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NUCLEAR REGULATORY COMMISSION CERTIFICATION
PADUCAH GASEOUS DIFFUSION PLANT
REMOVE/INSERT INSTRUCTIONS
REVISION 8
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INTRODUCTION

The United States Enrichment Corporation (USEC or Corporation) hereby submits its initial Application to the Nuclear Regulatory Commission (NRC) for a certificate of compliance for the Paducah Gaseous Diffusion Plant (PGDP) in accordance with section 1701(c) of the Atomic Energy Act of 1954 (AEA), as amended by the Energy Policy Act of 1992, and 10 CFR Part 76.

Pursuant to its statutory authority, on July 1, 1993, USEC entered into a Lease Agreement with DOE over portions of PGDP and assumed responsibility for operations on that date. Pursuant to 10 CFR 76.31, USEC is required to submit an initial application for a certificate of compliance to the NRC governing its operations at PGDP. In accordance with 10 CFR 76.35, this Application includes:

- technical safety requirements (10 CFR 76.35(e));
- a safety analysis report (10 CFR 76.35(a));
- a quality assurance program (10 CFR 76.35(d));
- an emergency plan (10 CFR 76.35(f));
- an environmental compliance status report (10 CFR 76.35(g));
- a fundamental nuclear material control plan (10 CFR 76.35(h));
- a transportation protection plan (10 CFR 76.35(i));
- a physical protection plan (10 CFR 76.35(j));
- a security plan for classified matter (10 CFR 76.35 (k));
- a radioactive waste management program description (10 CFR 76.35(m));
- a depleted uranium management program description (10 CFR 76.35(m));
- a description of USEC's funding program for waste and depleted uranium disposition (10 CFR 76.35(n)); and
- information from which the Commission can prepare an environmental assessment related to DOE's "Plan for Achieving Compliance" (10 CFR 76.35(c)).

The following information is provided in accordance with 10 CFR 76.33(a)(2):

Applicant Name, Address and Other Corporate Information

United States Enrichment Corporation
Two Democracy Center
6903 Rockledge Drive
Bethesda, Maryland 20817

USEC is a wholly owned Government corporation established by the AEA, as amended, and maintains its headquarters at the above address. USEC is neither owned, controlled nor dominated, by any alien, foreign corporation or foreign government. All shares of the Corporation are held by the U.S. Treasury. Pursuant to the Energy Policy Act, the Corporation has submitted a plan to the President for transfer of ownership of the Corporation to private investors, and the Corporation may implement this plan, after approval by the President and notification of Congress.

The mailing address for PGDP is:

United States Enrichment Corporation
Paducah Gaseous Diffusion Plant
P.O. Box 1410
Paducah, Kentucky 42001

Information on Corporate Directors and Officers

The following are the directors and principal officers of the Corporation. Except as indicated, all are citizens of the United States. The business address for all such persons is Two Democracy Center, 6903 Rockledge Drive, Bethesda, Maryland 20817. The members of the Board of Directors were each appointed by the President and confirmed by the U.S. Senate.

Directors

Mr. William J. Rainer
Chairman of the Board of Directors

Mr. Charles W. Burton
Member of the Board of Directors

Mr. Christopher M. Coburn
Member of the Board of Directors

Ms. Margaret H. Greene
Member of the Board of Directors

Kneeland C. Youngblood, M.D.
Member of the Board of Directors

Principal Officers

Mr. William H. Timbers
President and Chief Executive Officer

Mr. George P. Rifakes
Executive Vice President - Operations

Mr. James H. Miller
Vice President - Production

Mr. William J. Bennett
Vice President - Advanced Technologies

Mr. Richard O. Kingdon[1]
Vice President - Marketing and Sales

Mr. Robert J. Moore
Vice President - General Counsel

Mr. Philip G. Sewell
Vice President - Corporate Development

Mr. Henry Z. Shelton
Vice President - Finance, Chief Financial Officer

Mr. Charles B. Yulish
Vice President - Corporate Communications

Format and Content of the USEC Certification Application

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

1. Mr. Kingdon is a citizen of the United Kingdom.

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

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Appendix A

Applicable Codes, Standards, and Regulatory Guidance

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

1.0 American National Standards Institute (ANSI)

1.1 ANSI N14.1, Uranium Hexaflouride - Packaging for Transport, 1990 Edition

PGDP 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 PGDP that were not purchased to meet this edition of the standard - Satisfy only Sections 4, 5, 6.2.2 - 6.3.5, 7, and 8 of the standard. Cylinders purchased prior to 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.

See SAR Sections 3.7.1 and 4.3.1.5; the basis statements for TSR Sections 2.1, 2.2, and 2.3; and Section 2.2.2 of the Packaging and Transportation Quality Assurance Program (UEO-1041).

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

The extent to which PGDP satisfies the requirements of this standard will be determined as part of the SAR Upgrade activity.

For references to this standard, see SAR Section 2.4.3.

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

PGDP 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.

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

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

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

PGDP satisfies the requirements of this standard.

For references to this standard, see SAR Sections 5.2.2.1, 5.2.2.3, 5.2.3.2, 5.2.4.1, and Table 6.9-1.

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

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

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 Section 3.12.6.

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

PGDP 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 - PGDP 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 Section 5.2.2.1.

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

PGDP satisfies the requirements of this standard.

For references to this standard, see SAR Section 5.2.2.1.

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

PGDP satisfies the requirements of this standard.

For references to this standard, see SAR Sections 6.6.5.2 and 6.6.6.1.

1.10 ANSI A17.1, Safety Codes for Elevators, 1974 Edition

PGDP satisfies only the following section of this standard as clarified below:

Section 1005.4 - The building C-360 hydraulic lifts (elevator and levelator) are designed and tested to the requirements of this section of the standard for direct-plunger type elevators.

For references to this standard, see the TSR Section 2.1.

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

PGDP 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

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

PGDP satisifies 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

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

PGDP 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

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

PGDP satisifies 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)

1.15 ANSI NB-23, National Board Inspection Code, 1995 Edition

PGDP satisfies the requirements of this code as described below:

UF_6 accumulators and condensers are inspected at 5 year intervals in accordance with the 1995 edition of the National Board Inspection Code (NBIC).

For references to this standard, see SAR Sections 4.3.3.1.2 and 4.3.4.1.2 and TSR Section 2.3.

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

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

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

PGDP satisfies the requirements of this standard for the periodic testing of HEPA systems that are relied upon for personnel protection or to meet environmental emissions limits with the following exceptions:

Section 11- The test gas specified will be an alternative but equivalent Halide gas,

Section 15 - Laboratory testing of the adsorbent will test for HF loading instead of radioiodine since HF is the gas of concern at PGDP.

For references to this standard, see SAR Sections 5.3.2.10 and 5.3.7.5.

2.0 American Society of Mechanical Engineers (ASME)

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

PGDP 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 6.6.13, 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

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

Section VIII - PGDP satisifies the requirements of Section VIII for the edition in effect at the time of fabrication of the following pressure components and systems: freezer/sublimer, condenser/reboiler, accumulator, autoclave, cell coolant condenser, nitrogen system (relief devices only), air system and dryer, cell coolant pressure relief, and UF_6 cylinders except that UF_6 cylinders do not have pressure relief devices.

Section IX - PGDP satisifies the requirements of Section IX for the components identified above for Section VIII.

For references to this code, see SAR Sections 3.2.3, 3.2.5.8, 3.3.4.5.1, 3.6.7.7, 3.7.1, 4.3.3.1.2, and 4.3.4.1.2 and the basis statements for TSR Sections 2.1, 2.2, 2.3, and 2.4.

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. PGDP 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

As described in SAR Section 5.4.1.1, 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. PGDP 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 3.3.5.12, 5.4.1, and 5.4.1.1.

3.3 NFPA 15, Water Spray Systems, 1990 Edition

PGDP 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

PGDP 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.

3.5 NFPA 25, Inspection, Testing and Maintenance of Water-Based Fire Protection Systems, 1995 Edition

The 90-second response time criteria for the C-300 fire alarm is consistent with the requirements of this standard. See the basis statements for TSR Sections 2.3.4.8 and 2.4.4.5.

3.6 NFPA 30, Flammable Liquids, 1990 Edition

As described in SAR Section 5.4.1.1, the requirements of this standard are used as guidance only for procedures used to handle flammable liquids. PGDP 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 and year, see SAR Sections 5.4.1 and 5.4.1.1.

3.7 NFPA 72, National Fire Alarm Code, 1996 Edition

The 90-second response time criteria for the C-300 fire alarm is consistent with the requirements of this standard. See the basis statements for TSR Sections 2.3.4.8 and 2.4.4.5.

3.8 NFPA 101, Life Safety Code, 1991 Edition

PGDP 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.

3.9 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

The extent to which PGDP 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 8.13, Instructions Concerning Prenatal Radiation Exposure, Revision 2

PGDP satisfies the requirements of this regulatory guide.

For references to this regulatory guide, see SAR Section 5.3.2.2.

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

PGDP 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. PGDP satisfies the following sections of USEC-651 as clarified below:

Section 3.3 - all

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

Section 5.3 - all

Section 5.4 - all except for paragraph 5.4.4. Some cylinder valves in use at PGDP havee less than 13 threads.

Section 10.0 - all except as follows:

First paragraph - Not all PGDP 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 N 14.1)

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

Section 13.1 - all

For references to this standard, see SAR Section 3.2.1; Table 3.2-1; Sections 3.2.6, 3.7.1; Figure 3.7-1; Sections 3.15.1.3, 3.15.1.4, 4.3.1.5; and TSR Sections 2.1, 2.2, 2.3, and 2.4.

5.2 NCRP 112, Calibration of Survey Instruments Used in Radiation Protection for the Assessment of Ionizing Radiation Fields and Radioactive Surface Contamination, 1991

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

The methodology outlined in this report is one method used to calculate internal dose. See SAR Section 5.3.2.3.

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

PGDP 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

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

For references to this standard, see Sections 3 and 5.5.1.2 of the Emergency Plan.

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

PGDP uses the biokinetic model of this standard for internal dose calculations.

For references to this standard, see SAR Section 4.7.1.3.2 and 5.3.2.3.

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

PGDP satisfies the requirements of this standard as described in SAR Tables 1-3 (footnote c) and 1-4 (footnote b) 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.

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

PGDP satisfies the requirements of this standard as described in SAR Tables 1-3 SAR Tables 1-3 (footnote c) and 1-4 (footnote b) 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

This chapter provides information on the location and site characteristics of the Paducah Gaseous Diffusion Plant (PGDP) facility as specified in 10 Code of Federal Regulations (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 regarding (1) the contribution of external and natural phenomena to initiation of events, and (2) 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 2.1.1).

2. Local population location and density (Section 2.1.3).

3. Sources of external manmade event contributors such as nearby airports, railroads, and utilities (Section 2.2).

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 PGDP site location and description, surrounding populations, and use of nearly land and waters.

2.1.1 Site Location

PGDP is located in western Kentucky, in McCracken County as shown in Figure 2.1-1. The site is located about 3.6 miles south of the Ohio River, 19.9 miles east of the confluence of the Ohio and Mississippi Rivers, and 20 miles west of the Tennessee and Cumberland Rivers. The Missouri state boundary is 20 miles to the west, and Tennessee's state border is about 40 miles to the south. The city limits of Paducah, Kentucky, are 10 miles east of PGDP, and the city of Metropolis, Illinois, is situated approximately 5 miles north and east of the plant.

Paducah, with a 1990 population of 27,256, is the largest city in the immediate region. Two unincorporated communities, Grahamville and Heath, are located approximately 2 miles east of the plant. Parts of 28 counties in 4 states fall within a 50-mile radius of the plant (11 in Kentucky, 10 in Illinois, 4 in Missouri, and 3 in Tennessee). Figure 2.1-2 shows nearby communities, major highways, railways, and bodies of water.

PGDP's latitude is 37°6'49" N. and its longitude is 88°47'39" W. (measured at a central point in the plant). PGDP is situated in Universal Traverse Mercator Zone 16, N 4,108,777 m, and E340,595 m. The plant occupies a 3,423-acre site owned by the Department of Energy (DOE). It is surrounded by the West Kentucky Wildlife Management Area and by predominantly rural and agricultural land. In recent years, industrial, commercial, and residential development in the general vicinity of the site has increased.

2.1.2 Site Description

PGDP is located on a 3,423-acre site, of which 748 acres are within the controlled plant security fence. Of the remaining 2,675 acres outside the fence, 2,080 are managed by the Commonwealth of Kentucky as part of the West Kentucky Wildlife Management Area.

In all, the portion of PGDP leased by the United States Enrichment Corporation (USEC) contains more than 115 buildings and structures, with a total floor space of about 8 million ft^2. The fenced area of the site is dominated by four large process buildings, which constitute about 75 percent of the plant's total floor space. There also are cooling towers, electrical switchyards, and several support operations structures, including sewage and liquid effluent treatment plants, decontamination and recovery operations, coal and ash-handling facilities, boiler blowdown, water treatment, steam plant, maintenance operations, laboratories, fluorine facilities, and air plants. Figure 2.1-3 depicts PGDP's major buildings and structures. As shown in this figure, the site consists of facilities and areas leased to USEC, buildings leased by USEC that contain deleased areas, 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 fence, 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. Tables 2.1-1 and 2.1-1A lists buildings and structures leased to USEC and those retained by DOE as shown in Revision II to Exhibit A of the lease agreement as of January 21, 1997. Figure 2.1-4 depicts the USEC-leased versus DOE-retained buildings, structures and outside areas. Table 2.1-1B identifies those facilities owned by USEC. There are areas where contamination exists within the USEC-leased areas due to to legacy DOE activities. Radiation Protection maintains radiological surveys of currently identified areas.

2.1.2.1 Topography

The PGDP region is characterized by low relief. Elevations vary from 290 ft above mean sea level (MSL) at the Ohio River to 380 ft above MSL at the plant site, approximately 3.6 miles away. The fenced area is above recorded flood levels.

2.1.2.2 Vegetative Cover

Land within the PGDP security fence is virtually cleared of vegetation; it is a fully developed industrial area. Asphalt or crushed stone covers the area immediately surrounding process buildings, and grass covers the areas surrounding administration, laboratory, fire, and guard buildings.

Mature hardwood forests are located in the 2,080 acres of DOE land outside the fenced area. This 2,080-acre area is used by the Commonwealth of Kentucky for wildlife conservation, and it is managed by the Kentucky Department of Fish and Wildlife under a letter of agreement with the Atomic Energy Commission (AEC) that dates back to the 1950s.

2.1.2.3 On-Site Transportation and Transmission Systems

A total of 23 miles of paved roadway (concrete or asphalt) are located within the fenced area of PGDP. Additionally, patrol roads and paved access roads branch to the perimeter of the plant site.

Table 2.1-1. Buildings and structures leased to USEC.

Paducah Facilities Leased to USEC[1]

Facility	Description
C-100	Administration Building
C-100-A	Office Trailer
C-100-T-04	Temporary Office
C-100-T-05	Temporary Office
C-100-T-06	Temporary Office
C-101	Cafeteria
C-102	Hospital
C-102-T-01	Temporary Office
C-102-T-02	Temporary Office
C-102-T-03	Temporary Office
C-102-T-04	Temporary Office
C-102-T-05	Temporary Office
C-102-T-06	Temporary Office
C-200	Guard and Fire Headquarters
C-200-A	Office Trailer
C-201	Emergency Equipment Storage Building
C-201-A	Emergency Equipment Storage Building
C-201-B	Emergency Equipment Storage Building
C-201-C	Emergency Equipment Storage Building
C-202	Guard Training Building
C-203	Emergency Vehicle Shelter
C-206	Pumper Drafter Pit
C-206-A	Storage Trailer
C-206-B	Smoke Training
C-207	Fire Training Facility
C-212	Office Building
C-212-A	Main Guard Post (Gate 15)
C-215	Portals 18 and 19
C-216	Post 47
C-217	Post 43
C-220-A	Power Distribution System
C-220-D1	Bell Telephone System
C-220-D2	Pax Telephone System
C-230-A	Sanitary Water System
C-230-B	Sanitary Sewer System
C-230-C	Storm Sewer System
C-230-D	Chilled Water System
C-230-E	Plant (Process) Water System
C-230-F	Process Wastewater System

1. Excludes certain DOE Material Storage Areas (DMSAs) within selected facilities, as identified in Appendix A of the lease agreement, which have been retained by DOE.

Table 2.1-1. Buildings and structures leased to USEC. (Continued)

Paducah Facilities Leased to USEC[1]	
Facility	Description
C-230-G	Recirculating Cooling Water System
C-230-H	High-Pressure Fire Water System
C-230-J	Process Waste Heat Utilization System
C-232-A	Nitrogen System
C-232-B	Compressed Air System
C-232-C	Acetylene/Oxygen System
C-232-D	Steam Distribution System
C-232-E	Natural Gas System
C-300	Central Control Building
C-300-531	Instrumentation Tunnel
C-300-533	Instrumentation Tunnel
C-300-535	Instrumentation Tunnel
C-300-537	Instrumentation Tunnel
C-302	Operations Organization Data Center
C-303	Supervisory Control and Data Acquisition Systems Building
C-304	Training and Cascade Office Building
C-310	Purge and Product Building
C-310-331	Enclosed Bridge
C-310-410	Tie Line
C-310-A	Product Withdrawal Building
C-310-B	Mobile Office
C-315	Surge and Waste Building
C-315-331	Tie Line
C-320	Communication Building
C-331	Process Building
C-331-333	Enclosed Bridge
C-331-333	Tie Line
C-331-335	Tie Line
C-331-410	Tie Line
C-333	Process Building
C-333-A	Feed Vaporization Facility
C-335	Process Building
C-335-337	Enclosed Building
C-335-337	Tie Line
C-337	Process Building
C-337-A	Feed Vaporization Facility
C-350	Drying Agent Storage Building
C-360	Toll Transfer and Sampling Building

1. Excludes certain DOE Material Storage Areas (DMSAs) within selected facilities, as identified in Appendix A of the lease agreement, which have been retained by DOE.

Table 2.1-1. Buildings and structures leased to USEC. (Continued)

Paducah Facilities Leased to USEC[1]	
Facility	Description
C-375-E2	Oil Control Dam (East Drainage Ditch) KPDES 002
C-375-E3	Oil Control Dam (East Drainage Ditch) KPDES 010
C-375-E4	Oil Control Dam (East Drainage Ditch) KPDES 011
C-375-E5	Oil Control Dam (East Drainage Ditch) KPDES 012
C-375-N1	Oil Control Dam KPDES 003
C-375-S6	Oil Control Dam (South Drainage Ditch) KPDES 009
C-375-W7	Oil Control Dam (West Drainage Ditch) KPDES 008
C-400	Cleaning Building and Appurtenant Structures
C-400-A	Emergency Power for Critical Alarms
C-400-D	Lime Precipitation Unit
C-400-D	Ion Exchange Unit
C-406	Trichloroethylene Storage Tank
C-407	Nitric Acid Storage Tank
C-408	50-Ton Truck Scale
C-409	Stabilization Building
C-409-A	Storage Trailer
C-409-B	Storage Trailer
C-409-C	Storage Trailer
C-410-D	Fluorine Storage Facility
C-531	Switch House and Appurtenant Structures
C-531-1	Switch House
C-531-2	Switchyard
C-531-3A	Fire Valve House No. 1
C-531-3B	Fire Valve House No. 2
C-532	Relay House
C-533	Switch House and Appurtenant Structures
C-533-1	Switch House
C-533-2	Switchyard
C-533-3A	Fire Valve House No. 1
C-533-3B	Fire Valve House No. 2
C-533-3C	Fire Valve House No. 3
C-533-3D	Fire Valve House No. 4
C-535	Switch House and Appurtenant Structures
C-535-1	Switch House
C-535-2	Switchyard

1. Excludes certain DOE Material Storage Areas (DMSAs) within selected facilities, as identified in Appendix A of the lease agreement, which have been retained by DOE.

Table 2.1-1. Buildings and structures leased to USEC. (Continued)

Paducah Facilities Leased to USEC[1]	
Facility	Description
C-535-3A	Fire Valve House No. 1
C-535-3B	Fire Valve House No. 2
C-535-4	Test Shop (Maintenance Office)
C-536	Relay House
C-537	Switch House and Appurtenant Structure
C-537-1	Switch House and Appurtenant Structure
C-537-2	Switchyard
C-537-3A	Fire Valve House No. 1
C-537-3B	Fire Valve House No. 2
C-537-3C	Fire Valve House No. 3
C-537-3D	Fire Valve House No. 4
C-537-4	Test Shop
C-540	Oil Pump House and Appurtenant Structure
C-540-A	Oil Pump House
C-540-B	Oil Storage Tank (Northwest)
C-540-C	Oil Storage Tank (Southwest)
C-540-D	Oil Storage Tank (Northwest)
C-540-E	Oil Storage Tank (Southeast)
C-541	Oil Pump House and Appurtenant Structures
C-541-A	Oil Pump House
C-541-B	Oil Storage Tank (Northwest)
C-541-C	Oil Storage Tank (Southwest)
C-541-D	Oil Storage Tank (Northeast)
C-541-E	Oil Storage Tank (Southeast)
C-600	Steam Plant and Associated Utility Appurtenant Structures
C-601	Nitrogen Generator Building Addition
C-601-A	Steam Plant Fuel Storage Tank (Center)
C-601-B	Steam Plant Fuel Storage Tank (South)
C-601-C	Steam Plant Fuel Oil Pump House
C-601-D	Fuel Oil Storage Tank (North)
C-602	Coal Storage Yard
C-603-E	Nitrogen Storage Tank (East)
C-603-F	Nitrogen Storage Tank (Center)
C-603-G	Nitrogen Storage Tank (West)
C-604	Utilities Maintenance Building
C-604-A	Utilities Storage Building
C-605	Substation Building
C-606	Coal Crusher Building

1. Excludes certain DOE Material Storage Areas (DMSAs) within selected facilities, as identified in Appendix A of the lease agreement, which have been retained by DOE.

Table 2.1-1. Buildings and structures leased to USEC. (Continued)

Paducah Facilities Leased to USEC[1]

Facility	Description
C-607	Emergency Air Compressor Generator Building
C-611	Water Treatment Plant Distribution System and Appurtenant Structures
C-611-A	Building and Shop Storage
C-611-B	Head House
C-611-B1	Polymer Feed System Enclosure
C-611-C	Flocculator Basin
C-611-D	Settling Basin (Northeast)
C-611-E	Settling Basin (Northwest)
C-611-F	Settling Basin (Southeast)
C-611-F1	Secondary Coagulation Basin
C-611-F2	Chemical Feed Building for C-611-F1
C-611-G	Settling Basin (Southwest)
C-611-H	Filter Building and Pump Station
C-611-I	Clear Well
C-611-K	No. 4 Lagoon
C-611-O	Sanitary Water Storage Tank
C-611-P	Pump House
C-611-Q	36 Raw Water Line Booster Station
C-611-R	Water Tank-RCW Fire Water (High Pressure)
C-611-S	Corrosion Inhibitor Building
C-611-T	Booster Pump Station (Plant Water)
C-611-T-01	Temporary Office
C-611-U	Softening Facility (West)
C-611-V	Sludge Lagoon
C-611-W	Sludge Lagoon
C-611-X	Softening Facility (East)
C-611-Y	Recycle Lagoon
C-611-Z	Flocculator Basin
C-615	Sewage Disposal Plant, Collection System, and Appurtenant Structures
C-615-A	Primary Settling Tank
C-615-B	Final Settling Tank
C-615-C	Control Building
C-615-D	Digester
C-615-E	Trickling Filter
C-615-F	Trickling Filter
C-615-G	Sewage Lift Station
C-615-H	Sewage Lift Station
C-615-H1	Sewage Lift Station

1. Excludes certain DOE Material Storage Areas (DMSAs) within selected facilities, as identified in Appendix A of the lease agreement, which have been retained by DOE.

Table 2.1-1. Buildings and structures leased to USEC. (Continued)

Paducah Facilities Leased to USEC[1]	
Facility	Description
C-615-H2	Sewage Lift Station
C-615-J	Lift Station
C-615-K	Manhole
C-615-L	Oil Control Monitoring Station
C-615-M	Oil Control Structure
C-615-N	Oil Containment Lagoon
C-615-O	Oil Control Building
C-616	Liquid Pollution Abatement and Appurtenant Structures
C-616-A	Chemical Feed Building
C-616-B	Clarifier (East)
C-616-C	Lift Station
C-616-D	Sludge Vault and Valve Pit
C-616-E	Sludge Lagoon
C-616-F	Full Flow Lagoon
C-616-G	Sulfuric Acid Tank
C-616-H1	Ferrous Sulfate Storage Tank (East)
C-616-H2	Ferrous Sulfate Storage Tank (West)
C-616-J	Reduction Tank (East)
C-616-K	Service Building
C-616-L	Effluent Control Vault
C-616-M	Clarifier (West)
C-616-N	Reduction Tank (West)
C-616-P	Sludge Vault and Valve Pit
C-617-A	Effluent Control Station
C-617-B	Lagoon
C-620	Air Compressor Room
C-631	RCW Pump House and Appurtenant Structures
C-631-01	Pump House
C-631-02	Cooling Tower
C-631-03	Pump House (Firewater)
C-631-04	Blending Pump House
C-631-05	Blending Cooling Tower (West)
C-631-06	Blending Cooling Tower (East)
C-631-07	Maintenance Shop
C-631-08	Change House
C-631-09	Asbestos Crew Breakroom
C-631-10	Asbestos Crew Storage
C-633	RCW Pump House and Appurtenant Structures

1. Excludes certain DOE Material Storage Areas (DMSAs) within selected facilities, as identified in Appendix A of the lease agreement, which have been retained by DOE.

Table 2.1-1. Buildings and structures leased to USEC. (Continued)

Paducah Facilities Leased to USEC[1]

Facility	Description
C-633-1	Pump House
C-633-2A	Cooling Tower (South)
C-633-2B	Cooling Tower (North)
C-633-3	Blending Pump House
C-633-4	Blending Cooling Tower (North)
C-633-5	Blending Cooling Tower (South)
C-633-6	Sand Filter Building
C-635	RCW Pump House and Appurtenant Structure
C-635-1	Pump House and Piping
C-635-2	Cooling Tower
C-635-3	Blending Pump House
C-635-4	Blending Cooling Tower (North)
C-635-5	Blending Cooling Tower (South)
C-635-6	Process Waste Heat Utilization Pump House
C-637	RCW Pump House and Appurtenant Structures
C-637-1	Pump House
C-637-2A	Cooling Tower (South)
C-637-2B	Cooling Tower (North)
C-637-3	Blending Pump House
C-637-4	Blending Cooling Tower (North)
C-637-5	Blending Cooling Tower (South)
C-637-6	Sand Filter Building
C-710	Technical Services Building and Appurtenant Structures
C-710-A	Gas Cylinder Storage Building
C-710-B	Storage Facility
C-711	Gas Manifold
C-712	Acid Neutralization Pit
C-720	Maintenance and Stores Building and Appurtenant Structures
C-720-A	Compressor Shop Addition
C-720-B	Machine Shop Addition
C-720-C	Convertor Shop Addition
C-720-C1	Barrier Storage
C-720-D	Transformer Building
C-720-E	Change House Addition
C-720-G	PEM Receiving Building
C-720-H	Warehouse
C-720-J	Air Lock
C-720-K	Instrument Shop Addition

1. Excludes certain DOE Material Storage Areas (DMSAs) within selected facilities, as identified in Appendix A of the lease agreement, which have been retained by DOE.

Table 2.1-1. Buildings and structures leased to USEC. (Continued)

Paducah Facilities Leased to USEC[1]

Facility	Description
C-720-L	Oxygen Facility
C-720-M	Field Instrument Trailer
C-720-N	Railroad Scale House
C-720-N1	Railroad Classification Yard
C-720-P	Instrument Maintenance Trailer
C-720-Q	Instrument Maintenance Storage Trailer
C-721	Gas Manifold Storage
C-722	Acid Neutralization Pit
C-724-A	Carpenter Shop Annex
C-724-B	Carpenter Shop
C-724-C	Paint Shop
C-724-D	Lumber Storage Building
C-725	Paint Shop
C-726	Sandblast Building
C-727	Heat Treating Facility
C-728	Motor Cleaning Facility
C-729	Acetylene Building
C-730	Maintenance Service Building and Adjacent Parking Lot
C-731	Railroad Repair Equipment Storage Building
C-732	Maintenance Materials Storage Building
C-740	Material Yard
C-740-A	Semi-Trailer Unloading Facility
C-740-B	Oil Drum Storage Shelter
C-740-C	Miscellaneous Materials Storage Building
C-741	Mobile Equipment Building
C-742	Cylinder Storage Building
C-742-B	Drying Agent Cylinder Storage
C-743	Office Building
C-743-T-06	Temporary Office
C-743-T-07	Temporary Office
C-743-T-08	Temporary Office
C-743-T-11	Temporary Office
C-743-T-12	Temporary Office
C-743-T-13	Temporary Office
C-743-T-14	Temporary Office
C-743-T-15	Temporary Office
C-743-T-16	Temporary Office
C-744	Lubrication Building

1. Excludes certain DOE Material Storage Areas (DMSAs) within selected facilities, as identified in Appendix A of the lease agreement, which have been retained by DOE.

Table 2.1-1. Buildings and structures leased to USEC. (Continued)

Paducah Facilities Leased to USEC[1]	
Facility	Description
C-745-A	2½-Ton Cylinder Yards[b]
C-745-B	10-Ton Cylinder Yards[c]
C-745-B1	Cylinder Storage Yard Office
C-745-E	Kellogg Storage Yard
C-745-H	Safeguard Cylinder Storage Yard
C-745-J	Foreign Cylinder Storage Yard
C-745-Q	Cylinder Storage Yard[d]
C-745-R	Cylinder Storage Yard
C-745-U	Cylinder Storage Yard
C-746-G	Electric Equipment Storage
C-746-H1	PEM Storage Slab
C-746-H2	PEM Storage Slab
C-746-L	Tractor Storage
C-746-Q1	High Assay Waste Storage Facility
C-750	Garage and Appurtenant Structures
C-751	Fuel Dispensing Facility
C-800	Motorcycle Parking Area
C-801	Ohio Avenue Bus Shelter
C-810	Parking Area (C-100)
C-811	Parking Area (C-720)
C-RWS	Raw Water Pumping Station and Pipelines

a. Capital improvement constructed by USEC on leased premises.
b. With exception of DOE cylinder storage in Rows A - F, AA - FF, R, and RR.
c. With exception of DOE cylinder storage in Rows C, E, I, N, O, R, S, X, CC, EE, and II.
d. With exception of DOE tail cylinder storage in Rows A and V.

1. Excludes certain DOE Material Storage Areas (DMSAs) within selected facilities, as identified in Appendix A of the lease agreement, which have been retained by DOE.

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Table 2.1-1A. Buildings and structures retained by DOE.

Paducah Facilities Retained by DOE

Facility	Description
C-103	DOE Site Office
C-EXP	Change House
C-200	Underground Storage Tanks
C-204	Disintegrator Building
C-218	Firing Range
C-301	Storage Building
C-340	Reduction and Metals Facility
C-340-A	Powder Building
C-340-B	Metals Building
C-340-C	Slag Building
C-340-D	Magnesium Storage Building
C-340-E	Emergency Power for Critical Alarms
C-342	Ammonia Dissociator and Storage Facility
C-342-A	Ammonia Dissociator Addition
C-370-E	Water Quality Monitoring Station (Little Bayou Creek) (Inactive)
C-370-W	Water Quality Monitoring Station (Big Bayou Creek) (Inactive)
C-375-WB	KPDES Outfall Surface Runoff from West Part of Plant Outfall 015
C-375-W9	KPDES Outfall C-616 Chromium Reduction Facility Outfall 001
C-400	Gold Dissolver Storage Tank[a]
C-400	Technetium Storage Tank[a]
C-400 & C-404	Underground Transfer Line[a]
C-402	Lime House
C-403	Neutralizing Pit
C-404	Low-Level Radioactive Waste Burial Ground
C-405	Contaminated Items Incinerator
C-410	Feed Plant [illegible]ourtenant Structures
C-410-A	Hydrogen Hol[illegible]
C-410-B	Sludge Lagoon
C-410-C	Hydrofluoric Aci[illegible]eutralization Building
C-410-E	Hydrofluoric Acid Emergency Holding Pond
C-410-F	Hydrofluoric Acid Storage Building (North)
C-410-G	Hydrofluoric Acid Storage Building (Center)
C-410-H	Hydrofluoric Acid Storage Building (South)
C-410-I	Ash Receiver Shelter
C-410-J	Hydrofluoric Acid Storage Building (East)
C-411	Cell Maintenance Building
C-415	Feed Plant Storage Building
C-416	Equipment Cleaning Facility
C-420	Greensalt Plant
C-603-A	Nitrogen Manifold Building
C-603-B	Nitrogen Storage Tank

Table 2.1-1A. Buildings and structures retained by DOE. (Continued)

Paducah Facilities Retained by DOE

Facility	Description
C-603-C	Nitrogen Receiver (North)
C-603-D	Nitrogen Receiver (South)
C-603-H	Nitrogen Generator - Control House
C-603-I	Nitrogen Generator - Tower Area
C-611-M	North Concrete Sanitary Water Storage Tank
C-611-N	South Concrete Sanitary Water Storage Tank
C-623	North Ground Water Treatment Building
C-632-B	Acid Storage Tank
C-634-B	Acid Storage Tank
C-710	Underground Storage Tanks
C-720	Underground Petroleum Naptha Pipe
C-720	TCE Degreaser (Inactive)
C-730-D, E, F, H	M-K Ferguson Offices
C-730-G	Ebasco Offices
C-733	Waste Oil and Chemical Storage Facility
C-743-T-01	Environmental Restoration Office
C-743-T-02	Environmental Restoration Office
C-743-T-03	Office Trailer
C-743-T-04	Change House
C-743-T-05	Change House
C-743-T-09	ER Office
C-743-T-17	Field Laboratory
C-745-C	14-Ton Cylinder Yard[b]
C-745-D	Cylinder Storage Yard
C-745-F	Cylinder Storage Yard
C-745-G	Cylinder Storage Yard
C-745-K	Cylinder Storage Yard
C-745-L	Cylinder Storage Yard[c]
C-745-M	Cylinder Storage Yard[d]
C-745-N	Cylinder Storage Yard
C-745-P	Cylinder Storage Yard
C-745-S	Cylinder Storage Yard
C-745-T	Cylinder Storage Yard
C-745-V	L Shaped Area West and North of C-745-F Cylinder Storage Yard (approximately 6.5 acres)
C-746-A	North Warehouse
C-746-A1	UST
C-746-A2	UST
C-746-A3	Trash Sorting and Procesing Facility
C-746-B	South Warehouse
C-746-C	Clean Scrap Yard (North)

Table 2.1-1A. Buildings and structures retained by DOE. (Continued)

Paducah Facilities Retained by DOE

Facility	Description
C-746-C1	Clean Scrap Yard (South)
C-746-D	Classified Scrap Yard
C-746-E	Contaminated Scrap Yard (North)
C-746-E1	Contaminated Scrap Yard (South)
C-746-F	Classified Scrap Burial Yard
C-746-H3	PEM Storage Slab
C-746-H4	Nickel Ingot Storage Pad
C-746-K	Sanitary Landfill (Abandoned)
C-746-M	Waste Askarel Storage Facility
C-746-P	Scrap Metal Yard (East)
C-746-P1	Scrap Metal Yard (West)
C-746-Q	Greensalt Storage Building
C-746-R	Waste Organic Storage Area
C-746-S, Cell 1	Sanitary Landfill
C-746-S, Cell 2	Sanitary Landfill
C-746-S, Cell 3	Sanitary Landfill
C-746-S1	Landfill Service Building
C-746-T	Inert Landfill
C-746-V	ER Storage Facility
C-747	Burial Area (Inactive)
C-747-A	Burial Area (Inactive)
C-747-B	Burial Area (Inactive)
C-747-C	Oil Land Farm Area
C-748-A	KOW Disposal Area (Inactive)
C-748-B	Burial Area (Inactive)
C-747 C-748B Area	Vacant Area (Area bordered by Virginia Ave. To the North, 6th Street to the East, Tennessee to the South, and 4th Street to the West surrounding C-748B and C-747
C-749	Uranium Scrap Burial Yard (Inactive)
C-750-D	Underground Storage Tank
C-752	RA Waste Holding Facility
C-752-B	Decontamination Pad
C-752-C	Off-site Decontamination Pad
C-753-A	TSCA Storage Facility (Future)
Z-SWMU-11	C-400 Trichloroethylene Leak Site
Z-SWMU-12	C-747-A UF_4 Drum Yard
Z-SWMU-30	C-747-A Burn Area
Z-SWMU-31	C-720 Compressor Pit Water Storage Tank
Z-SWMU-74	C-340 PCB Spill Site
Z-SWMU-76	C-632-B H2SO4 Storage Tank
Z-SWMU-77	C-634-B H2SO4 Storage Tank
Z-SWMU-91	UF_6 Cylinder Drop Test Area
Z-SWMU-92	Fill Area for Dirt from C-420 PCB Spill Site

Table 2.1-1A. Buildings and structures retained by DOE. (Continued)

Paducah Facilities Retained by DOE	
Facility	Description
Z-SWMU-93	Concrete Disposal
Z-SWMU-96	Cooling Tower Scrap Wood Pile
Z-SWMU-100	Fire Training Area
Z-SWMU-137	C-746-A Inactive PCB Transformer/Sump
Z-SWMU-138	C-100 South Side Lawn (Filled W/C-611 Sludge)
Z-SWMU-145	Residential Landfill Borrow Area
Z-SWMU-159	C-746 H3PAD
Z-SWMU-160	C-745 Cylinder Yard Spoils Area - PCB Soil Contamination
Z-SWMU-162	C-617-A Sanitary Water Line-Soil Backfill
Z-SWMU-169	C-410-E HF Vent Surge Protection Tank
Z-SWMU-170	C-729 Acetylene Building Drain Pits
Z-SWMU-183	McGraw UST
Z-SWMU-XXX	Solid Waste Management Units Referenced on the Following Drawings C5E-16924-M01 Rev 0 LMES C5E-16924-M02 Rev 4 LMES C5E-16924-9016 Sheet 16/49 CH2M Hill C5E-16924-9021 Sheet 21/49 CH2M Hill C5E-16924-9034 Sheet 34/49 CH2M Hill
Outfall 014	KPDES Outfall, C-611 Water Treatment Backwash

a. Building C-400 is leased to USEC, and DOE retains the tanks and transfer line.
b. Empty cylinders transfer to USEC but remain in C-745-C.
c. With exception of cylinders stored in Rows II-A, II-B, and JJ - ZZ.
d. With exception of cylinders stored in Rows B - L.

Use of facilities includes areas necessary for ingress, egress, and proper maintenance.

All existing and future DOE monitoring wells, piezometers, extraction wells, and borings (temporary or permanent) used for the purpose 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. 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. At the request of LMUS or USEC, DOE will perform sampling as a reimbursable service for USEC.

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

Table 2.1-1B. Buildings and Structures Owned by USEC

Paducah Facilities Owned by USEC[a]

Facility	Description
C-205	Respirator Issue Building
C-410-K	Fluorine Building
C-611-A1	Activated Carbon Storage Building
C-611-F3	Activated Carbon Storage Building
C-709	Plant Laboratory Annex [b]
C-746-X	Electrical Equipment Storage Building
C-754	Low-Level Waste Storage
C-754-A	Low-Level Waste Storage
C-757	Solid and Low-Level Waste Processing Facility

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

[b] Building under construction.

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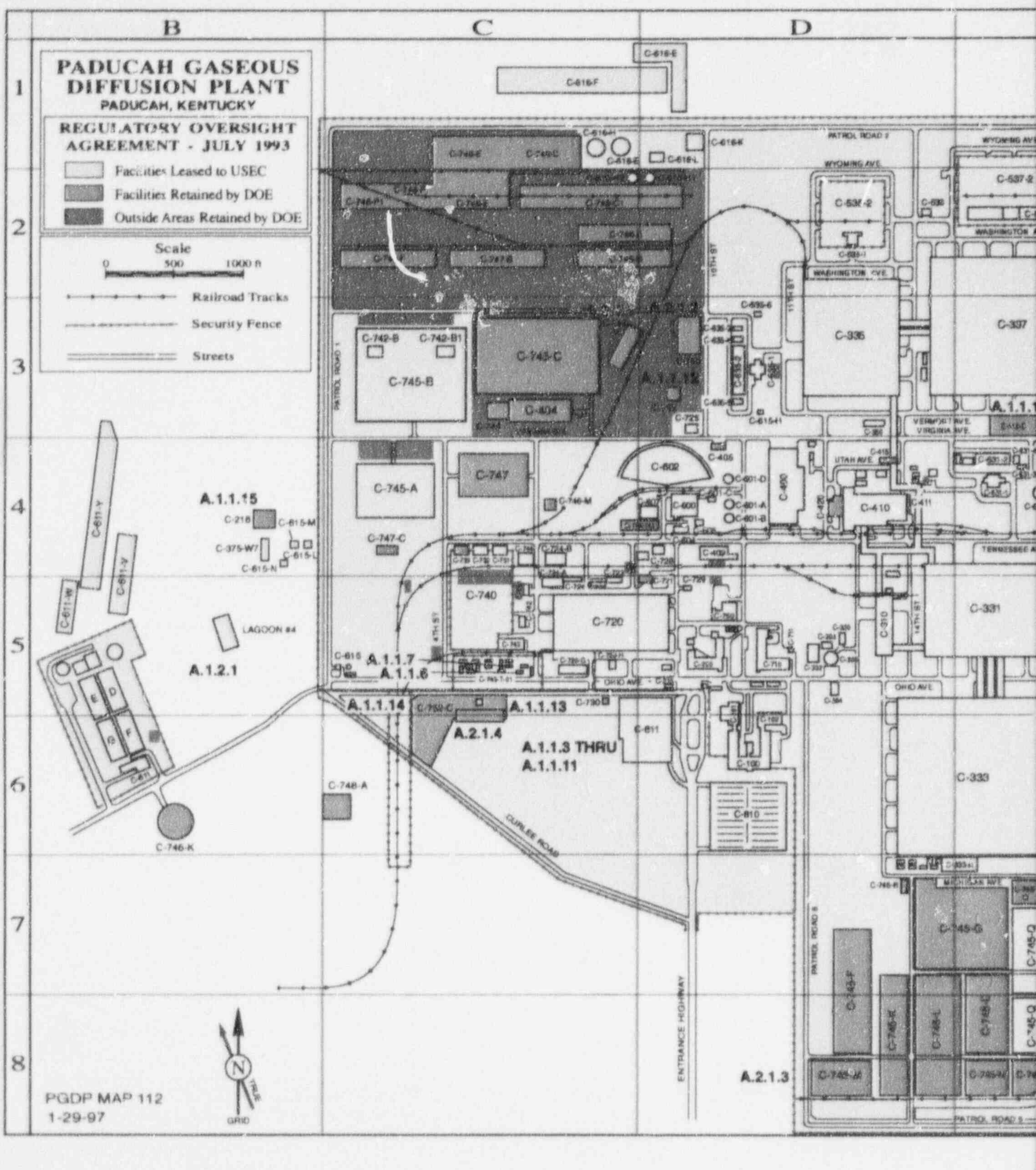
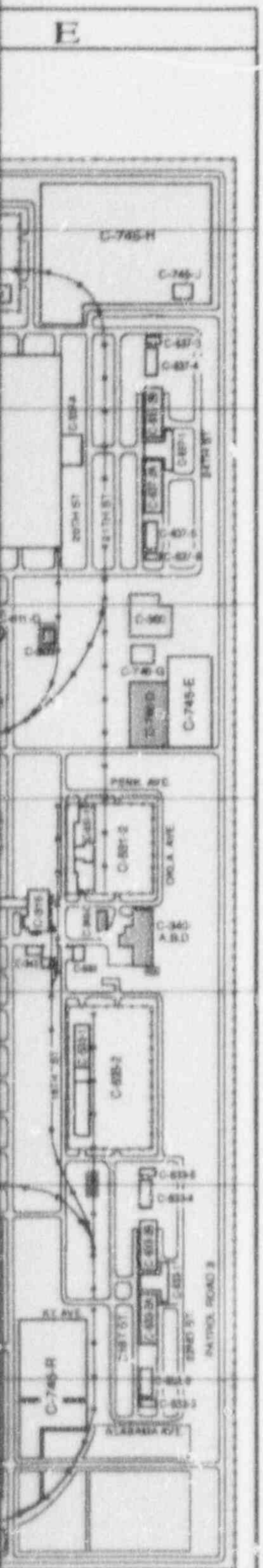


Figure 2.1-4. PGDP building lease status.



BUILDING DIRECTORY

BUILDING NUMBER		MAP LOCATION
C-100	ADMINISTRATION BLDG	D-6
C-100-A	OFFICE TRAILER	D-6
C-101	CAFETERIA	D-5
C-102	HOSPITAL	D-6
C-200	GUARD & FIRE HEADQTTRS	D-5
C-200-A	SECURITY & FIRE TRAINING	
C-201	EMERGENCY EQUIPMENT STOR BLDG	
C-202	GUARD TRAINING BLDG	
C-203	EMERG VEHICLE SHELTER	
C-204	DISINTEGRATOR BLDG	
C-206	PUMPER DRAFTING PIT	
C-212	OFFICE BLDG	D-5
C-212-A	MAIN GUARD POST (GATE 15)	
C-215	PORTALS 18 & 19	D-5
C-216	POST 47	
C-217	POST 43	
C-218	FIRING RANGE	
C-300	CENTRAL CONTROL BLDG	D-5
C-301	FIRE TRAINING BLDG	E-4
C-302	OPERATIONS DIV DATA CENTER	D-5
C-303	SUPV CNTRL & DATA SYS BLDG	D-5
C-304	TRAIN & CASCADE OFFICE BLDG	D-5
C-310	PURGE & PRODUCT BLDG	D-5
C-310-A	PRODUCT WITHDRAWAL BLDG	D-5
C-310-331	ENCLOSED BRIDGE	
C-310-331	TIE LINE	
C-310-410	TIE LINE	
C-315	SURGE & WASTE BLDG	E-5
C-315-331	TIE LINE	
C-320	COMMUNICATION BLDG	D-5
C-331	PROCESS BLDG	E-5
C-331-333	ENCLOSED BRIDGE	
C-331-333	TIE LINE (E)	
C-331-333	TIE LINE (W)	
C-331-333	TIE LINE	
C-331-410	TIE LINE	
C-333	PROCESS BLDG	E-6
C-333-A	FEED VAPORIZATION FAC	E-7
C-335	PROCESS BLDG	D-3
C-335-337	ENCLOSED BRIDGE	
C-335-337	TIE LINE (N)	
C-335-337	TIE LINE (S)	
C-337	PROCESS BLDG	E-3
C-337-A	FEED VAPORIZATION FAC	E-3
C-340-A	POWER BLDG	E-5
C-340-B	METALS BLDG	
C-340-C	SLAG BLDG	E-5
C-340-D	MAGNESIUM STORAGE BLDG	
C-340-E	EMERG POWER FOR CRIT ALARMS	
C-342	AMMONIA DISSOCIATOR/STOR FAC	E-6
C-342-A	AMMONIA DISSOCIATOR ADD	
C-350	DRYING AGENT STOR BLDG	D-4
C-360	TOLL TRANSF & SAMPLING BLDG	E-4
C-370-E	WATER QUAL MONIT/L BAYOU CK	*
C-370-W	WATER QUAL MONIT/B BAYOU CK	*
C-375-N1	OIL CONTROL DAM	
C-375-E2	OIL CONTROL DAM	
C-375-E3	OIL CONTROL DAM	
C-375-E4	OIL CONTROL DAM	
C-375-E5	OIL CONTROL DAM	
C-375-E6	OIL CONTROL DAM	
C-375-K7	OIL CONTROL DAM	
C-375-W8	OIL CONTROL DAM	
C-375-W9	OIL CONTROL DAM	
C-400	CLEANING BLDG	D-4
C-400-A	EMERG POWER FOR CRIT ALARMS	
C-401	NEUTRALIZING PIT	
C-402	LIME HOUSE	
C-403	NEUTRALIZING PIT	
C-404	L-L RAD WASTE BURIAL GROUND	C-3
C-405	CONTAMINATED ITEM INCINERATOR	D-4
C-406	TRICHLOROETHYLENE STOR TANK	
C-407	NITRIC ACID STOR TANK	
C-408	50 TON TRUCK SCALE	
C-409	STABILIZATION BLDG	D-4
C-410	FEED PLANT	D-4
C-410-A	HYDROGEN HOLDER	
C-410-B	SLUDGE LAGOON	
C-410-C	HYDROFLUORIC ACID NEUT BLDG	
C-410-D	FLUORINE STOR BLDG	
C-410-E	HYDROFLUORIC ACID EMERG H₂O POND	
C-410-F	HYDROFLUORIC ACID STOR BLDG (N)	
C-410-G	HYDROFLUORIC ACID STOR BLDG (C)	
C-410-H	HYDROFLUORIC ACID STOR BLDG (S)	
C-410-I	ASH RECEIVER SHELTER	
C-410-J	HYDROFLUORIC ACID STOR BLDG (E)	
C-411	CELL MAINT BLDG	
C-415	FEED PLANT STOR BLDG	
C-416	EQUIP CLEANING FAC	
C-420	GREENSALT PLANT	D-4
C-531-1	SWITCH HOUSE	E-5
C-531-2	SWITCHYARD	E-5
C-531-3A	FIRE VALVE HOUSE NO 1	
C-531-3B	FIRE VALVE HOUSE NO 2	
C-532	RELAY HOUSE	E-5
C-533-1	SWITCH HOUSE	E-6
C-533-3A	FIRE VALVE HOUSE NO 1	
C-533-3B	FIRE VALVE HOUSE NO 2	
C-533-3C	FIRE VALVE HOUSE NO 3	
C-533-3D	FIRE VALVE HOUSE NO 4	
C-535-1	SWITCH HOUSE	D-2
C-535-2	SWITCHYARD	D-2
C-535-3A	FIRE VALVE HOUSE NO 1	
C-535-3B	FIRE VALVE HOUSE NO 2	
C-536-4	TEST SHOP	
C-536	RELAY HOUSE	D-2
C-537-1	SWITCH HOUSE	E-2
C-537-2	SWITCHYARD	E-2
C-537-3A	FIRE VALVE HOUSE NO 1	
C-537-3B	FIRE VALVE HOUSE NO 2	
C-537-3C	FIRE VALVE HOUSE NO 3	
C-537-3D	FIRE VALVE HOUSE NO 4	
C-537-4	TEST SHOP	
C-540-A	OIL PUMP HOUSE	
C-540-B	OIL STOR TANK (NW)	
C-540-C	OIL STOR TANK (SW)	
C-540-D	OIL STOR TANK (NE)	
C-540-E	OIL STOR TANK (SE)	
C-541-A	OIL PUMP HOUSE	
C-541-B	OIL STOR TANK (NW)	
C-541-C	OIL STOR TANK (SW)	
C-541-D	OIL STOR TANK (NE)	
C-541-E	OIL STOR TANK (SE)	
C-600	STEAM PLANT	D-4
C-601	NITROGEN GEN BLDG ADD	
C-601-A	STEAM PLT FUEL-STOR TANK (C)	D-4
C-601-B	STEAM PLT FUEL-STOR TANK (S)	D-4
C-601-C	STEAM PLT FUEL OIL PUMP HSE	D-4
C-601-D	FUEL OIL STOR TANK (N)	D-4
C-602	COAL STORAGE YARD	D-4
C-603-A	NITROGEN MANIFOLD BLDG	
C-603-B	NITROGEN STOR TANK	
C-603-C	NITROGEN RECEIVER (N)	
C-603-D	NITROGEN RECEIVER (S)	
C-603-E	NITROGEN STOR TANK (E)	
C-603-F	NITROGEN STOR TANK (C)	
C-603-G	NITROGEN STOR TANK (W)	
C-603-H	NITROGEN GEN-CNTRL HSE	
C-603-I	NITROGEN GEN-TOWER AREA	
C-604	UTILITIES MAINT BLDG	D-4
C-605	SUBST BLDG	D-4
C-606	COAL CRUSHER BLDG	
C-607	EMERG AIR COMPRESSOR GEN BLDG	D-4
C-611	WATER TREATMT PLT	
C-611-A	BLDG & SHOP STOR	
C-611-B	HEAD HOUSE	
C-611-B1	POLYMER FEED SYS ENCL	
C-611-C	FLOCULATOR BASIN	
C-611-D	SETTLING BASIN (NE)	B-5
C-611-E	SETTLING BASIN (NW)	B-5
C-611-F	SETTLING BASIN (SE)	B-6
C-611-F1	SECONDARY COAG BASIN	
C-611-F2	CHEM FEED BLDG FOR C-611-F1	
C-611-G	SETTLING BASIN (SW)	B-6
C-611-H	FILTER BLDG & PUMP STA	
C-611-I	CLEAR WELL	
C-611-M	N CONC SAN WATER STOR TANK	
C-611-N	S CONC SAN WATER STOR TANK	
C-611-O	SAN WATER STOR TANK	E-4
C-611-P	PUMP HSE	
C-611-Q	36" RAW WATER LINE BOOSTER STA	
C-611-R	WAT TANK-RCW FIRE WATER	E-4
C-611-S	CORROSION INHIBITOR BLDG	
C-611-T	BOOSTER PUMP STA	
C-611-U	SOFTENING FAC (W)	
C-611-V	SLUDGE LAGOON	B-5
C-611-W	SLUDGE LAGOON (ABAN)	B-5
C-611-X	SOFTENING FAC (E)	
C-611-Y	RECYCLE LAGOON	B-4
C-611-Z	FLOCULATOR BASIN	
C-615	SEWAGE DISPOSAL PLANT	C-5
C-615-A	PRIMARY SETTLING TANK	
C-615-B	FINAL SETTLING TANK	
C-615-C	CONTROL BLDG	
C-615-D	DIGESTER	
C-615-E	TRICKLING FILTER	
C-615-F	SLUDGE BEDS	
C-615-G	SEWAGE LIFT STA	
C-615-H	SEWAGE LIFT STA	D-3
C-615-H1	SEWAGE LIFT STA	
C-615-H2	SEWAGE LIFT STA	
C-615-J	CHROMATE LIFT STA (ABAN)	
C-615-K	CHROMATE LIFT STA (ABAN)	
C-615-L	OIL CNTRL MONIT STA	C-4
C-615-M	OIL CNTRL STRUCTURE	
C-615-N	OIL CONTAINMT LAGOON	
C-616	LIQ POLLUTION ABATENT FAC	
C-616-A	CHEM FEED BLDG	
C-616-B	CLARIFIER-EAST	C-2
C-616-C	LIFT STA	
C-616-D	SLUDGE VAULT & VALVE PIT	
C-616-E	SLUDGE LAGOON	D-1
C-616-F	FULL FLOW LAGOON	C-1
C-616-G	SULFURIC ACID TANK	
C-616-H1	FERR SULF STOR TANK (E)	D-2
C-616-H2	FERR SULF STOR TANK (W)	
C-616-J	REDUCTION TANK (E)	
C-616-K	SERV BLDG	D-1
C-616-L	EFFLUENT CNTRL VAULT	D-2
C-616-M	CLARIFIER (W)	C-2
C-616-N	REDUCTION TANK (W)	
C-616-P	SLUDGE VAULT & VALVE PIT	
C-620	AIR COMPRESSOR ROOM	
C-631-1	PUMP HOUSE	E-4
C-631-2	COOLING TWR	E-4
C-631-3	PUMP HOUSE (FIREWATER)	E-4
C-631-4	BLENDING PUMP HOUSE	E-4
C-631-5	BLENDING COOLING TWR (W)	
C-631-6	BLENDING COOLING TWR (E)	
C-632-B	ACID STOR TANK	
C-633-1	PUMP HOUSE	E-7
C-633-2A	COOLING TWR (S)	E-7
C-633-2B	COOLING TWR (N)	E-7
C-633-3	BLENDING PUMP HOUSE	E-7
C-633-4	BLENDING COOLING TWR (N)	
C-633-5	BLENDING COOLING TWR (S)	
C-633-6	SAND FILTER BLDG	
C-634-B	ACID STOR TANK	
C-635-1	PUMP HOUSE & PIPING	D-3
C-635-2	COOLING TWR	D-3
C-635-3	BLENDING PUMP HOUSE	
C-635-4	BLENDING COOLING TWR (N)	
C-635-5	BLENDING COOLING TWR (S)	
C-635-6	PROCESS WASTE PUMP HSE	
C-637-1	PUMP HOUSE	E-3
C-637-2A	COOLING TWR (S)	E-3
C-637-2B	COOLING TWR (N)	E-3
C-637-3	BLENDING PUMP HOUSE	E-2
C-637-4	BLENDING COOLING TWR (N)	
C-637-5	BLENDING COOLING TWR (S)	
C-637-6	SAND FILTER BLDG	
C-710	TECH SERV BLDG	D-5
C-710-A	GAS CYL STOR BLDG	
C-711	GAS MANIFOLD	D-5
C-712	ACID NEUT PIT	
C-720	MAINT & STORES BLDG	
C-720-A	COMPRESSOR SHOP ADD	
C-720-B	MACHINE SHOP ADD	
C-720-C	CONVERTER SHOP ADD	
C-720-C1	BARRIER STOR	
C-720-D	TRANSF BLDG	
C-720-E	CHANGE HOUSE ADD	
C-720-G	PEM RECEIVING BLDG	
C-720-H	WAREHOUSE	
C-720-J	AIR LOCK	
C-720-K	INSTRUMENT SHOP ADD	
C-720-L	OXYGEN FAC	
C-720-M	FIELD INSTRUMT TRAILER	
C-720-N	RR SCALE HOUSE	**
C-720-N1	RR CLASSIFICATION YD	**
C-720-P	INSTRUMT MAINT TRAILER	
C-721	GAS MANIFOLD STOR	D-5
C-722	ACID NEUT PIT	
C-724-A	CARPENTER SHOP ANNEX	C-4
C-724-B	CARPENTER SHOP	C-4
C-724-C	PAINT SHOP	
C-724-D	LUMBER STOR BLDG	
C-725	PAINT SHOP	
C-726	SANDBLAST BLDG	D-4
C-727	HEAT TREAT FAC	D-5
C-728	MOTOR CLEANING FAC	
C-729	ACETYLENE BLDG	D-5
C-730	MAINT SERV BLDG	
C-731	RR REPAIR EQUIP STOR BLDG	C-4
C-732	MAINT MATERIALS STOR BLDG	C-4
C-733	WASTE OIL & CHEM STOR FAC	C-4
C-740	MATERIAL YARD	C-4
C-740-A	SEMITRAILER UNLOADING FAC	
C-740-B	OIL DRUM STOR SHELTER	
C-740-C	MISC MATERIALS STOR YD	
C-741	MOBILE EQUIP BLDG	C-4
C-742	CYL STOR BLDG	C-4
C-742-B	DRYING AGENT CYL STOR	C-3
C-743	OFFICE BLDG	C-4
C-744	LUBRICATION BLDG	C-4
C-745-A	2-1/2 TON CYL YD	
C-745-B	10-TON CYL YD	C-3
C-745-B1	CYL STOR YD OFFICE	
C-745-C	14-TON CYL YD	C-3
C-745-D	CYL STOR YD	E-8
C-745-E	KELLOGG STOR YD	
C-745-F	CYL STOR YD	D-7
C-745-G	CYL STOR YD	
C-745-H	SAFEGUARD CYL STOR YD	
C-745-J	FOREIGN CYL STOR YD	E-2
C-745-K	CYL STOR YD	D-8
C-745-L	CYL STOR YD	E-8
C-745-M	CYL STOR YD	
C-746-A	N WAREHSE (METAL FURN/SCRAP RECOV)	C-2
C-746-B	S WAREHSE	C-2
C-746-C	CLEAN SCRAP YD (N)	C-2
C-746-C1	CLEAN SCRAP YD (S)	
C-746-D	CLASSIFIED SCRAP YD	D-4
C-746-E	CONTAMINATED SCRAP YD (N)	C-2
C-746-E1	CONTAMINATED SCRAP YD (S)	C-2
C-746-F	CLASSIFIED SCRAP BUR YD	C-2
C-746-G	ELEC EQUIP STOR	E-4
C-746-H1	PEM STOR SLAB	
C-746-H2	PEM STOR SLAB	
C-746-H3	PEM STOR SLAB	
C-746-H4	NICKEL INGOT STOR PAD	
C-746-K	SAN LANDFILL (ABAN)	B-6
C-746-L	TRACTOR STOR	
C-746-M	WASTE ASKAREL STOR FAC	C-4
C-746-P	SCRAP METAL YD (E)	C-2
C-746-P1	SCRAP METAL YD (W)	C-2
C-746-Q	GREENSALT DRUM STOR BLDG	E-7
C-746-R	ORGANIC WASTE STOR AREA	D-7
C-746-S	NEW SAN LANDFILL AREA	
C-746-S1	LANDFILL SERVE BLDG	
C-746-T	INDUSTRIAL LANDFILL	
C-747	BURIAL AREA (INACT)	C-3
C-747-A	BURIAL AREA (INACT)	C-2
C-747-B	BURIAL AREA (INACT)	C-4
C-747-C	OIL LANDFARM AREA	C-4
C-748-A	KOW DISPOSAL AREA (INACT)	C-6
C-748-B	BURIAL AREA (INACT)	C-4
C-749	URAN SCRAP BURIAL YD (INACT)	C-3
C-750	GARAGE	D-5
C-800	ENTRANCE HWAY BUS SHELTER	
C-801	OHIO DR BUS SHELTER	
C-810	PARKING AREA (C-100)	D-6
C-811	PARKING AREA (C-720)	D-6

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3.2.5.1 Conductivity Monitoring

Each autoclave is provided with redundant conductivity cells to monitor the atmosphere within the autoclave to detect the presence of any HF that would result from UF_6 that might leak from a cylinder. The conductivity cell constantly withdraws a portion of the steam vapor, condenses it, and measures the electrical conductivity of the condensate. UF_6 leakage into the autoclave will form HF, which results in high conductivity, which in turn operates an interlock system to isolate the autoclave by closing the redundant inlet steam valves, evacuation valves, feed line valves, vent valves, condensate drain valves, and conductivity valves to contain any UF_6 release products within the autoclave. Procedural controls dictate that at least one of the conductivity cells must be in operation at all times to detect any small leaks of UF_6.

3.2.5.2 Water Inventory Control

As mentioned in Section 3.2.3, the maximum pressure generated in an autoclave from an accidental UF_6 release and subsequent reaction with the available water is best controlled by limiting the water in the autoclave shell. Redundant condensate level probes, LE-527-**A and LE-527-**B, are mounted in the 3-in. drain pipe slightly below the autoclave. These probes are referred to as the primary condensate probes. If the ultrasonic probes detect high water levels, the steam supply isolation valves close to limit the total water in the autoclave. To prevent false alarms, a time delay feature requires the system to be in the alarm state for five seconds before the alarm will initiate steam valve and thermovent line block valve closure. This system has been designated a system required to be included in the technical safety requirements (TSR) (see Figure 3.2-2). A secondary condensate probe, located lower in the condensate drain line provides an alarm before the condensate level reaches the primary probes. The secondary system is not a TSR system.

3.2.5.3 Autoclave Steam Pressure Control

The autoclave steam pressure control system is required to be included in the TSR and is used to stop the steam flow to the autoclave while heating a cylinder prior to reaching temperatures that could result in reaching its maximum allowable working pressure. If the autoclave pressure reaches 8 psig, the steam pressure control system closes the steam isolation valves and the thermovent line block valve and sounds an alarm. The components of this system are the pressure transmitters PT-514 and PT-515, pressure switches PSH-514 and PSH-515, steam supply isolation valves PV-520 and XV-524, and associated relays, solenoids and switches (see Figures 3.2-2 and 3.2-4). The thermovent line block valve is not covered by a TSR since the isolation function is accomplished by closing the steam isolation system.

3.2.5.4 Autoclave High Pressure Isolation System

The autoclave high pressure isolation system causes the autoclave to go into the containment mode and sound an alarm if the internal pressure of the autoclave reaches 15 psig. In addition, the system disables the hydraulic system required to open the autoclave shell preventing the autoclave from opening until the alarm condition has been cleared. This system is identified as a system required to be included in the TSR. The components of this system include the autoclave shell, head, and locking ring, pressure transmitters PT-514 and PT-515, pressure switches PSHH-514 and PSHH-515, containment block valves XV-504, CV-504, XV-505, CV-510, CV-511, XV-516, PV-520, XV-524, PV-525, XV-528, FV-529, XV-532, CV-533, and XV-565, and associated relays and switches, see Figures 3.2-2 and . ` 4

3.2.5.5 Autoclave Relief System

The autoclave relief system consists of the autoclave rupture disc PSE-518 and relief valve PSV-513, which vents pressure in excess of 200 psig (MAWP of the autoclave) to the atmosphere through a vent line through the roof (see Figure 3.2-2). The relief valve closes when the autoclave pressure drops below the MAWP to limit the amount of any release. This system is required to be included in the TSR.

3.2.5.6 UF_6 Detection System

Although the autoclaves are designed to contain a UF_6 release, UF_6 detection heads are installed above the autoclave head ring, the heated housing at the autoclave head, above the jet station piping, and in the piping trench. These systems consist of one detector each and will detect any leakage from the autoclave seal, the heated housing piping, the jet station piping, or the piping trench. If a leak is detected, an alarm is sounded locally at each autoclave and on the UF_6 detector alarm panel. The UF_6 detection systems located for the heated housings, jet station, and piping trench are designated as a system required to be included in the TSR (see Figures 3.2-5 and 3.2-6).

3.2.5.7 Autoclave Manual Isolation System

The autoclave manual isolation system contains three manual push buttons, one at the Operations Monitoring Room door, one at the crane bay exit near the local cylinder yard, and one in the ACR. When one of these buttons is pressed, each facility autoclave is placed into containment (at least one isolation valve on each isolable autoclave penetration closed). The buttons are used upon confirmed UF_6 outleakage to mitigate the release.

3.2.5.8 Operational Systems

The following operational systems are intended to prevent challenges to the safety systems. Although these systems are not relied upon to provide safety functions, they do provide diversity while performing their intended function of improving autoclave operations.

- The low cylinder pressure system closes the steam isolation valves and the thermovent line block valve and sounds an alarm if the cylinder pressure fails to reach 24 psia in 1 3/4 hours. The components of this system are the timer (internal to the programmable logic controller), pressure transmitter PT-502, pressure switch PSL-502, steam supply isolation valves PV-520, XV-524, and thermovent line block valve XV-565, and associated relays, solenoids, and switches.

- The high cylinder pressure system closes the steam isolation valves and sounds an alarm if cylinder pressure exceeds 90 psia. The components of this system are the pressure transmitter PT-502, pressure switch PSH-502, steam supply isolation valves PV-520, XV-524, and thermovent line block valve XV-565, and associated relays, solenoids, and switches.

- The cylinder pressure relief system relieves pressures in excess of 100 psig (lowest MAWP of the cylinders heated) from the feed cylinder and closes the steam isolation valves and the thermovent line block valve. The components of this system are the 100 psig relief discs, PSE-506 and PSE-508,

on the feed line, pressure transmitter PT-507, pressure switches PSH-507 and PSL-507, steam supply isolation valves PV-520, XV-524, and thermovent line block valve XV-565, and associated relays, solenoids, and switches. The pressure between the rupture discs is maintained between 9.5 and 19.5 psia.

- The autoclave opening prevention system is used to prevent the opening of an autoclave when the pressure exceeds 1.25 psig and the autoclave gives a visual indication. System components are the pressure transmitters PT-514 and PT-515, pressure switches PSL-514 and PSL-515, and associated relays and switches.

3.2.6 UF_6 Cylinder Handling

UF_6 feed is delivered to the feed facilities and stored in an interim storage yard until a particular cylinder assay is needed for feed. Cylinders are weighed and checked against fill limits. Each cylinder is inspected externally for any damage prior to placing in an autoclave for feed. All feed cylinders handled are normally empty or contain solid UF_6 and administrative controls prohibit the handling of liquid UF_6 in these areas except in emergency conditions.

3.2.6.1 Cranes

The C-333-A and C-337-A overhead bridge cranes handle only cylinders that are empty or contain solid UF_6. The two cranes in C-333-A and the north crane in C-337-A are 20-ton single-hook, pendant-controlled cranes. Each crane hoist has a direct current (dc) rectified shoe brake that is spring actuated in the event of a power loss. A geared up/down limit switch is connected to the cable drum to prevent exceeding limits for lowering or hoisting the load. When activated, it will stop the motor and activate the shoe brake. To prevent the lifting hook from colliding with the upper crane structure, each crane uses a swivel bar attached to a wire hanging from a paddle-type limit switch on the crane trolley. Like the paddle-type limit switches described above, when the lifting hook comes in contact with the swivel bar, the tension in the wire is released and the crane hoist motor is de-energized. Each of these cranes uses an H-frame-type sling to lift the cylinders with its single hook.

The south crane at C-337-A is a double-block crane equipped with a special lifting beam that is specifically designed for lifting liquid UF_6 filled cylinders. While the crane is not currently used for handling liquid UF_6 filled cylinders, the structural design is similar to the liquid UF_6 handling crane at C-310.

3.2.6.2 Short-Term Storage

Both facilities contain cylinder yards for the short-term storage of both full and empty cylinders. The yards are equipped with saddles that prevent the rolling of cylinders and subsequent damage that could result from improper spacing of cylinders. Storage yards are discussed in Section 3.7.

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3.3 UF_6 ENRICHMENT FACILITIES

The primary purpose of the enrichment facilities at PGDP is to produce uranium enriched in ^{235}U assay and to strip uranium partially depleted in ^{235}U content to an economically feasible assay. The PGDP enrichment facility consists of about 1,800 operating stages arranged in two parallel cascades for products up to 2.75 wt % ^{235}U. For higher assay products, up to 5.5 wt % ^{235}U, the stages are arranged more in series than in parallel configuration. The cascade buildings are designated as C-331 (400 stages), C-333 (480 stages), C-335 (400 stages), C-337 (480 stages), and C-310 (60 stages). The surge and waste building, C-315, does not contain any operating stages.

3.3.1 Facility Description

3.3.1.1 Cascade Shape

The term "cascade shape" typically refers to the process gas flow configuration among the various cells and units. Several factors influence the cascade shape. A cascade producing at a high product rate must have higher interstage flow rates between stages than one producing at a lower product rate. To use power efficiently, the stages in the middle (or near the feed point) must have higher total flow rates than those at the ends. Thus, the cascade shape is typically illustrated as a diamond configuration, with larger flow rates near the center of the cascade and lower flow rates near the withdrawal points. The cascade is tapered by appropriate sequencing of the different equipment sizes and by adjusting or varying the pressures across each size of equipment.

As discussed in Section 3.1, the degree of isotopic separation in an efficiently operating diffusion cascade is only about 0.2% per stage. Consequently, between 500 and 700 stages are required between the feed point and product withdrawal point to enrich uranium from normal feed at 0.71 wt % ^{235}U to a product ranging from 0.95 to 2.75 wt % ^{235}U (about 1,000 stages are needed to obtain 5.5 wt % ^{235}U). These stages are called the enricher. An additional 700 to 1,100 stages are used to strip the ^{235}U isotope from normal feed to a tails withdrawal assay of 0.2 to 0.3 wt % ^{235}U. These stages are called the stripper.

The enrichment cascade is normally illustrated in a diamond shape as shown in Figure 3.1-4. This indicates that there are really two cascades with larger equipment and higher flow rates in the middle and smaller equipment and lower flow rates at the ends. This configuration is required for the efficient use of power. However, the cascade does not have to be tapered as illustrated but can be made square, with the flow rate (pressure) constant in all stages from one end to the other; such a design would entail very inefficient use of power.

The flow taper required for efficient use of power can be achieved either by holding constant the stage equipment volume and gradually changing the pressure level from stage to stage or by holding pressure constant and gradually changing the equipment geometry. In practical cascades, both means of tapering are used. The middle part of the cascade, where the feed is introduced, contains the largest, highest pressure cells which results in the maximum interstage flow rate near the feed point. The flow taper is achieved in successive cells of the same equipment size by gradually reducing the pressure from cell to cell. At some point in the cascade, several hundred stages away from the feed point, the pressure

will have been reduced to such a low level that it becomes more economical at that point to change the equipment to a smaller size and to raise the pressure to compensate for the smaller equipment. If the equipment size is reduced by a factor of two, for example, the pressure would be increased by a similar factor. Throughout the smaller equipment, the pressure would again be tapered down toward the cascade ends to achieve efficient power usage. For cascades producing commercial reactor-grade enriched uranium for light water reactors, only about two, or possibly three, equipment sizes are needed, depending on the economics. Longer cascades designed to produce more highly enriched product might be designed with four or five equipment sizes. A schematic diagram of a cascade tapered with two equipment sizes would appear as in Figure 3.3-1. The width of the blocks shown in the diagram is proportional to the interstage mass flow rate, which can be adjusted by changing pressure and/or equipment size. The length of the blocks shown might represent five cells with ten stages per cell. Obviously, the electrical components that provide power to the stage compressors must also be tapered in accordance with the flow taper in the UF_6 system. The capacity of the coolant condensers and the RCW flow rates must also conform with the UF_6 flow taper.

The foregoing illustration of a cascade flow taper and overall shape applies to a very much simplified separation task involving only one feed stream, one product stream, and one tails stream. The actual makeup of feed and withdrawal streams for the cascade is somewhat more complex. The total product withdrawal can be made up of two streams at different assays, and the feed can be made up of two or three streams of different assays. At every point in the cascade where there is a feed or an intermediate withdrawal, the flow taper required for the most efficient power utilization must take into account the sudden change in cascade flow conditions at those points. A reasonable taper for the Paducah cascade at full power is illustrated in Table 3.3-1. A different taper would be required for other feed and withdrawal conditions. Table 3.3-2 gives the flow taper for 735 MW which is the nominal base power level of the Paducah cascade. The number of cells in operation may vary as the product assay changes. In actual practice, cells are started up or shut down, and the cascade is retapered routinely to maintain high efficiency when the product assay is changed. Table 3.3-2 also gives the number of cells in operation for the base power level.

An alternative mode of operation is that of cascade recycle. In the event that product withdrawal capacity is lost, the cascade can be put into "recycle." Operation in this manner will cause the assay in the top cells in C-310 to increase. As actions are taken to control the assay at the top of the cascade, the assay in the other portions of the upper cascade will increase. Eventually, the assay in the various portions of the cascade will increase to the approved limits. In order to control the assay in the cascade, some means of controlling the assay is required. This may be done by diverting product from the top of the cascade to surge drums, diversion of the product stream to a lower point in the cascade to mix assays, lowering the top assay, or diverting a lower assay stream such as the Bottom Overlap or feed material to the top of the cascade to downblend the assay. Intentional blending of material assay is extremely uneconomical and therefore is not the preferred alternative. These actions can be continued indefinitely if desired. During blending operations, the cascade assay is monitored by analyzing samples of the gas stream to ensure compliance with assay limits.

A similar situation will occur in the event that tails withdrawal capability is lost. In this instance, the assay of the cascade will tend to decrease with time and thus there is no hazard of an unacceptable increase in assay and no need to intentionally mix assays.

3.3.1.2 PGDP Cascade

The PGDP enrichment cascade is actually arranged in two parallel cascades as depicted in Figure 3.1-1. This figure shows a typical configuration for a maximum plant power load of 3,040 MW and a product assay of 2.0 wt % ^{235}U. The exact tie-in points of the overlaps may change, depending upon available power, desired product, or tails assay, etc., but are matched to an appropriate assay point to avoid mixing losses. The enrichment cascade is arranged in this parallel configuration to maximize efficiency and throughput while at the same time limiting product assay within established limits. Each stage is connected to the next upper and lower stage throughout the cascade. Bypass piping is provided for both cells and units, but individual stages cannot be isolated or bypassed separately. The cells, however, can be isolated.

The largest equipment in use in the PGDP cascade is designated as "000"-sized equipment. The first size reduction in the cascade sends the process gas into "00"-sized equipment, and a final reduction near the top of the cascade takes the process gas into 2X-sized converters. Both "000" and "00" stages use axial flow compressors to provide the motive force to move the process gas through the system, while

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The brake is attached to the motor on the end opposite the output shaft that drives the compressor. It consists of a brake drum, from 10½ in. to 23 in. in diameter, keyed to the rotor shaft and a brake mechanism. The mechanism presses two brake shoes against opposite sides of the drum periphery, using a large spring to force the shoes against the drum. The brakes are released by an electromagnetic coil (solenoid) in the mechanism which is large enough to overcome the force of the spring. Electric energy to operate the coil is taken from the motor feed circuit through a transformer to reduce the voltage to the coil level (or rectified to direct current in some models) to release the brake. A considerable amount of heat is generated in the brake in this stopping process, which is dissipated to the surrounding air by the shape and configuration of the brake drum.

The process motors are mounted on steel-reinforced concrete foundations adjacent to the compressors or directly on the steel compressor frame itself (smaller centrifugal compressors). Great care is exercised in leveling and precise alignment of the motor shaft and coupling to the compressor shaft.

Although the motor itself has provision to circulate cooling air through the motor and fan blades attached to the rotor, the higher-than-design ambient temperatures in which the motors operate require additional forced ventilation to dissipate normal operating heat. To overcome the motor heating problem, air is either blown on each motor from a central cell blower on the ground floor beneath the cell (C-310 and boosters), or the motor foundation incorporates a ductwork that carries air from the motor to an exhaust fan beneath the cell floor. The larger motors are built with an opening in their base through which the motor exhaust air flows, and the foundation ductwork aligns with that opening in the motor base.

All connections to the motor for lubrication, power, and instrumentation lead to and terminate at the motor foundation where they are connected to the motor systems. The motor and its associated connections are always located outside the cell enclosure.

3.3.4.4 Compressor and Motor Couplings

Process motors are connected to the compressor with an all-metal, laminated disc-type, nonlubricated, flexible coupling. This type of coupling is designed with a spacer or spool piece, which can be removed, along with that portion of the coupling attached to the compressor, without disturbing the alignment of either of the machines. The laminated disc allows a slight misalignment of the machines without damage.

Couplings differ slightly in configuration as applied to different applications. For example, there are 13 different types and sizes of couplings on centrifugal pumps in PGDP. Axial compressor couplings vary because of the use of uprated motors and modification to keyways on compressor shafts, as well as compressor size.

Couplings on high-speed centrifugal compressors are guarded by special guards made of ½ in. thick steel plate to protect against any missile which could be generated by a coupling failure in high-speed service. Inspection of coupling shim stacks is performed on installation of equipment.

3.3.4.5 Piping, Flanges, and Valves

Process piping, with its associated flanges, valves, and expansion joints, is the transportation system that moves the UF_6 from compressor to converter, cell to cell, and building to building. The use of interbuilding process piping eliminates the need for cascade feed, product, and waste facilities in each process building. Process piping varies in size from 3 in. to 54 in. in diameter. UF_6 piping is nickel-plated internally to reduce corrosion.

Process piping is heated either by routing the piping through heated enclosures or by steam tracing and insulation where heated housings are not practical to maintain the UF_6 in a gaseous state.

The arrangement of stage equipment within process cells minimizes the length of connecting piping to minimize nonproductive process losses.

Connecting pipe headers called interbuilding tie lines are used to move UF_6 between buildings. These lines vary in length from a few hundred feet to several thousand feet and are elevated to clear obstacles such as roadways. Housings that enclose the tie lines are steam-heated to prevent UF_6 freeze-out.

Cell block valves and bypass valves are normally fully opened or closed and are only operated when equipment is taken off-stream or placed on-stream. Block valves are also occasionally used to control flow by pinching, or partially closing, the valve. Expansion joints are provided at appropriate locations to allow for thermal expansion and small misalignment of process piping.

3.3.4.5.1 Piping and Weld Joints

Cascade piping and process equipment are connected by flanged joints, which are referred to as Van-Stone flanges. Van-Stone flanges are made up of two 3 in. high mating flanges with peripheral butt welds joining the flanges to provide a seal weld. This type of flange connection was adequate for subatmospheric operation but tests prior to CIP/CUP indicated that inadequate welds must be detected and repaired before operation at uprated conditions. (Cascade piping is installed and soap-tested to at least 5 psig.) The flanged joints on "B" line piping greater than 30 in. in diameter were reinforced with C-clamps unless the pipe flange was cut down to a 1 in. height and rewelded. The "A" line piping greater than 30 in. in diameter was clamped where the potential for exceeding atmospheric pressure exists.

New fabrication that involves welded joints is performed in accordance with ASME Code (Section IX) with the exception of the installation of the Van-Stone flanges.

The DPCS monitors numerous process parameters including vessel weight and pressures, RCW and R-114 temperatures and pressures, and valve positions. The system generates alarms and in some cases transfers the F/S to a safe operating mode upon detection of abnormal conditions.

The F/S weight measurement circuits include a calibration panel. The F/S control cabinet includes an operation/test switch which is used to lock out the low weight signal trip during trip tests. Interlocks are included to prevent operation of a F/S while in the test mode. Loss of ac power to a weight transmitter is indicated by a "weight signal fault" alarm and the F/S mode is forced to hot standby.

High-High Weight Trip

The potential exists for the stress rupture of the R-114 tubes or the F/S vessel due to overfilling (allowing UF_6 to bridge the tube-to-tube or tube-to-shell gap) and subsequent reheating due to expansion of the solid UF_6. Studies have shown that 11,900 lbs of UF_6 in a 10-MW vessel (compared with 18,000 lbs total capacity) is the limit without experiencing some degree of bridging, 22,400 lbs (compared with 38,000 lbs total capacity) is the comparable value for a 20-MW vessel.

For a 10-MW vessel, the high-high weight trip system is calibrated and tested to actuate when either channel of the weight monitoring system indicates a maximum of 10,000 lbs total UF_6/R-114 weight (a 10-MW unit holds approximately 1,000 lbs R-114). For a 20-MW vessel, a maximum of 20,000 lbs UF_6/R-114 weight initiates the trip, approximately 2,200 lbs of which is R-114. When compared to the amount of UF_6 required to initiate bridging, the weights of UF_6 required to actuate the high-high weight trip system provide a margin of more than 20% between the trip limit and the bridging limit.

Upon activation of the high-high weight trip, the F/S system is automatically placed in the modified hot standby mode, which is described above. This system is hardwired and cannot be overridden by the DPCS. The DPCS has a computerized version of this trip in addition to the hardwired version just described.

All critical components of the system are "locked in" position (see Figure 3.3-16). The term "locked in" refers to the fact that when the trip actions occurs, critical components cannot be overridden by operator action until the undesired condition has been corrected. This prevents an operator error from aggravating the undesirable condition. The critical components are maintained by the system until the process variables are again in acceptable ranges. At such time, the system can be manually reset and reverted to a specific mode of operation.

3.3.4.7.4 Freezer/Sublimer Coolant System

Both the 10- and 20-MW F/S installations have a closed loop R-114 coolant system consisting of a condenser/reboiler, an R-114 pump, a rupture disc relief system, associated piping and valves, and, in the case of the 20-MW and "piggyback" installations, an R-114 surge tank. This section identifies and briefly describes the administrative controls associated with the operation of the F/S coolant systems.

- Because of the potential for a violent exothermic chemical reaction in the F/S system, administrative controls require the substitution of dry air for R-114 in the F/S and cell coolant systems during the use of cell treatment gases.

- The R-114 pressure in the F/S system is to be controlled below 150 psig while R-114 is being charged to the F/S coolant system. This will prevent an R-114 release to the environment as a result of blowing the rupture disc and relief valve.

- An operator will monitor the R-114 system pressure during the time that the rupture disc is being replaced if the F/S is in service.

- The manual block valve between the R-114 condenser and the rupture disc will be sealed open any time the F/S coolant system is in service.

3.3.4.7.5 Freezer/Sublimer Functional Trips

A number of other functional trips have been incorporated into the F/S system to provide either safety or operational convenience, and are listed below:

- A high UF_6 pressure alarm/trip is activated when the UF_6 pressure reaches/goes above 18 psia (See Section 3.3.4.7.2.).

- The R-114 temperature trip operates when the R-114 temperature decreases to 82°F and places the F/S in the hot standby mode and sounds an alarm.

- The RCW temperature trip operates when the RCW temperature decreases to 80°F and places the F/S in the hot standby mode and sounds an alarm.

- A differential pressure trip will place the F/S system in the hot standby mode (and sounds an alarm) should the R-114 decrease to within 2.5 $\pm$1 psi of the RCW pressure, indicating a tube rupture within the R-114 condenser/reboiler.

- The high weight trip places the F/S in the cold standby mode when the unit reaches approximately 9,000 lb of UF_6/R-114 (about 1,000 lb of which is R-114) in the 10-MW vessel or approximately 18,000 lb (about 2,200 lb of which is R-114) in the 20-MW unit.

A tabulation of the safety and operational trips is shown in Table 3.3-8.

3.3.4.7.6 Outleakage Protection

The F/S vessels are constructed from nickel-lined steel with monel expansion bellows and the tubes are made from a cupronickel alloy, all of which are compatible with UF_6 service. The F/S vessels are inside the heated cell housing, which have low relative humidity, so external corrosion is not a significant concern. Piping and valves are similar to those in the enrichment cascade. The F/S systems are typically operated at pressures at or below atmospheric, so breaches of the pressure boundary would tend to result in atmospheric air inleakage.

3.3.5.2 Process Air System

Dry compressed air is one of the utilities required at PGDP for plant operations. Pneumatic instruments, controllers, and valves are used for control of the many plant processes. Air is also used in the enrichment process to operate purge and evacuation systems. In addition, air is used for plant support production equipment operations, steam plant operations, laboratory facilities, test facilities, maintenance functions, process seals, and other miscellaneous uses. It is supplied to PGDP from the air stations through a distribution system.

Constant header pressure is maintained by controlling the compressor output to equal the total usage of the plant, with a total possible output of approximately 26,200 standard cubic feet per min (scfm). Dry compressed air is supplied to the process buildings from four stations, C-600, C-607, C-620, and C-335 at a pressure of 86 to 92 psig. The plant air supply is usually referred to as a 100 psig air supply and is specified as such on system drawings.

C-600, C-607 and C-620 have two compressors each, and C-335 has three. The compressors at C-600 are steam-driven, while those at C-607, C 620 and C-335 are driven by electric motors. All of the air compressors are reciprocating-type except for the extra compressor at C-335, which is a four-stage high-speed centrifugal compressor. The compressors are equipped with intercoolers between stages, as well as after-coolers. The coolers use SFWS (sanitary and fire water system) or RCW. Drains carry condensed moisture out of the cooler. After leaving the coolers, the air passes to a large receiver that provides surge volume and pressure pulse dampening. To ensure that the air is dry, it is passed through drier tanks, then through activated alumina beds, and finally through a filter to remove any entrained alumina dust. Air stream moisture content is continuously monitored through a hygrometer. The moisture content of the air stream is normally less than 50 ppm which is equivalent to -33°F dew point at the system's minimum service pressure of 40 psig.

The air compressor stations may be operated separately or together to maintain air supply to the distribution headers. The air distribution system is arranged in a loop configuration to tie the major points of consumption together in such a manner that portions of the system can be taken out of service for maintenance while maintaining an uninterrupted supply of compressed air.

Dry compressed air enters the process buildings through service air headers and passes through reducing stations where the pressure is regulated to provide the proper pressure for air usage application. For instance, air is reduced to 22 psig for pneumatic instrument control and 5 psig for purging. Air filters are installed at instrument locations to prevent foreign materials from entering the instruments. Air line sizes are reduced to be commensurate with usage.

C-600 Air Station

The C-600 air station includes two steam driven variable speed two-stage reciprocating compressors.

C-607 Air Station

The C-607 air station included two electrically driven two-stage reciprocation compressors and an backup generator. The generator can supply adequate power to operate the compressors simultaneously.

C-620 Air Station

The C-620 air station is equipped with two synchronous motor driven constant speed two-stage reciprocating compressors.

C-335 Air Station

The C-335 air station is equipped with two reciprocating compressors and one high-speed centrifugal compressor. The reciprocating compressors are brushless synchronous motor driven constant speed two-stage units. The centrifugal compressor is a four-stage unit driven by an induction motor.

3.3.5.3 Process Nitrogen System

Nitrogen is utilized in the process buildings for purging process equipment and for process seal feed. While nitrogen is distributed throughout the plant at 50 psig, the pressure within the process buildings is reduced to correspond to the specific usage.

As in the process dry air system, the nitrogen system is arranged in loops to maintain service in the event that a portion of the system is out of service. The majority of the distribution system is 6 in. pipe supported above the ground.

The loss of nitrogen flow to the process buildings would only constitute an operational inconvenience to the cascade, because a check valve in each of the buildings would automatically transfer instrument air to the building nitrogen header upon a loss of header pressure. This transfer could be accomplished without a interruption of gas flow to the compressor shaft seals. Therefore, normal operation of the seal system would continue with no expected loss of material containment.

3.3.5.4 Process Steam and Condensate System

Steam is primarily utilized in the process buildings for heating building pipe enclosures to maintain the desired operating temperatures to prevent freeze-out of UF_6. Remote bulb thermostats transmit impulses to air relays which regulate the air loading on the steam control valves to achieve and maintain the set temperature.

Each cell enclosure in the process buildings is equipped with connections for two unit steam heaters, which are used to heat cell enclosures to operating temperatures prior to the initial operation.

Steam entering the process buildings is used at approximately 100 psig for steam tracing and is reduced to approximately 35 psig for the heating of pipe enclosures.

The condensate system functions as a method of removing the water formed by the cooling of the steam via steam traps. Steam traps are used to retain steam in the piping system until it has condensed and given up its latent heat. At that point, the condensate and air are discharged by the trap.

The coolant distribution system, exclusive of the condenser and gas cooler, is composed of steel pipe from the condenser to the gas coolers and a vapor return network from the gas coolers to the condenser. Each cell has coolant drain valves which may be opened to allow the coolant to flow into the drain lines leading to coolant storage tanks on the first floor of the buildings.

Each of the process buildings has two Ingersoll Rand vapor compressors. These evacuation pumps are used to evacuate R-114 vapor from equipment prior to opening the system to atmosphere and for transferring R-114 from tank cars to storage tanks. Coolant vapor removed from the system is condensed and returned to the storage tanks.

Drain Tanks

Each "00" building has one coolant drain tank, while "000" buildings have two such tanks to provide a storage volume for R-114. The normal R-114 pressure in these tanks ranges from 30 to 40 psia depending upon ambient temperature and the amount of noncondensible gases in the tanks. Coolant inventory can be transferred from one storage system to any other storage system in each of the four process buildings. Each of the "000" buildings has two tanks, with volumes of 1,300 ft^3 each in C-333 and 1,590 ft^3 each in C-337. Each "00" building employs a single coolant tank with a volume of 630 ft^3 in C-331 and 1,370 ft^3 in C-335.

Liquid Transfer Pumps

Coolant is returned to the cell coolant systems by means of centrifugal pumps set in pits below the drain tanks. Since the pumps will not pump air, the pumps are set in the pits (approximately 7 ft deep in "000" buildings, and 6 ft deep in the "00" buildings) to provide sufficient head to the suction of the pump. The "000" buildings employ two pumps, each with a capacity of 75 gpm, while the "00" buildings have two pumps with a 50 gpm capacity. They are used to transfer liquid R-114 between the drain tanks and the process coolant system. C-310 coolant is usually provided by building C-331, although it can be provided from other buildings as well.

Vapor Transfer Pumps

Each coolant storage and transfer system has two positive displacement pumps that are used to remove R-114 vapors from cell systems. This is done to minimize R-114 loss by recovering the R-114 from coolant systems requiring draining and evacuation for maintenance. Vapors from the cell are evacuated using the vapor transfer pumps and discharged through a water-cooled vapor condenser into the drain tank.

Vapor Condensers

These condensers, which are separate from the coolant condensers described above, are used for R-114 recovery purposes. This water-cooled heat exchanger condenses the R-114 vapor discharged from the vapor transfer pumps to allow liquid R-114 flow to the drain tank.

Coolant System Air Exhaust Pumps

These pumps are used to reduce the concentration of R-114 to parts per million levels after the majority of the coolant vapor has been removed to the extent possible by the vapor transfer pumps and to evacuate wet air from the cell coolant systems. The low vacuum obtained by these pumps allows almost complete evacuation of air from these systems and therefore more efficient operation of the coolant systems.

3.3.5.5.4 Recirculating Water Systems and Cooling Towers

The primary purpose of the RCW systems is to remove heat from the R-114 in the coolant condensers. In addition to this, RCW is supplied to other auxiliary equipment in the cascade area. Other important uses include 2½ in. fire water hose connections on the cell floor and ground floor of the cascade buildings.

During initial plant construction, each of the four process buildings had one or two cooling towers installed nearby to cool the hot RCW after it returns from the R-114 condensers. Each cooling tower is divided into cells which operate independently of the other cells. Seventeen additional cells were installed during CUP.

The cascade buildings are supplied with cooled RCW by vertical multi-stage turbine-type pumps that move the water from the pump house wet wells through underground mains and vertical risers to horizontal supply headers that are located under the process building roof trusses. The control of the pumps is normally performed from the pump house. However, control of all pumps can be performed from the C-300 building. The supply headers have branches that supply water to the R-114 condensers. Return lines are installed from the condensers to return headers, which are connected to the underground mains that return the heated water through risers to the top of the cooling towers. Blend pumps are available to provide cold water from the cooling tower basin to blend with the hot return RCW before it reaches the cooling towers. The pumps provide enough cold water to keep the blended water at 145°F or less, which is the maximum temperature for reasonable redwood and PVC-film type fill life. The water is cooled by sensible heat removal and evaporation as it falls through the tower to the basin of the cooling tower to complete the cycle.

To increase the updraft through each of the tower cells, large, horizontal, propeller-type fans in fiberglass shrouds are mounted at the top and are driven through gear reducers by electric motors. The shrouds promote an effective updraft and also serve to contain the blades from a fan in case of a failure.

The RCW piping servicing the process buildings is constructed of carbon steel pipe rated at 150 psig. Water flow in the piping is maintained at approximately 75-85 psig in the supply loops, while the return loop pressures are approximately 35 psig.

Each building is serviced by double-ended loops, with lines running into the buildings at opposite ends. Each building has two supply loops and two return loops. The "00" buildings are serviced by 42 in. headers while the "000" buildings use 60 in. headers. Inside the buildings, the headers are reduced to 18 in., 16 in. and 14 in. pipe in the "00" buildings, and 20 in. and 14 in. piping in the "000" buildings.

The RCW is treated with a phosphate-based corrosion inhibitor and dispersant to minimize corrosion and scale deposition. Chlorine is added to control the growth of microorganisms and sulfuric acid and soda ash are added for pH control. External electrolytic corrosion is inhibited by a cathodic protection system.

Large quantities of water are lost through evaporation in the cooling towers. This causes the dissolved chemicals to become more concentrated. To prevent solids accumulations from exceeding desired levels, a blowdown stream is provided. To meet Environmental Protection Agency (EPA) limitations on maximum concentration of contaminants in the pipeline effluent, the blowdown stream must be chemically treated to dispose of the contaminants. In the C-616 liquid treatment facility, the concentration of corrosion inhibitors and other pollutants is reduced in the waste water. To replace the water lost through evaporation and blowdown, a makeup water stream is required. In addition to the corrosion inhibitor treatment mentioned above, the makeup water is also given an acid treatment and a chlorination treatment.

The quantities of RCW required by the various process buildings depends primarily upon the process temperatures and the heat load required to be removed. A normal flow of RCW from all four recirculating systems would total approximately 400 million gal per day.

3.3.5.5.5 Cell Coolant Instrumentation

The coolant instrumentation in the process buildings is used to indicate the conditions existing in the coolant system to control these conditions at a predetermined value, and to sound an alarm and/or shut down the equipment when the existing conditions reach a point that may result in damages to the process equipment.

Each cell in the "00" process buildings is supplied with an independent coolant instrumentation system. In the "000" buildings, each half cell is provided with a coolant system with one set of instrumentation for the even stages and one set for the odd stages. To indicate the conditions in the coolant system, a thermocouple in the coolant vapor line is read out on a temperature indicator on the cell panel. Coolant pressure is sensed on a pressure transmitter (PT) connected to the coolant vapor line and read on a PIC on the cell panel. The PIC also indicates the position (percent open) of the control valve (CV) located in the cooling water supply line. Changes in stage temperature cause corresponding changes in coolant temperature and pressure. This pressure change is sensed by the PT, which causes the PIC to open or close the CV to return the coolant temperature and pressure to the control point.

An alarm is received when the coolant temperature becomes too high or when the coolant pressure becomes too low. This alarm consists of an audible and visual alarm in the ACR and a visual alarm on the local cell panel. The temperature is monitored by using a temperature blind switch (TBS) actuated by a gas-filled bulb acting as the temperature sensing element inside the coolant vapor line. A low pressure blind switch (PBS) is also actuated by the output of the PT. The alarm pressure point is changed each time the range of the pressure transmitter is changed. The PBS is set to alarm on low coolant pressure so that any relatively low coolant pressure will be noted and corrective action may be taken to bring the coolant pressure to the preset control point.

In the event of a failure of the high temperature alarm or if for some reason the system coolant pressure becomes extremely high, increasing the probability of rupturing the system, a high pressure trip circuit has been installed in the system to shut down the cell motors. In all process buildings except C-315, this system consists of a PBS, commonly referred to as a Meletron, and an associated relay tied into the system coolant vapor line. In the event that this circuit is made up, either accidently or by overpressure, it is necessary to manually reset the switch before the cell motors can be restarted. A block valve upstream of the Meletron permits isolation of the system during maintenance. This valve is normally sealed open. The seal is inspected on a quarterly basis to ensure that the Meletron is on-stream. In C-315, a mercuroid switch is used in place of the Meletron.

A cell coolant pressure relief system is provided as backup in case the Meletron or mercuroid switch should fail. This system in all process buildings, except C-315, is a rupture disc system designed to relieve the system pressure prior to rupturing the R-114 system. The cell coolant pressure relief system is required to be included in the TSR. It consists of a block valve in series with one or two 6-in. rupture discs manufactured from materials suitable for use with R-114 (e.g., Inconel) and a cone diffuser to prevent roof damage in case the discs rupture due to overpressure. The cells in C-310 are not equipped with a cone diffuser. The block valve is sealed open to assure the rupture discs are exposed to system pressure except during maintenance on the system. PGDP purchases rupture discs that are manufactured in accordance with the requirements of the ASME Boiler and Pressure Vessel (B&PV) Code, Section VIII. Rupture discs are applied and installed in PGDP systems based on Section VIII requirements. The block valve seal is inspected to assure it is intact to prevent the inadvertent closing of the valve. In C-310, a single rupture disc is used. The pressure settings for the Meletron, and rupture disc are shown below:

Cell coolant high pressure protective devices

Component	C-331, C-333, C-335, C-337	C-310
Meletron	225 psia	185 psia
Rupture disc[a]	300[b] psig	200[b] psig

a. Systems required to be included in TSR.
b. MAWP, disc ruptures at ± 5% of the rated pressure, as allowed by code.

3.3.5.6 UF_6/R-114 Separation Unit

Another system which is part of cell servicing is the UF_6/R-114 separation system in C-335. This vessel was the prototype for the F/S. The separation unit is used to freeze out UF_6 from process gas that has been significantly contaminated with R-114. Such mixtures usually result from equipment failure but may also result from abnormal cascade operation. The surge drums are used to store these mixtures until they can be separated. The primary purpose of the UF_6/R-114 separation system is to provide a mechanism to remove the R-114 and recover the UF_6 from process streams significantly contaminated with R-114. The UF_6/R-114 separation system is located on the operating floor in building C-335.

3.3.5.12 Fire Protection System

The fire protection system for the process system consists of automatic sprinkler systems in each of the six process buildings, C-310, C-315, C-331, C-333, C-335, and C-337. The sprinkler systems provide interior protection of the process buildings. These systems, which are wet-pipe type, are the same as found throughout industry and consist of water-filled piping with standard sprinkler heads installed in the pipes. The alarm valve within each system and all replacement components as required by NFPA 13, "Installation of Sprinkler Systems," are Underwriters Laboratories listed and/or Factory Mutual approved. The temperature rating of the sprinkler heads varies according to the ambient temperature of the area, but is generally 286°F for the cell floor and 212°F for the ground floor.

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

Water is supplied to the plant buildings sprinkler systems either by the sanitary and fire water system (SFWS) or the high pressure fire water system (HPFWS). The HPFWS is a grid system and supplies the sprinkler systems in the C-310, C-315, C-331, C-333, C-335, and C-337 process buildings, C-360, and the RCW cooling towers. The HPFWS is discussed in detail in Section 3.9.2.5. The SFWS is also a grid system and supplies the wet-pipe systems in other plant buildings. The SFWS is discussed in detail in Section 3.9.2.3. Lead-in lines carry water from the distribution piping to each sprinkler system riser. All lead-ins are generally 8 in. lines and run underground into the building with elbow connections made with the sprinkler system's water supply risers. In this pipe, the transition is made from the underground system to the inside system.

Once activated, the water flow through the distribution piping continues until it is shut off manually at the control valve or is replaced by water supplied through the fire department connection. The sprinkler systems have waterflow devices which are continuously monitored by the site fire alarm system.

As will be shown later, the automatic sprinkler systems will prevent fire-induced events. Consequently, based on the credible fire scenarios and an analysis of unmitigated fire effects, the sprinkler systems protecting the first and second floors of C-310, C-315, C-331, C-333, C-335, and C-337 (excluding the anti-freeze loops) are identified as systems required to be included in the TSR.

3.3.5.13 Special Gas Treatment

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

ClF_3 and F_2 are respiratory irritants even in low concentrations and can cause deep irritating burns on contact with the human skin. The American Conference of Government Industrial Hygienists (ACGIH) has defined the threshold limiting value (TLV) for ClF_3 as 0.1 ppm and the TLV for F_2 as

1 ppm based on an exposure of 40 hours per week. The concentration detectable by odor is considerably less than these levels.

Both gases react violently with organic and oxidizable materials and with most metals at elevated temperatures. Procedural controls are exercised over the introduction of these gases into the cascade following cell treatment to prevent an explosive reaction.

Incidents involving reactions of F_2 and ClF_3 have been rare, but these are hazards encountered in the operation of gaseous diffusion plants. Following cell treatment, strict adherence to the administrative controls for the introduction of F_2 and ClF_3 into the cascade and the prohibiting of R-114 in a cell during the special two-gas treatment are necessary for safety.

3.3.6 Purge Cascade

The top cells in the PGDP cascade are called the purge cascade. The purge cascade is located in the C-310 building with a portion of the product withdrawal equipment located in the C-310-A building. See Section 3.3.2.3 for a description of these buildings; the ventilation system is described in Section 3.3.5.11.

3.3.6.1 Description

The purge cascade performs three functions essential to the operation of the diffusion cascade. These functions are: the removal of light molecular weight gases from the cascade; the withdrawal of product from the cascade; and the removal of intermediate molecular weight gases, which may be occasionally present in the product stream. The intermediate molecular weight gases are removed from the UF_6 product by the intermediate gas removal system (see Section 3.3.6.7) or by entrainment in the condensed product UF_6 with subsequent extraction at the burp station after the UF_6 has solidified in product cylinders (see Section 3.4.6).

The day-to-day operation of the enrichment cascade results in the introduction of a variety of low molecular weight gases, called "lights," into the process stream. These lights are forced up the cascade (toward the product withdrawal point) by the diffusion process which separates gases on the basis of differing molecular weights. The principal lights forced to the top of the cascade are nitrogen (N_2) and oxygen (O_2). Other gases, including fluorine (F_2), hydrogen fluoride (HF), chlorine trifluoride (ClF_3), cascade coolant (chlorofluorocarbons, R-114), and various metallic fluorine compounds of technetium, molybdenum and arsenic also diffuse to the top of the cascade because they are lighter than UF_6.

Lights are introduced into the cascade in many ways, including inleakage from seals or buffered components. Cascade coolant and atmospheric air containing moisture also enter the cascade. Lights are also introduced periodically from cell servicing efforts (cell treatment, evacuation, etc.) and from feed cylinders which may contain a variety of contaminants. Finally, it is possible for lights to be introduced to the cascade in an uncontrolled manner, due primarily to equipment failure (i.e., process gas cooler failure, seal failure, expansion joint failure, etc.)

3.7 UF_6 CYLINDERS, STORAGE YARDS, AND HANDLING EQUIPMENT

The continuous operation of PGDP requires the storage of large inventories of UF_6 in cylinders. The wide variation in the rate of receipt of feed cylinders and shipment of product cylinders requires interim storage facilities for feed and product stockpile. Long-term storage must be provided for the cylinder containing depleted UF_6 tails which is continuously withdrawn from the enriching cascade. UF cylinder handling equipment is also provided for the many operations that must be accomplished daily.

3.7.1 UF_6 Cylinders

The containers commonly used for transport and storage of UF_6 feed, product, and tails materials are the 48-in. diameter 10- and 14-ton heavy-wall cylinders, the 48-in. diameter 10- and 14-ton thin-wall cylinders, and the 30-in. diameter 2.5-ton cylinders. Since the initial transport of large UF_6 containers in this country involved government-owned material, the criteria and standards for shipping cylinders were developed by DOE and are presented in Report ORO-651. ORO-651, Rev. 6 was updated and renamed USEC-651, Rev. 7, "Uranium Hexafluoride: A Manual of Good Handling Practices." Although UF_6 feed producers and enriching services customers own their own UF_6 cylinders, efforts to standardize the cylinder design has culminated in issuance of an ANSI standard, N14.1, "Packaging of Uranium Hexafluoride for Transport" which now has worldwide acceptance by the nuclear industry.

The 10- and 14-ton heavy-wall cylinders and the 2.5-ton cylinder are approved by the US Department of Transportation (DOT) and the Nuclear Regulatory Commission for shipment of UF_6. These cylinders have a wall thickness of 5/8 in. and an MAWP of 200 psig. The 10- and 14-ton thin-wall cylinders, which have 5/16-in. wall thickness, have an MAWP of 100 psig and are normally used for storage of UF_6 tails. Design details for these cylinders can be found in USEC-651 and ANSI N14.1.

Design fabrication, inspection, test, and cleaning of new cylinders are specified in USEC-651 and ANSI N14.1. The following items are noted:

- Cylinders are fabricated in accordance with Section VIII of the ASME Boiler and Pressure Vessel Code and are code-stamped.
- The volume of the cylinder must be determined by measuring the actual water capacity of each cylinder and stamping it on the nameplate.
- New cylinders are required to meet an internal cleanliness standard for assurance against explosive reactions between liquid UF_6 and organic impurities.

Additional cylinder inspection and maintenance requirements include the following:

- Visual inspection to ensure cylinder integrity prior to filling, heating, or shipping. A UF_6 cylinder is removed from service for repair or replacement when it has leaks, excessive corrosion, cracks, bulges, dents, gouges, defective valves, damaged stiffening rings or skirts, or other conditions that in the judgment of the inspector, renders it unsafe or unserviceable (see Figure 3.7-1 which was taken from USEC-651).

- All UF_6 cylinders that are to be filled shall have a hydrostatic pressure test date stamp that is less than five years old.

- Repairs to the containers shall be made in accordance with the "R" stamp procedure currently in effect at the plant, and empty cylinders must be air-leak tested after valve replacement.

- QA plans for the procurement of new cylinders and the decontamination and cleaning of used cylinders as well as the provisions of USEC-651 and ANSI-N14.1 provide assurance against explosive organic-UF_6 reactions.

An important consideration for tails storage is the assurance that adequate wall thickness of the storage cylinder is maintained. A study was conducted at PGDP in 1974 to evaluate the condition of a number of UF_6 storage cylinders. The wall thickness measurements of cylinders in service for 17 years indicated the corrosion rate was about 2 mils a year. Thicknesses ranged from 0.289 to 0.308 in. A minimum thickness of 0.206-in. wall thickness and 0.218-in. head thickness is required for a cylinder to pass the 100 psi rating stipulated in Section VIII of the ASME Boiler and Pressure Vessel Code. However, ANSI N 14.1 requires a minimum wall thickness of 0.25 inches for cylinders used in UF_6 service. Based on tensile strength, a safety factor of 4 is required. Based on the results of this study, the oldest cylinders were predicted to have a remaining service life of about 30 years.

Clean cylinders received for filling with tails material are inspected, weighed, and leak-rated. The inspection may also include a borescopic examination of the interior of randomly selected cylinders. The empty cylinders must be free of impurities that could contaminate or react with UF_6.

In air-leak testing, as part of the periodic (5 year) inspection, the empty cylinders are pressured with air to at least 100 psig and soap tested. Cylinders that fail the leak test are rejected until repaired. After leak testing, the empty cylinder is evacuated to 28 in. Hg and placed into storage until needed. After cylinder valve or plug replacement, the cylinders are pressured with air to at least 5 psig and soap tested and/or evacuated to less than 5 psia for 5 days.

As described in Section 3.4.5, cylinders to be filled with fissile material are weighed prior to filling, with heels in excess of 40 pounds requiring special instructions. It should be noted that "heel" is generally known to be reacted UO_2F_2. Thus, rejecting (until further evaluation) cylinders with greater than 40 pounds of heel is very conservative relative to the TSR of 40 pounds of moderating or unknown material.

The rejected cylinders are evaluated on a case-by-case basis. The history of the cylinder would be investigated by inspection of administrative records in search of easily identifiable sources of the discrepancy (such as scale problems). The cylinder would be inspected for clues which might indicate the source of additional material (tamper indicating device intact if applicable, cylinder valve outlet port contaminated with oil or other contaminant, etc.). Another option is a gas-over-solid sample, the characterization of which could reveal clues as to what may have happened. The cylinder could simply be washed with a sample of the raffinate collected for analysis. Other options are available depending upon the results of these typical investigative actions.

Settled water leaving the settling basins normally passes through self cleaning, "traveling" screens prior to being divided for use in the SFWS and the PWS.

3.9.2.3 Sanitary and Fire Water System

Settled water for the SFWS normally passes through the self cleaning screen but may bypass the screen and be diverted through the secondary coagulation basin prior to filtration for floc reformation. A sequestering material is then added to the water before filtration. Five sand filters that have a nominal capacity of 4 MGD are employed for the removal of suspended particles. The effluent of the filters is post-chlorinated and then flows to the clearwell.

The addition of chlorine to the filtered water prior to entering the clearwell in C-611-H is known as post-chlorination. This raises the chlorine residual from 0.2 to 0.5 ppm to a range of 1.0 to 1.25 ppm prior to distribution into the sanitary water system. The purpose of the post-chlorination is to ensure an adequate disinfection dosage is in the water before entering the 500,000 gal clearwell and distribution system where a 0.2 ppm minimum chlorine concentration must be maintained. Once in the clearwell, any further contamination of the water is very remote. Samples are taken every two hours to ensure that chlorine levels in the distribution system remain above the minimum value. Additionally, the Sanitary Fire Water System is routinely sampled for bacteriological analyses, with the samples tested by a certified laboratory.

Water for the SFWS is pumped from the clearwell, located at the C-611 Water Treatment Plant, into two 16 in. mains which convey the water to the gridded sanitary fire water distribution system. There are 5 pumps having approximate capacities of 1,200 gpm, 1,500 gpm, 600 gpm and two at 2,000 gpm at a rated head of 200 ft that can supply the SFWS. The pumps are all electrically driven, except for the two 2,000 gpm pumps which may also be diesel driven. All of the pumps are manually operated.

The SFWS within the fenced portion of PGDP is a gridded system of underground cement-lined 8 in. to 16 in. cast iron mains. These mains supply sanitary water for drinking, boiler makeup water, laundry, fire water, and numerous other operations that require sanitary water. The fire water demands arise from three-way yard hydrants around the various buildings and from sprinkler systems in all buildings except for the RCW cooling towers, the C-340 metals building, and the C-310, C-315, C-331, C-333, C-335, C-337, and C-360 process buildings.

Normal sanitary water system usage ranges from 2.5 to 3.5 MGD. The maximum capacity of the system, for a short duration demand such as would result from a fire, is approximately 6,400 gpm with falling C-611-O elevated tank and clearwell levels, and filter operation above the normal maximum of 2 gpm/ft^2.

The SFWS is maintained in the range of 65 to 80 psig. The C-611-O elevated storage tank, located east of the C-631-2 cooling tower, floats on the system and has a maximum capacity of 250,000 gal at overflow.

A low-level alarm is transmitted to the C-611 building and the C-300 CCF if the C-611-O tank level drops below a set level. This level is normally set at 85%. At this point one or all of the pumps can be manually started to pump water into the SFWS and maintain system pressure.

Sanitary water may be crossed over to RCW or HPFW systems to maintain operability of critical equipment throughout the process areas (C-310, C-315, C-331, C-333, C-335, and C-337), C-620, and the four pump houses. All connections of the SFWS to nonpotable sources, where not separated by an air gap, utilize a reduced pressure backflow preventer.

3.9.2.4 Plant Water/RCW System

The plant water system supplies makeup water to the RCW system serving the C-310, C-315, C-331, C-333, C-335, C-337, C-360, C-631, C-633, C-635, and C-637 areas. This system also supplies side stream cooling water to the C-600 steam plant. In addition, the plant water system supplies the water charge and makeup water for the HPFWS and can be completely diverted to the C-631-2 cooling tower basin for use in the HPFWS.

Settled water intended for use in the PWS, after passing through the self-cleaning screens, flows to the plant water pumps located at the C-611 water treatment plant. There are four electrically driven pumps, with approximately 9,000 gpm capacity each when rated at 49 ft total discharge head, that can supply the PWS. The plant water flows through a looped 24 in. to 36 in. system to supply the four recirculating cooling water systems, C-631, C-633, C-635, and C-637. Plant water may also be supplied to the recirculating water systems by gravity during periods of low Cascade power load or an outage of the pumps. The recirculating water systems supply the additional buildings listed above.

There are two booster pump stations located within the PWS. The C-611-P booster station provides the side stream cooling water for use in the C-600 steam plant. The C-611-T booster station is located in one leg of the looped system, and by valving can be used to supply plant water to the four recirculating cooling systems in the event of an outage of the pumps located at C-611.

The Recirculating Cooling Water system is treated with corrosion inhibitors to protect both the steel and copper metallurgies of construction. The current steel inhibitor is phosphate-based, with a separate inhibitor used for copper protection. A dispersant is also added to the system to assist with dispersion of the phosphate inhibitor and to control scale disposition. A biocide is used for biological control.

Water lost through evaporation in the cooling towers is made up by the Plant Water System. Evaporation causes the dissolved minerals in the Recirculating Cooling Water to concentrate. To prevent solids accumulations from exceeding desired levels, a blowdown stream is provided. The blowdown stream is routed to the C-616 Wastewater Treatment Facility for treatment before discharge to the receiving stream.

3.9.2.5 High Pressure Fire Water System

The HPFWS provides a water supply for the sprinkler systems in the six process buildings (C-310, C-315, C-331, C-333, C-335, and C-337), the RCW cooling towers (C-631, C-633, C-635, C-637), and C-360.

The HPFWS consists of a distribution piping network, a 300,000-gal elevated (275 ft to low water mark) steel storage tank (C-611-R), a water supply reservoir (C-631-2 cooling tower basin) and four fire pumps (housed in the C-631 pump house complex). The distribution piping network is a grid system consisting of 12 in. to 20 in. cast iron underground mains which loop around the four main process buildings and 8 in. cast iron lead-ins (see Figure 3.9-5). The lead-ins serve as tie lines which connect each automatic sprinkler system within a building to the distribution loop. Each lead-in connects at the base of the sprinkler's water supply riser. A single PIV is located in each lead-in as a single control point for potential isolation of the sprinkler system. Sectional isolation valves are located in the distribution piping between every three to ten sprinkler systems to permit isolation of more than one system should the need arise.

Water is supplied to the HPFWS from the plant water RCW system via five pumps located in the C-631 pump house complex. Four pumps take suction from the 4,764,000-gal C-631-2 RCW cooling tower basin and discharge into the HPFWS distribution loops. The four pumps consist of two remotely located sets of pumps. One set of pumps located in C-631-1 contains two fire water pumps. The second set of pumps located in C-631-3 contains two fire pumps. Each set of pumps has an individual feed main connected to the HPFWS distribution network at separate locations. The sixth pump is an electrically driven, automatically operated jockey pump having a 200-gpm capacity which takes suction from plant water. This pump is used to fill and perform routine pressure maintenance on the 300,000-gal elevated steel storage tank (C-611-R) that floats on the HPFWS. Each of the automatically operated pumps can also be started remotely either from the C-631-1 pump house or the C-300 CCF.

When the HPFWS was first placed in service, the distribution piping and the elevated storage tank were filled to capacity with plant water using the 200-gpm jockey pump. As indicated previously, the tank now floats on the system and the jockey pump automatically performs routine pressure maintenance. System pressure is normally maintained at 133 psig, which is just below the elevated tank's overflow point. Any tank overflow drains into the C-631-2 basin through an 8 in. pipe.

When a demand is placed on the HPFWS, water from the elevated storage tank flows into the distribution network to replace that discharged. When the tank's water level has dropped 1½ ft (approximately 17,000 gal), a level switch activates the jockey pump and makeup water is pumped to the tank from the plant water system. If the demand exceeds the jockey's makeup ability, the tank's water level will continue to drop. As the water level drops, additional level switches in the storage tank or pressure switches in the water main will activate the C-631 fire pumps as indicated below:

Pump No.	Capacity	Activation Point	Pump Type	Motor Type
1	200	306.5 ft	Jockey	Electric
2	4625	302.5 ft	Fire	Electric
3	4625	295 ft	Fire	Electric
5	4500	126 psig	Fire	Electric
6	4500	126 psig	Fire	Diesel

In the event of a failure of the float-operated level switches, the pumps will also automatically start upon low pressure (approximately 126 psig) indication in the underground network. The pumps can also be remotely started as indicated above. With all pumps operating, a maximum of 18,250 gpm is available to accommodate fire water needs. Should the water demand exceed the 4,746,000 gal available (once the 300,000-gal tank has emptied) from the C-631-2 basin, the plant water system can supply 25,000 gpm to the basin. In addition, 8,000 gpm can be piped to the basin using the crossover arrangement from the C-633 RCW system.

As stated earlier in Section 3.3.5.12, the fire protection system (wet sprinkler system components) is considered a TSR system. Therefore, the following components of the distribution system (outside cascade buildings) are also a part of the TSR system.

- Cooling tower basin (C-631-2).
- Four fire water pumps (C-631).
- 300,000-gal elevated steel storage tank (C-611-R).
- Piping comprising water distribution system.
- Sectional valves (key valves) in water distribution loops.
- Lead-ins to sprinkler systems and their PIVs.

System operability requires either the elevated storage tank or any two of the fire water pumps to be available with a combined capacity of at least 6875 gpm.

3.9.2.6 C-600 Chilled Water System

The C-600 chilled water system supplies approximately 42°F water for air conditioning and humidity control equipment in the C-100, C-101, C-102, C-300, C-600, C-710, and C-720 buildings. Air conditioning and humidity control equipment were provided, in the above mentioned buildings to provide a cool, low humidity environment for instruments, specialty shops, equipment, and secondly, for personnel comfort.

3.9.6.5 Auxiliary Equipment

The compressor auxiliary equipment at the three production stations are not identical; however, the process is the same in all cases. The function of the air compressor auxiliary equipment is to remove atmospheric particulates, moisture, and oil from the compressed air prior to entering the distribution system.

The air compressors at the three production stations have intercoolers between stages. Each unit has primary and secondary aftercoolers. The intercoolers and aftercooler are cooled with SFWS and/or RCW. The secondary aftercoolers are cooled with chilled water. Drains are provided on the air side of the coolers to continuously drain off moisture and oil that condense from the compressed air.

After leaving the secondary aftercooler, the air stream enters a receiver. The receiver is a large tank that provides a surge volume, dampens pressure pulsations and collects condensed moisture that is discharged from the bottom of the receiver tank.

The air stream then passes through oil absorbers. Air leaving the oil absorber is passed through dryers. The air drying beds are large vessels filled with activated alumina, arranged in groups of two so that one bed can be reactivated while the other bed is being dried. A pair of drying beds and associated equipment is considered a drying unit. Air leaving a drying unit passes through a filter designed to trap any alumina dust that may pass through the dryer beds. Air stream moisture content is continuously monitored through a hygrometer.

To maintain a constant header pressure, the total air supplied must equal the total usage on demand. Compressed air demand varies; therefore, some means of controlling the compressor output is necessary. The positive-displacement compressor is controlled by varying the speed of the compressor drive as is done at the C-600 station. Changes in air header pressure are amplified in a master pressure indicator controller. Air output from a second transmitter is also applied to the speed indicator. The output of the speed controller is transmitted to the steam throttle valve on the steam supply line to the high-pressure steam cylinder. An overspeed governor output is also fed to the throttle valve to prevent overspeed of the steam engine.

Constant speed motors are used to drive the C-607, C-620 and the C-335 compressors and require other means of load control. For the C-607, C-620 and C-335 reciprocating compressors, clearance pockets and suction valve bypass combinations are used to control air output. High- and low-pressure stages are unloaded simultaneously in steps of 25% of the total capacity. The clearance pockets are of a volume equal to approximately one-half the cylinder volume. The first step of unloading is accomplished by opening a clearance pocket valve on the crank end of the cylinders; the second step is effected by holding open the suction valve on the same end; the third step opens the suction valves on the head end; and final unloading is effected by holding open all suction valves. Changes in receiver pressure moves a spring-loaded governor control valve which in turn varies the air supply pressure to four pressure switches. The pressure switches operate solenoid valves in the air-operated unloader supply lines. A fifth pressure switch, operating independently of the governor control valve, unloads the compressor completely when the receiver pressure reaches a predetermined pressure.

The C-335 Centac centrifugal compressor discharge pressure is maintained by actuating both inlet and blowoff valves. As the air demand varies, the control system senses this by measuring the discharge pressure. If the discharge pressure increases, the inlet valve will close to a point where the compressor nears a surge condition. At this point the inlet valve remains stationary and the blowoff valve modulates to control discharge pressure. If the discharge pressure decreases, the blowoff valve closes and the inlet valve opens to maintain pressure.

Air production is measured at the three compressor stations by orifice meters. Varying system pressures create some inaccuracy in flow measurement, but they reflect system output adequately. A large pressure indicator in the C-300 building is the focal point for monitoring overall system pressure. When system pressures begin to drop, the shift superintendent acts to increase output or to coordinate usage.

The air distribution system is arranged in a loop configuration to tie the major points of consumption together in such a manner that portions of the system can be taken out of service for maintenance while maintaining an uninterrupted supply of compressed air.

3.9.7 Plant Nitrogen System

Gaseous N_2 is supplied by the vaporization of purchased liquid N_2. A distribution system provides a continuous supply of gaseous N_2 to process and auxiliary facilities.

3.9.7.1 Vaporized Nitrogen System

The vaporized N_2 system consists of equipment necessary to receive, store, dispense, and control the rate of evaporation of liquid N_2. The primary use of the vaporized N_2 system is to distribute N_2 to users through a piping distribution system; to furnish nitrogen, in liquid form, to users of liquid nitrogen; and to refill high pressure nitrogen cylinders.

3.9.7.1.1 Warm Converter

The warm converter unit is designed to fill high pressure (2,000 psig) N_2 cylinders. The high pressure is obtained by "bottling" liquid N_2 and applying heat by admitting steam to a coil immersed in a water bath surrounding the pot containing the liquid N_2. The high pressure vaporized N_2 is valved into the cylinders through a cylinder-filling manifold. The warm converter unit consists of a liquid N_2 filling line, a pressure-building pot, a steam-heated water bath, and a cylinder-filling manifold. The liquid N_2 filling line connects to the No. 1 liquid N_2 storage tank and the warm converter pressure building pot. Isolating valves are incorporated in the liquid N_2 filling line.

The pressure building pot is a high-pressure spherical vessel equipped with pressure gauges and valves. Steam-heating coils are located in the water bath which is contained in an open top shell surrounding the pressure building pot. Low pressure (5 psig) steam is used to heat the water surrounding the pressure building pot. The cylinder-filling manifold is a dual arrangement with five cylinder positions on each side. The cylinders are connected to the manifold by use of copper pigtails with each cylinder position equipped with an isolation valve.

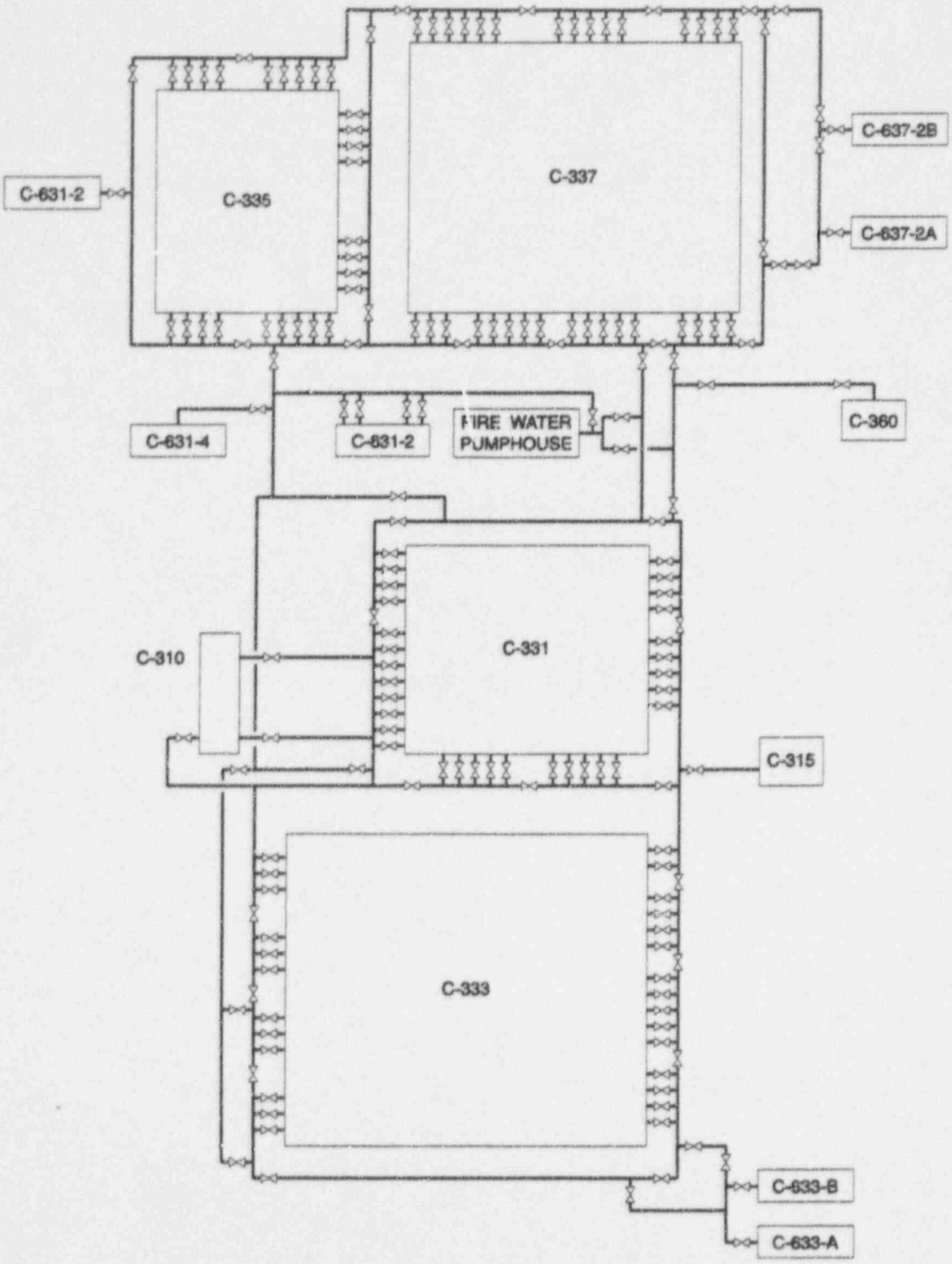

Figure 3.9-5. High pressure fire water system.

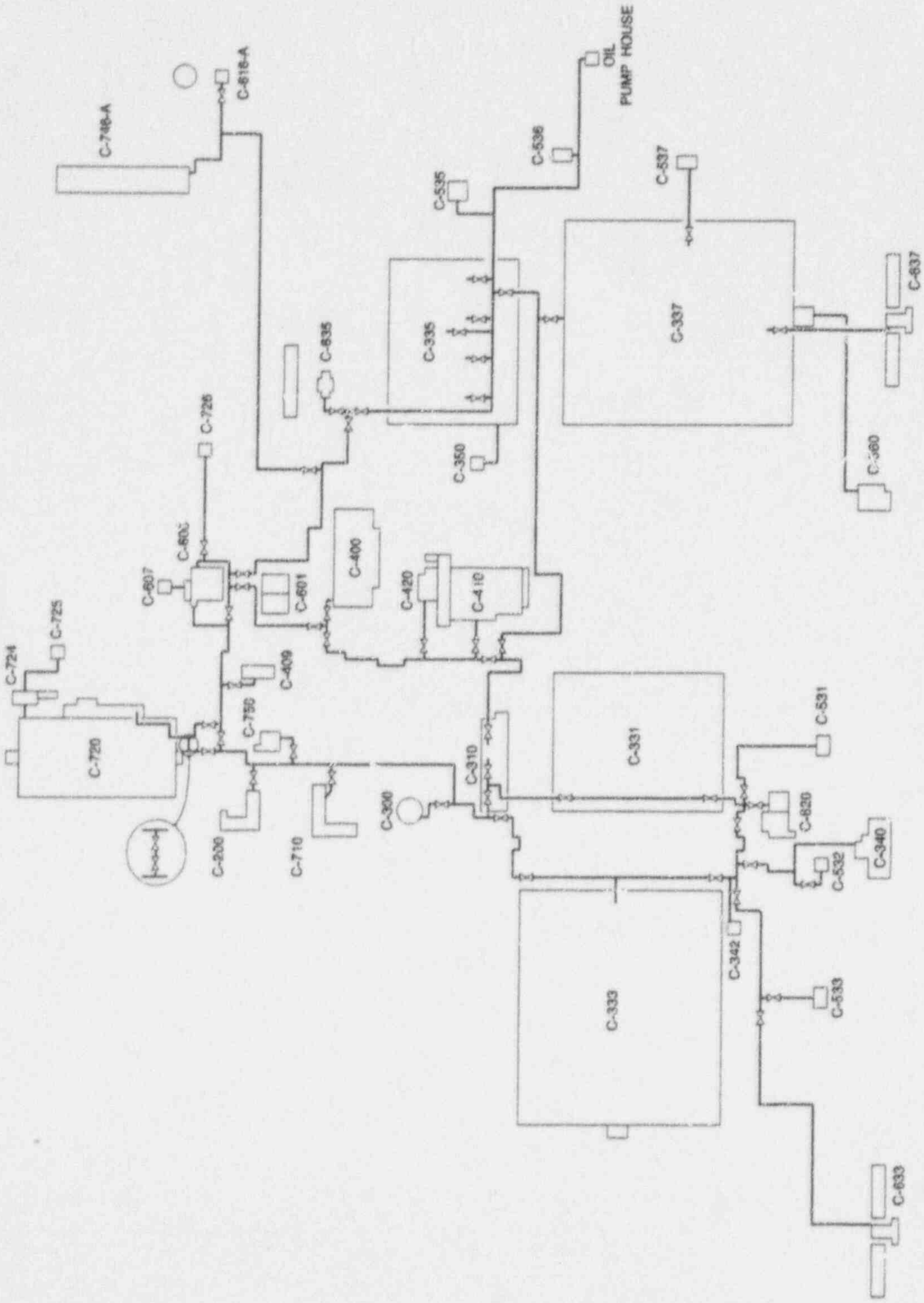

Figure 3.9-6. Dry air distribution system.

Following disassembly in C-720 and decontamination in C-400, expansion joint components are returned to the C-720 fabrication shop. At the fabrication shop, the pipe stub edges are ground smooth in preparation for installing a new or repaired expansion joint. The expansion joint is installed between the pipe stubs and soap tested for leaks. The pipe stub flanges are then ground and repaired as required to a condition acceptable for re-installation. The repaired expansion joint is then returned to the process building and installed in the cascade.

3.13.2.8 C-720 Repair and Handling of Converters

The converters have been in the cascade and exposed to process gas for a number of years, which means that they are contaminated and must be handled accordingly. The most common type of failure for converters is in the cooler, either in the aluminum-to-steel transition joints or a leak in the tubes. The aluminum-to-steel transition joints are removed and replaced. Maintenance of the leaking cooler tubes is performed by isolating, cutting and capping the tubes. Converters are repaired in the C-720 fabrication shop and the C-720-C converter shop and retested in accordance with current plant practices.

3.13.3 Fuel Storage Facilities

Various types of fuels are used in the daily operation of PGDP. Storage is provided for these fuels in different locations and quantities in order to furnish safe, efficient accessibility for their utilization.

3.13.3.1 Gasoline and Diesel Fuel

Gasoline and diesel fuel are the primary fuels for vehicular equipment and emergency equipment generators. As can be seen in Tables 3.13-2 and 3.13-3 storage tanks for diesel fuel and gasoline, respectively, are scattered throughout the plant to provide convenient access for refueling equipment. Larger tanks (up to 10,000 gal) are used where the demand warrants.

3.13.3.2 Fuel Oil

No. 2 fuel oil is maintained in storage tanks to fuel the C-600 boilers. Table 3.13-4 shows the quantities of fuel oil storage at C-600 steam plant for boiler secondary fuel. The No. 2 fuel oil tanks associated with the C-600 building (C-601-A, B, and D) have fire protection which consists of an automatic foam system.

3.13.3.3 Propane

Propane is the newest on-site fuel for specially equipped trucks and buses. Although the use of propane conserves energy, it also provides an alternative source of fuel for plant vehicles. Of course, propane is still used in furnaces and, in a few cases, as fuel for emergency generators. See Table 3.13-5 for information concerning the plant propane tanks.

3.13.3.4 Coal, Natural Gas, and Alcohol

Located on the north side of C-600 is a coal storage yard and a coal bunker which have a maximum capacity of 30,000 tons and 250 tons, respectively. The coal is stored in these areas until it is needed as fuel for the combustion process within the C-600 steam plant. The coal handling facility incorporates a dust suppression system and a fire protection system which consists of the dry pipe-type sprinkler system. On activation of the fire protection system, the facility will shut down.

The C-600 building can use a 6-in. natural gas line to supply the No. 1 boiler.

Alcohol was previously stored in a 6,000-gal tank near C-750 and mixed with gasoline to form gasohol. Gasohol is no longer being used and the tank is on standby for future alcohol use if desired.

Information about miscellaneous fuel storage is shown in Table 3.13-6.

3.13.3.5 Fuel Storage Tanks

The fuel tanks and associated equipment have electrical grounding in accordance with the national electrical codes. Also, the tank installations comply with OSHA fire protection regulations. |

3.13.4 Miscellaneous Facilities

There are several miscellaneous storage yards at PGDP. Two of these are C-740 and C-740-C. The C-740 yard is used to store bulk material for use in the plant construction program. Included are pipe and various structural members. This rectan[illegible] yard is located west of C-720. It has a 21-in. thick compacted gravel surface with dimensions of 410 [illegible] 692 ft providing an area of approximately 272,000 sq ft.

The storage yard, C-740-C, is located southwest of the C-720 building close to the receiving area. It is a gravel-paved yard with entrances off Ohio Street making it easily accessible for unloading materials delivered by semi-trailer. This yard is approximately 140 ft × 230 ft with an area of 32,200 ft^2. |

Other miscellaneous storage yards are C-746-H1, H2, and H3, and H4. These are all grade elevation concrete storage slabs that are used primarily for miscellaneous storage of materials components such as compressor spool pieces, induction furnace crucibles, compressor carts, pipe, steam plant components, building ladders, platforms, and fixtures.

C-746-H1 is located east of C-720 across 8th Street. Its dimensions are 75 ft × 130 ft. C-746-H2 is north of C-720 on the south side of Tennessee Avenue. It is approximately 84 ft × 125 ft. C-746-H3 is across Tennessee Avenue north of C-746-H2. It is an irregular shape, but is approximately 165 ft × 350 ft with an area of 56,150 ft^2. |

3.15 Q AND AQ STRUCTURES, SYSTEMS AND COMPONENTS

This section contains a listing of the Q and AQ systems and the associated boundary definitions. As stated in Section 2.2.2 of the Quality Assurance Program (QAP), the Q and AQ SSCs described in this section form the basis and identify the SSCs to which the QAP is applied. The information in this section has been developed to be current as of the date of this revision, therefore, SSCs will be treated in accordance with their categorization as designated in this section, regardless of information that may be contained in other sections of the SAR.

An initial determination has been made regarding which systems are required to support the parent system's Q or AQ function(s) (e.g., circuitry to carry an isolation signal to an isolation valve). As discussed in Section 3.16, the support systems (including electrical power, plant air, and control and instrumentation power) will continue to be evaluated, and included in the boundary definitions if appropriate. This section will be revised accordingly as this work is completed. Only those items that perform support functions that have been evaluated and determined to be Q or AQ are designated as such in this section. Where it has been determined that no support functions are necessary to perform the subject function it is noted as such.

The term "fail safe" as used in this section means that the subject system will perform the intended function or allow the intended function to be performed upon entering the faulted condition. The thermovent block valves do not isolate upon receipt of an isolation signal (reference Sections 3.15.1.1.1, 3.15.1.1.2, 3.15.1.4.1 and 3.15.1.4.2). The need for proximity switches (reference Section 3.15.1.4.10) will be evaluated to determine if they are necessary for the crane to perform its intended function. The proximity switches and rail stops (reference Section 3.15.1.3.9) are being evaluated for capacity and ability to perform their intended function. As part of the SAR Upgrade activity, an engineering evaluation will be performed to assess these issues to determine if modifications are necessary to place the plant in a fail safe configuration. If modifications are necessary, they will be initiated.

The C-360 and C-337A cranes are currently being replaced (see Sections 3.15.1.1.7 and 3.15.1.4.10). The C-360 north crane is nearing completion. The C-360 south crane is out of service and will remain so until it is also replaced with the new design. The description in Section 3.15.1.4.10 is based on this new crane design. The C-337A south crane description in Section 3.15.1.1.7 is based on the new crane design. There are areas of process buildings where the CAAS horns (see Sections 3.15.1.1.6, 3.15.1.2.5, 3.15.1.3.7, 3.15.1.4.9, 3.15.1.5.1, 3.15.1.6.1, 3.15.1.7.1, and 3.15.1.8.1) are not audible due to high ambient noise levels. Modifications will be initiated to ensure that the CAAS alarm horns are capable of being heard throughout the affected areas of the process buildings.

3.15.1 Q Boundary Definitions

3.15.1.1 Feed Facilities

Q systems in the C-333-A and C-337-A Feed Facilities are listed.

3.15.1.1.1 Autoclave Water Inventory Control System

Q Function

The system function is to isolate the sources of condensate upon detecting a high condensate drain line water level in order to prevent over-pressurization of the autoclave or the possibility of a criticality upon a UF_6 release.

See Sections 3.2.3 and 3.2.5.2 for a description of this system.

Boundary

The system boundary includes:

1. Condensate level probes
2. Steam supply block valves
3. Thermovent block valve
4. Air supply
5. Solenoid valves
6. Piping to the block valves
7. Associated circuitry to de-energize the air supply and solenoid valves back to the first interrupt device.

The solenoid valves and the air operated block valves fail safe on loss of air and electrical power to the building.

3.15.1.1.2 Autoclave High Pressure Isolation System

Q Function

The autoclave high pressure isolation system provides the means to isolate the autoclave upon detection of a high autoclave pressure, assumed to be generated by a UF_6 release from a cylinder within the autoclave. The high pressure isolation system locks out the hydraulics to prevent opening the autoclave during a release or over-pressurization of the autoclave.

See Section 3.2.5.4 for a description of this system.

Boundary

The boundary includes:

1. Pressure transmitters
2. Pressure indicators
3. Temperature indicators for the Surge Drum rooms

3.15.2.10 Space Recorders

AQ Function

Monitors the concentration of uranium in process vent streams and alarms when a predetermined set point is exceeded.

See Section 3.3.5.9.3 for a description of this system.

Boundary

The 200 foot vent stack and the discharge of the north and south bank sodium fluoride (NaF) traps in C-310.

The space recorder boundary includes:

1. Space recorder cabinet
2. Components contained within the cabinet
3. Intake tubing from exhaust stream through the cabinet, sample return tubing
4. Remotely located chart recorder and alarm
5. Connecting wiring, and electrical connections up to, but not including, building utilities

3.15.2.11 High Pressure Fire Water System

AQ Function

The function of the high pressure fire water system (HPFWS) is to provide water through sprinkler systems to mitigate lube oil fires in the cascade buildings C-331, C-333, C-335 and C-337 and in product and tails withdrawal buildings C-310, and C-315.

See Section 3.9.2.5 for a description of this system.

Boundary

The boundaries of the system are from the C-631-2 cooling tower basin up to and including the sprinkler heads. This includes:

1. Cooling tower basin
2. Five fire water pumps (6875 gpm capacity required)
3. 300,000 gallon elevated steel storage tank
4. Piping comprising water distribution (to the process buildings, C-310, and C-315).
5. Sectional valves in the water distribution loops
6. Lead-ins to sprinkler systems and their PIVs
7. Automatic wet pipe sprinkler system in the process buildings except the antifreeze and the dry pipe sprinkler systems in C-310 (canopy area for product withdrawal), and C-333-A and C-337-A.
8. Two pumps are diesel driven. The following items must be controlled for the operation of the diesel pumps:
   a. the diesel engine,
   b. the fuel oil,
   c. the fuel oil supply tank,
   d. and the fuel supply system.
   e. the pumps starting mechanisms are also bounded including the air start system (back to and including the air storage tanks) and the starting batteries.
9. Three of the pumps are electric. The electric power supply is bounded from the pumps back to the 13.8 kV-4160 V transformers (2PH3, 2PH4A, and 2PH4B) that supply the 4160 V switchgear in C-631-1. The boundary includes:
   a. the switchgear main bus,
   b. bus supply circuit breaker,
   c. the bus tie breaker,
   d. and the protective relays for all circuit breakers in the switchgear.
10. Pressure instrumentation and controls for automatic start-up of the pumps.
11. Associated circuitry.

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INTRODUCTION

The United States Enrichment Corporation (USEC or Corporation) hereby submits its initial Application to the Nuclear Regulatory Commission (NRC) for a certificate of compliance for the Paducah Gaseous Diffusion Plant (PGDP) in accordance with section 1701(c) of the Atomic Energy Act of 1954 (AEA), as amended by the Energy Policy Act of 1992, and 10 CFR Part 76.

Pursuant to its statutory authority, on July 1, 1993, USEC entered into a Lease Agreement with DOE over portions of PGDP and assumed responsibility for operations on that date. Pursuant to 10 CFR 76.31, USEC is required to submit an initial application for a certificate of compliance to the NRC governing its operations at PGDP. In accordance with 10 CFR 76.35, this Application includes:

- technical safety requirements (10 CFR 76.35(e));
- a safety analysis report (10 CFR 76.35(a));
- a quality assurance program (10 CFR 76.35(d));
- an emergency plan (10 CFR 76.35(f));
- an environmental compliance status report (10 CFR 76.35(g));
- a fundamental nuclear material control plan (10 CFR 76.35(h));
- a transportation protection plan (10 CFR 76.35(i));
- a physical protection plan (10 CFR 76.35(j));
- a security plan for classified matter (10 CFR 76.35 (k));
- a radioactive waste management program description (10 CFR 76.35(m));
- a depleted uranium management program description (10 CFR 76.35(m));
- a description of USEC's funding program for waste and depleted uranium disposition (10 CFR 76.35(n)); and
- information from which the Commission can prepare an environmental assessment related to DOE's "Plan for Achieving Compliance" (10 CFR 76.35(c)).

The following information is provided in accordance with 10 CFR 76.33(a)(2):

Applicant Name. Address and Other Corporate Information

United States Enrichment Corporation
Two Democracy Center
6903 Rockledge Drive
Bethesda, Maryland 20817

USEC is a wholly owned Government corporation established by the AEA, as amended, and maintains its headquarters at the above address. USEC is neither owned, controlled nor dominated, by any alien, foreign corporation or foreign government. All shares of the Corporation are held by the U.S. Treasury. Pursuant to the Energy Policy Act, the Corporation has submitted a plan to the President for transfer of ownership of the Corporation to private investors, and the Corporation may implement this plan, after approval by the President and notification of Congress.

The mailing address for PGDP is:

United States Enrichment Corporation
Paducah Gaseous Diffusion Plant
P.O. Box 1410
Paducah, Kentucky 42001

Information on Corporate Directors and Officers

The following are the directors and principal officers of the Corporation. Except as indicated, all are citizens of the United States. The business address for all such persons is Two Democracy Center, 6903 Rockledge Drive, Bethesda, Maryland 20817. The members of the Board of Directors were each appointed by the President and confirmed by the U.S. Senate.

Directors

Mr. William J. Rainer
Chairman of the Board of Directors

Mr. Charles W. Burton
Member of the Board of Directors

Mr. Christopher M. Coburn
Member of the Board of Directors

Ms. Margaret H. Greene
Member of the Board of Directors

Kneeland C. Youngblood, M.D.
Member of the Board of Directors

Principal Officers

Mr. William H. Timbers
President and Chief Executive Officer

Mr. George P. Rifakes
Executive Vice President - Operations

Mr. James H. Miller
Vice President - Production

Mr. William J. Bennett
Vice President - Advanced Technologies

Mr. Richard O. Kingdon[1]
Vice President - Marketing and Sales

Mr. Robert J. Moore
Vice President - General Counsel

Mr. Philip G. Sewell
Vice President - Corporate Development

Mr. Henry Z. Shelton
Vice President - Finance, Chief Financial Officer

Mr. Charles B. Yulish
Vice President - Corporate Communications

Format and Content of the USEC Certification Application

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

1. Mr. Kingdon is a citizen of the United Kingdom.

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

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These administrative controls are normally adequate to assure a "clean" system. To protect personnel against a possible error, maintenance procedures require that a small test hole be opened in the system by maintenance personnel wearing respiratory protection and the system observed for cleanliness, prior to making a making a major opening in the equipment. Should it be found contaminated, the hole can be covered, and the purging process repeated.

The maximum release from failure to purge equipment for maintenance would be 5 to 10 lb of UF_6. This scenario has a low probability of occurrence and is independent of power level.

4.3.2.3.7 Vehicular Impact

Various types of vehicles are used each day in the process buildings to move men and equipment from one area to another. An extremely low probability accident which could lead to a breach of containment would be the impact of a fork truck or similar vehicle with process equipment. The distance from the cell housing to the "B"-stream piping, converter, and compressor shell is less than the length of a forklift tine. Such an accident could cause a breach of 20 in^2 in a process pipe. At CUP pressures, 6,000 lbs of UF_6 would be released before the equipment could be isolated and shut down. At subatmospheric pressure, wet air would flow into the system prior to shutdown of equipment causing operational problems; loss of UF_6 would be negligible.

4.3.2.3.8 Inadvertent Coolant Drain

It is possible to drain the R-114 system of an on-stream cell by opening the wrong drain valve. Should this occur, a very rapid temperature rise would occur in the process gas system of the affected cell similar to that described in Section 4.3.2.4.1. Unless immediate manual cell shutdown is effected, the temperature will quickly exceed 450°F and failure of compressor blades can be expected. Unless the compressors fail, the process temperatures may become great enough to start a UF_6-hot metal reaction which is discussed in Section 4.3.2.5.5. Draining the R-114 from the cell removes the threat of high pressure resulting from cooler leaks following a UF_6-hot metal reaction. The scenario of an operator inadvertently draining the R-114 from an on-stream cell has a medium probability with a source term of 5 to 10 lbs of UF_6 released in a CUP cell as the worst-case accident situation. The UF_6 released from a cell operating at subatmospheric pressure would be negligible.

4.3.2.4 Loss of Support Systems

Auxiliary support systems are required to supply air, electrical power, and water to the enrichment equipment. A loss of any of the support systems has an immediate impact on the operation of the cascade equipment. The following paragraphs examine accident scenarios resulting from a loss of systems supporting the operation of the cascade equipment to determine the impact on the accident analysis.

4.3.2.4.1 Loss of Instrument Air

The loss of instrument air would have a significant total impact on cascade operations. The plant air system is designed with air plants in four locations to prevent the total loss of air to all cascade areas. In the event of a total power failure, the C-607 air plant (powered by a diesel generator set) will provide approximately 4,000 scfm of air for instrument applications.[11]

The most likely scenario would be a line break at one of the process buildings from fatigue. All air supply headers are protected by elevating the lines above roadways and under bypass housings where possible to prevent equipment from impacting them during daily plant operations. However, in the case of a line break, several minutes would elapse before the break could be located and isolated. This would necessitate a shutdown of one or more cascade buildings until service is restored.

The immediate impact to cascade operations would be the loss of all pneumatic instrumentation. The C-300 central control facility (CCF) would receive a low air pressure alarm on the utilities panel, set at 77 psig. Total air flow indication would increase and the process building ACR would also receive similar alarms on their control panels. A plant air pressure of less than 40 psig is considered to be a total plant air failure. Stage control valves would open, condenser RCW valves would close, and stage motor load alarms will sound due to inventory shift from stage control valve changes.

Building C-300 would inform cascade areas to shut down the affected equipment. The cascade would be split at the top and bottom of the affected area, all cascade feed would be stopped and affected lube oil and RCW pumps would be shut down.

The air-to-open RCW control valves on the coolant condensers would close; R-114 temperature would immediately start to increase. RCW control valves are air-to-open to prevent freeze out of UF_6 in equipment if the cell was down with RCW flow cooling the R-114. Rapid temperature and pressure increases in the R-114 system would continue until the cell is shut down. A coolant high pressure alarm would be received in the ACR when the coolant temperature reaches 195°F (169 psia). This would be followed by a cell trip at 220°F (222 psia) initiated by the coolant Meletron switch located on each R-114 condenser. If the coolant Meletron failed and subsequent efforts to shut down the cell fail, the coolant pressure would increase until the R-114 condenser rupture disc relieves the pressure in the condenser.

The coolant condenser relief systems on "00" and "000" cells consist of a block valve (sealed open), one rupture disc, and a cone-shaped diffuser to prevent roof damage in the event of disc rupture due to overpressure. PGDP purchases rupture discs that are manufactured in accordance with the requirements of the ASME Boiler and Pressure Vessel (B&PV) Code, Section VIII. Rupture discs are applied and installed in PGDP systems based on Section VIII requirements. Those stamped with a single rupture value have a burst tolerance of ±5% and must not be stamped higher than the MAWP (typically 300 psig). Those which are stamped with a burst pressure range include the tolerance, and the maximum stamped value must not exceed 105% of MAWP. Rupture discs do not require any maintenance or inspection other than sealing open the block valve and replacement upon failure. Rupture discs are designated safety system components to prevent overpressure of the R-114 system, and subsequent rupture to the UF_6 system.

Adequacy of the relief system was verified in 1979 by Lockheed at their Huntsville Research and Engineering Center during a series of tests to determine if a newly designed diffuser would restrict the discharge from the rupture disc systems employed at GDPs.[12] The diffuser was required following an overpressurization of an R-114 system at ORGDP in 1977 which caused structural damage to the roof of the building. Although the tests were primarily designed to test the diffuser, pertinent characteristics of a 00-type condenser were used for the test. These were:

A second Normetex pump accident scenario was examined. If the pump discharge valve were to fail closed on an on-stream pump, the discharge pressure would rise quite rapidly and could conceivably rupture the pump discharge bellows. To prevent this type of accident, dual high pressure shut-down instrumentation is installed as a safety system on the pump discharge. High pressure will sound an alarm at 37 psia and cause a pump operational trip at 39 psia. The high discharge pressure safety system will trip the pump at 42 psia to prevent exceeding the 45 psia pressure rating (MAWP) of the discharge bellows. This scenario is of negligible safety concern. A failure of the safety system would result in a source term bounded by the fatigue failure scenario described in the previous paragraph.

4.3.3.1.2 Condenser and Accumulator Failures

The UF_6 accumulators and condensers are built in accordance with the ASME Boiler and Pressure Vessel (B&PV) Code, Section VIII. They are inspected at five-year intervals in accordance with the current edition of the National Board of Inspection Code (NBIC). Tests have shown there has been no appreciable loss of metal from either the C-310 or C-315 accumulators. A fatigue failure of components located between the Normetex pump and the product condensers would result in the release of UF_6 as described in 4.3.3.1.1. A failure between the condenser and the drain station block valves would result in a release from the liquid UF_6 portion of the system.

The rupture of a withdrawal system component containing liquid UF_6 could result from a fatigue failure of an instrument line on the accumulator or the fatigue failure of the drain line from the accumulator. The worst case in either of these low probability accidents would occur if the accumulator was partially filled during the change out of UF_6 drain cylinders at the withdrawal station.

The instrument line break is characterized by a leak from a severed ¼ in. diameter copper tube. In this instance, the UF_6 is estimated to leak out of the system at a rate of 133 lb/min. A leak on the drain line could be larger depending on the location and type of break, but in no case would the total leak be greater than 1,000 lb of UF_6.

The high voltage UF_6 detection system located in this area will alarm in the C-310 ACR and in C-300, but does not initiate automatic actions. It is assumed that this system would alarm in approximately 15 sec and alert the C-310 ACR operator to a possible release. The ACR operator would don full protective equipment, physically verify the release, notify C-300, and return to the ACR to perform valving operations to isolate the leak and reduce the system pressure by evacuation. These actions could require up to 40 minutes to accomplish. If the release is small, the lengthy response would not increase the total release above the 1,000 lb estimate. If the release approaches 133 lb/min, the release will be readily apparent from outside the facility, and the ACR operator would initiate mitigative steps. These operations are estimated to require no more than 5 minutes to complete from the start of the release until the system is evacuated.

The UF_6 detection system is a safety system; however, the valves, controls, etc., used in the isolation and evacuation of the condensers and accumulators are not identified as safety system components due to the varied and diverse means available for system evacuation. If the UF_6 condenser vent valves and the accumulator vent valve fail to open, the system can be evacuated through the pump evacuation valves or the evacuation valves at the withdrawal stations. These actions may take longer than 5 minutes to accomplish if personnel protective equipment must be donned to access these areas.

4.3.3.1.3 Valve and Pigtail Failure

The worst-case accident scenario considered possible at the product withdrawal station is a complete rupture of the drain manifold to cylinder pigtail with the accumulators partially full. This could result from an inadvertent scale cart movement while the pigtail is attached. In analyzing this scenario, it is assumed the cylinders receiving the liquid UF_6 are always filled with the valve in the 12 o'clock position.

The testing and inspection of pigtails before UF_6 service reduce the likelihood of this accident. A key-operated interlock switch shuts off the air supply to the cart, and administrative controls require the key ring to be placed on the pigtail when it is connected to a cylinder. In addition, a pressure sensor on the drain line prevents cart movement unless the pigtail is at atmospheric pressure, (± 3 psi). However, should the pigtail become completely severed and dislocated, UF_6 would escape from the manifold end of the severed pigtail at a rate of 20 lb/sec and from the cylinder end at a rate of 80 lb/min.

The withdrawal areas at PGDP are equipped with a UF_6 release detection and isolation system which includes two, fast-acting block valves on each drain manifold and a valve closer on each cylinder valve as described in SAR section 3.4.7. Assuming a 5 sec response time for the UF_6 detection unit, a 1 sec closure time for the manifold block valves, and 10 sec for the cylinder valve closer to operate, the total outleakage from this medium probability accident is 140 lb of UF_6. Although testing at C-360 tends to support these closure times, the valve specifications accept longer times. This scenario will be reevaluated in the ongoing GDP Safety Analysis Report (SAR) Upgrade Program.

The evaluation presented above is the existing safety basis analysis for a valve or pigtail failure at the production withdrawal station. However, the assumed release detection and valve actuation times may not be conservative. The release has been recalculated based on more conservative values for detection time (15 sec), block valve closure time (15 sec), and cylinder valve closure time (30 sec). Using the same release rates assumed above (20 lb/sec liquid release from the manifold end of the break and 80 lb/min gaseous from the cylinder end), the total release would be 660 lb of UF_6. This higher value reflects an upper bound for this potential release and has been used in the TSR basis statement.

4.3.3.1.4 Buffered Valve and Flange Failures

The consequences of failure of buffered valves or buffered flanges are difficult to evaluate because of the failure mechanisms involved. These systems are designed primarily to protect against releases resulting from metal fatigue type failures in the thin metals used in these applications. Valve bellows will occasionally fail, but the outleakage rates will vary with the degree of damage. Buffer systems are monitored so that leaks are readily detected and can be isolated.

The potential accidents and releases described above have negligible safety consequences. Any small amounts of hazardous material which might escape into the facility from a heated enclosure containing these expansion joints and valves would be readily detected by both sight and odor before they reached hazardous proportion. That would enable operating personnel to evacuate the immediate area and notify the ACR operator to isolate the leak and activate emergency response personnel. Because of this low risk situation, these buffer systems are not considered to be safety systems.

4.3.4.1 Failure of Equipment

The same assumptions as those listed in Section 4.3.3.1 are used to postulate accident scenarios in the tails withdrawal facilities.

4.3.4.1.1 Failure of Compression Components

The same scenarios as those listed in Section 4.3.3.1.1 are postulated for the Normetex withdrawal pumps. Although a low-speed centrifugal pump is used to pump UF_6 to the Hortonsphere, the centrifugal compression loops are in standby. The following accident analysis is maintained for completeness.

Inventory movement occurs during periods of upsets in the cascade due to the failure or shutdown of equipment. Such upsets cause either an increase or decrease in the amount of UF_6 in the surge drums due to changing demands on the surge volume of the C-315 building. When such demand changes occur, automatic valves must operate to regulate the flow of UF_6 to the condensers, surge drums, and centrifugal compressor for recycle.

Abnormal operation of the C-315 loop can exist in one of the following situations:

- Recycle valve fails to open for any reason such as failure of controls or a stuck valve.
- Recycle valve is in the 100% open position due to sticking, a ruptured diaphragm or loss of flow from C-331.
- Surge drums are at or below cascade pressure (C-331 "A" pressure) due to loss of control in the C-315 loop.
- Loss of a shaft seal on one of the C-315 centrifugal compressors causing inleakage with the resultant loss of pumping capability due to lights.
- Upsets in the main cascade due to equipment shutdown.

If the suction to a centrifugal compressor is closed or becomes "starved," it will circulate the gas within the pump causing heat buildup. Under these compression conditions, extreme heat buildup can cause the impeller to rub the casing and cause a UF_6-metal reaction. A UF_6-metal reaction on one of the low speed C-315 compressors could cause a portion of the pump to destruct and strike the discharge cooler releasing R-114 into the system with a force large enough to rupture the process boundaries. Operator actions during abnormal situations can include pump shutdown and evacuation to a subatmospheric source.

The C-315 incident discussed in Section 4.1.1 resulted from a lack of flow in the pump loops resulting in heat generation to the point where the R-114 coolers failed releasing coolant in an explosive manner.

The possibility of a UF_6-metal reaction due to low flow in the compressors in C-315 is reduced by several modifications. Differential temperature instrumentation has been installed to detect a rapid increase in temperature across a pump. In conjunction with other indications, the operator can identify an unacceptable low flow condition and trip the pump. Compressor motor amps, discharge pressure, recycle line pressure and recycle control valve position, supplement the differential temperature alarm. In addition, the recycle lines in the compression loop have been increased in size from 8 to 12 inches to aid in maintaining flow. These improvements reduce the probability of a UF_6-metal reaction in C-315 to a low probability event. In a worst-case situation, the UF_6 released is not expected to exceed 50 lb.

The centrifugal compressor discharge flow sensors were added following the R-114 cooler failure. The flow sensors, which used annubar flow elements were not sufficiently sensitive to respond to reduced flow conditions. The annubar flow elements were also prone to plugging. The flow sensors are no longer used.

Seal failures occur periodically, but at subatmospheric pressure conditions would not lead to a UF_6 release. During most abnormal conditions, the pumps are evacuated by venting to the subatmospheric cascade, reducing the potential for outleakage. The probability of compressor seal failure above atmospheric pressure is considered to be medium with a release of 5 to 10 lb of UF_6.

4.3.4.1.2 Condenser and Accumulator Failure

There have been no problems with leaks in the UF_6 accumulators or condensers in the past. The UF_6 accumulators and condensers are built in accordance with the ASME Boiler and Pressure Vessel (B&VE) Code, Section VIII. They are inspected at five-year intervals in accordance with the current version of the National Board of Inspection Code (NBIC). Tests have shown there has been no appreciable loss of metal from either the C-310 or C-315 accumulators. Normally, only a small amount of UF_6 is in the accumulator. This minimizes the potential outleakage in the event of a leak at the cylinder connections or from fatigue failure. The accumulators can be completely filled if necessary during cylinder changeout. However, during the period of switching from one cylinder to another, the accumulator inventory may increase. As in Section 4.3.3.1.2 an accumulator failure is characterized by a UF_6 leak from a severed instrument line at a rate of 133 lb/min.

The UF_6 detection safety system would detect the leak and alarm in the local control room and in the C-331 ACR. The control room operator would close the appropriate block valves and open evacuation valves if necessary to isolate the leak and evacuate the UF_6. Valves can be operated from the ACR and additional valves can be operated manually if necessary as part of the emergency response. The worst case is postulated to be the release of approximately 1,000 lb of UF_6 before the block valves and UF_6 drain cylinder valve are closed. The probability of such an accident is considered to be low.

4.3.4.1.3 Valve and Pigtail Failure

The most probable source of a major release in the tails withdrawal facility might be expected to occur at the cylinder filling stations. Here, threaded and gasketed pigtail connections are used to connect cylinders to the withdrawal system piping.

The primary uses for the C-400 receiving booth are servicing those NaF and MgF_2 traps that are not serviced in the field and also for storage of contaminated parts. These traps are used for the absorption of UF_6 and trace quantities of technetium. However, these operations are presently conducted only once or twice per year. At the present time and in the foreseeable future, minimal use of the receiving booth is foreseen. As a result of the safety precautions and method of operation employed, no credible accidents involving toxic material release are expected during the operation of this facility.

4.3.7.1.2 Mishandling of Contaminated Solution from Decontamination Systems

The spray booth operation's only area of concern is safe handling of uranium contaminated solutions. The spray booth can be operated without unusual risk to the health and safety of employees with respect to personnel exposure to contaminated solutions. The potential for criticality is discussed in Section 4.4.

4.3.7.1.3 Exposure to UF_6 from Cylinder Cleaning Facilities

Cylinders which are sent to the C-400 or C-409 UF_6 cylinder cleaning facilities have been emptied such that only a heel of solid reaction products and a minor amount of gaseous and solid UF_6 remains. The cylinder will have been evacuated to pressures well below atmospheric, minimizing the amount of UF_6 in the cylinder. However, both vapor phase UF_6 releases and releases of UO_2F_2 and HF, after admission of water into cylinders containing UF_6 heels, are possible.

The enrichment will be limited to less than 1 wt. % ^{235}U, which will be independently verified. Cylinders must be processed in accordance with NCSAs governing cylinder washing and testing activities. Cylinders which have been exposed to no more than 5.5 wt. % ^{235}U are processed in C-409. Cylinders must be processed in accordance with NCSAs governing cylinder washing and testing activities. In almost every case, the cylinder heel consists of non-volatile solid uranium compounds as well as minor amounts gaseous and solid UF_6. If there are no other gases present, the pressure in a cylinder containing gaseous UF_6 at 90°F would be approximately 3.7 psia. A drop and puncture of such a cylinder would result in an inleakage followed by a slow diffusion of UF_6 reaction products to the atmosphere. This type of outleakage could be easily controlled to avoid any personnel hazard.

If the heel were substantially all UF_6, however, there might be some possibility for a release when water is admitted to the cylinder in the first operation of the cleaning cycle. When water is admitted into the cylinder it reacts with the UF_6 to form UO_2F_2 and HF. There is sufficient excess water to complete this reaction. The HF formed will dissolve in the wash solution and is drained from the cylinder. Special procedures are used to avoid the possibility of high pressure in the cylinder when water is admitted in the first operation of the cleaning cycle.

An accident has never occurred when existing equipment and procedures have been used and would be considered to be an extremely low probability event because of the precautions taken in emptying cylinders prior to cleaning. Normally, the contents of cylinders to be cleaned are fed out at elevated

temperatures in autoclaves and are generally evacuated to very low pressures which reduce the UF_6 content well below the heel limit. Furthermore, a substantial fraction of the weight of the heel is solid material that will not produce high vapor pressures.

4.3.7.1.4 Uranium Recovery System Ruptures

System ruptures could occur from corrosion caused by the chemicals used in this process. Loss from any of the systems should be minimal and corrective measures could be taken. A delay in the operation would be experienced during the repair or replacement of equipment. All vessels containing corrosive materials are visually inspected and their thickness measured ultrasonically once each year. Pressure vessels are inspected internally by Quality Evaluation every five years These inspections are expected to prevent a serious rupture caused by corrosion.

It is unlikely that the equipment would be ruptured by mechanical forces acting upon the system due to the design of the equipment, and therefore, no unique hazards are foreseen.

4.3.7.1.5 Chemical Spills from Uranium Recovery System

Chemical spills could occur as a result of a rupture of the systems by corrosion, mechanical forces, overflow, or during chemical unloading. It is possible that a chemical spill would be of sufficient magnitude to cause a significant environmental insult and could cause an interruption of operations during clean-up. Chemical tank dikes are inspected and spill protection procedures for chemical unloading areas are followed; no unique hazards are foreseen.

4.3.7.1.6 Fluorine System Rupture

The F_2 system consists of feed facilities, storage tanks, and a plant distribution system. Fluorine is fed to the system through one of three racks of eight 5 lb F_2 bottles connected to a manifold by pigtails contained in cabinets located in C-410-K. The fluorine is supplied to one of three storage tanks in C-410-D from which it is dispensed to the distribution piping on demand through a control valve located in C-410-D. The tank pressure is maintained at about 25 psig while the distribution system is controlled at about 5 psig. The fluorine is distributed through overhead pipelines to the C-310, C-331, and C-335 process buildings, and to the C-350 ClF_3/F_2 facility. The potential accidents and estimates of releases associated with this system are shown in Table 4.3-7.

The worst-case credible accidents for this system are those which involve pipe ruptures within buildings. This piping is well protected for the most part due to its location below ceilings or under roof girders. The estimated total releases in various buildings are summarized in Table 4.3-8. The building concentrations also shown in Table 4.3-8 are based on assumptions of equilibrium mixing with no ventilation losses.

4.4.2.3 C-409 Uranium Recovery System

The primary mission of the C-409 Uranium Recovery System is the processing of uranium contaminated solutions that have too great an enrichment to be processed by the C-400 Uranium Recovery System (> 1.5 wt % ^{235}U). The C-409 uranium recovery systems includes a solution acidifying and storage tank system, a precipitation tank system, a rotary vacuum precipitation system, and a filtrate tank system. The solution acidifying and storage tanks include 4 stainless steel solution acidifying tanks, 12 stainless steel solution storage tanks, 2 solution transfer pumps, 1 nitric acid day tank, and 1 nitric acid metering tank. The precipitation system consists of six stainless steel precipitation tanks, one slurry transfer pump, and one NaOH feed drum. The rotary vacuum precipitation system consists of one rotary drum filter, one vacuum receiver, one vacuum pump, one mist eliminator, one silencer-separator, one precoat tank and mixer, one precoat pump, and one filtrate transfer pump. The filtrate tank system consists of eight stainless steel filtrate tanks, one filtrate transfer pump, and a 1,200-gal portable tank or other storage systems. A stainless steel floor pan with a maximum depth of 1-in. covers the floor area encompassing the uranium recovery system.

The solution acidifying and storage tanks are nominal 10-in. diameter and are by design and arrangement of favorable geometry for nuclear criticality safety for handling uranium solutions containing 5.5 wt % ^{235}U or less. The tanks are used in groups of four connected by equalizing lines and each group is considered one tank set. One tank set is used to acidify the uranium solution, the remaining three tank sets are used to store the acidified solution. The acidifying tank set is used to collect solution transferred from the storage tanks adjacent to the C-400 spray booth.

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

The Precipitation system tanks are nominal 10-in. diameter and are by design and arrangement, favorable geometry for criticality safety for handling uranium solutions containing 5.5 wt % ^{235}U or less. Each of the tanks is equipped with two liquid level sensors. Should the liquid level reach these switches, the solution storage transfer pump, the slurry transfer pump, and the filtrate pump will trip off and a visual and audible alarm will sound. An upper level switch also actuates a visual and audible alarm.

A combination of limits on concentration/density and the use of favorable geometry is used to ensure the nuclear criticality safety of the system. Concentration/density is used as a control for NCS in one portion of the system. The transter of filtrate to the 1,200-gal portable tank or other storage systems is limited to 0.1 gU/liter. This ensures that the solution transferred out of the system does not require further NCS controls. The majority of the system is fabricated of pipe that is of favorable geometry for 5.5 wt % ^{235}U. The drum filter unit is designed to be safe at enrichments up to 5.5 wt % ^{235}U.

4.4.2.4 C-400 Cylinder Wash

Cylinder washing is performed to maintain the cleanliness of the UF_6 cylinders and to prepare for the required 5-year hydrostatic pressure testing recertification. NCS controls will be established to ensure double contingency in accordance with the requirements of Section 5.2. The enrichment will be limited to less than 1 wt. % ^{235}U, which will be independently verified.

The wash solution storage tanks are nominal 16-in. diameter tanks which are geometrically safe for less than or equal to 2.0 wt % ^{235}U. The drain pan for wash solutions has a maximum depth of 8-in. which is geometrically favorable for solutions of up to 2.0 wt %enrichment.

4.4.2.5 Field Decontamination

Field decontamination is performed for clean up of areas where significant amounts of fissile material may be encountered in the plant. The exact nature of the work varies from area to area, but two basic methods are used: the dry cleaning method or the soda ash solution method. The dry cleaning method is used wherever possible. This method makes use of floor sweep, brooms, scoops, and vacuum cleaners equipped with secondary HEPA filters. The soda ash solution method is used when necessary. A soda ash in water solution is used with sponges, rags, and floor sweepers to clean up an area. For both cleaning methods, 5.5 gal drums or 5.5 gal vacuum cleaners are required as a nuclear criticality safety volume control on all jobs where materials are enriched to 1.0 wt % ^{235}U or higher. Each vessel such as a 5.5 gal drum or HEPA vacuum cleaner containing contaminated waste is moved one at a time and interaction control is provided by requiring a minimum 2-ft edge-to-edge spacing during all storage and handling operations.

Cleaning solutions used are limited to 5.5 gal containers. All vacuum cleaners and other decontamination equipment e.g., floor sweepers shall have a maximum internal volume of 5.5 gal and must have a NCS approval sticker attached.

4.4.3 UF_6 Handling Facilities

The equipment evaluated for criticality safety in these facilities includes the autocl[illegible] product cylinders, scale and elevator pits, oil interceptors, Normetex pumps, and various tanks.

The olfactory warning properties of airborne exposure are significant because of strong respiratory tract irritation due to HF.

The HF odor is detectable by personnel at very low concentrations (between 0.03 and 0.13 ppm, depending on reference) making an unknown 10 mg intake of soluble uranium unlikely at a GDP facility. Based on stoichiometric calculations, a 1.0 ppm concentration of HF would result in an airborne uranium concentration of approximately 2.43 mg/m^3. A 1-hr exposure to an atmosphere 8 to 30 times the threshold detection limit for HF would result in an intake of approximately 2.9 mg of uranium, assuming the standard man breathing rate of 1.2 m^3/hr.

The hazards from uranium are twofold — chemical toxicity and radiation. Fortunately, the warning properties and low specific activity combine so that large intakes are unlikely except during inadvertent releases. The chemical toxicity limit is limiting in the lower assay end of the cascade due to the decrease in ^{234}U. The specific activity of depleted uranium is about 0.4 μCi/g. The specific activity of reactor feed at 4% enrichment is still only 2 μCi/g.

^{234}U is the uranium nuclide with the highest dose. The DAC for the uranium isotopes present in the GDPs (^{234}U, ^{235}U, ^{236}U, and ^{238}U) varies only from 5E-10 μCi/ml to 6E-10 μCi/ml. U is also the predominant isotope in terms of total alpha radioactivity in all areas (except at the tails withdrawal points or the process equipment immediately up gradient from that point). ^{238}U produces slightly more than half the total activity only in process equipment near "tails." ^{235}U, enriched to as much as 2% of the mass, is never a significant contributor to the total alpha activity. To determine the actual composition of the uranium, isotopic determinations would have to be performed on nearly every sample. Since ^{234}U is limiting in terms of the DAC and ALI, all uranium is assumed to be ^{234}U for dose compliance purposes as a conservative measure.

Nuclides other than uranium are present at PGDP (^{99}Tc, ^{241}Am, ^{237}Np, ^{238}Pu, ^{239}Pu, ^{230}Th). Outside of the technetium and uranium, these nuclides are not routinely detected in removable contamination and airborne samples and are only present in trace quantities within certain areas of the plant. A formal site characterization has not been completed at PGDP to determine isotope composition and isotope ratios within areas of the plant. However, wipe and air samples obtained within the plant and containing significant activity may be analyzed for these nuclides. Experience reveals uranium or technetium to be the dominant nuclide with other isotopes not being routinely detected.

Air sampling data specific to intakes detected on urine bioassay above action levels are evaluated along with bioassay for various nuclides in an effort to determine the radionuclides involved in the intake. In accordance with 10 CFR 20.1204(a) and (g), radionuclides contributing significant internal dose are included in the internal dose assessment.

5.3.2.8 Respiratory Protection

The Respiratory Protection Program follows the requirements of 29 CFR 1910.134 and 10 CFR 20 for use, issuance, training, and qualifications for respirator users. There is a written policy statement on respirator usage pursuant to 10 CFR 20.1703(a)(4). Respiratory radiological protection requirements are specified in RWPs or procedures.

Respiratory protection may be used to limit internal exposures when engineering and administrative controls, including access restrictions and the use of specific work practices, are not practicable. The selection and use of respirators for radiological protection are in accordance with 10 CFR 20.1703. Qualifications for individuals permitted to use respiratory protection include an annual physical examination by a physician, respiratory protection training, and fit testing.

The Respiratory Protection Program is administered by Industrial Hygiene (IH). RWPs specify respiratory protection requirements to prevent inhalation of uranium or other radioactive material. RP coordinates respiratory protection requirements with IH prior to specifying the requirements on the RWP.

Use of respiratory protection will be considered under any of the following conditions:

1. Entry into posted Airborne Radioactivity Areas;

2. During breach of contaminated systems or components;

3. Work in areas or on equipment with removable contamination levels greater than 100 times the values in Table 5.3-6; and

4. During work on contaminated surfaces with the potential to generate airborne radioactivity.

In specific situations, the use of respiratory protection may be contraindicated due to physical limitations, such as heat stress, or the potential for significantly increased external exposure with approval of the RP Manager. In such situations, stay time controls to limit intake are established and continuous workplace airborne monitoring is provided along with expedited analysis of results.

Respirators are required for activities where an individual may be exposed to soluble uranium that may exceed 0.8 DAC-hours during a work shift.

5.3.2.9 Occupational Exposure Analysis

The TEDE at PGDP has traditionally been very low. The collective doses for 1992, 1993, and 1994 were 7.106 person-rem, 7.581 person-rem, and 6.789 person-rem, respectively. The highest individual TEDE during those years was 0.347 rem. These values are for the entire site and do not account for the fact that in the future, dose will be divided between areas regulated by the NRC and DOE. Table 5.3-9 list internal and external dose summaries for 1992 through 1994.

5.3.2.10 Ventilation

Building ventilation systems are described in Section 3.3.5.11.

When portable units equipped with differential pressure ((DP) gauges are used for radiological protection purposes, HEPA filter differential pressure will be checked when the unit is placed in service or daily when running continuously. A reading greater than 5 inches water across the HEPA filter shall require a shutdown for inspection or filter change. Vacuum units not equipped with DP gauges will have

Soil Contamination Areas

If surveys of soil surfaces conducted in USEC-controlled spaces, indicate surface contamination greater than the total contamination levels shown in Table 5.3-2, the area is posted as required by approved 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.

Contamination Areas

CAs are areas where removable contamination level averaged over an area of approximately 1 m^2 (see Table 5.3-6, footnote b for limitations) has been identified as being greater than the levels specified in Table 5.3-6 but not greater than 100 times the levels in Table 5.3-6. CAs are conspicuously posted "Caution, Contamination Area" with the exception of some areas, enclosures, structures, or equipment on Cell Floors. RWPs are required for access to CAs. Due to the large physical size of the Cell Floors (up to approximately 25 acres) and evidence that current contamination control practices are effective in protecting personnel from unnecessary exposure to contamination, the Cell Floors will normally be posted as CCZs with additional wording to indicate that unposted CAs are present and an RWP is required for any access. Unposted CAs on the Cell Floor will only be permitted for easily described, generic locations out of the normal walk ways such as motor ends, cell housings, specific compressor components, etc. The areas that may be allowed to exist unposted will be specified in approved procedures. High Contamination Areas will not be allowed to be unposted. Contamination Areas associated with job specific tasks will not be permitted to be unposted. General RWPs for non-job-specific access to the Cell Floors will contain sufficient information to enable radiation workers to avoid contacting unmarked contaminated surfaces. The General RWPs for such areas shall contain sufficient information to meet the requirements of 10 CFR 19.12 that states, "All individuals working in or frequenting any portion of a restricted area shall be kept informed of the storage, transfer, or use of radioactive materials or of radiation in such portions of the restricted area . . ." Unescorted access to CAs and Cell Floors requires, as a minimum, the successful completion of Radiological Worker II training.

With the exception of Cell Floor CCZs described in the preceding paragraph, personnel exiting CAs are required to monitor themselves for contamination after removing their protective clothing and prior to leaving the step-off area except as noted in Section 5.3.3.5. Those personnel excepted above will perform a whole body frisk when exiting the CCZ. Equipment and materials will be monitored prior to removal from CAs. If contaminated, the equipment and materials will be decontaminated prior to removal from the CA or will be contained and controlled as radioactive material.

High Contamination Areas

HCAs are areas where contamination levels have been identified as greater than 100 times the levels specified in Table 5.3-6. HCAs will be conspicuously posted "Caution, High Contamination Area," and personnel access is subject to RWP requirements.

Airborne Radioactivity Areas

ARAs are areas where the potential exists for airborne radioactivity concentrations to exceed 10% of the DAC averaged over 8 hours, or a peak concentration of 1 DAC, or soluble uranium concentration exceeds 50 $\mu g/m^3$. ARAs will be conspicuously posted "Caution, Airborne Radioactivity Area," and personnel access is subject to RWP requirements.

Radiation Areas

RAs are areas accessible to personnel in which radiation levels could result in a person receiving a dose equivalent in excess of 5 mrem/hr at 30 cm. These areas will be posted "Caution, Radiation Area" and personnel access to these areas is subject to RWP requirements. Unescorted access to RAs requires, as a minimum, the successful completion of radiological worker training. The RP Manager may exempt the requirement for an RWP in certain RAs as specified in approved procedures.

At USEC facilities, the primary radiation concern is the cylinder yards. When feed cylinders are emptied, short-lived radionuclide daughter products of uranium remain in the cylinder. This residual material is called the "heel." After the cylinder is emptied, it can exhibit a dose rate exceeding 100 mrem/hr at 30 cm for a short period of time. Since the "heel" forms at the bottom of the cylinder and the cylinder is stored on or near the ground, the area where the dose rate exceeds 100 mrem/hr at 30 cm is not accessible. Cylinders are surveyed after being emptied and placed on the scale cart. Any cylinders with dose rates exceeding 100 mrem/hr at 30 cm will not be moved or raised after being placed in the storage area, without continuous coverage by a HP technician with a survey meter.

Freshly emptied cylinders will be surveyed and segregated to areas posted as "Radiation Areas" to allow them to decay. Work and entry in these areas will be performed by qualified radiological workers under the guidance of an RWP.

High Radiation Areas

HRAs are areas accessible to personnel in which radiation levels could result in a person receiving a dose equivalent in excess of 100 mrem/hr at 30 cm from the radiation source or from any surface that the radiation penetrates. These areas will be posted "Danger, High Radiation Area" or "Caution, High Radiation Area."

There are two cases when radiation levels exceeding 100 mrem/hr at 30 cm may be anticipated. The first case is during instrument calibration. The second case involves temporary high radiation levels that may occasionally be present around freshly emptied cylinders due to short-lived daughter products that are left in the "heels." However, the general inaccessibility of the portions of the cylinder exhibiting levels above 100 mrem/hr allows them to be controlled as RAs. Very High Radiation Areas are not anticipated at PGDP Physical and/or administrative controls to prevent inadvertent or unauthorized access to HRAs will be maintained. Minimum requirements for unescorted entry into HRAs includes the following:

5.4.7 Process Building Sprinkler Systems Covered by TSRs

The sprinkler systems in the process buildings are designated as AQ in Section 3.15. Although these systems are designated as AQ systems, they are controlled by the fire protection program herein described; the fire protection program provides the level of control necessary to support the accident analysis. The configuration of fire protection systems has been maintained through the use of a plant procedure. This procedure prescribes the requirements for configuration management of fire protection systems and ensures that modifications and repairs to these systems are under the control of the AHJ. In addition, procedures are in place for the operation, testing, inspection, and impairment control of fire protection systems. Together, these procedures and practices have provided adequate assurance that fire protection systems and features will perform their intended functions. These procedures will continue to be used to ensure configuration management of fire protection systems.

The fire protection program is controlled by Fire Services which includes the fire protection engineering staff. This group has oversight of the fire protection systems. System modifications are reviewed by a fire protection engineer for compliance, or equivalent, with the guidance listed in the standards and the particular situation.

Fire protection engineers review plans for system modifications for compliance with the guidance in applicable standards (final approval authority rests with the AHJ). Modifications and repairs are coordinated between maintenance, contractors, and Fire Services personnel to ensure proper system work is completed. Repairs to a system are done with recognized and approved parts that are commercially available. Repair parts/replacement parts are specified and controlled by the AHJ.

Permits for outages and the actual outage of any system are approved by Fire Services. Maintenance is requested through Fire Services, and post-maintenance testing is done or overseen by members of Fire Services.

The operability of the process building sprinkler systems are addressed in applicable TSRs.

5.4.8 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.

5.4.8.1 Fire Alarm System Reliability

The reliability of the fire alarm system is not commensurate with the level of protection described in the application because that the system may not detect the loss of contact with an individual alarm for a sprinkler system or fire alarm box. This is an infrequent occurrence and the ability of automatic systems is not impaired. Alternate communications to the central alarm receiving location are provided. Improvements to the alarm system are planned as described in the Compliance Plan.

5.4.8.2 Fire Protection Water Pump Reliability

Two of five fire water pumps are required to provide the capacity discussed in the SAR. The pumping system is old and does not provide a level of adequate reliability implied by the SAR. The performance of the existing fire water pumps is monitored through periodic inspection and testing. Refurbishment of the two electric fire water pumps is planned as described in the Compliance Plan. The diesel-powered fire water pump will be abandoned in place.

5.4.8.3 Fire Protection Equipment

The larger process buildings currently do not contain sufficient hose and equipment to support manual firefighting without bringing additional hose and equipment into the building. The existing fixed fire suppression systems provide control of postulated fires, and additional equipment will augment that capability. Additional equipment will be purchased and installed as described in the Compliance Plan.

5.4.8.4 Procedure Upgrades

Some fire protection procedures are being upgraded as part of the procedures upgrade program. Upgraded procedures supporting the inspection and testing of fire protection components and program implementation are planned. Several new procedures will be needed to support the equipment upgrades that are discussed above. The existing procedures are being used until new and upgraded procedures are available.

5.4.8.5 Building C-315 Sprinkler Modifications

Section deleted.

5.4.8.6 Pre-fire Plans

Pre-fire plans have not received periodic review. They will be reviewed, updated, and scheduled for periodic review.

5.4.8.7 Hot Work Permit Program

The hot work permit procedure will be revised to ensure Fire Services involvement and oversight of the hot work permit program and applicable training programs will also be revised.

5.4.8.8 Combustible Loadings

An analysis will be conducted to determine the maximum allowable combustibles loadings within the process buildings. Building custodians will be provided information and training to recognize the acceptable levels of combustible loading in the process buildings, both in general and in local areas.

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 on-site) 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 Shift Operations Manager and provides direction and coordination for shift operations. The Shift Operations Manager reports to the Operations Manager. The staff and support organizations (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, Business Management, 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 on-site 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 shutdown 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, six years nuclear experience, and six 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 one year quality assurance experience or one 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 and 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, 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 shutdown 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, six years of nuclear experience, and six years of management experience (which may be concurrent with the nuclear experience).

The General Manager is appointed by the 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, six years of nuclear experience, and six 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 on-site transportation of UF_6; providing electric power, steam, compressed air, nitrogen, plant and sanitary water, waste water treatment for the cascade and support facilities; and providing chemical cleaning 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 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 four years of nuclear experience with at least six 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 providing 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 four years of nuclear experience with at least six 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 four years of nuclear experience with at least six months in a gaseous diffusion plant.

The Production Support Manager is appointed by the Enrichment Plant Manager with concurrence by the General Manager and by 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 radiation protection program. 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 four years experience in radiation protection including six 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 the 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 four years of nuclear experience with at least six months in a gaseous diffusion plant.

The Work Control Manager is appointed by the Enrichment Plant Manager with concurrence by the General Manager and 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 Cascade Coordinators and provides technical and administrative support.

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

The Shift Operations Manager is appointed by the Operations Manager with concurrence by the 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 the incident commander during plant emergencies and making notification of events.

The Plant Shift Superintendent is authorized to stop operations when system operability or the overall safety of operations is in question. The Plant Shift Superintendent is also authorized to initiate restart after shutdown for non-routine reasons. For shutdowns that are directed by the Executive Vice President, Operations; Vice President, Production; Safety, Safeguards and Quality Manager; the General Manager, or the Enrichment Plant Manager; the Plant Shift Superintendent 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 Operations Manager, 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 sciences, or equivalent technical experience and four years nuclear experience with at least six months at a GDP.

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. Responsibilities also include project management, construction and coordination of large project plant modifications or additions.

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

The Engineering Manager is appointed by the General Manager with concurrence by the Vice President, 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; 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 matter 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 analyses, or could cause a criticality concern.

The Nuclear Safety Manager shall have as a minimum a bachelors degree in engineering or physical sciences or equivalent technical experience, and four years nuclear experience with at least six 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. 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 four years of nuclear experience with at least six months at a GDP.

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

6.1.1.21 Security Manager

The Security 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.

The Security Manager is responsible for plant police services and security. The Security Manager has direct access to the General Manager concerning security matters and stop work authority for activities not being conducted in accordance with applicable security requirements.

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

The Security Manager is appointed by the Site and Facilities Support Manager with concurrence by the General Manager.

6.1.1.22 Fire Services Manager

The Fire Services 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.

The Fire Services Manager is responsible for plant fire services including interpretation and application of the applicable fire codes and standards, and has stop work authority for activities not being conducted in accordance with applicable fire protection requirements.

The Fire Services Manager shall have as a minimum a bachelors degree or equivalent technical experience, 4 years of fire protection experience, and 6 months of nuclear experience.

The Fire Services Manager is appointed by the Site and Facilities Support Manager with concurrence by the General Manager.

6.1.1.23 Training and Procedures Manager

The Training and Procedures Manager reports to the General Manager.

The Training and Procedures Manager is responsible for preparation, presentation, and recording of employee orientations and for technical and qualification training programs' development and implementation. In addition, this manager is responsible for the development and implementation of the procedures management program.

The Training and Procedures Manager shall have as a minimum a bachelors degree or equivalent technical experience and four years of nuclear experience.

The Training and Procedures Manager is appointed by the General Manager with concurrence by the Vice President, Production.

6.1.1.24 Nuclear Regulatory Affairs Manager

The Nuclear Regulatory Affairs Manager reports to the General Manager. The Nuclear Regulatory Affairs Manager is governed by and must adhere to policies established by the Nuclear Regulatory Assurance and Policy 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 investigations, and reporting; and NRC regulatory commitment management. As delegated by the Nuclear Regulatory Assurance and Policy Manager, the Nuclear Regulatory Affairs Manager has responsibility for coordinating certification related and certificate renewal-related activities.

The Nuclear Regulatory Affairs Manager shall have as a minimum a bachelors degree in engineering or the physical sciences or equivalent technical experience, and four years nuclear experience.

The Nuclear Regulatory Affairs Manager is appointed by the General Manager with concurrence of the Nuclear Regulatory Affairs and Policy Manager.

6.1.1.25 Operations and Maintenance First-Line Managers

First-line operations and maintenance managers report to Group or Section Managers.

First-line operations managers shall have as a minimum a high school diploma and three years of plant operations experience with at least six months in a gaseous diffusion plant. First-line maintenance managers shall have as a minimum a high school diploma and three years of plant maintenance experience with at least three months in a gaseous diffusion plant.

First-line operations and maintenance managers are appointed by Group or Section managers with concurrence by the Organization managers.

First-line operations managers can authorize the restart of equipment that has been shutdown in a routine fashion when the prerequisites and limitations of the associated operating procedure are met.

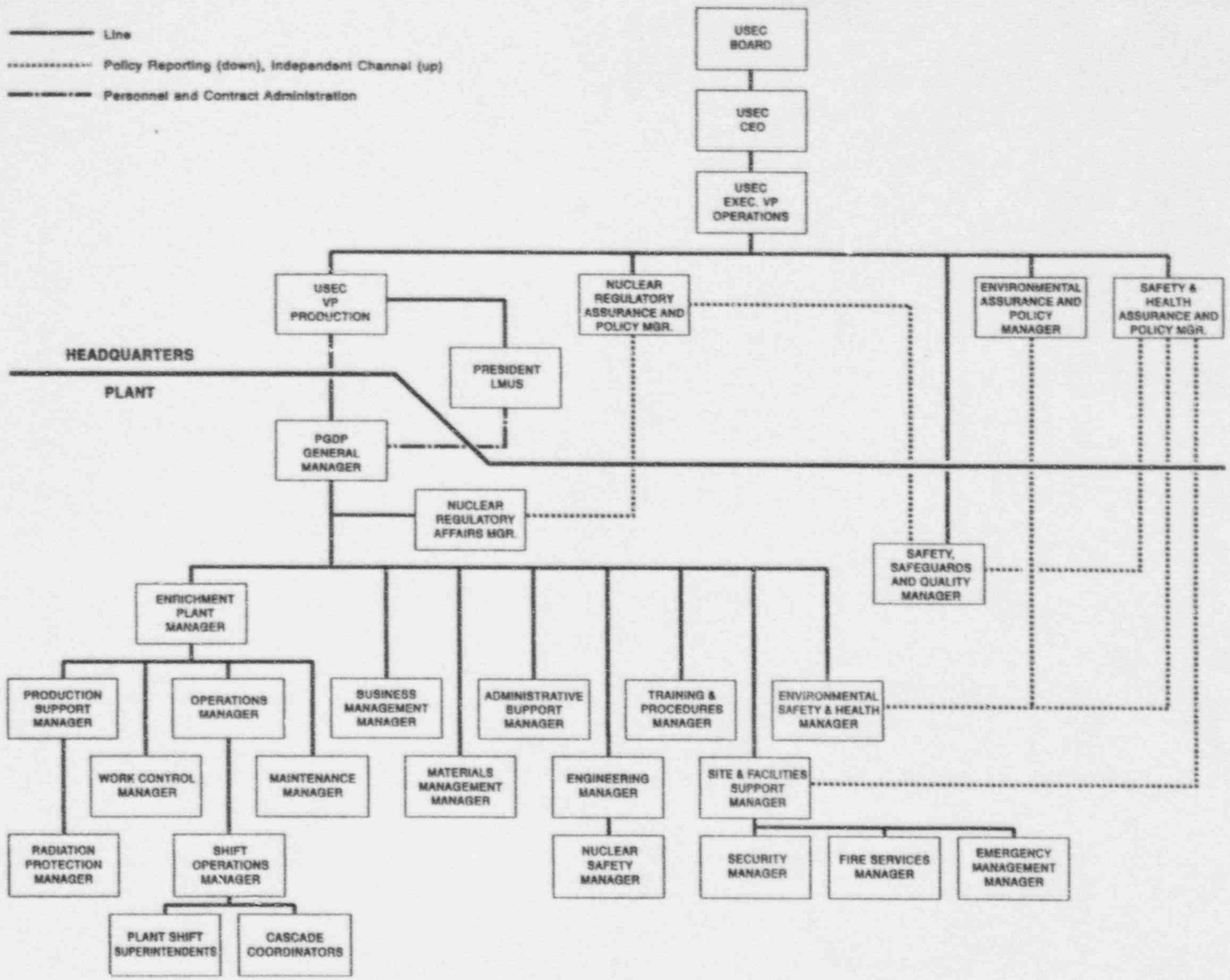

Figure 6.1-1. Uranium enrichment facilities organization chart.

Figure 6.1-2 deleted

The Quality Control group within Production Support performs inspections that are specified in work packages and procurement documents.

6.4.3 Training of Maintenance Personnel

Section 6.6 describes the system approach to training methodology used for initial and continuing training.

6.4.4 Maintenance Facilities

Section 3.13 describes PGDP maintenance facilities and specialized equipment.

6.4.5 Maintenance Procedures

Maintenance procedures fall into two broad categories. Administrative procedures define the processes for identifying, scheduling, prioritizing, and coordinating maintenance, both corrective and preventive, as well as prescribe the development of work packages and how maintenance is to be conducted. Technical maintenance procedures are developed for repair, calibration, and testing of specific components or component types.

Section 6.11 describes the procedure control process that ensures procedure development, review, revision, approval, control and distribution.

6.4.6 Types of Maintenance

Q items and AQ items are maintained by performing PM including periodic calibration, CM, and Surveillance.

PM are those tasks performed on a periodic basis to prevent failures, facilitate performance, and maintain or extend life of the equipment. PMs are identified, scheduled, and performed in accordance with maintenance procedures. Computer generated monthly reports are issued showing the status of scheduled PMs, including a description of the PM, date last performed, and date next due. PMs are adjusted as described in Section 6.4.7.

CM are those actions to check, troubleshoot, and repair equipment that has degraded or failed. CM identification, prioritization, planning and scheduling, performance and documentation are discussed in Section 6.4.7.

Surveillances are performance checks, calibrations, tests, and/or inspections which are performed to verify the proper operability of equipment and/or systems in accordance with the plant's Technical Safety Requirements. The Technical Safety Requirements identify the surveillance requirements and frequencies.

6.4.7 Maintenance Programs

Maintenance is comprised of CM, PM including calibration, and trend analysis. Work control is the process used to carry out these activities. Key elements that are used to help PGDP achieve the desired level of performance are listed below.

CM consists of the following elements:

- **Work Order** — A work order is the mechanism by which the need for maintenance is identified and prioritized.
- **Planning and Scheduling** — Planning and scheduling activities result in: (1) maintenance job plan and job package that identifies materials and schedules; (2) identification of required support services; and (3) identification of the need for coordination with other jobs. Maintenance activities are prioritized by the Facility Operational Manager based on safety significance and available resources.
- **Work Execution** — Job packages are reviewed, a pre-job briefing is conducted, work is performed as planned, and the maintenance that was performed is documented.
- **Post-Maintenance Testing (PMT)** — Provides for testing to ensure that equipment and/or components will fulfill their required function when returned to service after maintenance.
- **Work Order Completion** — Provides a post maintenance package review to validate job package completion and the maintenance work history.

PM consists of the following elements:

- **Basis for PM** — The bases for PM tasks are developed through a review and applicability evaluation of manufacturer recommendations, available industry standards, and historical operating information. This development initiative is coordinated by the PM group, and involves design engineers, system engineers, and operating/maintenance personnel. The formal documented bases for the tasks are approved, controlled, and distributed by the design authority.
- **Scheduling**— PMs are scheduled according to plant conditions and task frequencies. The work control program identifies SSCs that require PM work packages. PMs are conducted and closed out in accordance with the work control and PM Program procedures. The TSR surveillances that are also credited in the PM Program will be conducted as required, or the actions required by the TSR will be followed. For delinquent PMs (not including TSR surveillances), the system engineer, with concurrence from the applicable functional area manager, or designee must determine the effect of extending of the PM on system operation. The decision includes a determination of compensatory actions and an acceptable completion date for the PM tasks.

6.5 OPERATIONS

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

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

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

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

Normal Operations

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

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

Off-normal (but not emergency) Operations

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

- Small releases of UF_6 or other toxic gases (such as F_2, HF, CLF_3, Cl_2) that result in evacuation of the immediate area and monitoring for reentry, but do not affect other areas of operations of the plant and have no impact off site;
- Occupational safety injuries and/or illnesses with a response required to render aid or transport to the plant or off site medical facility;

- Small fires that are quickly extinguished;
- Unexpected radiological contamination that requires reporting of plant areas or additional employee protective measures.

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

Emergency Operations

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

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

6.5.1 Shift Operations

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

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

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

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

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

are located in the CCF. The plant power system is monitored and controlled through a communication network with the power suppliers. Typical operational activities that are monitored and controlled from the CCF include determining and establishing optimal plant power level, executing or altering the maintenance work plan if necessary, and maintaining necessary manpower level to support plant operations.

Staffing levels for the shifts are not fixed but are based on the expected or planned activity for the shift period. Staffing levels take into account the routine monitoring of plant equipment including operator rounds, expected operational activity level, facility size, and Technical Safety Requirement (TSR) specified staffing requirements. When special activities are included in the work plans, the staffing will be increased as required to perform the planned activity. The required minimum staffing level for Paducah is approximately 43 as detailed in Section 3 of the TSRs. This is a fraction of the normal average shift staffing of approximately 80 persons.

Each shift organization is composed of a PSS and an assistant PSS; a cascade coordinator (CC) who directs overall cascade activities; shift engineer; first-line managers for the cascade buildings, power operations, utility operations, chemical operations, and maintenance; safety and health representatives who perform radiation protection and safety functions; Police Operations Shift Commander; Fire Services Shift Commander; and operators, maintenance mechanics, Police Operations 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, Shift 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 provide the needed functions for round-the-clock operations. The assistant PSS supports the PSS in management during shift operations. First-line managers provide management for, coordination of, and assurance for proper execution of assigned tasks. The shift engineer provides engineering support for technical issues involving operations. Health physics technicians provide support for 24-hour shift operations. The shift safety and health specialist provides support by evaluating and monitoring the work environment for safety and health concerns. The Police Operations 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 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 CCF is the focal point for all emergency reporting and initiating of all emergency responses. A special emergency telephone network is available in the CCF. Fire alarm and sprinkler indicator systems, criticality alarm panel, seismic alarms as well as numerous operational alarms are monitored in the CCF. As described in the Emergency Plan, the PSS will initiate off-site notifications and plant personnel call-ins when required.

As discussed in SAR Section 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 CCF. The PSS reviews each report to determine system operability and whether the condition is reportable. Reports that are required to be made are described in procedures available to the PSS along with appropriate telephone numbers. If an item is reportable, the PSS makes the initial notification.

6.5.2 Cascade Operations Organization and Administration

The cascade is the UF_6 enrichment portion of the plant. The cascade is composed of six major process buildings which houses 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 UF_6 Handling. 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 facility managers in conjunction with the rotating shift organization. The rotating shift organization follow daily instructions and work plans developed and communicated by the group managers. The CC 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.

- **Maintenance Mechanics** — This program is designed to provide the necessary knowledge and skills to repair, install, calibrate, and troubleshoot the process facilities mechanical equipment in a safe and efficient manner. Training includes site specific training on installation and repair of process equipment; both field and shop repair/calibration of equipment and components; welding, cutting and brazing, equipment alignment, and mobile equipment operation. Specific program description is documented in the TDAG for mechanical maintenance mechanics. Based on job specific assignment, personnel may be trained in any or all of the above listed 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."

6.6.7 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:

- Fundamentals on atomic structure, radiological definitions, types of ionizing radiation, units of measurement, dose, and dose rate calculations;
- Biological effects of ionizing radiation including cell sensitivity, chronic, and acute exposure,
- Radiation work permit applications and use;
- Radiation limits for occupational and nonoccupational 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 Control 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 also includes practical applications of the personal protective equipment, personnel monitoring, and radiation measurements. Radiation worker training is reviewed and approved by Radiation Protection management and administered by the central training organization.

6.6.8 Health Physics Technician Training

Health Physics Technician training and qualification is administered by Radiation Protection in accordance with guidelines in the TDAGs for Health Physics Technicians. It utilizes the systems approach to training (Section 6.6.3) and applies to those individuals, both plant and subcontractor employees who will be engaged in the evaluation of radiological conditions in the plant facilities and implementation of necessary radiological control measures as they apply to nuclear facility workers and members of the general public.

6.6.9 Fire Protection and Emergency Management Training

6.6.9.1 Emergency Management Training

Emergency Management Training is administered by Emergency Management under the direction of the Site and Facilities Support Manager. It is detailed in the PGDP Emergency Plan Section 7.2.

Emergency Management drills and exercises are conducted to develop, maintain, and test the response capabilities of personnel, facilities, equipment, and training (Section 6.6.9).

6.6.9.2 Fire Protection Training

Fire Protection Training is administered by the central training organization 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 technicians (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 is 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.

6.6.9.3 Fire Protection Engineer Training

Fire protection engineering support is available to evaluate the fire hazards of changes to maintenance and process systems, provide in-house consultation, perform building surveys, and investigate fires. Fire Protection Engineer (FPE) qualifications require a four (4) year related technical degree or ten (10) years of related experience, five (5) years of which are directly related to FPE support. FPEs are offered one professional development course every twenty four (24) months.

Fire Protection engineer training is administered by Fire Services. Training requirements are described in Section 5.4.5, Staffing and Training. Fire Protection Engineer training is not SAT-based.

6.6.10 Environmental, Safety and Health Training

This training 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. Specific programs identified as required compliance training for PGDP employees is contained in each organization's compliance training requirement matrix which provides a list of both the subject areas to be trained and the target audience to receive the training. Some of the areas include:

- Radiological Worker Safety,
- Nuclear Criticality Safety,
- Respirator Training,
- Confined Space Entry,

- Asbestos Worker Safety,
- Hearing Conservation,
- Heat/Cold Stress,
- OSHA Hazard Communication,
- Hoisting and Rigging,
- Mobile Equipment (Cranes, forklifts, etc.),
- Lockout/Tagout Work Permits,
- Safety & Health Work Permits, and
- RCRA Storage and Handling.

6.6.11 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. Site and Facility Support is responsible for identifying the specific training required and assigning subcontractor personnel to this training prior to allowing work to be performed under the contract.

Construction Engineering projects are conducted in accordance with OSHA construction engineering standards, 29 CFR 1926. Construction Engineering consults with Industrial Safety and Plant Training to determine what safety and health training should be provided to meet this standard. Subcontractor training is identified to meet project requirements on an individual project basis.

6.6.12 Nuclear Criticality Safety Engineer/Specialist Training

Nuclear Criticality Safety Engineer/Specialist training and qualification is administered by the Nuclear Criticality Safety Section of the Nuclear Safety Group. Nuclear Criticality Safety Section procedures and TDAG define education and experience prerequisite for incumbents, required training courses, and continuing training requirements.

6.6.13 Audit and Inspection 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.

The Safety, Safeguards, and Quality Manager is responsible for identifying all qualification and requalification requirements for quality assurance auditors. The Production Support Manager is responsible for identifying all qualification and requalification requirements for quality control inspectors.

6.6.14 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 not SAT-based but 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. This training includes:

- Management Skills Training,
- Initial and Continuing Process Safety Training for Managers, and
- Applicable elements of the Operations and Maintenance Initial and Continuing training.

6.6.15 Cascade Coordinator Training

Cascade coordinator training is administered by the Operations Organization and provided to those persons who direct the overall operations of the gaseous diffusion cascade. Training provides cascade coordinators an understanding of the overall integration of the process and support systems necessary to operate the GDP. Cascade coordinators also receive manager training.

6.6.16 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 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. Superintendent qualification is granted by the Operations Manager upon successful completion of training.

6.6.17 System Engineer Training

System Engineer Training is administered by Engineering and is provided to those persons who provide engineering support and review of the modifications to Q items or SSCs identified in NCSAs required to meet the double contingency principle. The training is based on a detailed review of job analysis data, training requirements for specific systems, and existing training materials.

6.6.18 Laboratory Technician Training

Laboratory Technician Training is administered by Production Support in accordance with the guidelines set down in the Training Development and Administrative Guide for Laboratory Technicians Training. The training is based on a SAT process. The analysis results were used to establish the learning objectives, test items, instructional methods, and instructional settings.

6.6.19 Waste Management Operator Training

Waste management operator training is administered by Production Support and is provided to those persons who handle, store, and move waste for on-site treatment or package for shipment to off-site TSD facilities. The program includes training on the following:

- Basic knowledge of chemical safety

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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;

2. Procedures document the training and experience requirements for operators of special handling and lifting equipment;

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Table 1-1. Buildings where quantities greater than 10 mCi of NRC-regulated materials are handled.

Building Number	Primary Regulated Material Handled (See Table 1-3)	Principle Activity Conducted (See Table 1-4)
C-100-T-04	A,B,C,D	Industrial Hygiene
C-310	A,B,C	Purge and Product Withdrawal
C-310-A	A,B,C	Product Withdrawal
C-315	A,B,C	Surge and Waste
C-331	A,B,C	Cascade Process
C-333	A,B,C	Cascade Process
C-333-A	A,B,C	Feed Vaporization
C-335	A,B,C	Cascade Process
C-337	A,B,C	Cascade Process
C-337-A	A,B,C	Feed Vaporization
C-360	A,B,C	Toll Transfer and Sampling
C-400	A,B,C,D	Decontamination and Related Activities
C-409	A,B,C,D	Decontamination, Related Activities, and Laboratory
C-710	A,B,C,D,E	Laboratory
C-720	A,B,C,D,E	Maintenance and Stores
C-721[a]	D,E	Storage of Sources
C-727	A,B,C,D	Low-Level Waste Storage
C-728	A,B,C,D	Motor Cleaning
C-743	A,B,C,D	Radiation Protection and Low Level Counting Laboratory
C-746-Q1	A,B,C,D	Higher Assay Waste Storage
C-754	A,B,C,D	Low-Level Waste Storage
C-754-A	A,B,C,D	Low-Level Waste Storage

a. Density meters are stored in this facility but are used site-wide for measurements.

Table 1-2. Storage yards where quantities greater than 10 mCi of NRC-regulated materials are handled.

Yard Number	Primary Regulated Material Handled (See Table 1-3)	Principle Activity Conducted
C-745-A	A,B,C	UF_6 Ton Cylinder Storage
C-745-B	A,B,C	UF_6 Cylinder Storage
C-745-E	A,B,C,D,E	Kellogg Storage[a]
C-745-H	A,B,C	UF_6 Cylinder Storage
C-745-J	A,B,C	UF_6 Cylinder Storage
C-745-Q	A,B,C	UF_6 Cylinder Storage

a. Storage of contaminated equipment with inaccessible surfaces that are possibly contaminated with regulated material.

3. CLASSIFICATION AND NOTIFICATION OF ACCIDENTS AND OTHER EMERGENCIES

Significant plant emergencies are classified as either Alerts or Site Area Emergencies (SAEs). This classification system facilitates the notification process and the implementation of immediate response actions applicable to a specific emergency. This system also provides for upgrading the response, accordingly in the event of a change in the severity of the condition.

Emergency action levels (EALs) are used to determine whether any given accident or event arises to the level of an emergency, and if so, whether it should be classified as an Alert or SAE. These levels are used to give a relatively quick indication to the plant staff of the severity of an accident or event. The purpose of the EALs is to provide the earliest possible indication of actual or potential emergency conditions. EALs associated with radiological or nonradioactive hazardous materials releases are based upon the Environmental Protection Agency's (EPA) Protective Action Guides (PAGs), summarized in EPA 400-R-92-001, *Manual of Protective Action Guides and Protective Actions for Nuclear Incidents*, and the Emergency Response Planning Guides (ERPGs) established by the American Industrial Hygiene Association for extremely hazardous chemicals. The plant emergency organization determines the potential of reaching or exceeding the PAGs or ERPGs in the event of a radiological hazardous materials release to the environment.

EALs may be symptom based or event based. However, the nature of plant operations and instrumentation generally precludes symptom-based EALs. Developed EALs are provided in an EPIP.

3.1 CLASSIFICATION SYSTEM

The classification system is based on the requirements of 10 CFR 76.91.

3.1.1 Alert

An Alert is defined as an incident that has led or could lead to a release to the environment of radioactive or other hazardous material. Such a release is not expected to require a response by an off-site response organization to protect the general public off-site.

An Alert involves emergency situations that could have a direct effect on the health and safety of plant personnel. Upon classification of an emergency as an Alert, the Emergency Response Organization (ERO) is activated and key off-site authorities are notified. An Alert also addresses limited releases of radioactive and/or hazardous material and therefore might require some on-site monitoring and assessment actions by the plant ERO.

An Alert ensures that emergency personnel are readily available to respond to a change in plant conditions and to provide assessment support as required. An incident classified as an Alert may require

off-site emergency support organizations to respond to on-site emergencies, such as fires or security related events. Classification of an emergency as an Alert will ensure that appropriate on-site, off-site, and USEC personnel are properly advised and available for activation with appropriate resources if the situation becomes more serious.

3.1.2 Site Area Emergency

The most severe classification used in emergency planning at the gaseous diffusion plants is the Site Area Emergency (SAE). An SAE is defined as an incident that has led or could lead to a significant release to the environment of radioactive or other hazardous material. Such an incident could require response by an off-site organization to protect persons off-site.

An SAE could result in off-site releases that exceed the Environmental Protection Agency PAGs for radiological releases or ERPGs for toxic materials releases.

Classification of an emergency as an SAE requires the full activation of the ERO, including the Emergency Operations Center (EOC) cadre, and other appropriate personnel and resources as necessary to mitigate the consequences of emergency conditions, monitor the situation, and ensure protection of on-site and off-site personnel. The nature of SAEs requires prompt protective actions for on-site personnel in the vicinity of the incident area and may require protective response measures for the entire site population and members of the public. Actions include activating the on-site ERO, alerting or mobilizing field monitoring teams, notifying appropriate off-site authorities, and activating the Public Warning System.

The SAE classification includes accidents or other emergency conditions that have a significant potential for the release of radioactive or hazardous materials. The Crisis Manager (CM) classifies an emergency as an SAE whenever conditions exist that indicate protective actions are or may be required for the general public off-site. An SAE may also result in the request for assistance from off-site emergency support organizations.

3.2 NOTIFICATION AND COORDINATION

This section describes the methods used for notification of emergency response personnel and appropriate local, state, and federal agencies and response organizations. Also described are response actions for Alerts and SAEs. Actual methods and sequencing of notifications are covered in specific EPIPs. Section 3.3 describes requirements, content, and format of the information to be provided to off-site authorities during a classified plant emergency. During normal working hours, the EOC is operational within 15 minutes of the announcement to activate the facility. Outside normal working hours, the EOC is operational within 60 minutes of the announcement to activate the facility, which takes into account the transit time of the responding EOC cadre.

3.2.1 Alert

The purposes of classifying an emergency as an Alert are to ensure that appropriate emergency response personnel are activated and stationed at their emergency duty stations to mitigate the consequences of the

accident, that the emergency is properly assessed, that off-site officials are notified, and that steps can be taken to quickly escalate the response if necessary.

The PSS is responsible for initially classifying the event and directing activation of applicable portions of the plant ERO as necessary. This activation is accomplished by using the plant radio system, pagers, PA system, or the plant telephone system. The means for notification of plant personnel is the Plant Emergency Alarm System, which consists of several distinct alarms, the PA system, pagers, and telephones. Upon classifying an event as an Alert, the PSS becomes the CM.

The CM promptly notifies or directs notification of the appropriate county and state authorities normally within 15 minutes after an event is classified as an Alert as provided for in the EPIP. USEC Headquarters is also notified as soon as is practical. However, this notification will not interfere with the county and state notifications. The emergency notifications to state and local authorities are conducted via telephone or radio if the telephone system is not operational. The specifics of this notification process are described in Section 3.3 and in more detail in the appropriate EPIPs. Additional information on emergency communications equipment is provided in Section 6.2.

The CM notifies or directs notification of the NRC Operations Center as provided for in the EPIP immediately after notification of appropriate state and local authorities but no later than one hour after the emergency is classified as an Alert. When the EOC is operational, a manager designated on the emergency line of executive succession assumes responsibility as CM including NRC notification.

Based on the nature of the event, the CM issues protective response measures to the applicable plant population at his/her discretion. Typically, during an Alert, protective actions for plant personnel, if any at all, are limited to the particular incident area. Specific plant protective actions are described in detail in Section 5.4, Protective Actions, and more thoroughly in designated EPIPs.

Although very unlikely during Alerts, the CM determines the need and subsequent request for off-site assistance. The various off-site emergency support organizations and agencies that may be requested to provide assistance to the plant are listed in Section 4.3.

The CM monitors emergency conditions during an Alert for potential changes in the emergency classification. This entails the decision to escalate the emergency class to an SAE as plant conditions degrade and the decision to terminate the emergency and begin plant recovery operations when specific event termination criteria have been reached.

3.2.2 Site Area Emergency

The purpose of declaring an SAE is to ensure that off-site officials are informed of potential or actual off-site consequences, that off-site officials are provided with recommended actions to protect persons off-site as necessary, and that the plant's ERO is augmented by additional personnel and equipment as necessary.

It is possible that an emergency may be classified as an SAE without the initial classification of the emergency as an Alert. The PSS is responsible for the initial classification of the event. When the EOC is operational, a manager designated in the emergency line of executive succession assumes the responsibility as

CM including declaring the appropriate class of emergency and making any changes to the emergency classification, including event termination. The classification of an emergency as SAE requires the full activation of the ERO. Plant emergency response personnel receive notification of activation through the plant telephone system, radios, pagers, and the PA system. Upon classifying an event as a SAE, the PSS becomes the CM.

The CM promptly notifies or directs notification of the appropriate county and state authorities, normally within 15 minutes after an emergency is classified as an SAE as provided for in the EPIP. USEC Headquarters is also notified as soon as is practical. However, this notification will not interfere with the county and state notifications. The state and local notifications include appropriate recommended protective actions for the general public near the plant property. The NRC Operations Center is notified as soon as possible after the state and local notifications have been made but no later than one hour after the declaration of an SAE. The emergency notifications to state and local authorities are conducted via telephone. The specifics of this notification process are described in Section 3.3. Additional information on emergency communications equipment is provided in Section 6.2.

The CM directs plant personnel to take appropriate protective response actions based on the assessment of the emergency. During an SAE, protective actions for plant personnel may range from evacuating a particular building or area based on emergency conditions. Specific plant protective actions are described in detail in Section 5.4 and more thoroughly in designated EPIPs.

During an SAE, additional emergency support may be necessary to augment the plant ERO. The CM normally makes the determination of need for and subsequently requests assistance from off-site emergency support organizations. The various off-site emergency support organizations and agencies that may be requested to provide assistance to the plant are listed in Section 4.3.

The CM monitors emergency conditions during an SAE for potential changes in the emergency classification. The CM terminates the emergency and begins recovery operations when specific termination criteria have been met.

3.2.3 Other Emergency Events

For those emergency events that are not classified as Alerts or SAEs, the plant maintains the responsibility and capability for assessment of the event, implementing appropriate protective actions, and ensuring that off-site officials are informed of potential or actual consequences.

3.3 INFORMATION TO BE COMMUNICATED

Upon classification of an emergency as an Alert or an SAE, the CM notifies or directs initial emergency notifications to off-site authorities as soon as possible, normally within 15 minutes of classification as provided for in the EPIP. Additional emergency information is provided to off-site authorities periodically as new information becomes available. Notifications to off-site authorities will be provided when a change in emergency classification occurs and when protective action recommendations off-site are required. An example of the form used for off-site notifications is included in the appropriate EPIP for emergency notifications.

4. RESPONSIBILITIES

USEC is responsible for overall direction and control of NRC-regulated activities at PGDP. 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 of 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 on-site 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 plant in a safe, reliable, and efficient manner. The General Manager is responsible for and is authorized to declare an emergency and to initiate the appropriate response.

4.1.2 Enrichment Plant Manager

The Enrichment Manager provides assistance and support to the General Manager in providing for safe operation of the plant and is assigned specific areas of oversight for day-to-day production operations, maintenance, and emergency management.

4.1.3 Operations Manager

The Operations Manager is responsible for the operations of the enrichment cascade. This includes such activities as ensuring the correct and safe operations of the plant utility and chemical services, UF_6 processes, proper handling of UF_6, and the periodic testing of equipment to ensure safe and efficient operation.

4.1.4 Production Support Manager

The Production Support Manager is responsible for establishing and implementing the radiation protection program, laboratory operations, and waste management program.

4.1.5 Maintenance Manager

The Maintenance Manager is responsible for directing and supervising the implementation of the enrichment maintenance program for electrical, mechanical, and instrumentation and control systems and equipment.

4.1.6 Environmental Safety and Health Manager

The Environmental Safety and Health manager is responsible for establishing and implementing the environmental monitoring program, the site environmental protection program, and 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, and nonproduction facility maintenance.

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; the configuration management program, and nuclear safety. Responsibilities also include project management, construction, and coordination of large project plant modifications or additions.

4.1.9 Administrative Support Manager

The Administrative Support Manager is responsible for human resources, information services, documents and records, commitment management, and public affairs.

4.1.10 Nuclear Regulatory Affairs Manager

The Nuclear Regulatory Affairs manager is responsible for the day-to-day interface with NRC representatives on matters of regulatory compliance. As delegated by the Nuclear Regulatory Assurance and Policy Manager, the Nuclear Regulatory Affairs Manager has responsibility for coordinating certification related and certificate renewal-related activities.

4.1.11 Shift Operations Manager

The Shift Operations Manager oversees the activities of the PSSs 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 developing, maintaining, and updating the plan and for ensuring that the emergency management program is designed to comply with federal, state, and local regulations.

4.1.14 On-Duty PSS

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

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

4.1.15 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 and may be dispatched to an incident scene as the incident commander.

4.1.16 Materials Management Manager

The Materials Management manager is responsible for managing the projects, programs, and the activities related to site purchasing, packaging and transportation, material control, stores, shipping and receiving, and property disposition.

4.1.17 Deleted

4.1.18 Deleted

4.2 ON-SITE EMERGENCY RESPONSE ORGANIZATION

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

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

The ERO is divided into functional groups as follows:

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

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

4.2.1 Direction and Coordination

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

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

The order of succession for the CM position is as follows:

1. PSS
2. General Manager
3. Enrichment Plant Manager
4. Operations Manager
5. Nuclear Regulatory Affairs 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 of the emergency response is transferred.

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

2. Protective Action Recommendations. Initially this is a PSS responsibility as CM. When the EOC is operational, approval of off-site protective action recommendations is transferred to the CM in the EOC.

3. Facility Activation. The PSS 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 On-Site Staff Emergency Assignments

4.2.2.1 Plant Emergency Squad

Capability for on-scene emergency response is provided by the plant emergency squad consisting of the following:

1. PSS personnel,
2. Police personnel,
3. Fire Services personnel, and
4. Operating shift, nonsupervisory, supervisory, and specialist personnel.

Within the plant emergency squad are personnel who have experience and are trained in fire fighting, HAZMAT response, health physics/radiation protection, and environmental response. Fire services personnel are also trained in emergency medical treatment. 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, maintenance, and engineering activities.

4.2.2.2 Emergency Operations Center Cadre

The Emergency Operations Center (EOC) cadre provides the external support required by the IC 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 on-site response and mitigation and off-site interface activities. Senior managers confer, provide personnel and materials, coordinate activities, and communicate with on-site and off-site personnel. Appropriate support staff are in the EOC to provide technical support to the EOC cadre and to the IC at the scene.

4.2.2.3 Joint Public Information Center

The Joint Public Information Center (JPIC) is normally 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.

4.2.2.4 Recovery Manager

When the nature and extent of an emergency indicate that recovery operations are required, the CM designates a recovery manager (RM) to direct these operations prior to terminating the emergency. The RM, in turn, designates a staff to assist in these operations. The duties and responsibilities of the RM and the Recovery Organization are addressed in Section 9.

4.3 LOCAL OFF-SITE ASSISTANCE TO FACILITY

The severity of some emergencies may warrant the use of off-site individuals, organizations, and agencies. As a result, Letters of Agreement (as identified in Appendix B) have been entered into with off-site groups to provide assistance in the event of an emergency. These support services encompass areas such as medical assistance, fire control, evacuation, ambulance services, and law enforcement. When the CM determines that off-site assistance is needed, the appropriate organization is notified and assistance is requested. Plant police personnel provide site access control and escort support for the responding off-site organizations. Except for suspension of the formal visitor access system to accommodate requested off-site support personnel, normal safeguard and security measures, including material controls and accountability, are maintained. Necessary emergency information is provided to the responding organizations, including potential hazards associated with the incident.

The off-site 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 off-site medical facility. Transportation of injured persons to the medical facility is normally provided by the plant's on-site ambulance. In the event that the on-site ambulance is not available, commercial ambulance service provides the transportation of injured persons to the off-site medical facility. This includes contaminated injured on-site workers. Ambulances are equipped with radios to maintain communications with local hospitals. The primary medical facilities for injured personnel, with or without contamination, are the Western Baptist Hospital and Lourdes Hospital, both

The county judge/executive, mayor, or DES director can authorize the opening and staffing of the Paducah-McCracken County EOC. The EOC may be opened and staffed because of a threat of an emergency or for an actual emergency. Minor emergencies may be directed by agency officials from their normal workstations.

Local law enforcement and fire services assistance will be coordinated with the director and staff in the Paducah-McCracken County EOC or with the appropriate mutual aid agency.

Notification and warning points have been established for each local government (Paducah and McCracken County). Local governments coordinate response efforts from the Paducah-McCracken County EOC.

4.4.3 Federal Government Interfaces

4.4.3.1 United States Nuclear Regulatory Commission

The NRC has established certification requirements applicable to the GDPs to protect the public health and safety from radiological hazards, to provide for the common defense and security, and to ensure adequate safeguards. The NRC also provides regulatory oversight over USEC's uranium enrichment activities to ensure compliance with these requirements, including the emergency planning requirements set forth in 10 CFR 76.91. The NRC Operations Center is notified of any emergency immediately after notification of the appropriate off-site organizations within one hour after the declaration of an Alert or SAE. The NRC evaluates the protective actions taking place and coordinates with USEC and DOE to ensure that all reasonable and appropriate actions are being taken to protect the public health and safety.

4.4.3.2 United States Department of Energy

DOE provides nuclear safety oversight for those activities on-site involving DOE environmental management facilities and operations. Events involving DOE operations or property are reported to DOE's Oak Ridge Operations Office (ORO/DOE). DOE maintains various emergency response assets capable of providing radiological monitoring and support assistance during an emergency.

4.4.3.3 Federal Bureau of Investigation

The Federal Bureau of Investigation (FBI) has jurisdictional authority for safeguards and security emergencies involving violations of federal criminal law. A representative of the FBI may assume command and control of these types of emergencies. The FBI Hostage Rescue Team or regional SWAT team may also be provided if requested. The FBI will coordinate all responding federal law enforcement agencies.

4.4.3.4 Other Federal Agencies

The following federal agencies may be involved in plant emergencies:

1. *Federal Aviation Administration (FAA).* FAA restricts airspace over the plant at the request of the CM or the PSS as appropriate.

2. *U.S. Coast Guard (USCG).* USCG functions as the federal authority on all navigable waterways and their tributaries. The USCG commander of the Ohio River Group will control all waterway traffic and coordinate response to emergencies on behalf of the U.S. EPA.

3. *Federal Emergency Management Agency (FEMA).* FEMA is the primary federal government agency for the administration of planning, preparedness, operational coordination, and recovery programs.

4. *U. S. Environmental Protection Agency (USEPA).* USEPA is the major federal government agency for the regulation and control of pollution and waste management programs. USEPA provides a federal on-scene coordinator for significant hazardous materials incidents.

5. *U. S. Occupational Safety and Health Administration (OSHA).* OSHA is the primary federal government agency for the regulation of nonradiological worker safety.

PADUCAH GASEOUS DIFFUSION PLANT
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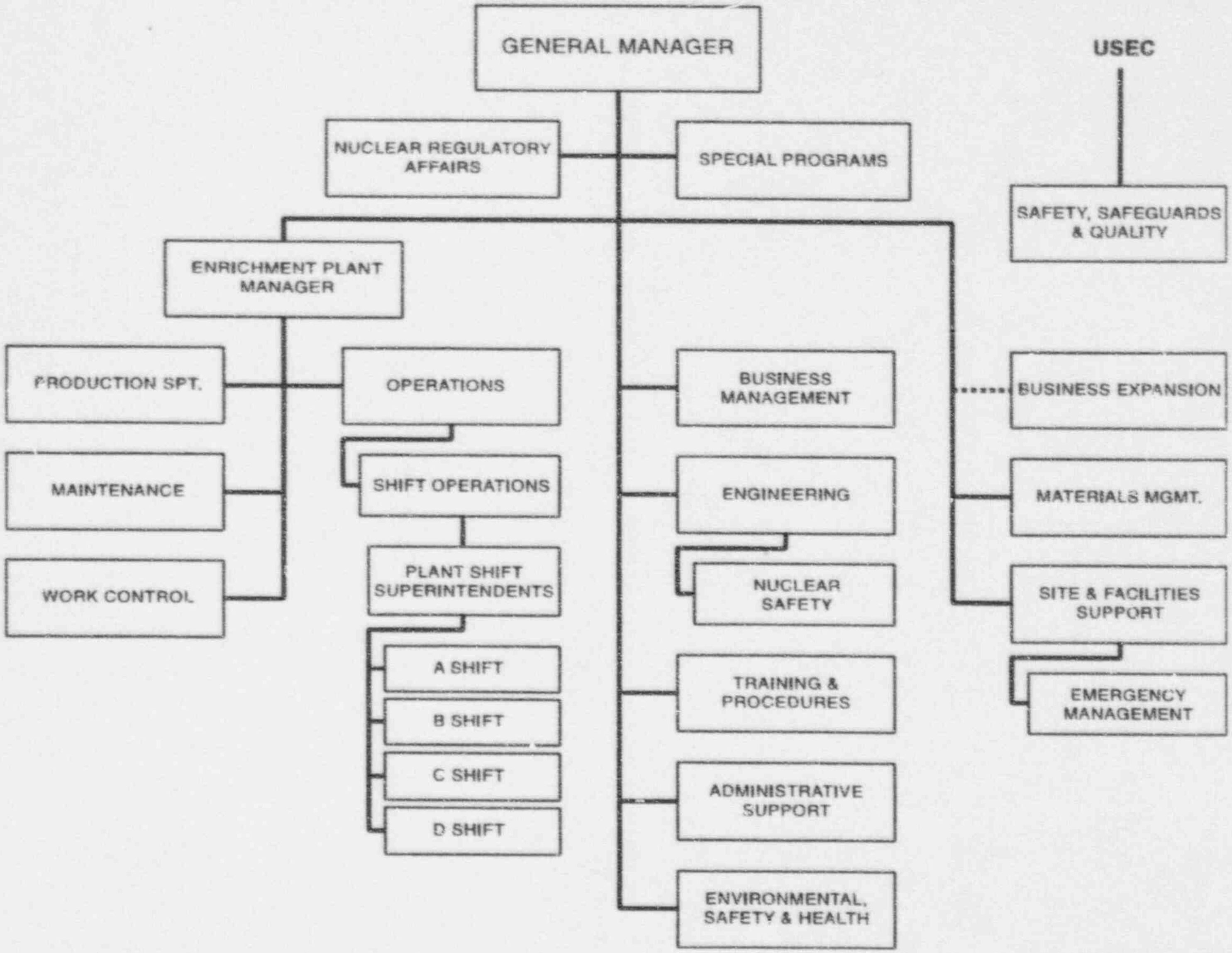
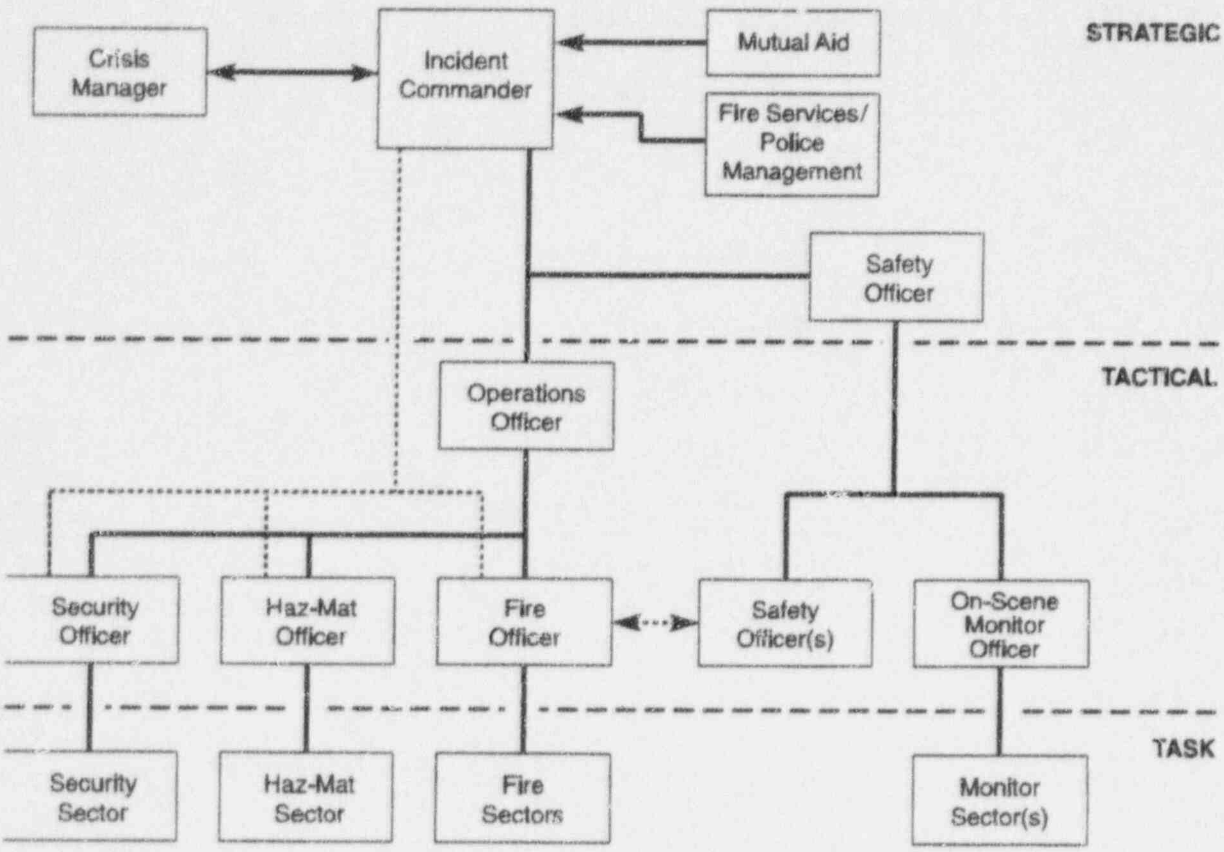


Figure 4-1. Normal plant organization.



Sector officers working on the primary incident, report to the operations officer (for example, fire sectors report to the operations officer for fires. Other sectors report to the Incident Commander.

Emergency squad members, fire fighters, and police officers will be assigned to sectors as applicable. Local emergency squad members may be assigned to support sectors in a safe zone.

Figure 4-2. Typical plant on-scene ERO.

5. EMERGENCY RESPONSE MEASURES

Emergency measures must be taken in response to an emergency. Upon recognizing that an emergency exists, necessary portions of the emergency organization are activated. Once activation has taken place, assessments of the condition are made, corrective and protective actions are taken, and aid to affected persons is administered as required.

After becoming aware that an emergency exists, the PSS does the following:

1. Takes actions to ensure the safety of plant personnel and the general public,

2. Takes actions to ensure safe operation/activities of the plant,

3. Classifies the emergency and makes required notifications,

4. Performs assessment actions, and

5. Performs any other emergency actions as appropriate.

5.1 ACTIVATION OF EMERGENCY RESPONSE ORGANIZATION

Upon recognition of an emergency, the PSS, APSS, or other qualified individual responds to the incident scene as the IC. The IC determines appropriate immediate protective actions at the incident scene. The PSS classifies the event if applicable. If the emergency is classified as either an Alert or SAE, the PSS as CM activates the EOC. Minimum staffing requirements for activation and operation of the EOC are identified in an EPIP, and must be met prior to assumption of command and control by the crisis management team. CM responsibilities are assumed by a manager designated in the emergency line of executive succession when the EOC is operational. Methods for ERO notification/activation are the same regardless of the time of the emergency and include plant radios, emergency pager system, and telephones. When notified, EOC cadre members are required to respond immediately. ERO activation is accomplished through the appropriate EPIPs.

The CM delegates public information duties to the public information advisor, who, in concert with USEC headquarters, is responsible for activating the JPIC.

The IC maintains command and control over the specific area response and protective actions. The IC coordinates mitigation and protective action strategy and direction and keeps EOC informed of the incident status when the EOC is operational.

In the event that two or more emergencies occur simultaneously so that they cannot be managed effectively as a single incident scene, provisions in the appropriate EPIPs allow for the establishment of additional incident scenes, designation of multiple incident commanders, and division of response resources as necessary.

5.1.1 *Section deleted*

5.1.2 *Section deleted*

5.2 ASSESSMENT ACTIONS

This section describes the processes used for assessing the actual or potential on-site and off-site consequences of an emergency. Initial and continuing assessment actions are the responsibility of the CM. Post-accident assessments are a shared responsibility between the IC, the CM, and the recovery manager, if assigned.

Continuous assessment throughout the course of an emergency is necessary to effectively coordinate and direct the elements of the ERO. The initial assessment actions are dictated in part by the nature and severity of the emergency. Emergency assessment provides an indication of the vulnerability to life, the environment, and property injury or damage if an emergency occurs. The different assessment actions for Alert and SAEs are described in Sections 5.2.1 and 5.2.2. Equipment used to assess releases is described in Section 6.4.

5.2.1 Assessment Actions During an Alert

An Alert requires basic emergency assessments. Attention must be paid to parameters that may indicate a possible worsening of conditions (e.g., radioactive/hazardous materials releases). The existence of an Alert requires the following initial and ongoing assessment actions as applicable:

1. Increased surveillance of applicable plant instrumentation and visual observation of the incident conditions,

2. Determination of the resources necessary to mitigate the event from evaluation of reports of damage and injury or by on-scene inspection,

3. Monitoring event conditions for potential changes in emergency classification level.

5.2.2 Assessment Actions During an SAE

In the event of an SAE, assessment activities are more extensive than for an Alert. During a release of radiological/hazardous materials, assessment of on-site and off-site exposures are performed regularly to determine if and when on-site sheltering or evacuations or off-site sheltering may be required. The results, including methods and assumptions, are communicated to appropriate off-site officials as off-site protective action recommendations. In addition to the activities that would be carried out during an Alert, the following activities are performed at the direction of the PSS or the CM when the EOC is operational, as appropriate:

1. Performing continuing emergency assessments for mitigating events and protective actions on-site, based on on-scene and field monitoring results, release information, and meteorological conditions for radiological/hazardous material releases, and

2. For off-site hazardous material releases, providing specific material information, release information, plume direction, projected plume location, appropriate meteorological information, and field monitoring results to responsible off-site authorities.

5.2.3 Post-Accident Assessment

Post-accident emergency assessments are provided by the IC, the CM, and the RM, if assigned.

EPIPs contain criteria that must be met before recovery can be initiated. These criteria may be radiation readings for criticality events, airborne concentration values for hazardous material releases, or other appropriate identifiable conditions. Concurrence from off-site officials must be obtained before terminating an SAE.

In the event of a UF_6 release, individuals exposed or suspected of being exposed are evaluated for uranium uptake by urinalysis. If appropriate, surface water samples may be taken and evaluated during the release if access is available to the monitors and post-accident as part of the overall recovery plan. Post accident soil samples are taken and evaluated as required by the recovery plan.

During post-accident assessments, specific recovery goals are identified such as the removal of contaminated soil or the return of a damaged facility to productivity. These actions may be based on survey or inspection data obtained prior to entry into the recovery phase or based on new data obtained specifically for the proposed recovery goal. See Section 9, Recovery and Plant Restoration for information regarding plant restoration and recovery activities.

5.3 MITIGATING ACTIONS

Plant personnel who are technically trained and capable of implementing the plant's emergency plan and procedures perform mitigating actions. Emergency procedures have been established to provide effective response to the various emergency events described in this plan. During emergency conditions, the primary concern is to minimize the impact on plant personnel and the general public.

Actions to mitigate releases to protect plant personnel and members of the public may require operation personnel to take corresponding emergency operating or off-normal procedure actions. Actions taken by operating personnel may be indicated by plant operating parameters required by Technical Safety Requirements or directed by plant management personnel.

5.3.1 Personnel Actions

By initiating prompt protective actions, such as evacuating personnel in the immediate incident area and controlling access to the surrounding accident vicinity, consequences to plant workers as well as the general public are minimized. Additional information on protective actions is provided in Section 5.4.

5.3.2 Limiting Releases

Emergency operating, implementing procedures, and facility design provide for radioactive and toxic material release prevention and for the proper mitigating actions to reduce or stop any releases. Mobile firefighting equipment is provided and maintained on-site to support fire-fighting, back up the fixed fire suppression systems, and provide a hazmat response capability. This equipment includes a minimum of one 1,000 gpm pumper, one truck with Hazmat, radiological and rescue equipment, and one ambulance. Each major process building is provided with an automatic sprinkler system. Detailed descriptions of the plant water supplies and automatic sprinkler systems are provided in the SAR. Isolable system releases are mitigated by qualified operators using emergency operating procedures. Non-isolable system or cylinder releases are mitigated to the degree possible by 29 CFR 1910.120(q) certified hazardous materials technicians using industrial hazmat response methods. Release mitigation or prevention actions or features include the following:

- Process gas and other chemical leak detection systems
- Seismic alarms
- Sprinkler system and other fire-suppression systems
- Fire detection systems
- Firefighting capabilities
- Hazmat response capabilities, including plugging and patching
- Use of water sprays on airborne releases of material
- Storage in fire-resistant containers
- Use of fire-resistant building materials
- Criticality controls

5.3.3 Safe Shutdown

An emergency condition that may have an actual or potential impact on operations may require the safe shutdown of process equipment or systems. The SAR describes the plant systems and instrumentation available for detecting abnormal operating conditions that could result in an emergency and the methods and criteria used to ensure a safe shutdown of plant equipment and systems. The PSS or CM determines which, if any, equipment or systems require shutdown in connection with a specific accident or emergency and takes appropriate action to ensure that the designated equipment or systems are shut down safely and promptly. Individual equipment and processes generally require 5 to 30 minutes to shut down safely. After an accident or other emergency, the plant is restored to a safe condition before the IC issues an all clear. The means for ensuring that the plant is in a safe condition include monitoring, visual inspections, and equipment testing.

5.4 PROTECTIVE ACTIONS

During emergencies, the IC or CM must determine the best possible means to limit exposure of on-site and off-site personnel to potential or actual threats, such as radioactive or toxic materials that may be accidentally released to the environment. As discussed in this section, emergencies include natural events. Guidelines are provided to limit the exposure of personnel in the case of accidental releases to the environment. These guidelines, which are prescribed corresponding to potential health effects, are called PAGs for radioactive materials and ERPGs for hazardous materials. Specific EPIPs have been developed for the protection of emergency workers and other on-site and off-site personnel.

This section describes the protective actions developed to limit exposure of plant personnel and the public following an emergency. The protective actions to be implemented on-site are the responsibility of the plant, while the appropriate off-site authorities are responsible for providing off-site protective actions.

5.4.1 On-Site Protective Actions

On-site protective actions will be prescribed by the IC for the incident scene or CM for all persons within the boundaries of the DOE reservation, which includes the protected area of the plant. Protective actions for persons on-site (including employees, visitors, contractor personnel, and transient populations) include alerting, evacuation and assembly, accountability, sheltering, search and rescue, and monitoring and decontaminating, as appropriate.

5.4.1.1 Alerting

Whenever it is determined that a threat or potential threat to the safety of personnel on the DOE reservation exists, the CM directs that potentially affected persons on the DOE reservation or within a specified area be alerted. Alerting is accomplished by use of the PA system, plant radios, telephones, or if required, by runner.

5.4.1.2 Evacuation and Assembly

One action available to protect personnel on the DOE reservation is evacuation and subsequent assembly. When required, the IC or CM orders an evacuation of all persons from affected areas. The evacuation alarm and announcement, including any special instructions, is sounded over the PA system, plant radios, or other plant communications systems as appropriate. Evacuations are directed in the event of actual or imminent structural failure, release of hazardous material that would expose personnel to unacceptable concentrations, a criticality, or a weather watch or warning. The procedures to be followed in these evacuations are included in an EPIP. Provisions are made for consideration of impediments to evacuation caused by weather conditions, traffic, or radiological/hazardous materials release. Because of the large area within the protected area fence and the nature of the potential hazards, no scenario has been identified that would require the evacuation of the entire protected area.

Within the protected area fence, all persons in the affected area will proceed to an assembly point or evacuation area. Assembly points for criticalities are designated in an EPIP. For other events, directions on the specific evacuation routes will be provided. The appropriate selection of an evacuation area and evacuation route for a HAZMAT release is determined according to plant conditions, wind direction, and weather.

For other areas of the DOE reservation, the following procedures will be followed:

- USEC contractors/subcontractors and their visitors will be directed to an assembly point specified as for persons within the protected area.
- DOE contractors/subcontractors and their visitors will be directed to an assembly area identified in an EPIP and the DOE Paducah Environmental Management & Enrichment Facilities Integrating Emergency Plan.
- Transients on the DOE reservation (i.e., hunters, fisherman, hikers, etc.) will be directed to exit the reservation and then contact the plant by telephone for further information and instructions.

5.4.1.3 Accountability

In an emergency, one of the more probable protective actions for persons on the DOE reservation is evacuation of a building or area to a designated assembly area. When required, the IC or CM orders an accountability of all persons from affected areas. The accountability announcement, including any special instructions, is sounded over the PA system, plant radios, or other plant communications systems as appropriate. Provisions for determining and maintaining the accountability of personnel at these assembly areas or for accountability of personnel at their work stations or locations are detailed in an EPIP or in the case of DOE or DOE contractor personnel, in the DOE Paducah Environmental Management and Enrichment Facilities Integrating Emergency Plan. Search and rescue operations may be initiated if a person is determined to be missing.

Persons within the protected area fence, Building C-743 and the trailer complex, and Building C-611 are provided training on their assembly/accountability roles and responsibilities or are provided with an escort. Employees and contractor personnel are trained on actions to be taken in an emergency prior to their work

assignments. Escorts are trained in emergency response procedures, which includes instructions on methods of notification and the required actions in the event of an emergency. To ensure proficiency, periodic evacuation and accountability drills are conducted. When an accountability is required, personnel report through their line organizations to Building C-300, which maintains the overall accountability status of the plant. Escorts are responsible for accounting for visitors by name through their line organizations. The PGDP accountability is considered complete when all USEC, USEC contractor, and USEC visitor personnel are accounted for or missing persons are identified.

Other persons on the DOE reservation outside of the protected area fence report through their contractor organizations to the Lockheed Martin Energy Services (LMES) facility in Kevil, which maintains overall DOE contractor accountability. Accountability status is provided to the CCF in Building C-300. The LMES accountability is considered complete when all DOE prime contractor, subcontractor, and visitor personnel are accounted for or missing persons are identified.

5.4.1.4 Sheltering

Sheltering of personnel could be prescribed as a protective action if an analysis of the shelter is available indicating that it would provide effective protection from the existing or potential hazard or if other means of protection is not available.

5.4.1.5 Search and Rescue

If an accountability reveals that a person is missing and there is a high probability that the person might be located within the incident area, the IC may assemble a search and rescue team made up of members of the Emergency Squad subject to entry requirements identified in EPIPs. The search and rescue team obtains information on the latest known location, and likely areas are searched until missing persons are located. The IC provides on-scene direction of the search and rescue teams. Teams are briefed prior to entry on their specific mission, route of ingress/egress, area of danger, personal protective clothing/equipment required, and stay times for control of exposure to radioactive or hazardous materials.

5.4.1.6 Monitoring and Decontamination

If decontamination is necessary, the decontamination sectors are established using appropriate decontamination equipment. Decontamination and waste disposal are conducted in accordance with specific implementing procedures. Monitoring capability is provided to assembly areas when necessary depending upon the nature of the emergency, using mobile resources available within the emergency response equipment inventory, monitoring equipment provided by field monitors dispatched from Building C-300, or equipment provided by Health Physics technicians directed to support these areas.

5.4.1.7 Use of Protective Equipment and Supplies

Individuals entering an area during an emergency where airborne concentrations of contaminants are considered immediately or potentially hazardous to life or health are required to wear appropriate protective clothing and self-contained breathing apparatus. Plant personnel assigned emergency response

tasks requiring the donning of protective equipment maintain communications via the plant radio system, either by hand-held radio or radios within the self-contained breathing apparatus. Protective clothing and other required personal protective equipment are available throughout the plant at predesignated areas. Emergency personnel receive training on donning and using specific protective clothing and related equipment. Section 7.2 describes the plant's comprehensive emergency management training program.

Emergency kits and other supplies are used to provide monitoring equipment, protective clothing, and respiratory equipment for individuals arriving or remaining at the plant during certain emergency situations. These supplies are on emergency vehicles. Specific procedures dictate the requirements for use of this equipment. The facilities, equipment inventory, and emergency equipment maintenance are described in Section 7.6.

5.4.1.8 Contamination Control Measures

Personnel evacuating areas potentially contaminated by an incident proceed to monitoring and decontamination stations as directed by the IC or CM. Monitoring and decontamination is performed in accordance with plant procedures. Access to the potentially contaminated area is controlled to provide for plant contamination control. Contamination control measures for both radiological and toxic materials are implemented in plant procedures.

5.4.2 Off-Site Protective Actions

The plant is equipped with a detection and warning system to recognize hazardous and radioactive material releases. In the event of a release, the CM is responsible for providing protective action recommendations to local officials as part of initial notifications and ongoing communications. These recommendations are based on assessment actions and a thorough understanding of the actual and potential plant conditions.

By prior agreement with off-site authorities, the CM has full authority to activate the Public Warning System sirens in the event of a radiological/hazardous material release that has spread beyond or that threatens to travel beyond the DOE reservation boundary. This activation notification applies to residents and transient members of the public within approximately a two-mile radius from the plant center, including the Kentucky Wildlife Management area.

In conjunction with activating the Public Warning System sirens, the CM, also by prior agreement with off-site authorities, contacts the Emergency Broadcast System (EBS) affiliate to initiate the appropriate EBS announcement. The EBS messages associated with siren activation for nearby residents are to shelter in-place or advisories that no action is needed. Additionally, the CM may recommend that roads that traverse the DOE reservation be closed.

The plant will provide continuing assessments during releases off-site, but protective actions beyond those mentioned will be directed by off-site authorities who are responsible for members of the public living within their jurisdiction.

The most severe, credible accident at the plant would involve the dropping and rupturing of a liquid UF_6 cylinder. During a liquid UF_6 cylinder release incident, the UF_6 reacts with moisture in the air. The resulting hydrolysis products are uranyl fluoride particles and HF gas. An off-site hazard could result from the chemical toxicity of HF and uranium. The radiotoxicity of uranium is insignificant when compared with its chemical toxicity. Analysis indicates that there is an off-site hazard from a release of other plant hazardous materials. (Section 2 describes the various types of hazards and their consequences.) In either event, sheltering citizens in the path of the plume can greatly mitigate the consequences.

5.5 EXPOSURE CONTROL IN RADIOLOGICAL EMERGENCIES

In the event of a radiological/hazardous material release, potentially affected personnel are evacuated or sheltered in accordance with an EPIP. A monitoring and decontamination station is established at designated plant locations when directed by the IC or CM. Plant emergency response personnel perform personnel monitoring and decontamination in accordance with plant procedures.

When releases occur on-site before the evacuation of nonessential personnel can be completed, personnel are routed to the evacuation/decontamination assembly areas.

On-site contamination control measures are described in plant procedures.

5.5.1 Emergency Radiation Exposure Control Program

5.5.1.1 Radiation Protection Program

This section of the Plan describes measures that are used to provide necessary assistance if individuals are injured or radiologically exposed or contaminated.

In certain emergency situations, the acceptance of above-normal radiation exposure may be warranted. It may not be possible to perform corrective/protective actions while maintaining exposures below limits specified in 10 CFR 20.

Although an emergency situation transcends the normal requirements for limiting exposure, there are EPA recommended levels of exposure acceptable in emergencies (set forth in Section 5.5.1.2).

Three categories of risk versus benefit are considered:

1. Saving of human life and reduction of injury,
2. Protection of health and safety of the public, and
3. Protection of property.

The CM authorizes emergency workers to receive emergency doses above the established plant administrative exposure limits. Exposure guidelines for emergency situations are described in the following section.

5.5.1.2 Exposure Guidelines

Exposure guidelines for radiological emergencies are consistent with the U.S. Environmental Protection Agency's PAGs summarized in EPA 400-R-92-001, *Manual of Protective Action Guides and Protective Actions for Nuclear Incidents*. Exposure guides for toxic/hazardous chemicals have been incorporated in EPIPs and are consistent with the ERPGs established by the American Industrial Hygiene Association for extremely hazardous chemicals.

The following are radiation exposure guidelines:

- Doses to all workers during emergencies to the extent practicable, are limited to 5 rem. Justifications for exposing workers beyond the 5 rem limit include the presence of conditions that prevent the rotation of workers or other commonly used dose-reduction methods.
- Emergency exposures are limited to 10 rem for protecting valuable property.
- Emergency exposures are limited to 25 rem for life saving activities and the protection of large populations.
- Emergency exposures in excess of 25 rem are authorized only for rare situations when such exposure is unavoidable in order to carry out a lifesaving operation or to avoid extensive exposure to large populations. Persons undertaking any emergency operation in which the dose will exceed 25 rem to the whole body do so only on a volunteer basis and with full awareness of the risks involved, including the numerical levels of dose at which acute effects of radiation will be incurred and the numerical estimates of the risks of delayed effects. Details for providing this information and for documenting an individual's willingness to volunteer are in an EPIP.

For hazardous material/toxic gas release incidents, the IC and emergency response personnel assess the incident scene and take appropriate protective and mitigative response actions based on available information, such as MSDSs, emergency response guidebooks, professional industrial hygiene guidance, and meteorological conditions.

During a UF_6 release on-site, the resulting hydrolysis products are uranyl fluoride particles and HF gas. The radiotoxicity of uranium is insignificant when compared with the chemical toxicity of HF and uranium. Therefore, exposure control during an emergency involving UF_6 will be based on chemical toxicity.

5.5.1.3 Monitoring

Provisions have been made for 24-hour-per-day capability to determine uranium uptakes received by emergency personnel. Personnel who may be required to respond to the scene of an emergency are required to wear thermoluminescent dosimeters (TLDs). Issuance of self-reading dosimeters and maintenance of interim emergency whole body dose records are addressed in an EPIP. Emergency worker dose records are maintained in accordance with radiological protection procedures.

Figure 5-1. ***Figure deleted.***

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6. EMERGENCY RESPONSE EQUIPMENT AND FACILITIES

Emergency planning requires facilities and equipment that allow the emergency organization to perform the following actions:

1. Assess the extent of the emergency,
2. Perform the proper corrective actions to mitigate the effects of the emergency,
3. Perform actions to protect on-site and off-site personnel,
4. Provide information to off-site support agencies, and
5. Perform the proper recovery actions.

Emergency facilities, equipment, and materials are established and maintained to adequately support emergency response operations. Response activities will be coordinated at the emergency facilities required to be activated for each particular classification. These facilities and associated equipment will be used to coordinate and manage response as well as to assess and monitor functions. Additional facilities provide for specific response activities, such as security, decontamination, medical support, laboratory analyses, and media interface.

6.1 EMERGENCY RESPONSE FACILITIES

Emergency facilities are activated as needed to provide direction and control, off-site resource coordination, and public information for emergencies. Facilities are declared operational when minimum staffing is present and vital equipment is operational as outlined in procedures. The following are descriptions of facility locations, composition, activation criteria, and functions.

6.1.1 Emergency Operations Facility

The USEC duty officer is the 24-hour notification point for events that impact USEC. USEC will receive all notifications from the plant concerning events that may require emergency response. If the event is classified as an Alert or SAE, USEC personnel needed to assist the site-based response will be made available.

In support of emergency response operations at the plant, the USEC Emergency Operations Facility (EOF), located in Bethesda, Maryland, provides oversight, makes appropriate notifications, coordinates interactions with the public and media, and may request assistance from federal agencies.

6.1.2 Central Control Facility

The CCF, located in Building C-300, is used to maintain surveillance and control of operational processes, conduct incident assessment and mitigation, and initially direct protective actions. Response actions of the CCF staff are directed by the PSS. The PSS provides overall command and control of plant emergencies. CCF personnel are responsible for initially performing the following duties until the EOC is operational:

1. Assessing abnormal conditions,
2. Notifying EOC personnel,
3. Making off-site notifications,
4. Activating the Public Warning System,
5. Performing corrective actions,
6. Directing plant operations, and
7. Implementing on-site protective actions.

6.1.3 Command Post

The Command Post is a distinctly marked vehicle or specific area equipped with communications capabilities and other resources required to manage the incident. The Command Post provides the IC and emergency response personnel with a location as close as possible to the actual scene from which they can operate and assess the situation.

Uncontrolled events, such as meteorological changes or escalation of the emergency, may cause the relocation of the Command Post.

6.1.4 Emergency Operations Center

The EOC is the on-site facility for the overall management of the emergency response. The EOC is a dedicated facility located in Building C-300. The EOC is the facility for coordinating on-site response and mitigation and off-site interface activities.

The PSS activates the EOC for Alerts, SAEs, and for other emergencies at his/her discretion. When operational, the EOC provides coordination and management for the overall site emergency response. The EOC communicates with USEC and federal, state, and local organizations.

The CM directs activities at the EOC with support from the EOC director. The EOC director is responsible for coordination of EOC functions and communications.

EOC personnel are responsible for performing the following functions:

1. Dispatch of field monitoring teams,
2. Technical interactions with off-site federal, state, and local officials,
3. Generation of emergency information for public information activities,
4. Ensuring required support to the incident scene,
5. Coordination of support for on-site response and mitigation, and
6. Timely notification of the USEC EOF.

6.1.5 Central Alarm Station

The Central Alarm Station (CAS), located in Building C-200, serves as a focal point for security activities during an emergency. The senior protective force officer not at the scene

is responsible for coordinating CAS activities and communications and reports to the Safeguards and Security advisor. The CAS performs the following functions:

1. Dispatches protective force personnel,
2. Maintains communications with the protective force officer at the emergency scene,
3. Advises protective force personnel management, and
4. Advises the EOC staff

6.1.6 Decontamination Facilities

Specific facilities, resources, and provisions for the decontamination of personnel, vehicles, and equipment are provided. These facilities are located, designed, and equipped to handle potential emergencies identified in the Emergency Plan.

Normally the decontamination equipment and supplies available on emergency response vehicles are adequate for required decontamination activities in the field; however a self-contained personnel decontamination trailer is available if needed.

Building C-400 has provisions for decontaminating vehicles and equipment. Chemical Operations has the equipment and personnel capability to provide equipment decontamination services in the field.

6.1.7 Joint Public Information Center

The JPIC is the designated location for the dissemination of official information about the emergency to the media and to the public. The JPIC accommodates the following:

1. The coordination of information with interfacing federal, state, and local organizations and spokespersons,

2. Press releases and media briefings, and

3. Work space for site personnel, interfacing organization personnel, and representatives of the news media.

The primary JPIC is located in the Lockheed Martin Energy Systems Kevil facility.

JPIC operations are described in EPIPs.

6.2 COMMUNICATIONS EQUIPMENT

This section describes the communications systems in place to support emergency response. The communications systems are designed to ensure the reliable, timely flow of information and action directives between all parties having a role to play in the mitigation of emergencies. Reliability is provided via redundancy, dedicated communication equipment to preclude delays due to system overload, and routine use and testing of many of the systems, which lowers the probability of undetected system failures. Timeliness of information flow is achieved by prompt notification, predefined lines of communications, predefined emergency action levels, and predefined levels of authority and responsibility. The communications network is formulated around this basic concept and is designed to channel information directly to the key parties having closely related functions, thus eliminating errors often associated with second-hand information. The essential communications links are manned continuously and are periodically tested to ensure availability. The communications systems in place include the following:

1. Commercial telephone system,
2. Red handle emergency phones (PBX),
3. Pull box system,
4. Alert signal system, general plant and building (howlers, sirens, etc.),
5. Facsimile machines,
6. STU-III secure phone,
7. Radio repeater networks for plant groups,
8. Mobile communications system,
9. National Warning System (phone line),
10. Local emergency response agency radio network,
11. PA system,
12. Cellular telephones,
13. Pagers,
14. Public Warning System,
15. Single-side band radio (Federal Emergency Communications), and
16. 800 MHz radio system.

6.2.1 On-Site Communications

The Emergency Management Manager or designee is responsible for planning and scheduling the inventory and inspection of designated emergency equipment and supplies and ensures that identified deficiencies are corrected in a reasonable period of time.

6.2.1.1 Telephone Systems

The administrative telephone system provides business and emergency communications. The telephone system consists of single line, multi-line, and programmable digital units. The EOC telephones are tested weekly.

STU-IIIs provide secure voice communications to on-site and off-site users of other STU-III telephones. It can operate as a normal telephone in the "clear" mode. The Cascade coordinator's STU-III phone is tested weekly.

Cellular telephone service is available from the plant site. The PSS and assistant PSS response vehicles are equipped with c lar telephones that are tested weekly. This system also provides backup for the plant telephone syste

6.2.1.2 PA System

A PA system is in place with the capability to cover most occupied site buildings. During emergencies, the system is not used for routine traffic. The system is tested daily. Two-way radios and runners are used to communicate with individuals that are not covered by the PA system.

6.2.1.3 Radio Systems

The four two-way radio networks support normal plant operations and, therefore, are effectively tested daily. The PSS and assistant PSS response vehicles' 800 MHz radios are tested weekly and during response drills and exercises. The PSS, assistant PSS, and fire service response vehicles, including the plant ambulances, each have the capability of communicating with responding units on the county emergency response frequency.

6.2.1.4 Pager System

Key EOC personnel have pagers which provide access from any tone-type telephone and can relay return telephone numbers or coded responses to the holder of the unit. EOC cadre pager drills are conducted at least quarterly. Pagers are used frequently for nonemergency uses, which enhances the regular testing program.

6.2.1.5 Facsimile Machines

The facsimile machines located in the EOC are used to communicate with USEC and federal, state, and local agencies and are tested weekly.

6.2.2 Off-Site Communications

The plant uses the commercial telephone system for off-site emergency communications. Cellular telephones can be used as a backup to the commercial telephone system. The PSS, assistant PSS, and fire service response vehicles, including the plant ambulances, each have the capability of communicating on the county emergency response frequency.

The Public Warning System, consisting of outdoor warning sirens and emergency broadcast system announcements, is used to provide emergency notification. Operations testing of the Public Warning System is conducted monthly.

6.3 ON-SITE MEDICAL FACILITIES

The plant maintains medical coverage consistent with the activities being conducted on-site. In an emergency, off-duty medical personnel are notified and directed to required locations as needed. The PSS notifications include alerting appropriate occupational health services and medical personnel in the event of emergencies ranging from industrial accidents to toxic or radiological releases. Letters of Agreement are maintained with area hospitals. These off-site hospitals also have facilities, equipment, and supplies for the treatment of contaminated individuals. A summary of the medical resources follows.

A plant medical facility is maintained on-site during the day shift (Monday through Friday). This facility has the supplies, equipment, and personnel to treat most injuries. This includes capabilities for the treatment of contaminated individuals including a shower for contaminated ambulatory patients, radiation survey instruments, and decontamination supplies. Medical personnel assess patient condition, provide necessary emergency care, and determine appropriate supplemental treatment.

Doctors and nurses provide medical services during the day shift (Monday through Friday); plant fire fighters provide emergency medical coverage the remainder of the time.

Emergency medical technicians provide and staff ambulance service. Additional ambulance support is available from off-site.

6.4 EMERGENCY MONITORING EQUIPMENT

The plant maintains various radiation detection equipment on-site for normal and emergency response use. Criticality accident alarms have been placed in those areas and in facilities containing fissile material as described in Section 5.2 of the SAR. The criticality accident alarm system provides for radiation detection and an alarm system to alert plant personnel.

Persons requiring radiation exposure monitoring wear beta-gamma-sensitive dosimeters (TLDs), which are processed and evaluated by a processor holding current accreditation from the National Voluntary Laboratory Accreditation Program of the National Institute of Standards and Technology. These personnel exposure monitoring dosimeters are exchanged and analyzed at least quarterly. As appropriate, other types of dosimeters, (e.g., finger rings, direct-reading dosimeters, and neutron dosimeters) are used.

Radiation dose rate and contamination survey instruments used are appropriate to measure the types and energies of radiation encountered at GDPs. Instruments capable of supporting radiography operations are also maintained in inventory. Instrumentation includes alpha/beta count rate and scaler instrumentation as well as ion chambers used to evaluate personnel exposure.

Designated plant emergency vehicles responding to the scene will contain necessary emergency equipment and supplies and ensure that radiological monitoring equipment is readily available to emergency personnel. Radiological monitoring equipment is also stored in Building C-300 for designated field monitoring personnel. Emergency equipment and its storage locations are identified in appropriate EPIPs.

In addition to radiological monitoring equipment, the plant maintains emergency monitoring instrumentation for chemically toxic material releases. These instruments are maintained in dedicated emergency response kits and will also be supplied from the plant's inventory of routinely used monitoring equipment. Equipment to monitor toxic chemical materials is also located on designated emergency vehicles. The dedicated emergency instruments are listed in applicable EPIPs.

The primary source of meteorological information is the plant weather monitoring system consisting of a 60-meter tower with meteorological sensors at the 10-meter and 60-meter elevations, a data terminal, and a data acquisition system. The tower and sensors are located south of the C-810 parking lot. This system measures wind speed, wind direction, temperature, and temperature differential. The data is displayed in C-300.

PGDP has no weather forecasting capability. Weather forecasting information is obtained from the Paducah office of the National Weather Service located at the Barkley Field Airport. Weather forecasts are used to inform plant personnel of impending related hazards, principally driving hazards, and may affect the scheduling of proposed plant evolutions such as cylinder movement. Meteorological data is used to ensure safe emergency scene response (from the upwind direction), facilitate plume dispersal modeling, and to develop appropriate protective action recommendations in the event of an airborne release. Current meteorological data is displayed in the plume modeling area of the EOC in building C-300.

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7. MAINTAINING EMERGENCY PREPAREDNESS CAPABILITY

This section describes the responsibilities for developing, maintaining, and updating the Plan and EPIPs and for maintaining emergency preparedness capability.

7.1 WRITTEN EMERGENCY PLAN AND PROCEDURES

Emergency Management is responsible for maintaining and updating the plan, as appropriate, on an annual basis in support of the annual application for renewal of the certificate of compliance. USEC may make changes to the plan without prior Commission approval if the changes do not decrease the effectiveness of the plan. USEC will furnish these changes to the NRC in accordance with 10 CFR 76.5 and to affected off-site response organizations within six months after the change is made. Emergency Management controls the distribution of the emergency plan ensuring that groups having responsibilities for response functions are included in the distribution.

EPIPs are Level 2 plant procedures and are revised, reviewed, approved, controlled, and distributed in accordance with plant administrative procedure requirements. These requirements, in part, ensure that new or revised EPIPs state duties, responsibilities, and actions to be taken by individual groups or individuals in response to an emergency condition. Level 2 procedures are approved by the General Manager and are distributed to each controlled procedure set holder. The revisions of the procedures incorporate required changes to correct deficiencies identified in emergencies, training, drills, or exercises.

7.2 TRAINING

The Emergency Management Manager is responsible for emergency management training program oversight. A series of course modules has been developed for on-site and off-site training programs.

Personnel assigned to the ERO are required to satisfactorily complete an initial training program prior to assignment. Required continuing or refresher training is conducted biennially except for firefighting and hazardous material emergency response, which is conducted annually, and emergency medical technician recertification, which is conducted in accordance with Kentucky statute. A physical examination and respiratory protection training are prerequisites to both firefighting and hazardous material emergency response initial and refresher training.

The initial training program is composed of a collection of functional modules which emergency personnel receive based on their emergency assignment. Specific training requirements are defined by applicable EPIPs.

A formal training record retention program has been established and is maintained for ERO members, support personnel, and off-site agency response organizations. Evaluation records for each course are maintained for incorporation into upgrades of the program.

Emergency Management staff participates in professional emergency management development training activities and other related training.

7.2.1 General Emergency Plan Training

Emergency plan training is provided biennially through General Employee Training by Training to personnel requiring unescorted access inside the fenced protected area including USEC, USEC contractor/subcontractors, DOE, many DOE contractor/subcontractors, and other identified personnel. Visitors to the fenced protected area are provided with escorts who have received GET training and can provide directions for protective actions in the event of an emergency. The following objectives are met:

1. To train personnel with respect to their responsibilities during an emergency situation, and
2. To keep personnel informed of any applicable changes to the Plan.

All site personnel allowed unescorted access complete initial emergency management training and retraining to ensure proper response to emergencies. The subjects covered include response to the following:

1. Fire alarms,
2. Toxic gas releases,
3. Security emergencies,
4. Bomb threats,
5. Evacuation alarms,
6. Tornadoes, and
7. Earthquakes.

7.2.2 Specialized Emergency Plan Training for the Emergency Response Organization

A formal training program which includes classroom-type training (lectures, seminars), practical applications (tabletop drills, functional drills, and exercises), and self-study programs has been developed for the ERO and support personnel.

The ERO receives training commensurate with assigned positions. This training program ensures the continued emergency management training of all persons who may respond/participate during a plant emergency. Specialized emergency management training is provided and includes but is not limited to the following categories of topics:

- On-Scene Response Activities. Topics covered include incident command, firefighting, HAZMAT response, including monitoring and emergency medical technician training.

- Emergency Management Orientation. Topics covered include concept of operations, emergency organizations, responsibilities and authorities, requirements, facilities and equipment overview, and off-site interface summary including public information.

Exercise controllers and evaluators are trained on proper conduct of emergency exercises. This training includes information on safety precautions, scenario messages, simulated actions, participant interactions and controller input, evaluation methodology, and critique format.

7.3.2 Quarterly Communications Checks

Communications checks with off-site response organizations are conducted on a quarterly basis and include the check and update of necessary telephone numbers.

7.4 CRITIQUES

Formal critiques are conducted for key participants, controllers, and evaluators following each exercise. These critiques are conducted by personnel who were not participants, normally emergency management or contractor personnel.

Emergency Management screens all critique comments. Critique items that have safety significance indicate a regulatory violation or reflect serious deficiencies in plan content or implementation are identified to the PSS and a Problem Report is initiated. Resulting corrective actions are tracked in the plant management tracking system in accordance with plant procedures. The remaining critique items are submitted to the Emergency Management Drill and Exercise Committee, which determines their validity and determines the appropriate method for corrective actions as required by an EPIP.

Emergency Management tracks corrective actions identified by the Emergency Management Drill and Exercise Committee through completion or implementation. Organization Managers are responsible for implementing exercise corrective actions in their respective funcional areas.

7.5 PROGRAM AUDIT

The Emergency Management Program is audited in accordance with Section 2.18 of the Quality Assurance Program to ensure adequate and effective program function. This ensures that changes in plant layout are included in revisions to the Plan. The scope of the audit includes the Plan and the EPIPs, training activities, exercise deficiencies, emergency facilities, equipment, and supplies, and those records associated with off-site support agency interface.

Selection of audit team members and audit team familiarization is as required by Quality Assurance procedures. Audit personnel do not have direct responsibilities for implementing the Emergency Management Program and are qualified according to Quality Assurance procedures. Lead auditor qualification and requalification is performed in accordance with Supplement 2S-3 to ASME NQA-1-1989.

Procedures require that Emergency Management investigate adverse audit findings and schedule corrective actions that prescribe measures to prevent recurrence. The auditing organization evaluates the adequacy of the written responses.

Procedures require that follow-up actions be taken to verify that corrective actions are completed as scheduled.

7.6 MAINTENANCE AND INVENTORY OF EMERGENCY EQUIPMENT, INSTRUMENTATION, AND SUPPLIES

The Emergency Management Manager or designee is responsible for planning and scheduling the inventory and inspection of designated emergency equipment and supplies and ensures that identified deficiencies are corrected in a reasonable period of time.

Four two-way radio networks and two telephones systems, including the telephones in the EOC, are in daily use at the plant and, therefore, are effectively tested on a continual basis.

Adequate equipment and supplies are kept available and maintained in operable status for emergency response personnel to perform their respective duties and responsibilities. This includes equipment and materials for radiological and toxicological monitoring, protective clothing, fire-fighting equipment, sampling equipment, respiratory protection equipment and emergency air supplies, vehicles, and administrative supplies.

Emergency response vehicles (i.e., fire, HAZMAT, E-Squad, and plant ambulances) are maintained as required by Fire Services and Facility Maintenance procedures. Emergency equipment and supplies provided on emergency response vehicles are inspected and inventoried as required by Fire Service procedures. Emergency equipment and supplies provided on emergency response vehicles include instruments, demand respirators, self-contained breathing apparatus, firefighting equipment and gear, medical equipment, rescue equipment, HAZMAT response materials, and supplemental lighting. Emergency equipment stored in building C-300 is inspected and inventoried quarterly. Materials and supplies with rated shelf-lives are tracked and replaced as required in Emergency Management, Fire Services, or Industrial Hygiene procedures. Emergency instruments are operationally tested quarterly and after each use. Normal plant use two-way radios are used for emergency response.

Sufficient reserves of emergency equipment and instruments are available to replace emergency equipment that is removed for calibration or repair. Emergency instruments are calibrated at the intervals specified for each type of instrument by Radiation Protection and Industrial Hygiene procedures. A summary report of each inventory and inspection is prepared and submitted as Emergency Management documentation.

7.7 LETTERS OF AGREEMENT

Changes to the Plan are communicated to the appropriate off-site response organizations. Letters of Agreement with off-site support organizations and agencies are reviewed and updated every four years or more frequently if needed. A change in original signatory to a given letter of agreement does not in itself require revision of that letter. A change in applicability of content of a letter of agreement, however, does require a revision to that letter. Letters of Agreement are identified in Appendix B.

9. RECOVERY AND PLANT RESTORATION

In any emergency, the immediate action is directed toward limiting the consequences of the incident in a manner that affords the maximum protection to plant personnel and the general public. Once the corrective and protective actions have established an effective control over the situation and emergency conditions no longer exist, the emergency response shifts into the recovery phase.

Emergencies may or may not impact plant operations within the scope of NRC-regulated activities. Therefore, it is possible to continue operations that are not impacted, either directly or indirectly, by an emergency situation.

It is the responsibility of the CM to determine when the recovery phase of the emergency can be initiated. The following criteria for terminating an emergency and beginning recovery operations are considered when appropriate to the circumstances:

- If classified emergency, conditions no longer meet any emergency classification criteria (EAL).
- The affected facility/area is in a stable condition and can be maintained in that condition, indefinitely.
- Fire or other similar emergency conditions no longer constitute a hazard.
- Releases of hazardous materials to the environment have ceased or are controlled.
- Discussions with the ERO and appropriate off-site agencies identify no valid reason to continue in any emergency classification.

9.1 RECOVERY

The nature and extent of the emergency determines what recovery operations are required and the extent of the recovery organization that must be formed. A recovery plan must be flexible enough to adapt to the existing conditions.

It is not possible to anticipate in advance all of the conditions that may be encountered as a result of the emergency. However, recovery and restoration activities will be conducted to maintain exposures as low as reasonably achievable (ALARA). Depending of the nature of the emergency, recovery activities could include decontamination of facility personnel, sampling to determine the extent of material release, or bioassay strategy for exposed or potentially exposed persons.

Recovery includes those actions necessary to return an incident site and the surrounding environment to pre-emergency conditions to the maximum extent practicable. General principles addressed in this section serve as a guide for developing a flexible plan of action.

The PSS manager is responsible for ensuring retention of all records associated with an incident relating to an NRC regulated activity or a USEC leased facility.

Specific recovery plans are developed in accordance with applicable EPIPs. The DOE site manager is responsible for ensuring the adequacy and appropriateness of recovery operations involving nonleased portions of the facility.

9.2 RECOVERY ORGANIZATION

Prior to termination of an emergency and deactivation of the ERO, a recovery organization is established to implement recovery plans. This organization is managed by a recovery manager who has overall responsibility for recovery activities including checking safety equipment involved in the emergency and restoring it to normal conditions. The recovery manager compiles and evaluates records related to the recovery including ALARA records and delivers these records to the PSS office for retention. The recovery manager is aided by key operating and management positions representing broad functional areas. These include some or all of the following, depending on the nature of the event:

1. Operations,
2. Maintenance,
3. Engineering,
4. Radiation Protection,
5. Environmental, Safety and Health,
6. Waste Management,
7. Police Operations,
8. Public Affairs,
9. Administration, and
10. Logistics.

Appendix A

LIST OF PGDP EMERGENCY PLAN IMPLEMENTING PROCEDURES

CP2-EP-EP5032	Plant Emergency Management Program
CP2-EP-EP5033	Evacuation and Take-Cover Procedure (Plant and Buildings).
CP2-EP-EP5030	Personnel Accountability
CP2-EP-EP5043	Medical Emergencies
CP2-EP-EP5044	Mutual Emergency Assistance
CP2-EP-EP5046	Emergency Operations Center (EOC)
CP2-EP-EP5045	Earthquake Emergency
CP2-EP-EP5034	Severe Weather Emergency
CP2-EP-EP5031	Oil and Hazardous Material Spills and Release
CP2-EP-EP5038	Criticality and Radiation Emergencies
CP2-EP-EP5047	Bomb Threat Emergency
UE2-HR-EP5030	Emergency Public Information
CP2-EP-EP5042	Termination and Recovery After Emergencies
CP2-EP-EP5051	Emergency Response Training
CP2-EP-EP5055	Emergency Classification
CP2-EP-EP5056	Emergency Notifications
CP2-EP-EP5050	Computer Generation of Plume Models for Emergency Response
CP2-EP-EP5052	Emergency Response Drills and Exercises
CP2-EP-EP5057	Emergency Monitoring
CP2-EP-EP5054	Off-Site Shipping Incident Technical Assistance
CP2-EP-EP5058	Maintenance of Emergency Facilities and Equipment
CP2-EP-EP5059	Emergency Communications
CP2-EP-JI5030	Joint Public Information Center Setup in Kevil

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RADIOACTIVE WASTE MANAGEMENT PROGRAM

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The radiological side of the facility is used to inspect and sort LLRW and potentially contaminated waste for further processing or storage. Wastes are inspected for hazardous materials and are monitored for the presence of radioactive contamination using bulk or hand monitors. Radioactive wastes are containerized for shipment to storage or treatment facilities. Wastes suitable for release to unrestricted areas are transferred to the nonradiological side of the facility for processing for disposal.

6.3.2 C-754 Clamshell Building

The C-754 Clamshell Building is a 10,000 ft^2 facility consisting of a concrete pad with a lightweight fabric cover on a steel frame. The facility is capable of handling truck and forklift traffic. Solid and liquid LLW is stored in this facility.

6.3.3 C-754-A Clamshell Building

This 5,000 ft^2 facility is of the same design as the C-754 Clamshell Building but has a dense grade aggregate floor. The facility is used for the storage of solid LLW in containers including drums, roll-off bins, metal boxes, etc.

6.3.4 C-746-Q1 High-Assay Waste Storage Facility

C-746-Q1 is used for the storage of liquid and solid LLW. This 9,000 ft^2 facility is a permanent steel-framed, metal-walled structure with a sealed concrete floor. The floor includes sealed integral concrete dikes, which provide secondary containment. The eastern section of this building consisting of approximately 5,000 ft^2 is leased by USEC and is separated from the DOE-operated western side of the facility by a metal partition. The facility is equipped with criticality alarms. Nuclear criticality safety requirements for the storage of fissile and potentially fissile wastes in this facility are implemented through the Nuclear Criticality Safety program.

6.3.5 C-727 Mixed Waste 90-Day Accumulation Area

The C-727 facility is a pre-engineered metal building with an area of approximately 3,000 ft^2. The concrete floor is sealed, and secondary containment is provided. This facility is used for the storage of radioactive waste and is identified as a 90-day storage area for mixed solid and liquid waste.

6.3.6 *Section deleted*

6.4 RADIOACTIVE WASTE PROCESSING

USEC operates two facilities in C-400 for the removal of uranium from wastewaters—the Lime Precipitation Unit and the Number 4 Dissolver. Another unit, the C-400 Ion Exchange Unit, is used for the removal of technetium-99 from wastewater. These facilities are limited to the treatment of waters containing uranium at assays of less than 1 percent (Lime Precipitation and Ion Exchange units) and 1.5 percent (Number 4 Dissolver). The Lime Precipitation Unit uses lime to remove uranium from the solution. The particulate uranium is then removed from the wastestream using a rotary vacuum filter precoated with diatomaceous earth. Figure 2 is a flow diagram of this system.

The Number 4 Dissolver uses sodium hydroxide to remove uranium from solution. This system also uses a rotary vacuum filter precoated with diatomaceous earth to filter the uranium-bearing solids from the wastewater stream. This system is depicted in Figure 3.

Processed wastewater from these units is contained in tanks for sampling and analysis prior to discharge or reuse. The wastewater is discharged through Kentucky Pollution Discharge Elimination System (KPDES) Outfall 001. Solid treatment residues are managed as waste not suitable for release to unrestricted areas pending characterization.

The C-400 Ion Exchange Unit uses resin to remove Tc-99 from wastewater. The wastewater is passed through 3 resin columns operated in series. After processing the water is returned to storage tanks for sampling and analysis prior to discharge through the Sewage Treatment Plant to outfall 008.

Aqueous wastes containing uranium at an assay greater than 1.5 percent are treated in the C-409 High Assay Cleaning/Decontamination facility. Uranium is removed from the solutions using sodium hydroxide as the precipitating agent. The precipitated uranium is filtered from the solution using a rotary vacuum filter. Wastewater is reused in C-409 or is transferred to C-400 for reuse or discharge through Outfall 001 after sampling and analysis. The system is configured similar to the Number 4 Dissolver in C-400.

USEC-generated LLRW, such as metal and incinerable waste, is shipped to off-site commercial treatment facilities for volume reduction. Treatment residues from these processes are either returned to PGDP or are shipped directly to an approved off-site commercial disposal company.

Mixed aqueous wastes that cannot be processed in USEC facilities are transferred to DOE for on-site storage until treatment is available at DOE facilities or commercial treatment facilities that are licensed in accordance with 10 CFR 61, or applicable Nuclear Regulatory Commission (NRC) Agreement state requirements, or a foreign facility licensed in accordance with the rules and regulations of that country.

Some DAW is shipped off-site for volume reduction through incineration. Suitable scrap metal is shipped off-site for volume reduction by smelting.