogen Cylinders</u>

The N_2 cylinders are PORTS-owned and must be sent off plantsite for a hydrostatic test (at 2500 psig) every five years. Utilities Operations is responsible for filling these cylinders with N_2. Before filling, the cylinders must be properly identified, have unexpired hydro-test dates, and be free of visible defects before they may be filled with 184 scf of N_2 at 1800 psig.

3.1.1.6.8.8 <u>Secondary Confinement System</u>

Because ambient air pressure is greater in the storage drum rooms than the air pressure on the process buildings operating floors, the storage drum rooms are well sealed to prevent any release from entering the operating floors. Should a small amount of hazardous gas escape into the process buildings, the filter rooms (air intakes) on both sides of the conditioning gas storage area would disperse the gases quickly. The entrance doors are tightly closed at all times and cracks sealed to prevent air exchange. Both entrance doors have the same alarm system as described before and also controls for the storage areas ventilation fan. Because of these design characteristics, each storage drum room is considered a secondary confinement system.

3.1.1.6.8.9 <u>Heating</u>

The X-330 ClF_3 Storage Drum Room utilizes four electric, forced-air heaters with two thermostatic controls. One control serves as a backup. During winter operation, it is essential that the storage drum rooms have heat to prevent liquefaction of ClF_3 in the storage drum.

The X-333 storage drum room uses a steam heating system. The steam coils are mounted in an enclosure on the outside of the storage drum room wall. A fan pulls the air from the room across the steam coils and discharges it back into the room.

3.1.1.6.8.10 <u>Ventilation</u>

Each storage facility has an exhaust duct extending from the roof of the storage drum room through the roof of the process building (80 ft). Each exhaust system utilizes an 8300-cfm fan. Controls for the fan are located immediately outside the storage room entrance door. When the fan is turned on, the controls also open a 4 ft. x 4 ft. air-operated damper at the opposite end of the room (see Figure

5. High-low lube oil level in the drain tank,
6. High lube oil pressure,
7. Low hydraulic pressure,
8. Sump pump alarms and controls,
9. Mimic of the unit auxiliary power supply with indicators showing the position of the transformer secondary breakers and tie breaker.

Utilities Panel

There are dial indicators and alarms on each plant utility system. Each ACR is equipped with such a panel. Both audible and visual alarms are actuated on low pressure. They are as follows (Figure 3.1.1.10-2):

1. RCW header pressure,
2. Plant air pressure,
3. Plant nitrogen pressure,
4. Sanitary water pressure,
5. Fluorine distribution pressure,
6. Ventilation system floor differential pressure,
7. Ventilation system air supply pressure,
8. Pressure recorder with both seal exhaust and area datum pressure.
   Alarms are actuated on high pressure isolation (Area 1 and Area 3 only).

Line Recorder Panels

Line recorders are used to monitor N_2, 0_2, and R-114 on the cascade. There is one line recorder for each unit in X-330 and X-333, and there are two line recorders per unit in the X-326 (except for Unit 25-7 which has only one). They all have switching arrangements which permit them to monitor all the cells in their respective units, as well as the cells in adjacent units. Periodically, due to wet air inleakage, the instrument lines plug. This disables the ability to monitor the specific cell. The instrument line may be capped if the cell above it has the ability to detect inleakage. In this case, the instrument line is repaired or replaced at the next scheduled cell outage. This feature allows monitoring to be continued during line recorder maintenance. The PCF has a slave recorder for each unit in the cascade.

Tails Assay Monitor (ACR-2) Panel

In ACR 2, a slave recorder from the tails assay spectrometer is located on the ACR operator's desk. A printout of the tails assay is provided at 3-minute intervals. In case of spectrometer failure, U-tube samples are pulled every two hours and analyzed by the Mass Spectrometer Section in the X-710 Building.

Top and Side Purge Monitors (ACR-6)

ACR 6 contains the monitors and controls for both top and side purge operations. They are described in detail in Section 3.1.2.

3.1.1.10.1.1 Valve Status Control

A number of cascade auxiliary valves that do not have electrical position indicators are controlled administratively by means of valve control tags and pin charts. This system is used to show valve status and minimize the possibility of misvalving on the crossover manifold or feed headers. Double checks help prevent costly inventory mixing losses and reduce the nuclear hazard potential associated with uranium material entering equipment of unsafe geometry, (see Figure 3.1.1.10-3).

Each ACR, except ACR-5 and the PCF, maintains a control board which show the system valves with the identification number and position of the valves. Each manually operated valve has two identifying status tags for the handwheel. The number on the tags identifies the unit, cell, and header, whether it is a crossover or block valve, and the system to which it connects. Valves are opened/closed using a written "valving order" (a valve procedure that must be followed in the order written). One tag is then removed from the valve and placed on the valving pin chart. The valving order and tag(s) are presented to the ACR operator who again checks the order for errors, places the tag(s) on the control board, and changes the pins on the pin chart to indicate their correct position.

It is the responsibility of each first line manager to maintain coordination between the area and the PCF. It is the responsibility of the Cascade Controller to coordinate valving between buildings. Operating procedures outline the use of the tags and valve control boards.

3.1.1.10.1.2 Communications

The ACR operator has three methods of communication: radio, telephone, and a paging system. Two radio channels are available to contact Operations, Maintenance and Security. There are three telephone systems: a conventional telephone, a PAX telephone, and a Red phone system. The PAX system is used to talk to the operators on the operating or cell floors and to persons at other plantsite locations.

A dual paging system is used to communicate to all floors. One system, building air horns, sends out coded blasts to communicate with operators, sound a recall or personnel accountabiity. A Klaxon horn system is used for emergency evacuation in case of a radiation hazard.

3.1.1.10.2 Plant Control Facility (PCF)

The Plant Control Facility (X-300) is a dome-shaped, circular building approximately 110 feet in diameter located east of the X-326 Process Building. The exterior walls, roof, floor slabs, stairs, tunnels, vault, and other structural members are constructed of reinforced concrete.

Supervisory control equipment, offices, and auxiliary rooms are located on the ground floor, and the building power equipment, communication equipment, and air-conditioning and ventilating equipment are located in the basement. Control and instrumentation tunnels extend from the basement of the PCF to each of the process buildings. Communication, control and instrumentation cables from each of the six ACRs, the switch-houses and the telephone building enter the PCF through these tunnels.

the surge drum room can withstand much higher pressures than those to which it will be subjected in service.

3.1.4.3.7 Refrigeration System

The refrigeration units consist of a Mycom F42B two-stage compressor, a 75-hp direct-drive motor, a special control panel, and required auxiliary equipment that is mounted on a common platform. The unit is designed for fully automatic operation with the following safety trips designed for equipment protection:

a. Compressor motor overload.
b. Both "low" and "high" pressure cutouts.
c. Low lube oil pressure.
d. High temperature discharge.

Figure 3.1.4-17 shows a typical refrigeration unit. Each cold recovery area is equipped with two units, one in operation and one on standby. Each has the capacity to operate six cold traps. A low temperature refrigerant (R-12) is used in these system. Each unit requires a charge of approximately 300 pounds.

3.1.4.3.8 ClF_3 Storage Pig

The ClF_3 storage "pig" is located on the outside wall of the X-330 Cold Recovery Area. It contains approximately 60 scf of ClF_3 at all times (See Figure 3.1.4-18). Section 3.1.4.6.3 describes the use for space recorders.

The drum is constructed of heavy-gauge, 3/8-inch steel with a bolt-on inspection plate having an aluminum gasket. Two drum-type valves are used for inlet and outlet block valves and the ClF_3 is transferred in and out through 1/4-inch copper lines with silver-soldered joints. Ambient temperatures could range from 45°F (winter) to 100°F (summer). The area is well ventilated. Code Inspection performs an external visual inspection once per year on the ClF_3 Pig. Code Inspection performs an internal inspection on this storage drum every ten years and also runs an ultrasonic thickness test every three years. The drum has been pressure tested at 30 inches vacuum and 150 psig.

A guard rail is provided for protection from small moving vehicles (e.g. bicycles and electric carts); however, no protection is provided from forklifts.

3.1.4.3.9 Air Ejectors and Vent Stacks

In the X-330 Cold Recovery, two 3-inch air ejectors are used to eject vent gases through a common 5-inch vent header that extends 15 feet above the process building roof. Two venting operations can take place simultaneously, provided one is a wet air evacuation and one is from a cold trapping operation. Jet air is supplied from the 100-psig plant air header. Failure of the air due to misvalving to the ejectors would be of no consequence to a cold trapping operation. A pressure increase would result in closing of two automatic control valves located ahead of the jet and ahead of the cold trap.

The X-333 Building is supplied with two air ejectors: a 3-inch air ejector for venting reaction products through a 3-inch vent header extending above the process building, and a 6-inch air ejector primarily for wet-air evacuations discharging into a 4-inch vent header extending 15 feet above the process building. Again, motivating air is supplied from the plant dry-air header. The 4-inch air ejector's motivating air has a 1 1/2-inch solenoid valve controlled remotely from the ACR. The manual valves associated with the air ejector with alumina traps have no electrical indicating lights or interlock system to prevent the solenoid valve from operating should the jet discharge valve be closed. This is a recognized hazard and is covered by strict administrative controls.

Air failure and misvalving to these air ejectors would be the same as described for the X-330 Building.

3.1.4.4 Building Construction and Confinement Systems

The X-330 and X-333 Cold Recovery Areas are constructed on the ground floor of the process buildings, both utilizing the same materials of construction.

The floors are 8-inch reinforced concrete and are painted in the refrigeration room, cold trap room and chemical trap room to provide for easy decontamination. The walls and partitions are constructed of 8-inch by 16-inch concrete block. The walls in the cold trap room are plastered and painted. The roofs are constructed with a heavy ribbed steel metal and 2-1/2 inch fiberglass insulation inside sheet metal sheathing and covered with 3 inches of lightweight concrete.

Dimensions and layout of the cold recovery areas are shown in Figures 3.1.4-8 and 3.1.4-9.

The toxic materials are confined within the surge drums, holding drums and associated piping. The weakest points in the system are the monel expansion joints installed in the piping connecting the surge drums. The piping associated with the cold traps has no expansion joints and the entire system is constructed to withstand much higher pressures than it will experience. The entire process takes place at subatmospheric pressure so that any leak would result in ambient air leaking into the system.

Secondary confinement is provided by the building and pipe housings. The surge drum room and holding drum rooms are closed off at all times and provide good secondary containment. The trap room area can be closed off and the ventilation system shut down from outside the area. Only E and F cold traps, in X-330 cold recovery, are open so that no secondary confinement is afforded.

3.1.4.5 Heating and Ventilation Systems

3.1.4.5.1 X-330 Cold Recovery

Heating

All external piping associated with the cold traps is insulated and trace heated with serpentine heaters controlled by mercoid switches set at 150°F. The surge drum room, holding drum room, and pipe housings are electrically heated and controlled at approximately 150°F. Should a power failure

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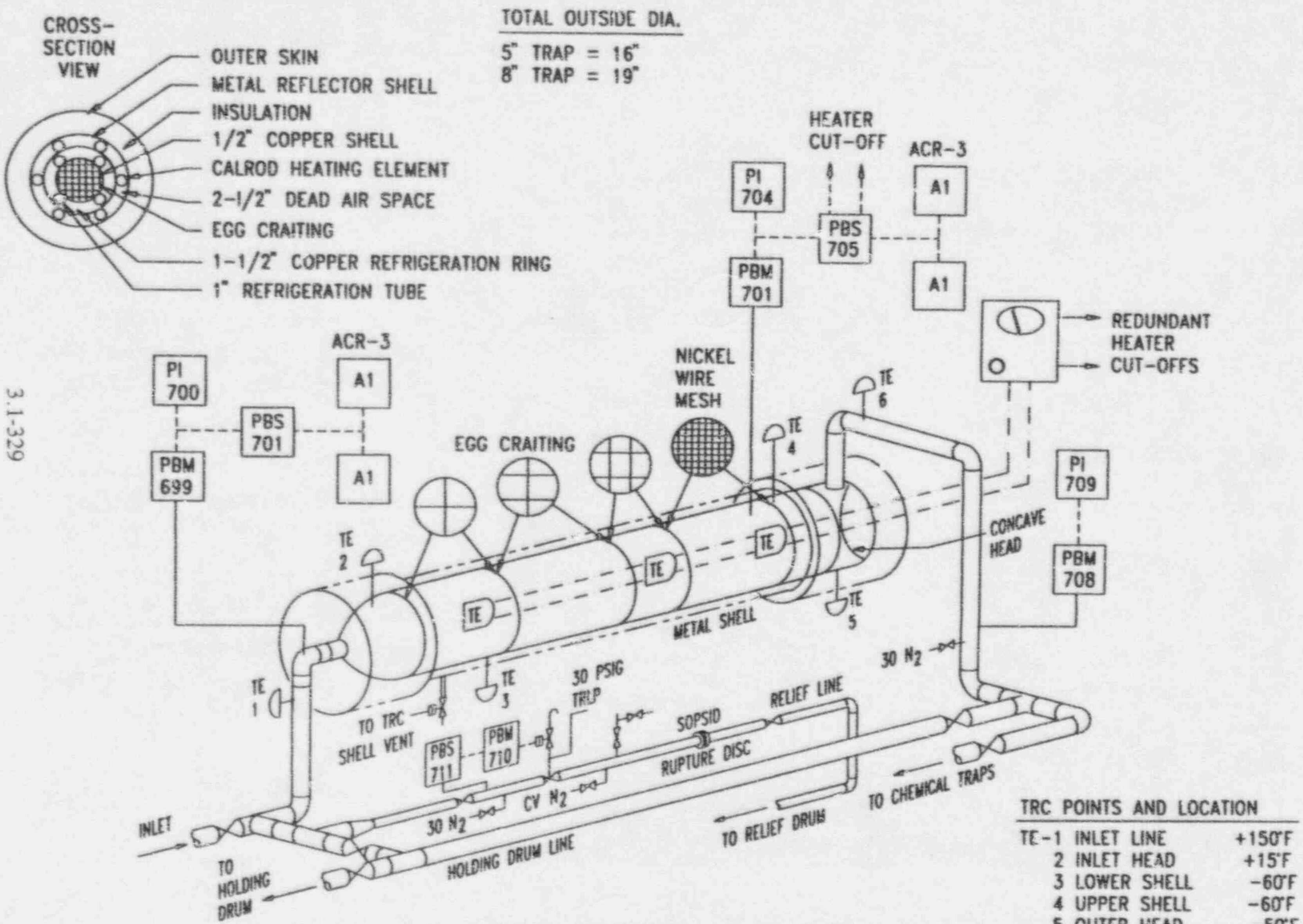

Figure 3.1.4-11 X-330 Cold Trap Design and Instrumentation

TRC POINTS AND LOCATION

TE-1	INLET LINE	+150°F
2	INLET HEAD	+15°F
3	LOWER SHELL	-60°F
4	UPPER SHELL	-60°F
5	OUTER HEAD	-50°F
6	OUTER LINE	+150°F

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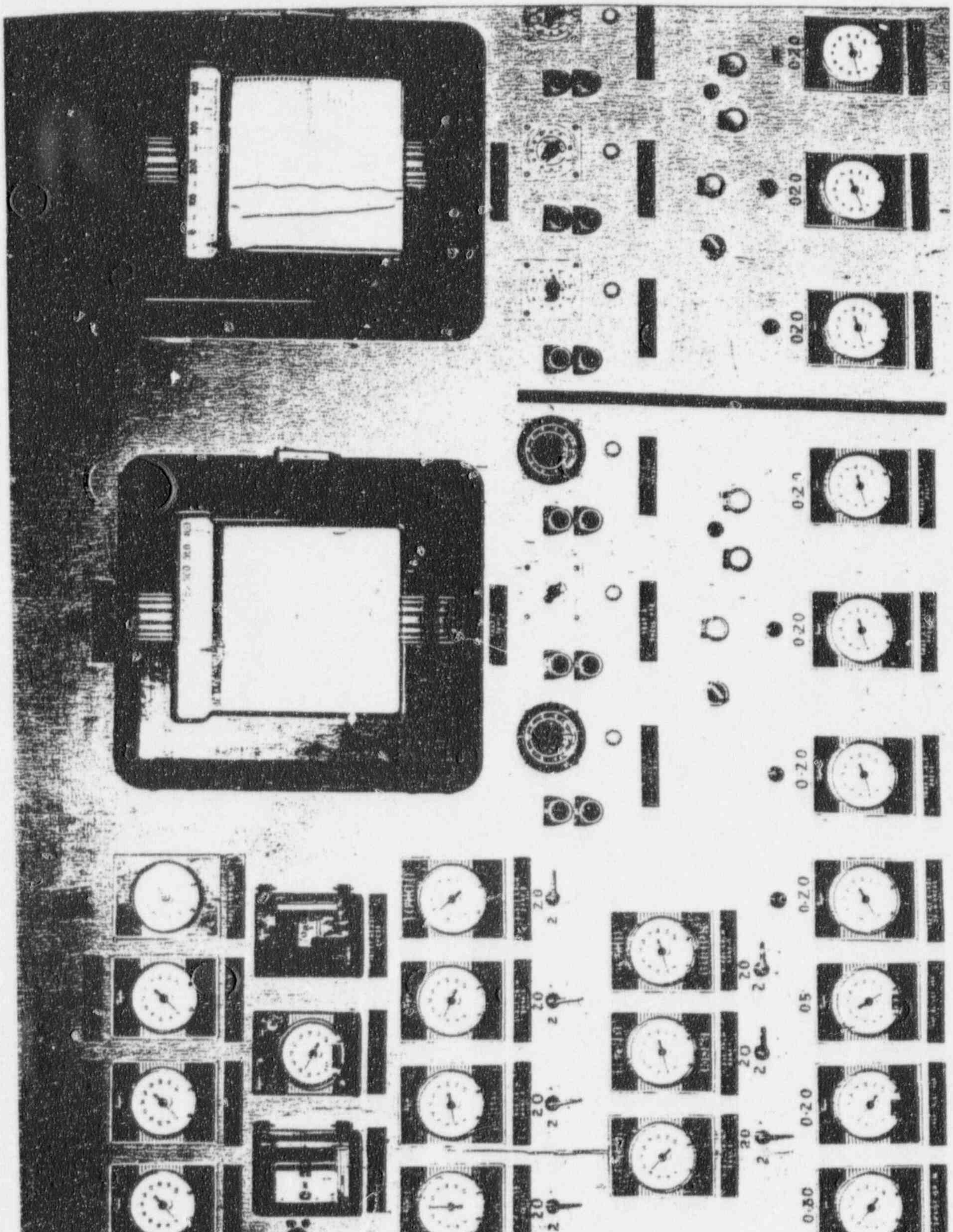

Figure 3.1.4-12 Instrumentation Panel for Storage Drums and Cold Traps

After the connections are leak-tested, the cylinder valve is opened, the cylinder cold pressure or vacuum is measured, the autoclave is closed, the steam is turned on, and the cylinder is heated for 6 hours. At that point, the steam is turned off and evacuated from the autoclave. The UF_6 vapor which was introduced into the UF_6 pressure monitoring circuit is evacuated to the cascade and the pigtail is loosened to allow rotation of the cylinder so the valve is at the 6 o'clock position. The "back" end of the cylinder is tilted upward slightly to allow for the valve to be positioned as low in the liquid UF_6 level as possible. Tilting the cylinder allows for a liquid drain leaving only about 800-1000 lbs. of UF_6 in the 10-ton cylinder. Due to space limitations, some transfer requests result in leaving about 1200-1500 pound "heels" in the 10-ton "parent" cylinder. After the cylinder has been rolled and tilted, the pigtail is tightened, leak rated, and the autoclave re-closed. The steam is turned on again to maintain the desired temperature of 220°F until the transfer is complete. The transfer will typically consist of filling four 2 1/2-ton "daughter" cylinders from each 10-ton "parent" cylinder. Final sampling for customer acceptance is performed simultaneously with the transfer by withdrawing two approximately 1500-gram liquid samples and, in some cases, an additional smaller (usually 200 grams) sample. The sampling is effected by momentarily diverting the flowing UF_6 from the transfer line into a sampling manifold which is calibrated to contain either 200 grams or 1500 grams depending on the size of the "sample loop" which was isolated by valves. The flow to the 2 1/2-ton cylinder is resumed and the isolated quantity of UF_6 is then allowed to drain into an appropriate sample cylinder which is cooled with liquid nitrogen to assure total condensation of the sample quantity. The sample manifold and the UF_6 drain line are enclosed in electrically heated housings, whereas the pigtails connecting the 2 1/2-ton and sample cylinders are wrapped with electrical heaters and insulated to prevent the UF_6 from "freezing out" in the lines. The 2 1/2-ton cylinder rests on a scale while being filled to the 0.5% weight tolerance ($\pm$25.0 lbs.) written into a typical contract for enriching services.

Transfer operations are also conducted using 2 1/2-ton and 14 ton cylinders as parent cylinders. A transfer from one of these types of cylinders is similar to the operation described above with the exception that 2 1/2-ton parent cylinders are completely disconnected from the autoclave manifold during roll and tilt.

One of the samples is sent to the X-710 Laboratory for chemical and isotopic analysis. The duplicate sample is retained for a time as a "referee" in case the need would arise to reanalyze the material. Customer P-10 tube samples are extracted from the X-710 Lab samples and sent, if requested by the customer, to an independent analytical laboratory to verify the data supplied by the Portsmouth GDP laboratory. Discrepancies rarely occur between the Portsmouth GDP and audit firm analytical results; however, the "referee" sample may be used to resolve any such discrepancies. Most of the customers secure the services of an auditing firm which not only monitors the quality of the product but also monitors the quantity by observing the weighing operations performed by Feed and Transfer personnel.

The autoclaves are also typically used for sampling of 2 1/2-ton, 10-ton or 14-ton cylinders without transferring the contents. Sampling is performed in a similar manner as described above except a small quantity of UF_6 is allowed to flow through the sample manifold to "flush" the system and is evacuated to the cascade. Flushing removes any traces of UF_6 deposited in the manifold during the prior operation. After the manifold has been flushed, the sample is taken.

The autoclaves are also used for sample dumping. Sample dumping consists of installing 5-, 8-, or 12-inch cylinders or a rack of sample bombs in the autoclave. The contents are then heated, liquified and transferred to a designated dump cylinder. In the case of sample bombs it is also permissible to

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install the sample bombs on the dump rack in the upright position vice inverted as when dumping to a dump cylinder. Upright installation allows the sample bombs to be vaporized and evacuated directly back to the cascade. The Cylinder Low Pressure Cut-Off System is not a Limiting Condition for Operation in this case because once line clarity is verified, evacuation is begun immediately, which prevents cylinder pressure from ever reaching 20 psia during the heating cycle. The need for the cylinder low pressure cut-off is eliminated by the presence of a continuous vacuum which prevents any pressure build-up as well as continuous operator monitoring during the evacuation process.

3.2.1.3.1.2 X-344A Autoclave Safety Systems

The safety systems for autoclaves at X-344A are functionally the same as described for autoclaves in the X-343 Feed Vaporization Facility (see 3.2.1.1.1). The autoclaves are constructed according to Section VIII of the ASME Boiler and Pressure Vessel Code.

3.2.1.3.2 Scales

See 3.2.1.1.2.

3.2.1.3.3 UF_6 System Connectors and Associated Equipment

See 3.2.1.1.3.

3.2.1.3.4 Cranes and Rigging

See 3.2.1.1.4.

3.2.1.3.5 X-344A Evacuation System

UF_6-containing gases from pigtail purging, cylinder evacuation and cylinder sampling are evacuated to the cascade via a tie-in to the X-342 PG tie lines.

3.2.1.3.6 UF_6 Leakage Detectors

The Gas Evacuation Relay (GER) system is controlled by a network of manual alarm pushbuttons and relay control wiring located throughout the entire X-344 complex to initiate autoclave containment (all four) and shut down of building ventilation systems.

3.2.1.4 Side Feed Facilities

Facilities are provided to allow introduction of various assays of UF_6 to the equivalent assay point in the isotopic cascade.

The side feeding of UF_6 requires that the cylinder temperature be elevated only slightly above

with this instrumentation, but normally the control valves are on manual control and 100% open and the flow rate is only monitored. The Tails Withdrawal station's #1 and #3 condensers have two flow elements while the #2 condenser has only one flow element. The ERP #1 and LAW have both high- and low-flow elements, each having an air-operated control valve. The control valves are connected to the HPV circuit. When the HPV circuit is activated, these valves will close to prevent UF_6 from backing up into a failed compressor loop from the UF_6 condenser.

The gas then enters the UF_6 condenser and is cooled by R-114, evaporating at the ERP and LAW Stations at a temperature of 150°F to 170°F. The UF_6 gas is condensed to a liquid; it then flows by gravity to the accumulator(s). Each condenser is vented through a 1-inch vent return line having an automatically air-operated control valve to remove light gases from the top of the condenser. Excessive lights, indicated by the opening of the vent control valve and an increase in pressure, could be caused by seal inleakage from the compressors or high lights concentrations on the cascade. Also, a pressure increase could result from lights being trapped in the withdrawal cylinder.

To remove the lights from a product cylinder (burping), the liquid valve on the withdrawal manifold is closed and the evacuation valve opened. This will transfer the lights from the cylinder to the vent return header. When the valves are returned to normal, the cylinder pressure should be lower.

The condenser vent control valve is connected to the HPV circuit. The control valve will close when this circuit is actuated.

The accumulators float on line just below the condensers to provide a large volume when withdrawal interruptions are required. Except for Tails Withdrawal, each withdrawal loop is provided with two accumulators. A level indicator is provided and high- and low-level alarms. The accumulator outlets are joined; flow between them is controlled by an air-operated valve. The valve closes when the gamma spectrometer detects an assay outside the limits of target assay. It also can be closed at the discretion of the operator from the withdrawal room, ACR, and LCR.

Before entering the withdrawal manifold, the liquid UF_6 passes through a manually operated block valve. This valve can be closed from outside the withdrawal room should the previously mentioned shut off valve fail to close.

The withdrawal manifold is equipped with several manually operated valves:

- A block valve to discharge liquid UF_6 to the cylinder,
- An evacuation valve to remove UF_6 from the pigtail or provide evacuation for any part of the withdrawal loop and
- Nitrogen purge valve.

Each manifold is also provided with a compound gauge used to monitor withdrawal pressure and to monitor purging and leakrate operations.

The liquid withdrawal line goes from the heated housing to the first air-operated pigtail-isolation

valve. The pigtail-isolation valves are shown in Figure 3.2-13. Each isolation valve and the pigtail are individually heated with 110V AC electric heater strips sized to maintain a temperature of approximately 200°F. The use of torches to heat cylinder valves or pigtails is prohibited. Certified pigtails (described in Section 3.2.1.1.3) are used and all newly made connections are made with new, clean, virgin Teflon gaskets. A leak rate check is required at 20-30" vacuum and at 40 psig for five minutes.

The pressure test portion of the pigtail leak test which utilizes 40 psig air at the Withdrawal Stations and 100 psig at the Autoclave Facilities in either case exceeds the operating pressure of the UF_5 in the pigtail. The Autoclave area uses a 100 psig value because the 100 psig pressure is also used in conjunction with the test of the cylinder high pressure autoclave steam shutoff system. If the cylinder high pressure test was being performed in conjunction with the pigtail test, 40 psig test pressure would also be specified.

The basis for pigtail design and testing is standard engineering design practices and operating experience. Pigtail design is controlled by a Quality Assurance plan and the design drawing. The hydrostatic test requirements and inspection criteria are provided on the design drawing for each type of pigtail and in the quality inspection procedure. Some of the inspection criteria are: flexibility in inches, thread inspection, visual inspection for external damage, leak test, etc.

There are no retest requirements stated because plant experience has demonstrated that the pigtails will fail the connection/disconnection leak test due to thread wear and inspection long before there is any structural weakness in the pigtail. The pigtails are visually inspected by procedure and are subjected to a leak test by procedure prior to every hookup to a cylinder. A pigtail that fails to comply with the acceptance criteria regardless of the failure mode is addressed by TSRs that ensure the pigtail line isolation systems are operable. The accident analysis states (Case R-28) that the only feasible failure mode of a pigtail rupture is by outside forces and not from an internal failure mechanism.

Cylinder Change

Two personnel must be present when a cylinder is connected or disconnected and they are required to complete the Withdrawal Check List. They must verify that each item on the check list is performed sequentially.

Cylinders are inspected for unacceptable damage prior to being connected to the withdrawal position as specified in USEC-651 and plant implementing procedures. After an acceptable leak rate check has been performed on the pigtail, the air-operated pigtail cylinder valve and the cylinder valve itself are checked for leakage through the valve seats. The cylinder valve is then opened and the pigtail pressure is checked to verify clarity. A cold, empty cylinder should have a vacuum greater than 20 inches Hg; those having a UF_6 heel should have greater than 10 inches Hg vacuum. This check verifies that undesirable non-condensibles are not present in the cylinder and that the cylinder is not leaking. Before being connected to the withdrawal manifold, the cylinder weight is verified.

During withdrawal operations, control panels are monitored by operators. The cylinder weight and average assay are recorded hourly or more often as conditions dictate. This information is to calculate the final, average assay. Cylinder fill and assay limits are listed in Figure 3.2-1. When a

pumps for conditioned raffinate feed to the filter, low and high level controls for tanks and filters, pH monitors, two liquid filtrate tanks, twc ›umps for transfer of the filtrate to ion exchange, associated piping (1/2 to 2-inch NPS, schedule 40, 304L or 316SS) and valves, and connections with plant air, electricity, and water. (See Figure 3.3.1.4-7a). There is a ventilation system installed over the feed/mix tanks to exhaust noxious fumes (such as mercury vapor) from the building.

The Heavy Metals Precipitation Facility removes the trace amounts of uranium and other heavy metals from raffinate by raising the pH with sodium hydroxide (precipitation) and processing through filter media.

Solutions from the raffinate slabs ("A" or "B" Loop) or from the tunnel storage are sampled to determine uranium concentration and then transferred to the mezzanine storages. Only trace amounts ($\leq$ 185 PPM) of uranium will be present in the raffinate treated. Allowable uranium concentrations are assured by testing again before the raffinate is drained by gravity from the Mezzanine Storage to the mix/feed tanks. Chemical Operators sample the raffinate and the analysis is performed by the Process Laboratory.

After the raffinate has been transferred to the mix/feed tanks, sodium hydroxide is metered into the tanks to achieve a pH of 8.0 to 9.0. At this pH the heavy metals form into solids (precipitate) suspended in the solution. This pH adjusted raffinate is then pumped through one of two pressure filters. The clear filtrate is pumped to ' chnetium ion exchange feed tank. The sludge from the filter is placed in a container and stored fo ature disposal.

3.3.1.4.9 Technetium Ion Exchange

The Technetium Ion Exchange Facility is located in the X-705 Building in "B" area between columns 10 and 12 and A to AA. The ground floor surface in "B" area is poured concrete with an acid-resistant topping. The Mezzanine overhead is a combination of steel grating and poured concrete floor.

The equipment consists of two feed tanks, two exchange column metering pumps, six ion exchange columns, a discharge storage tank and a transfer pump. (See Figure 3.3.1.4-7B).

The heavy metals filtrate solutions (raffinate solutions which have been neutralized and processed through heavy metals precipitation) are transferred to the technetium ion exchange feed tank. The solutions are then pumped from the feed tank using a metering pump through three of the six ion exchange columns, in series, for technetium removal by ion exchange onto the resin (Dowex [R] SBR, OH Anion Exchange Resin). Resin efficiency is checked by sampling the discharge side of the last ion exchange column in series once per shift. When the technetium concentration at the discharge side of the last column exceeds limits the resin is replaced. From the last column the solution flows to a 500-gallon discharge tank.

The solution is then pumped to the Biodenitrification Storage Tanks. The solution is sampled for uranium, technetium, nitrates, zinc, iron, copper, and nickel. Chemical Operators pull the samples and they are analyzed in the Process Laboratory to ensure that the U is $\leq$ 1.0 ppm and the 99-Tc is $<$ 0.2 ppm. The used resin is placed in compatible 55-gallon drums and stored for future disposal.

3.3.1.4.10 Solvent Extraction Process

There are three solvent extraction loops, A, B, and C, each consisting of pre-evaporators, solvent extraction columns, and post evaporators. The function of the solvent extraction process is to purify and concentrate the uranyl nitrate solutions which are the fed to the calciners.

The A-Loop and B-Loop feed columns, B-1 measured storage, consists of geometrically safe columns. The columns feed the steam heated A-Loop and B-Loop pre-evaporators which increase the specific gravity of the feed solution. The concentrated feed solution is transferred to A-Loop or B-Loop concentrate storage slabs for processing in the extraction columns. In a similar manner, the tunnel measured storage columns feed either of the two C-Loop pre-evaporators. C-Loop's concentrated solution is stored in geometrically favorable columns. With these exceptions, the A-Loop, B-Loop, and C-Loop are essentially the same. The concentrate solution is transferred to the concentrate storages for processing in the extraction columns.

Conductivity probes/sensors are installed on the steam condensate line from each evaporator. If a tube failure was to occur or a high conductivity reading registered, an audible alarm would sound to alert the operator and automatic control valves would switch the flow from the storm sewer to a 150 gallon capacity geometrically safe storage tank located in the piping corridor underneath the recovery area. The condensate from all the evaporators collects into a common header containing an additional three (3) conductivity probes/sensors in series. If two (2) of the three (3) conductivity probes/sensors exceed preset limits, the condensate will automatically route flow to the 150 gallon capacity geometrically safe storage tank. Depending on the uranium concentration, the condensate will be transferred to Microfiltration for further processing or back through Uranium Recovery for re-processing. If the uranium concentration is at acceptable limits for discharge, the condensate will be discharged to the storm sewer.

The low concentration distillate is condensed and transferred to the waste treatment system for final processing and disposal.

The solvent extraction process selectively removes the uranyl ion from a mixture of metallic ions and other compounds in the feed solution. This process occurs in two steps and results in an aqueous uranyl nitrate solution and a uranium depleted raffinate stream.

Each loop's aqueous uranyl nitrate solution, referred to as T-water, is stored in geometrically favorable columns. The T-water from all the loops is fed to the post-evaporators (3) which concentrates it in geometrically favorable concentrate storage prior to being fed into the calciners.

The uranium depleted raffinate stream is a nitric acid solution containing toxic heavy metals. The raffinate is transferred to the north and south tunnel raffinate storage columns for interim storage. Raffinate processing includes heavy metals precipitation, technetium removal in ion exchange columns, and Biodenitrification.

3.3.1.8.5 Fire Protection

All areas of the X-705 Building are protected by an 85 psig wet-pipe sprinkler system. Water is supplied from the 12-inch and 18-inch circulating mains of the sanitary and fire water systems. Sprinkler system operation activates electric alarm bells outside X-705, and is indicated on the X-300 Process Control Facility and X-1007 Fire Headquarters fire alarm panels. The sprinkler system has fixed-temperature sprinkler heads installed in accordance with NFPA-13. If criticality problems are possible as a result of sprinkler actuation, it is possible to valve off sections of the sprinkler system. A more likely course of action under such emergency conditions would be to cover the equipment suspected to cause a criticality hazard.

In addition to the sprinkler system, X-705 is protected by portable fire extinguishers. Special fire extinguishers are provided in the converter disassembly area to put out a nickel fire.

3.3.1.9 Nuclear Criticality Safety

X-705 nuclear safety is provided by a combination of geometrically safe design and appropriate controls.

Most contaminated solution storage is in 4-inch or 5-inch diameter columns, unreflected 5-inch diameter tanks, or 1-1/2 inch thick slabs. Storage columns are placed in safe arrays. The columns in the tunnel basement are separated by neutron absorbing paraffin columns. Five-inch diameter polybottles containing contaminated solutions are stored upright in holders spaced a safe distance apart.

Contaminated solids, such as sodium fluoride or floor sweepings, are stored in 5-inch diameter steel cans in floor holders. Uranium oxide or UNH crystals are stored in steel or tin containers, small polyethylene bottles, or approved secondary containers in the floor holders. Holders are fastened securely to the wall and/or floor. Many 5-inch cans are stored in floor holders in "H" Area (Figure 3.3.1.9-1). Other storage areas are located throughout the building.

UF_6 cylinders with heels, polybottles of contaminated solutions, and cans or bottles of pellets, oxide, or UNH are brought to the X-705 Facility on special trucks or trailers that have holders designed to carry the material in a safe configuration. The trailer can be unloaded and the material placed into permanent holders, or the trailer may be parked at a designated spot and used for temporary storage.

The containers are loaded and unloaded from the trailers or the storage areas one at a time and movement is done along "safe pathways". In an area where a "safe path" is not marked, the operator is responsible for not approaching any equipment or storage that could contain a significant amount of uranium.

Five-gallon plastic mop buckets are used for mop water and cleaning solutions when there is no visible contamination or when the uranium contamination is low assay. For high assay material, limits are placed on the amount of solution used. When buckets are not in use, they are either removed to a non-contaminated storage area, covered, or turned on to their sides so that contaminated solution cannot

run into the bucket during an accident and accumulate to an unsafe depth. Special care avoids introducing contaminated solutions into the large uncovered tub in the small parts pit or into the dumpsters (at Columns J-16 and G-11).

Barrels in X-705 are kept covered unless attended or have holes drilled in them 1-1/2 inches from the bottom. Orange "burnable" drums and black "scrap metal" drums have holes. The green "security" drums have no holes; they are covered (or turned upside down while empty) at all times except when being filled. Contaminated waste drums with no holes are used for waste materials removed from processes. The waste is first sampled to determine that it is low in uranium concentration. These nuclear safeguards provide assurance that an unexpected occurrence (e.g., inadvertent fire sprinkler system actuation) does not result in a criticality.

Tunnel carts drain cleaning solutions completely for reasons of nuclear safety and to eliminate the loss or spread of solution. Any depression that can accumulate solution has a drain hole in the bottom. Similarly, the equipment is loaded on carts to minimize the potential for solution being trapped in its interior to depths exceeding 1-1/2 inches.

The cylinder heels are removed from empty product cylinders by washing them with boric acid solution. Respective safe heel weights are 0.5, 1.0, 41, and 49 pounds of uranium for 8-inch, 12-inch, 30-inch, and 48-inch diameter cylinders. Boric acid is used because boron is a neutron poison (absorber). Prior to washing, the cylinder transfer sheet is checked for uranium assay and heel weight to verify that it is nuclearly safe to add the boric acid/water solution. If the assay or the heel weight exceed the limits for the cylinder size, the Criticality Safety Group must be contacted to provide strict procedures for safe decontamination of the cylinder. Eight and twelve-inch cylinders are placed inside a cadmium shield before being decontaminated with boric acid. Cadmium is a neutron poison. Normal 8-inch cylinders contain uranium of less than 12.5 percent assay and 12-inch cylinders contain uranium of less than 5 percent assay. Under moderation control (the hydrogen to uranium (H/U) atomic ratio is less than 0.088) the 8-inch cylinders can contain up to 97 percent U-235 and the 12-inch cylinders can contain up to 40 percent. These cylinders are tagged with stainless steel "moderation control" tags. As part of the HEU refeed project, cylinders filled under moderation control conditions that contain uranium assays exceeding normal limits are decontaminated under controlled conditions to maintain nuclear safety. A separate area is to be fenced off in X-705 for this activity. If the heel weight is excessive, Criticality Safety is contacted for the necessary guidance for decontamination operations criteria. If the heel weight cannot be reduced to less than six pounds, the cylinder is cut open for dry decontamination.

Boric acid solutions are mixed in an open top mechanically-agitated tank. The mixing tank is not a safe geometry for uranium solutions, so no contaminated solutions are allowed in the mixing tank. A boric acid solution storage tank (first storage column) overflows back into the mixing tank; therefore, contaminated solutions are not allowed into the boric acid solution storage tank.

The 5-inch cylinder cleaning fixture spacing, piping, and column sizes are designed to be nuclearly safe for uranium assays. When the cylinders are rinsed and the valve stems removed, they are considered clean empty cylinders and the safe cylinder spacing rules no longer apply.

- Sampling of F_2 and electrolyte for laboratory analysis.
- Regeneration of NaF traps with heated dry air. The HF removed and heated air exit through the vent system (Figure 3.4.7-18).
- Heating or cooling the electrolyte in the fluorine generators.

All piping is either schedule-80 black iron or schedule-40 Monel. The majority of the valves are flanged Tufline plug valves with a Monel body and plug, and a Teflon sleeve. The remaining valves are bellows sealed diaphragmed globe type. All piping and valves are exposed, readily accessible for maintenance, and color coded as follows: white (air), blue (nitrogen), tan (hydrogen), and yellow (fluorine).

A control valve (CV 99) has been installed in the trap room on the F_2 line, prior to its entrance to the NaF traps, to reduce back-pressure problems (Figure 3.4.7-18). This valve will automatically close when the pressure differential in the F_2 headers is too high or when the system is shut down. Another control valve (CV 236) is located in the metering station to control the flow of fluorine to the distribution system (Figures 3.4.7-18 and 3.4.7-22). To reduce downtime, by-pass lines and parallel valve and piping configurations are provided throughout the system.

3.4.7.2.12 Process Instrumentation and Alarm Systems

Fluorine cell operations vary considerably due to production requirements, availability of storage volume, PDC compressor capacity, limitations of generating and electrical equipment, etc. Fluorine generation is monitored by means of instrument indications at the Fluorine Panel Board. The Fluorine Panel Board contains readout and control instruments for both the fluorine system and auxiliary systems such as electric power, steam, and cooling water. A schematic diagram of the board is shown in Figures 3.4.7-26 and 3.4.7-27.

3.4.7.2.12.1 Emergency Shutdown

An emergency shutdown system exists to protect fluorine generation equipment and to isolate the piping and storage tanks. When activated, this system, named the "Q" circuit when it was originally installed but having no relationship to safety system requirements, shuts off electric power to the cells and closes CV-99 and CV-247 (Figure 3.4.7-20). Closing CV-247 (the recycle valve) will cause the PDC pumps to "starve" (low supply pressure), which triggers pump shutdown and closes CV-236 (the discharge/tank isolation valve).

The "Q" circuit can be activated by any one of several of the alarms on the control panel or by either of two manual switches. One manual switch is located in the control room and the other switch is located in the maintenance area outside of the west wall of the generator room. The alarm conditions which activate the "Q" circuit are as follows:

high pressure: H_2 cell pressure and F_2 cell pressure simultaneously

low pressure: none

differential pressure: H_2/F_2, cell header

other: rectifier power overload
rectifier cooling water pump failure
rectifier cooling fan failure
rectifier high temperature

The "Q" circuit is activated manually whenever an operator decides that alarm conditions warrant system shutdown. Before the F_2 generating system can be reactivated, the "Q" circuit must be reset by pressing a button on the panel board.

3.4.7.2.12.2 NaF Trap Control Instrumentation

A schematic flow diagram for the NaF traps and the control panel for the electric air heaters are shown in Figure 3.4.7-28. When the traps are being heated to regenerate the NaF, HF is exhausted directly to the atmosphere.

3.4.7.2.12.3 Electrolyte Level

To regulate the amount of gaseous HF entering the F_2 generators, flow meters (HF rotometers) are used. The electrolyte level is checked at least every 2 hours by the operators to insure the level is 4 1/2 inches (± 1/2 inch) from the top of the cell. A dipstick is used to check the level of electrolyte. If the level is not acceptable, the operator corrects it by adjusting the HF flow.

3.4.7.2.12.4 High-Pressure Controls

Two 85 psig (maximum 90 psig) rupture disk pressure relief devices are provided in the piping directly south of each F_2 storage tank in the X-342B Building. Between each set of rupture disks is a 5 psig N_2 buffer zone connected to a pressure indicator (PI) and a pressure blind switch (PBS). If the pressure in the buffer zone changes (high or low), an alarm will sound, a light will indicate the condition, and the operator will take appropriate action.

There are also pressure blind switches on the F_2 and H_2 headers. The switches will activate an alarm and activate a light in the control room when F_2 and H_2 header pressure exceeds set values. High pressure is usually related to a plug in the line.

3.4.7.2.12.5 Fluorine Distribution

Fluorine is distributed from X-342 to users through the PG Return Header and the Black Iron Header. A metering station measures the amount of fluorine which is distributed. Fluorine can be metered at a high flow rate through Orifice FE-406 or at a intermediate flow rate through FE-283. Usually, Fluorine used in the CLF_3 systems is metered by cascade operations personnel from the X-330 or X-333. Mass flowmeter XX-850 is also used to measure fluorine flow rates when necessary from X-342A. Figure 3.4.7-22 is a schematic diagram of the F_2 metering station.

3.4.7.3 Chemical and Fire Hazards Associated with the HF/F_2 Systems

3.4.7.3.1 Chemical Hazards

The following hazardous chemicals are used in the HF/F_2 systems:

- Potassium Bifluoride (KHF_2) (electrolyte),
- Lithium Fluoride (LiF) (electrolyte additive),
- Hydrogen Fluoride (HF),
- Fluorine (F_2),
- Soda Ash (Na_2CO_3) (neutralization material for equipment contaminated by contact with F2 or HF),
- Slaked Lime ($CaCOH)_2$) (used to trap free fluorides present in the soda ash), and
- Hydrogen (H_2) (by-product of electrolyzed HF).

The hazards associated with HF and F_2 are described in Appendix A. Because of the limited on-site use of the remaining materials and the fact that the hazards associated with those materials are considered to be standard industrial hazards, the remaining materials will not be discussed further in this report.

3.4.7.3.2 Fire and Explosion Hazards

Fluorine (F_2) or hydrogen fluoride (HF) alone do not constitute a fire or explosion hazard because they are nonflammable, but F_2, and HF in some cases, will promote ignition (sometimes violent) in contact with wood or other organic materials. There is also a latent fire or explosion hazard due to the possible generation of hydrogen in containers, piping, and equipment used in handling and storage of F_2 or HF. Any container for F_2 or HF should never be heated and should be protected from direct sunshine and stored in a location where temperatures below 100°F can be maintained.

Containers of volatile liquids should never be filled completely in order to allow for liquid expansion as temperature rises. No water, dilute acid, or other liquids should ever be added to a steel container used for F_2 or HF. A container reclosed after such contamination is likely to rupture with extreme violence.

3.4.7.4 Ventilation Systems

The fluorine generation facilities in X-342A have a ventilation system at ceiling level which operate continuously. If the system stops, an alarm is sounded at the control panel.

X-342B has no special ventilation system. There are open louvers near the roof in the ends of the building. There is also an exhaust fan which can be used to evacuate the facility,

Because X-344C is an open shed, there is no ventilation system in the facility.

3.4.7.5 Confinement Systems

The HF/F_2 storage vessels, piping, and equipment provide the primary confinement for the process materials.

3.4.7.6 Monitoring and Protection Systems

3.4.7.6.1 Gas Release Alarms

3.4.7.6.1.1 HF Leak Detectors

HF detectors (Pyr-A-Larms) are mounted above: (1) each of the three F_2 Storage Tanks (the reaction of F_2 and wet air will produce HF); (2) the HF Vaporizer; and (3) the HF Storage Room. If HF vapor is detected, an alarm is actuated in the X-342A control room and at the affected facility. This alarm warns personnel to cautiously approach the facility to identify the cause. The Pyr-A-Larms are checked monthly by I&C Maintenance. Figure 3.4.7-29 shows a typical detector mounted above an F_2 storage tank.

3.4.7.6.1.2 Manually-Operated Gas Release Alarms

Manually-operated gas release alarms are located throughout the X-342A facility. Activation of these alarms will result in the sounding of the building evacuation siren.

3.4.7.6.2 Fire Protection

Portable fire extinguishers are located throughout the X-342 and X-344 complex. There are also fire alarm pull stations provided throughout the complex. These alarms are tied into the plant fire alarm system. When activated, the plant emergency squad will respond immediately to the respective alarm location.

3.4.7.6.3 Emergency Showers and Eye Baths

Emergency showers and eye baths are located in all the HF/F_2 facilities with the exception of the X-342B F_2 Storage Building.

3.4.7.6.4 Radiation Alarms

There is a Radiation Alarm located in the X-342A facility. This alarm is part of the X-344A/X-342A radiation alarm system. A detailed description of the plant radiation alarm system is contained in Section 4.6.2.

3.4.7.6.5 Equipment Protection

As described in Section 3.4.7. 1, the panel board comprises many indicators and controllers of process parameters to allow both process control and equipment protection. The "Q" circuit is used as an emergency shutdown to protect equipment from costly disabling damage. The testing and inspection programs required for various protective systems are presented in the following subsection.

3.4.7.7 Testing and Inspection Program

Routine testing and inspections of various monitoring and protection systems are conducted periodically.

In addition to periodic tests and inspections, Operations personnel daily inspect all equipment in the facilities and document the inspections on a Process Control Sheet. This daily inspection includes operational and safety equipment and checks for gas leaks.

3.4.7.7.1 Code Inspection of HF/F_2 Equipment

Code Inspection performs an external visual inspection once per year on each of the three F_2 storage tanks and the F_2 surge tank. An internal inspection of the walls and welds of the three F_2 storage tanks and the F_2 surge tank is performed once every ten years by Code Inspection. Ultrasonic thickness tests are performed on the three F_2 storage tanks once every three years. In addition, ultrasonic thickness tests are performed on the cooling/heating tubes in the F_2 generators by Code Inspection after generator disassembly.

3.4.7.7.2 Fluorine Generation Conditions

The amperage, voltage, electrolyte temperature, air space, water temperature, HF and F_2 header pressure, H_2 differential pressure, compressor discharge pressure, NaF trap temperatures, and F_2 cylinder pressures are continually monitored by Operations personnel and recorded every two hours on the Fluorine Production Log when F_2 generation is operating.

3.4.7.8 HF/F_2 Safety Systems, Design Features, and Administrative Controls

3.4.7.8.1 Safety Systems

No safety systems are identified for the X-342A HF Feed System. However, components of the HF/F_2 systems have been identified as AQ items and are described in Section 3.8.2.

3.4.7.8.2 Design Features

There are no design features for safety identified for the X-342A HF Feed System.

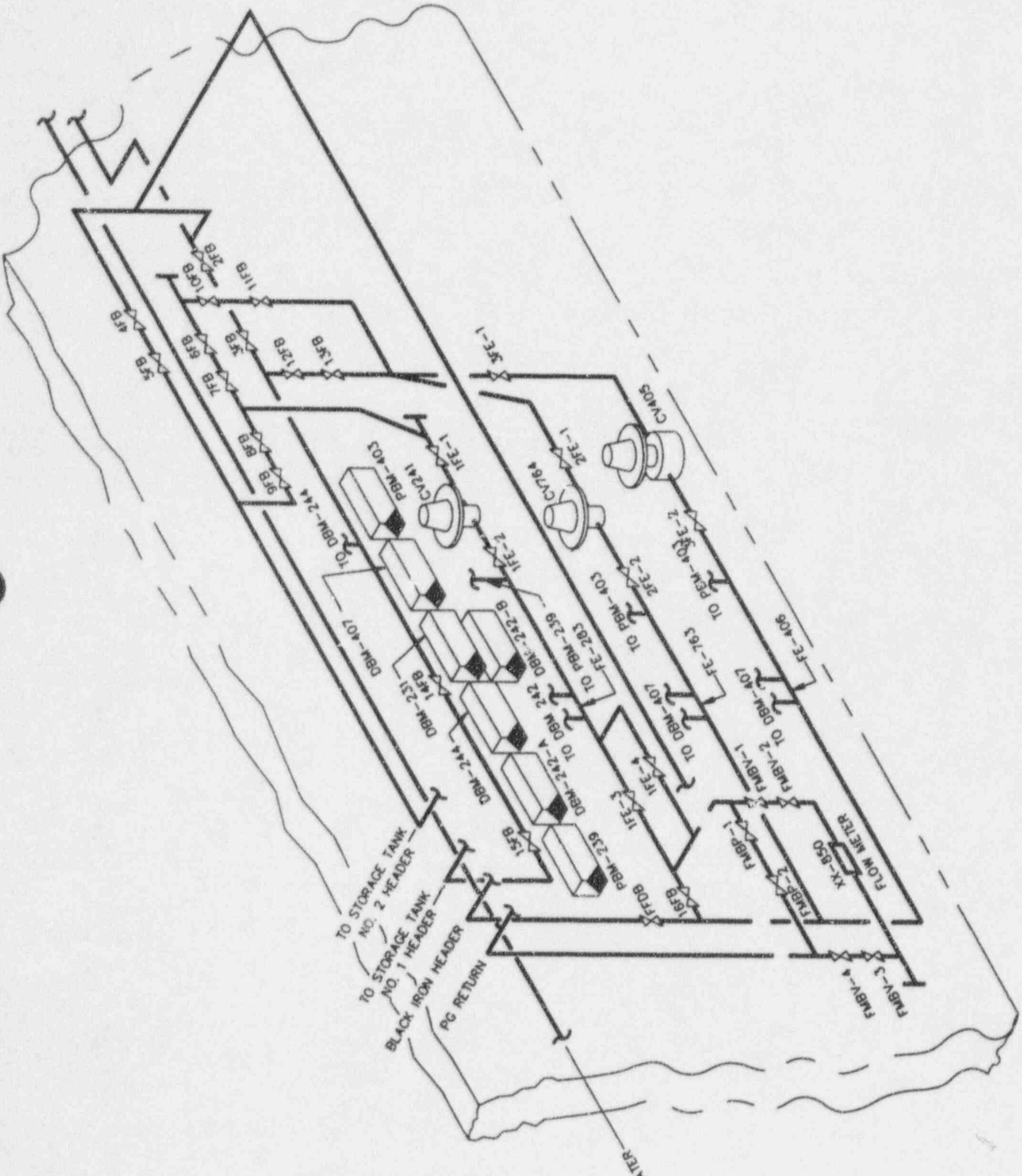

Figure 3.4.7-22 Fluorine Metering Station

FIG. 347-22
3-25-97
ACAD LDR

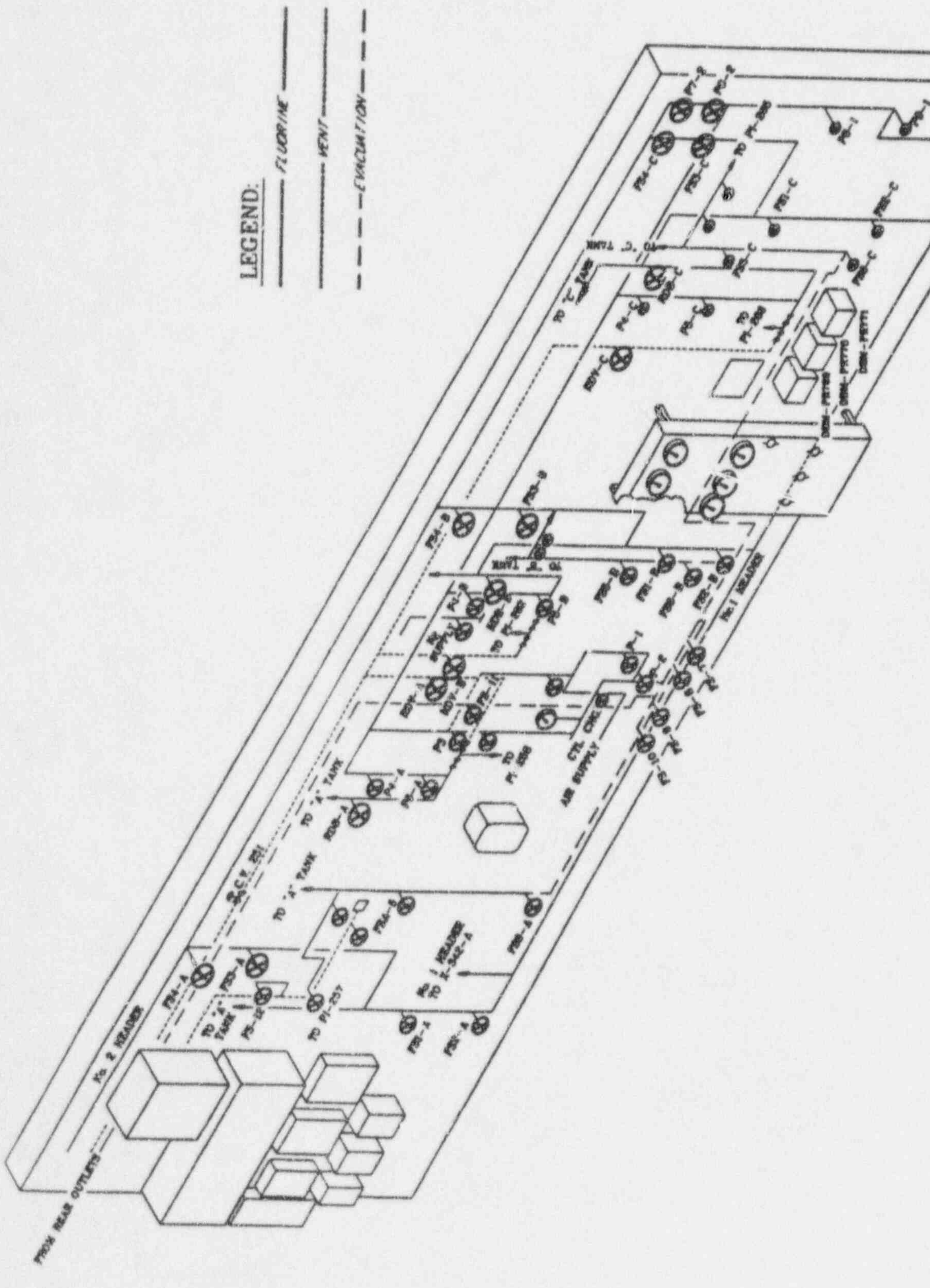

Figure 3.4.7-23 Schematic of Fluorine Storage Piping System

ACAD LDP
9-6-95
3.4.7-23

The x-ray equipment was purchased in 1979 from the General Electric Company and was installed by the manufacturer according to established standards. The unit is maintained by a manufacturer representative as required. The x-ray equipment utilizes rare earth screens to minimize radiation exposure. A film processor is used to develop the x-ray film and is maintained by a maintenance and repair contract.

The emergency room is equipped with patient carts, a defibrillation monitor, a nuclear accident carrier, and a crash cart.

The decontamination area contains: 1 Berthold Hand Monitor, 1 Ludlum Model 12 Meter, and 1 Samson Meter.

The following services are also provided in the facility:

- Limited optical services,
- Tonometry testing (testing for glaucoma),
- Oxygen in the emergency room and ward with five tanks in a marked storage chest, and
- A kitchen for food preparation during afternoon, night, and holiday shifts.

3.5.6.2.2 Monitoring and Protection Systems

There are two systems designed to provide protection to personnel in the facility. They are:

- The rare earth screen used with the x-ray machine,
- Radiation evacuation alarm slaved to radiation alarms in Buildings X-710, X-760, and X-770,
- Public address system,
- Fire alarm, evacuation system.

3.5.6.3 Waste Disposal System

There is no special waste disposal system associated with the dispensary. The gaseous, liquid, and solid wastes may be characterized as those normally associated with an office facility. Disposal of waste, outdated or legend drugs are processed according to appropriate federal and state requirements. The x-ray developer is entered into the hazardous waste program for disposal.

3.5.6.4 X-1007 Fire Station

The X-1007 Fire Station contains a first aid room and Fire Services provides ambulance service. The first aid room is used by the shift fire captain on weekends to treat personnel with minor injuries. Personnel with serious injuries or illnesses are transported by ambulance to the Pike County Hospital or other hospitals. There is no major equipment in the first-aid room. There are no protection, confinement, waste disposal, or safety systems associated with the room.

Emergency medical transport is by an ambulance. Qualified personnel operate the vehicles, which are equipped with necessary emergency equipment and supplies.

3.5.6.5 Health Protection Facilities Safety Systems, Design Features, and Administrative Controls

There are no safety systems, design features, or administrative controls identified for the health protection facilities.

3.7 HEU DOWNBLENDING ACTIVITIES

3.7.1 Description

DOE currently has approximately 13,000 kgU of HEU stored at PORTS that is not required for programmatic purposes. DOE and USEC have agreed that DOE will provide this material for refeed and downblending to LEU product. Per the Memorandum of Agreement between DOE and USEC dated December 15, 1994, and the Regulatory Approach for Post NRC Certification of Gaseous Diffusion Plants (JW Parks to GP Rifakes, October 11, 1995), DOE will retain regulatory authority over HEU, except for residual HEU that is held up in equipment subsequent to DOE HEU cleanout performed as part of the HEU suspension project and Category III quantities (or less) of other HEU (these small quantities of HEU may be handled incidental to general enrichment activities).

The Fundamental Nuclear Materials Control Plan, submitted as part of this SAR and the associated programs and plans, describes the accounting methods for the HEU refeed operation.

The HEU refeed material is stored in 5", 8" and 12" cylinders in the X-345 facility which is not leased by USEC. The HEU is moved under DOE oversight by secure transport from the X-345 facility to the X-326 Product Withdrawal (PW) facility across plant roadways. Both plant roadways and the PW facility are leased by USEC.

Once in PW, the cylinders are stored in a secure DOE-regulated vault until feeding is required. After feed orders are issued, HEU cylinders are connected to one of twenty-two feed manifolds.

Downblending activities are usually conducted using the nine feed and topping stations in the PW Area. The material is fed by sublimation and may flow through one of two magnesium fluoride (MgF_2) traps (located upstream of the centrifugal compressor) prior to the introduction to the cascade.

Typical HEU feed rates vary from 2 to 60 kg UF_6 per day (but may be as high as 120 kg per day) while the LEU flow rate through the compressor is slightly more than 18,000 kg UF_6 per day. The HEU feed rate is controlled to ensure that no more than 50 kg of ^{235}U contained in uranium enriched from 10 wt-% up to 20 wt-% ^{235}U is present in Units X-25-7 and X-27-2, interconnecting piping and the X-326 surge drums during routine operations. A sample is taken twice daily below the UF_6 "front"and the enrichment found in the sample is used to calculate the amount of gaseous UF_6, enriched from 10 wt-% up to 20 wt-% ^{235}U, and verify that the calculated amount does not exceed 50 kg ^{235}U. This material is present, but it is not withdrawn as product and is not easily accessible, due to the physical and chemical condition of the material and due to the safeguards controls provided. This assures that the ^{235}U possession limits, defined in Table 1-3, are not exceeded. Operational controls on the amount, enrichment and cascade location of ^{235}U in the gaseous UF_6 during normal, off-normal and accident conditions have been developed as described in Appendix A, along with nuclear criticality considerations for the higher enrichment levels that will be experienced and a description of the additional safeguards implemented to prevent unauthorized removal of the uranium from the portions of the cascade described above.

If removal from the cascade of some or all of the uranium enriched from 10 wt-% to 20 wt-% ^{235}U as a result of HEU refeed becomes necessary, the NRC Resident Inspector for the Portsmouth Plant shall be notified prior to removal, and all of the removed uranium enriched above 10 wt-% shall be protected in accordance with the requirements of 10CFR73.67(d) or the material shall be transferred to a DOE-regulated facility or area for storage or downblending to less than 10 wt-% ^{235}U.

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After a cylinder has been fed, it is removed from the feed position and weighed to determine the amount of uranium fed to the LEU enrichment process. A relatively small amount of non-volatile uranium typically remains in the cylinders after feeding. This "heel" is removed by a cleaning process conducted in a DOE-regulated X-705 Small Cylinder Cleaning area or shipped offsite for cleaning. Solutions resulting from the cleaning process are blended with solutions containing normal, depleted or LEU to reduce the assay to less than 10 wt-% ^{235}U. The solution is then transferred to the uranium recovery area where it is converted to uranium oxides; finally the oxides are stored for future disposition. The cleaned cylinders and any cylinders destroyed during the cleaning process are returned to DOE.

As a part of the normal operation of the gaseous diffusion process, cells are treated with oxidant gases to remove deposits of uranyl fluoride and other compounds from the cascade equipment surfaces in a manner described in Section 3.1.1.12. Generally, these treatments liberate a few hundred to several thousand grams of uranium from deposits. The treatment gases, including any uranium liberated from deposits as UF_6, are evacuated to surge drums and then returned to the enrichment cascade at a point near its origin.

Cell treatment may result in the liberation of small quantities of residual HEU that was left in USEC process equipment following completion of the DOE cleanup process. This may occur at any point during the remaining operational life of the enrichment cascade. The liberated HEU material will mix with the LEU material in the process equipment and surge drums and the treatment gases will be returned to the cascade, where it will be mixed with the much larger quantities of uranium present in the interstage flow at LEU enrichments. This process ensures that the blended stream remains within the ^{235}U possession limits defined in Table 1-3. Analysis of uranium enrichment is not performed prior to returning the mixtures to the cascade. Any changes in uranium inventory due to "recovery" of the relatively small amounts of HEU would be reflected in USEC's enrichment cascade Inventory Difference (ID) during periodic inventories.

In addition to the HEU downblending activities, there may be occasions when equipment or components removed from the LEU cascade, X-705 Building or other leased areas contain moderately (10-20 wt-% ^{235}U) enriched or highly enriched uranium due to the presence of residual deposits of material that were not completely removed during the HEU Suspension program. On those limited occasions when this occurs, the equipment will be disassembled and decontaminated in an area in the X-705 Building which is placed temporarily under DOE regulation with appropriate safeguards in place. Material removed which exceeds 10 wt-% ^{235}U will be retained by DOE or will be blended with LEU solution until the overall enrichment is less than 10 wt-% ^{235}U. DOE regulation and associated safeguards will cease to be applied when material equal to or greater than 10 wt-% ^{235}U is no longer present. The blended-down solution would be processed through uranium recovery as described above.

3.7.2 Organization and Responsibilities

DOE will retain regulatory authority over HEU, except for inaccessible residual holdup and Category III quantities (or less) of other HEU. Up to 50 kg of ^{235}U, contained in uranium enriched from 10 wt-% up to 20 wt-% ^{235}U, may be present in Units X-25-7 and X-27-2, interconnecting piping and the X-326 surge drums in the gas phase during routine operations, as a result of HEU refeed. This equipment, its inventory and operation, is covered by the NRC Certificate and is under NRC regulatory