APPLICATION FOR AMENDMENT

SEQUOYAH FACILITY LICENSE SUB-1010

DOCKET 40-8027

URANIUM HEXAFLUORIDE TO URANIUM TETRAFLUORIDE

PROCESSING PLANT

January 2, 1985

TABLE OF CONTENTS

TABLE OF CONTENTS (Continued)

PART I

LICENSE CONDITIONS

URANIUM HEXAFLUORIDE TO URANIUM TETRAFLUORIDE PROCESSING PLANT

Chapter 1 - STANDARD CONDITIONS AND SPECIAL AUTHORIZATIONS

1.1 Name

Sequoyah Fuels Corporation
Incorporated in the State of Delaware
Principle Offices: Kerr-McGee Tower, Oklahoma City, Oklahoma 73125.

1.2 Location

Sequoyah Hexafluoride Conversion Facility
P.O. Box 610, Gore, Oklahoma 74435
UF_6 to UF_4 Processing Plant.

1.3 License Number and Period of Time the License is Requested

Amendment - License Number SUB-1010, Docket 40-8027

Renewal Application Dated September 30, 1982 (as revised October 1, 1983)

1.4 Possession Limits

1.5 Location Where Material Will be Used

Information required for the paragraphs 1.3, 1.4 and 1.5 will be found on page I.1-1 of the renewal application for License SUB-1010.

1.6 Definitions

Depleted Uranium: Material is the result of partial depletion of the isotope Uranium 235 in the starting UF_6 material containing no more than 0.3% U235. This uranium composition will exist as UF_6, UF_4, UO_2F_2, UOX, and small amounts of waste in solutions generated by the plant.

1.7 Authorized Activities

The following activities are authorized:

1. Conversion of UF_6 (depleted) to UF_4 (depleted).

2. Laboratory service activities related to this conversion process.

3. Treatment, storage and disposal of process and contaminated waste material.

4. Storage of depleted feed material and depleted product.

1.8 Exemptions and Special Authorizations

Contamination-free Articles

Articles which may have been contaminated with source uranium materials through use, handling, or storage in the facility shall be disposed of or transferred to persons not licensed to possess radioactive materials when each of the following conditions are satisfied:

a. All surfaces are accessible for survey or it is reasonable to assume from the design and usage that no uranium could have contaminated the inaccessible surfaces.

b. Surveys of accessible surfaces by health physics personnel verify that neither the fixed alpha contamination is in excess of 15,000 disintegrations per minute (dpm) per 100 cm^2 with an average not in excess of 5,000 dpm nor the removable alpha contamination is in excess of 1,000 dpm per 100 cm^2, and the beta-gamma radiation is not in excess of one millirad (mr) per hour with an average not in excess of 0.2 mr/hr as measured by an open-window beta-gamma survey meter with a window thickness of not more than seven milligrams per square centimeter.

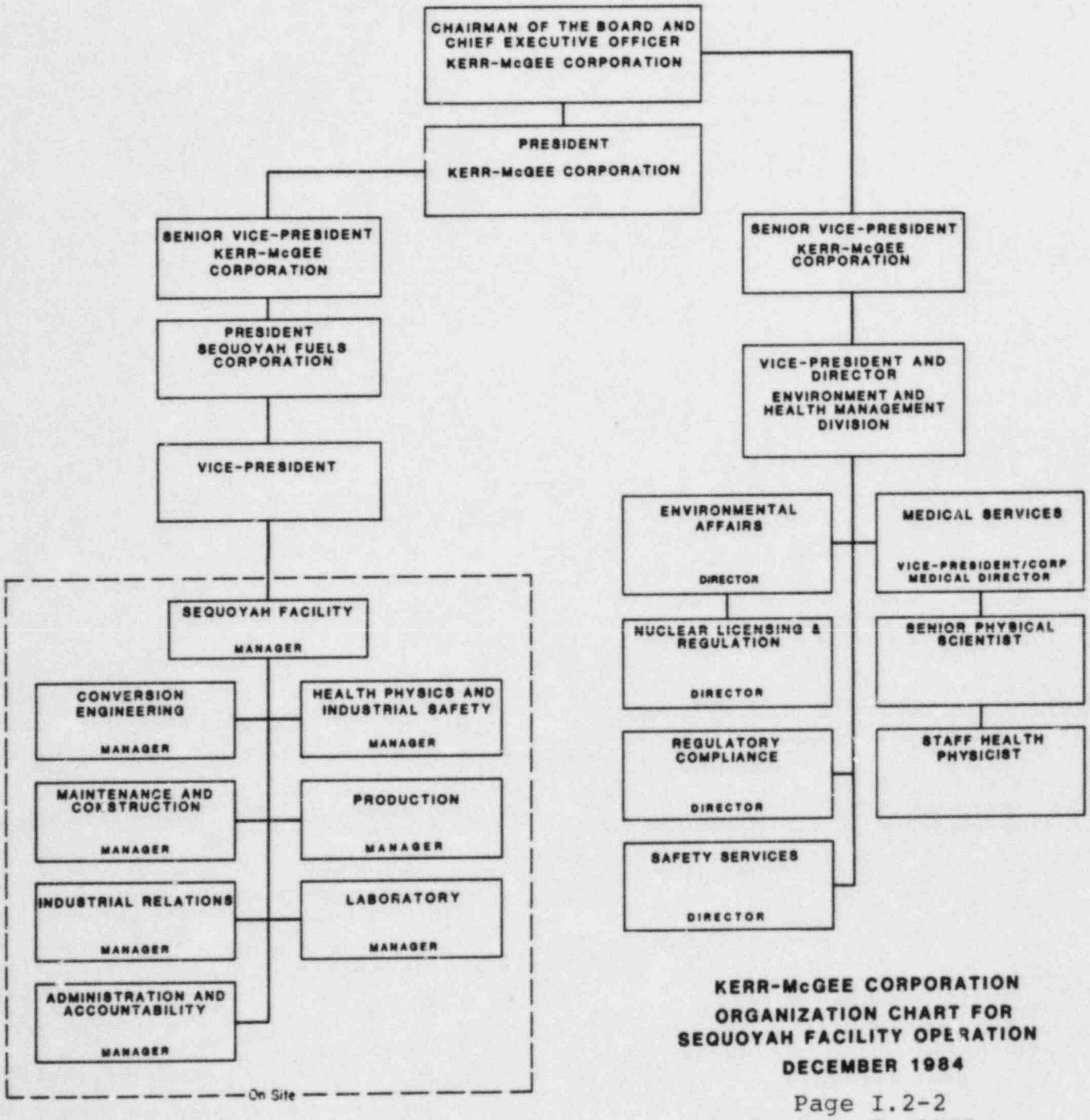
Posting Exception

An exception to the posting requirements of 20.203(e)(2) shall be made for areas and rooms within the plant. All entrances to restricted areas shall be conspicuously posted with a sign having the words "Caution - Any area or room within this plant may contain radioactive material."

Chapter 2 GENERAL ORGANIZATION AND ADMINISTRATIVE REQUIREMENTS

The provisions of this chapter in the application for renewal of the Sequoyah Conversion Facility License SUB-1010 shall apply equally to the UF_6 to UF_4 Conversion Facility.

The operating group consists of one person per shift (three during start up if required), including a lead operator who reports to the shift supervisor of the Sequoyah Facility. Health physics personnel from the Sequoyah Facility monitor both routine and non-routine activities in the UF_6 to UF_4 conversion plant. The UF_6 to UF_4 Conversion Plant operates on the same schedule as the Sequoyah Facility, i.e. seven days per week, three shifts per day depending upon production requirements. The UF_6 to UF_4 Conversion Plant is not connected to the scheduled production activities of the Sequoyah Facility. Consequently, discontinuing operations to investigate and correct abnormal conditions will not interfere with conversion plant production.



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Chapter 3 RADIATION PROTECTION

The UF_6 to UF_4 Conversion Plant will be built within the boundaries of the Sequoyah Facility restricted area. Activities in this new plant shall be integrated with the activities of the existing Sequoyah Facility. However, in view of the level of uranium 235 concentration in the materials handled in this plant, it shall be separated from the Sequoyah Facility to prevent the exchange of material between the two plants.

This chapter incorporates for the new plant the Radiation Protection conditions as presented in Chapter 3 of the Sequoyah Facility license renewal application, revised October 1983, and updated by subsequent responses to NRC questions.

Chapter 4 NUCLEAR CRITICALITY SAFETY

The UF_6 to UF_4 Conversion Facility processes only uranium depleted in U_{235} content. It does not process special nuclear materials in any form and therefore criticality safety is not an applicable concern to the operation of the process or disposal of waste.

Chapter 5 ENVIRONMENTAL PROTECTION

The provisions of Chapter 5 of the application for the renewal of License SUB-1010 are completely applicable to this amendment. Chapter 5 describes the effluent controls and monitoring systems which continue in operation after the installation of the UF_6 to UF_4 Conversion Plant.

5.1 Effluent Control Systems

The UF_6 to UF_4 facility will have two gaseous effluent release points. There will be a gaseous effluent from the conversion process and there will be an outlet from a dust collection system. Releases from the process will be directed into the existing H_2/F_2 burner and downstream HF scrubber. A small amount of UF_4 dust may accompany this discharge stream but will be lost in the concentrations of normal UF_6 collected in the scrubber. The off gas stack for the dust collection system shall be provided with a continuous stack sampler. Samples shall be analyzed on a daily basis. The sample results will be reported to facility and corporate management on the daily status report. The action level established for the existing facility will apply equally to the UF_6 to UF_4 process facility.

The environmental monitoring schedule as shown in Table 5-1 of the renewal application shall continue to apply to this UF_6 to UF_4 operation.

Chapter 6 SPECIAL PROCESS COMMITMENT

Total commitments involving the operation of the UF_6 to UF_4 process will primarily be restricted to the adequacy of cooling water supply and process ventilation. Each of these subjects are described more fully in other chapters as to their construction and purpose.

1. It is imperative that the Cooling Water Emergency system (CWE) is operative and full pressure is being exerted on the emergency spraying system at the vaporizers. The status of the CWE system shall be determined prior to start up and regularly during the period of operation.

2. The H2-F2 burner system and the subsequent scrubber system shall be in operation prior to start up and routinely confirmed during operation.

3. The cooling water system for the gas coolers shall be in operation prior to start up and be routinely checked during operation.

4. An adequate nitrogen supply is required and shall be confirmed prior to start up and routinely during operation.

Chapter 7 DECOMMISSIONING PLAN

The proposed processing facility is located on the property included in the Sequoyah Facility decommissioning plan and shall be incorporated into that plan. It is expected that the building and equipment can be decontaminated to the point where it can be released for unrestricted use. Materials not decontaminated shall be disposed in an approved manner.

The decommissioning cost of this additional facility increases the cost for decommissioning the Sequoyah Facility by approximately $500,000.

The reserve account activity shall be adjusted to account for the additional estimated cost of reclamation of this UF_6 to UF_4 facility.

Chapter 8 RADIOLIGICAL CONTINGENCY PLAN

A radiological contingency plan has been incorporated into the Sequoyah Conversion Facility License No. SUB-1010. The addition of the UF_6 to UF_4 processing will not decrease the effectiveness of the existing plan.

PART II

SAFETY DEMONSTRATION

Chapter 9 OVERVIEW OF OPERATION

9.1 Corporate Information

The UF_6 to UF_4 Plant is operated by Sequoyah Fuels Corporation, a wholly owned subsidiary of Kerr-McGee Corporation. Additional details in regard to the Kerr-McGee Corporation will be found in the Sequoyah Conversion Facility License Request for Renewal, SUB-1010.

9.2 Financial Qualification

See information provided with SUB-1010.

9.3 Summary of Operating Objective and Process

The UF_6 to UF_4 Processing Plant will supply UF_4 for commercial use. The primary function of the process is to reduce UF_6 to UF_4 for its subsequent reduction to uranium metal.

The process involves the receipt of government-furnished UF_6 in 14-ton cylinders, its vaporization into a gas, and treatment with hydrogen supplied from the thermal catalytic cracking of ammonia to reduce the UF_6 to UF_4. Subsequent steps involve the recovery of the off gas and the further physical processing of the product to meet customer specifica- tions. The off gas produced will be filtered and subsequently exhausted to a H2-F2 burner now in place at the Sequoyah Facility whose discharge gasses are quenched with water and absorbed in a scrubber solution.

The Sequoyah Facility and its personnel have operated for a number of years and generally have experience with the materials handling and individual processes proposed.

9.4 Site Description

A complete description of the site appears in License SUB-1010.

The primary reason for selecting this location for the installation of the UF_6 to UF_4 Plant is due to the presence of certain required equipment, the experience of the personnel available, and the ability to recycle recovered HF directly into the Sequoyah process.

9.5 Location of Buildings on Site

The drawing titled "Depleted UF_4 Plant Site Location Plan" (See Figure 16-3) identifies the location of the UF_6 to UF_4 Facility on a plot plan of the Sequoyah site. This location was chosen because of its proximity to the services needed to handle the off gas from the process and its primary byproducts.

9.6 Maps and Plot Plans

Please refer to License SUB-1010 for drawings that describe the Sequoyah site completely. The location of the UF_6 to UF_4 Processing Plant within the Sequoyah site is described in Paragraph 9.5.

9.7 License History

The application for renewal of the Sequoyah Facility License SUB-1010 contains a complete chronological history of the Sequoyah license. Application for renewal was first submitted on September 30, 1982. The final additions and corrections were submitted on September 4, 1983. This application for amendment is now being reviewed by the USNRC.

9.8 Changes in Procedures, Facilities and Equipment

Procedures relating to safety review, process changes and changes of equipment as described in License SUB-1010 are followed in the UF_6 to UF_4 Processing Plant.

Reduction of UF_6 to UF_4 is conducted by contacting the gaseous UF_6 with gaseous hydrogen to form solid UF_4. It is important to exclude the presence of oxygen from the system in order to avoid the production of undesirable contaminating products, UO_2F_2 and uranium oxides such as UO_2 and U_3O_8. The main byproduct of this reaction is a gaseous stream of hydrogen, nitrogen, HF and very small amounts of UF_4 dust. Location and layout of the plant are dictated at the Sequoyah Facility by the location of handling equipment for liquid hydrofluoric acid and combustion and absorption equipment related to the treatment of residual off-gas. As a result the location of choice for the UF_6 to UF_4 Processing Plant is the area immediately to the north of the Sequoyah Facility with proximity to both recovery systems and HF handling systems.

The plant will process only depleted uranium and therefore will not require separate personnel facilities such as laundry, showers and change areas. It is located at a distance to insure separation of significant amounts of depleted uranium from the normal uranium processed in the Sequoyah Facility.

10.2 Utilities, Including Emergency Power

Utility service is provided from connections to the existing Sequoyah Facility. These include steam, domestic water, fire water, cooling water and electrical power. Details of these systems are addressed in the existing NRC license for the Sequoyah Facility.

10.2.1 Primary Electrical System

A separate load center is established for the UF_6 to UF_4 Facility. One transformer is supplied from one recloser in the main power distribution system. Since this facility will not normally be required to operate continuously, emergency power will not be required on the same basis as the balance of the Sequoyah Facility. Emergency lighting will ensure orderly shut-down procedures.

10.2.2 Cooling Water

Cooling water is supplied by extensions from the Sequoyah Facility system.

10.3 Heating, Ventilation and Air Conditioning

A general schematic of the air handling system is shown in Drawing 800-M-6404. Building air movement is the normal manufacturing plant rates of exchange, for which no special features are provided.

Certain equipment is separately ventilated in the event of an unforseen release and exhausted through a bag filter to ensure the minimum release of radioactive material through an accident.

Heating is accomplished using space heaters. Heaters will be located in areas of the process building as needed to provide comfortable operating conditions. Air conditioning is provided for the control room.

10.4 Waste Handling

10.4.1 Liquid Waste

Liquid waste will only be generated at the current Sequoyah Facility scrubber and be combined with liquid waste generated by the Sequoyah Facility off-gas system. (See 16.1.16)

10.4.2 Solid Waste

Solid waste will consist of normal manufacturing trash and treated the same as that generated in the Sequoyah Facility. (See 16.1.17)

10.5 Chemical Systems

The cracked ammonia supply system is the only non-radioactive chemical operation associated with the UF_6 to UF_4 Facility. This system is similar to the ammonia disassociation system installed in the Sequoyah Facility during its original construction, and in fact feeds the UF_6 to UF_4 Facility directly.

10.6 Fire Protection

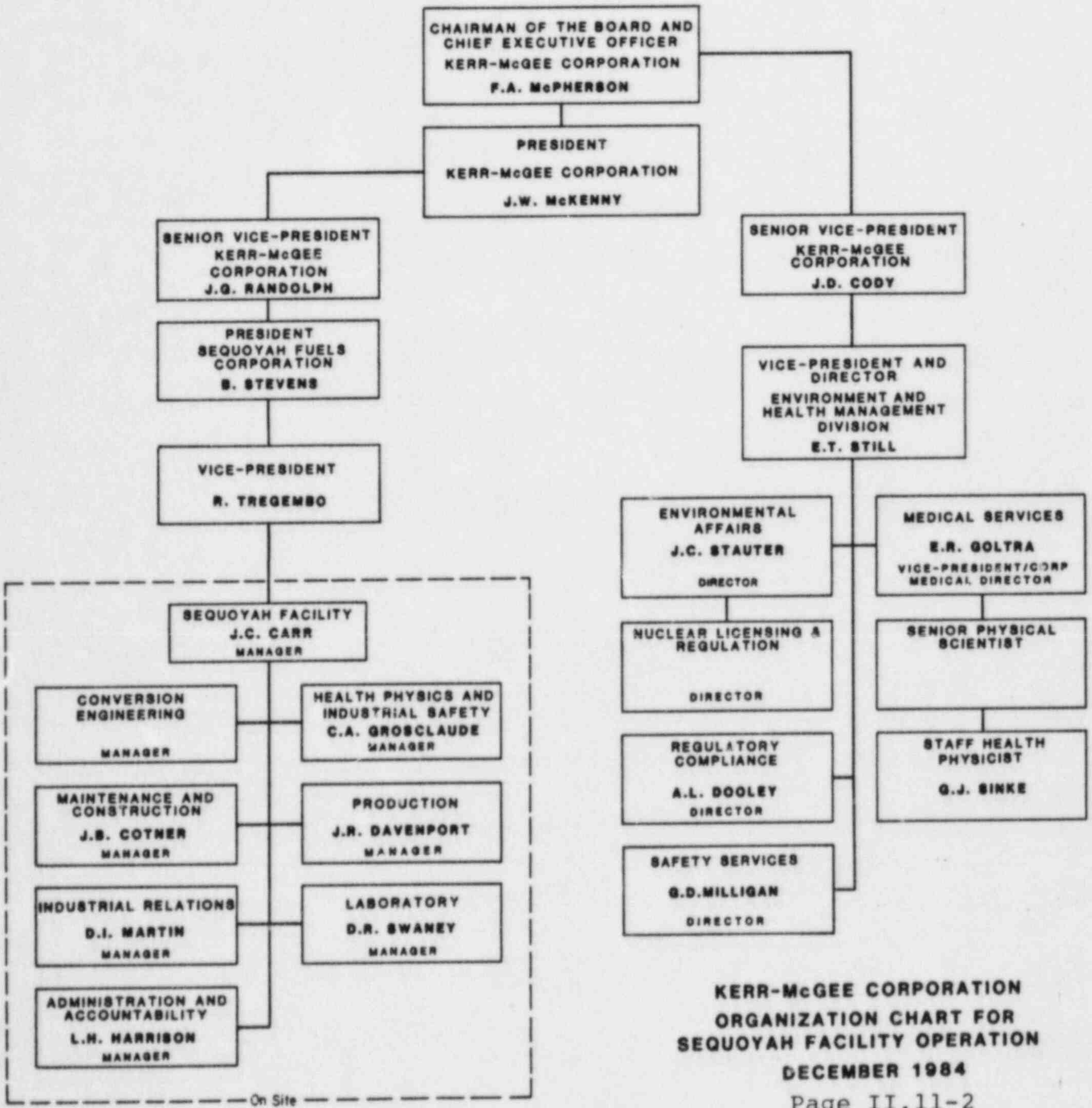
The UF_6 to UF_4 building is designed in accordance with applicable codes and standards for fire protection. Non-combustible construction is utilized throughout the facility. The building is a steel frame structure supporting metal decked roofs with insulation and built up roofs, interior face, and metal siding wall enclosure; portions of the building may be constructed of masonry.

The fire water loop will be extended and a new fire hydrant will be located close to the building.

Fire protection procedures and inspections are integrated with those of the Sequoyah Facility.

Chapter 11 ORGANIZATION AND PERSONNEL

As described in Chapter 2, the UF_6 to UF_4 Processing Plant is operated in conjunction with the conversion plant. The operator will report to the shift foreman. The operation is under the general technical direction of the area supervisor. Additional information on this subject will be found in the Sequoyah Facility Application for License Renewal SUB-1010 dated September 1982.



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Chapter 12 RADIATION PROTECTION PROCEDURES AND EQUIPMENT

Chapter 12 of the Application for Renewal of License SUB-1010 provides a complete discussion of the required information applicable to all work done in the UF_6 to UF_4 Facility. Since this facility processes depleted UF_6, no additional or special procedures are involved beyond that required by the natural uranium processed by the Sequoyah Facility.

Chapter 13 OCCUPATIONAL RADIATION EXPOSURES

Chapter 13 of the application for the renewal of the Sequoyah Fuel License SUB-1010 supplies a complete and detailed discussion of the past history and the current program in place at the Sequoyah Facility. Since the UF_4 to UF_6 processing plant is an integral part of the facility, the same procedures will be applied to occupational exposure in this facility. The UF_6 to UF_4 facility does not present hazards in excess of those currently present in the facility and therefore no special procedures or instructions will be needed.

Chapter 14 ENVIRONMENTAL SAFETY-RADIOLOGICAL AND NON-RADIOLOGICAL

The application for renewal of License SUB-1010 for the Sequoyah Facility contains a summary of Environmental Data obtained from the environmental monitoring program for the Sequoyah Facility and a discussion of the maximum annual dose to the nearest resident. Non-radiological environment impacts of gases and liquid effluent from the Sequoyah Facility are also summarized.

Environmental monitoring for the UF_6 to UF_4 processing plant is included in the Sequoyah Environmental Monitoring Program. Analysis of environmental samples will not reveal specific releases from the UF_6 to UF_4 processing plant, since the same isotopes are present in the Sequoyah Facility releases. Isotopic analysis of environmental samples provides the information required to infer the amount of depleted uranium contained in environmental samples. Releases from UF_6 to UF_4 processing plant will generally not be recognizable against the current matrix of the normal Sequoyah environmental samples.

Chapter 15 NUCLEAR CRITICALITY SAFETY

The UF_6 to UF_4 processing plant will process only depleted uranium, therefore, no SNM material is present in the plant and nuclear criticality safety is not a concern of the operation.

Chapter 16 PROCESS DESCRIPTION AND SAFETY ANALYSIS

16.1 Process Steps and Flowsheet

16.1.1 General

The purpose of this process is to react depleted uranium hexafluoride with disassociated ammonia to produce depleted uranium tetrafluoride (UF_4) and anhydrous hydrofluoric acid. The uranium tetrafluoride will be packaged in 55 gallon drums. The anhydrous hydrofluoric acid will be condensed to a liquid and used in the existing conversion facility.

Reference is made to Drawing 800-M-1401 "Depleted UF_4 Flow Sheet" for stream compositions, temperatures, pressures, and flow rates.

The bulk of the processing equipment will be housed in a steel frame and metal skin building with approximately 2500 square feet of ground floor area. There will be three upper level working platforms and the building will be approximately 50 feet high. Layout within the building is shown on the drawing "Depleted UF_4 Building Plan," attached as Figure 16-1.

The UF_6 vaporizing area will be west of the above building with a wind screen wall on the north and a canopy rain shield. Location is shown on the drawing "Depleted UF_4 Building and Storage Plan," (Figure 16-2), which also shows storage for UF_6 cylinders and full and empty drums.

Locations of the proposed depleted UF_4 plant within the site is shown on the drawing "Depleted UF_4 Site Location Plan" (Figure 16-3).

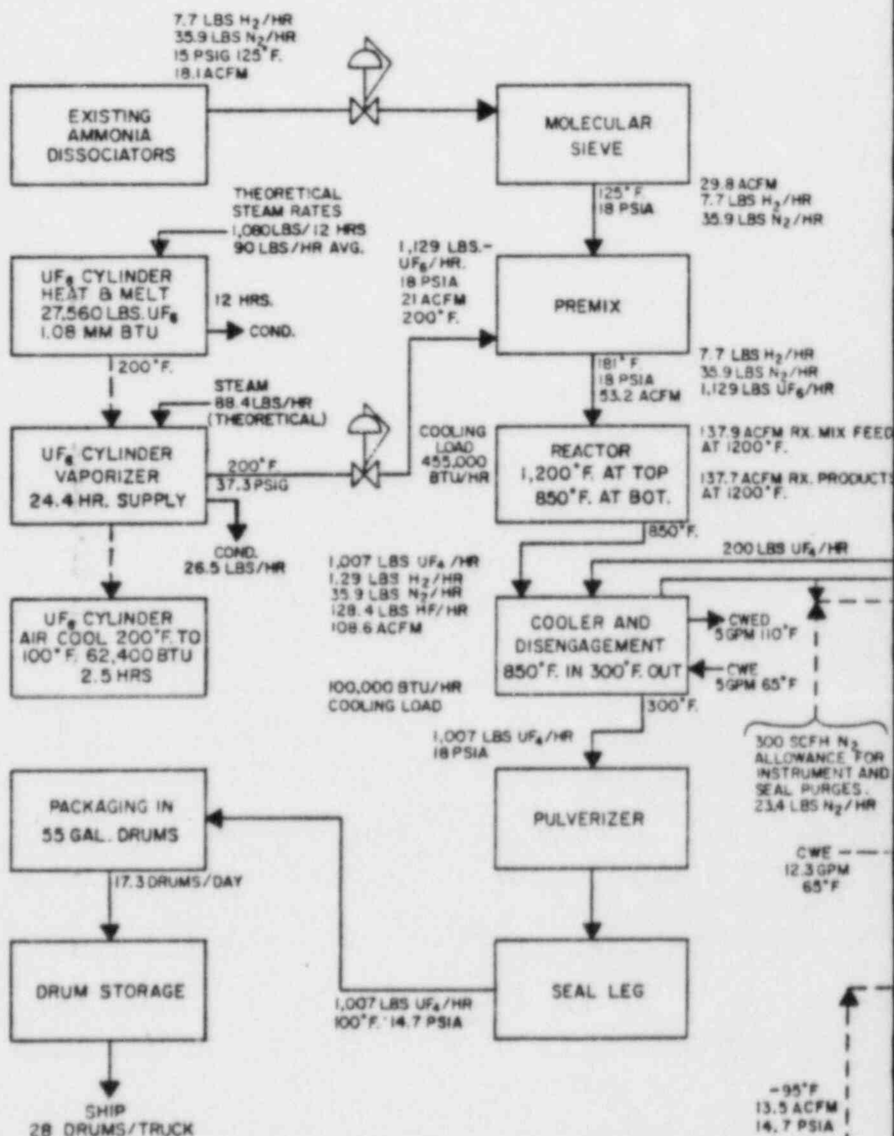
Utility and reagent supplies from the UF_6 conversion facility are described in License SUB-1010.

16.1.2 Depleted Uranium Hexafluoride Supply

The uranium hexafluoride will be supplied in 14 ton thin walled and thick walled steel cylinders from the stockpile of the Department of Energy (DOE). After emptying they will be returned to the DOE.

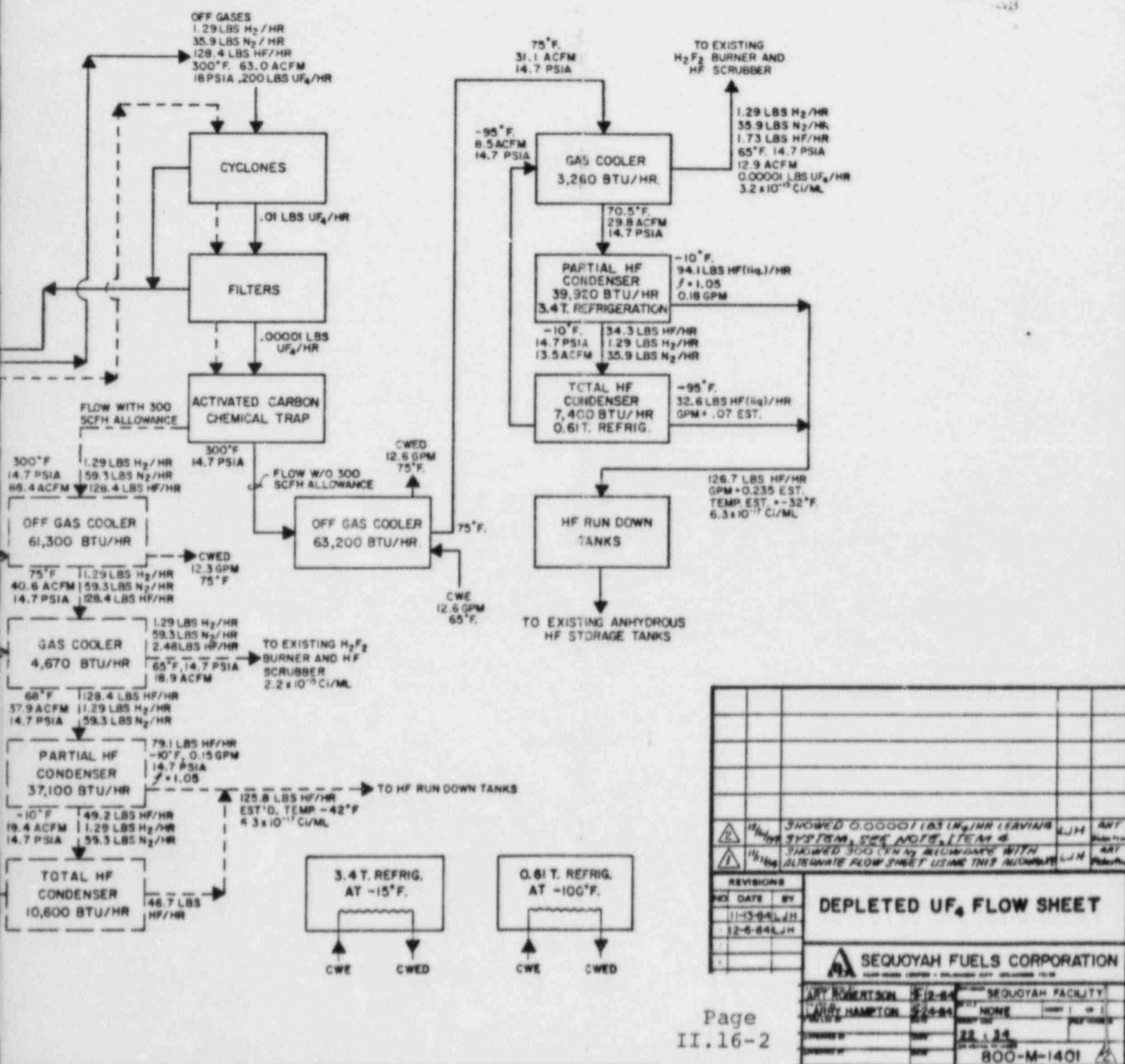
16.1.3 Dissociated Ammonia Supply

Ammonia will be thermally dissociated in one of the three existing ammonia dissociators located at the main conversion building. The dissociated ammonia (a mixture of nitrogen and hydrogen gases) will be piped to the depleted UF_4 plant. The ammonia should be 99.9% decomposed to nitrogen and hydrogen.



NOTES:

1. RATES SHOWN ARE INSTANTANEOUS RATES TO PRODUCE 7.5 MM LBS. UF_4/YR. WORKING 3 SHIFTS PER DAY, 7 DAYS PER WEEK, 52 WEEKS PER YEAR WITH AN 85% ON STREAM FACTOR.
2. DISSOCIATED AMMONIA RATES ARE BASED ON A 20% EXCESS OF HYDROGEN.
3. ---- FLOW SHEET AFTER ALLOWING 300 SCFH N_2 IN LEAKAGE TO SHOW EFFECT OF INLEAKAGE ON HF RECOVERY SYSTEM.
4. FINAL DESTINATION OF UF_4 THROUGH FILTERS IS NOT KNOWN. IT IS SHOWN LEAVING BOTH IN THE CONDENSED HF AND THE OFF GASES TO THE EXISTING BURNER TO SHOW WORST CASE.



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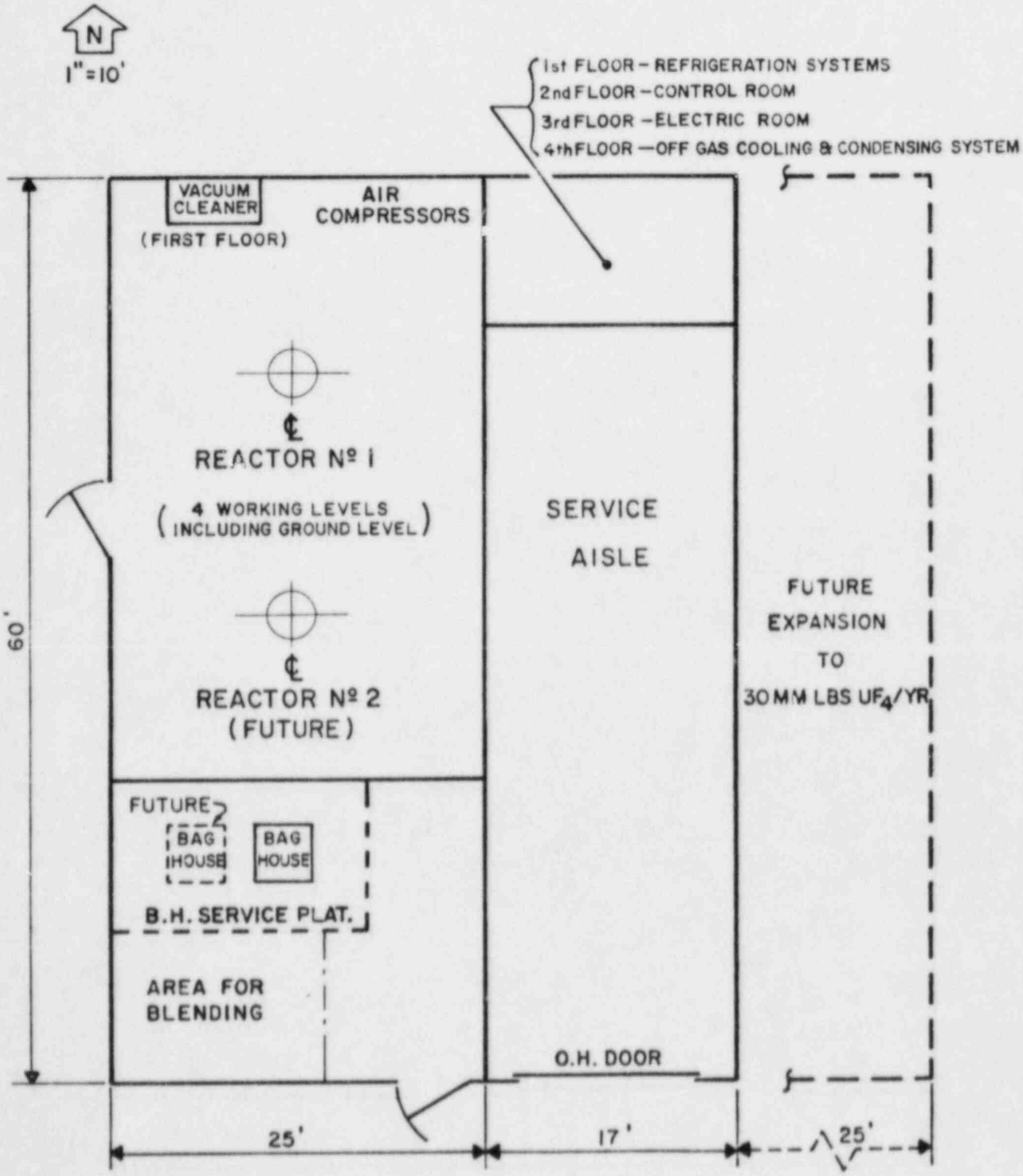
DEPLETED UF_4 BUILDING PLAN

TOTAL SQ. FEET = 2,520'

FIGURE 16-1



NOTE 1) INSTALL Nº1 REACTOR LINE FOR 7.5 MM LBS UF_4/YR

2) INSTALL Nº2 REACTOR LINE FOR ANOTHER 7.5 MM LBS UF_4/YR

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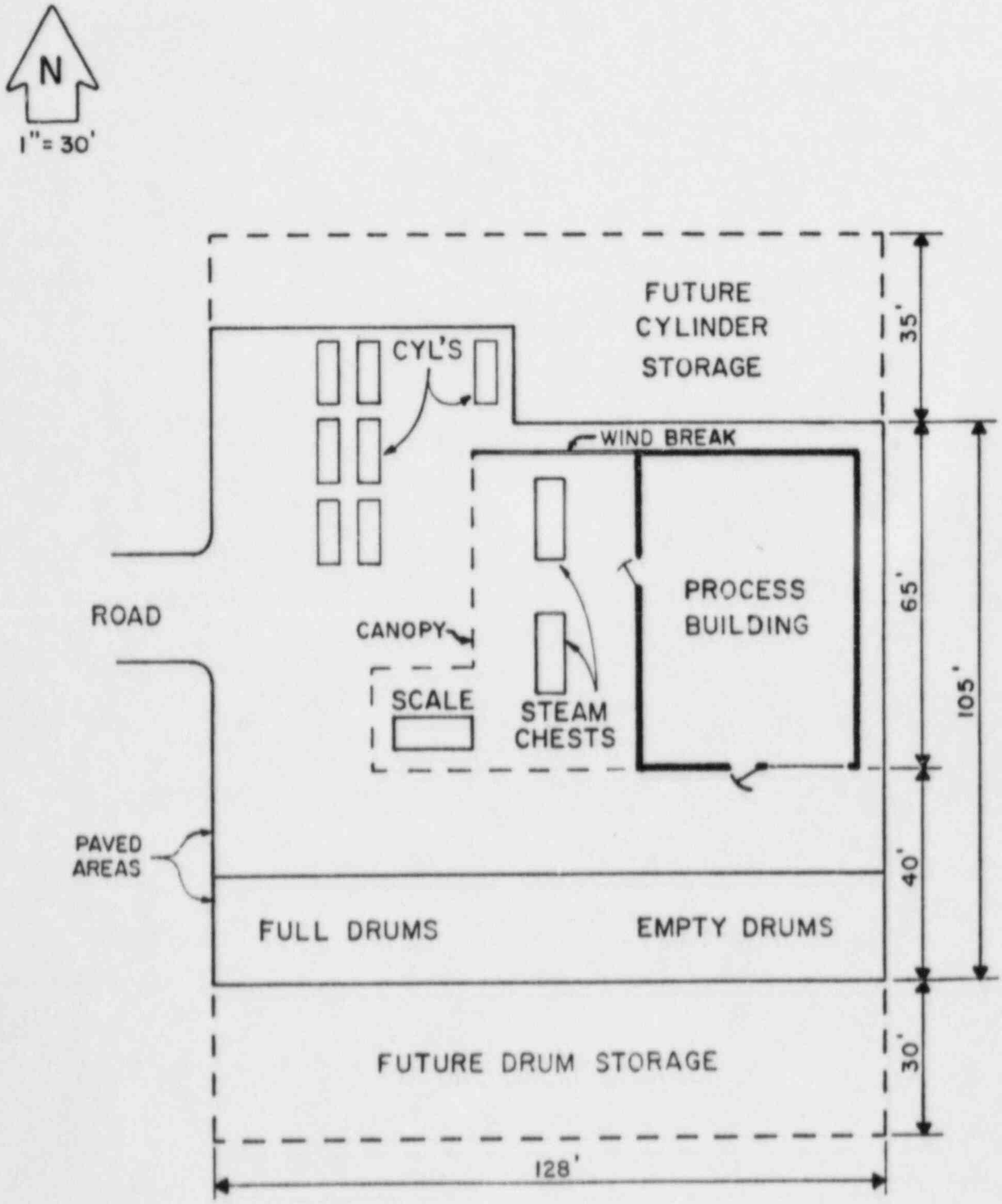
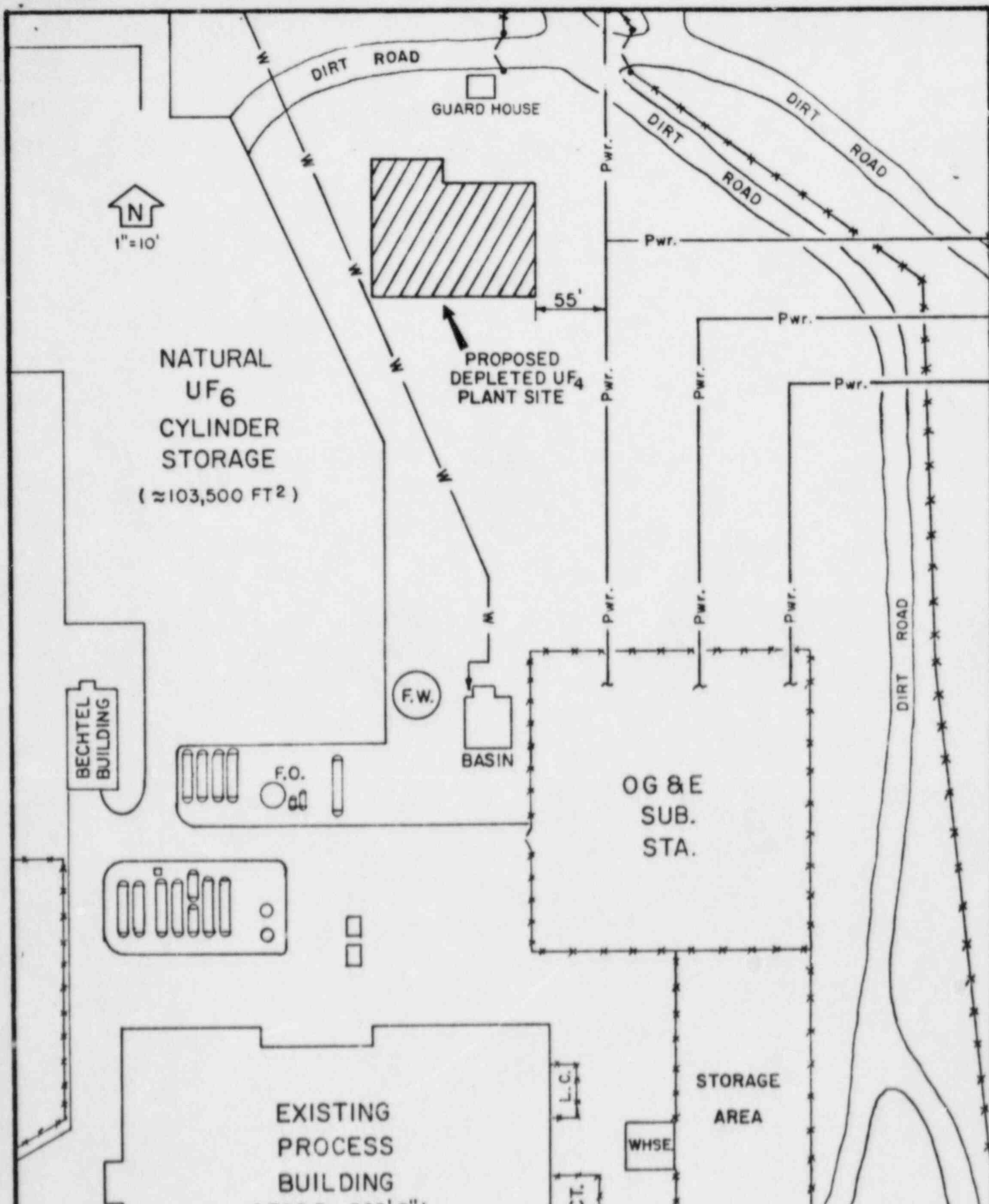
DEPLETED UF_4 BUILDING AND STORAGE PLAN

FIGURE 16-2





DEPLETED UF_4 SITE LOCATION PLAN

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FIGURE 16-3

16.1.4 Molecular Sieve

The dissociated ammonia will be passed through the molecular sieve to remove any residual ammonia in this stream. If ammonia is allowed to remain with the dissociated ammonia it will react with uranium hexafluoride and produce an ammonium fluoride-uranium fluoride complex, an unwanted byproduct. The molecular sieve consists of two parallel vertical cylindrical tubes 4" diameter and 3' long filled with an adsorbent having a strong affinity for adsorbing ammonia. The dissociated ammonia will flow through the adsorbent in one tube and exit that tube essentially free of ammonia. When the adsorbent in the first tube is to be regenerated, the flow of dissociated ammonia is diverted through the second tube.

The first tube is regenerated by heating the adsorbent with electric heaters and purging with nitrogen. This causes the adsorbed ammonia to be vaporized from the adsorbent and carried away by the nitrogen purge gas.

16.1.5 Uranium Hexafluoride Vaporizing

Fourteen ton full UF_6 cylinders are transported by a fork truck from storage to the vaporizing area. The cylinder will be placed by the truck on a scale and weighed. It will then be moved by the truck to one of the adjacent steam chests and placed in a horizontal position on the cylinder support cradle. After connection of the UF_6 discharge piping (pig tail) to the cylinder valve the connection to the valve will be pressure tested with nitrogen gas at about 70 PSIG to ascertain system tightness.

The body of the steam chest will be lowered from above and positioned around the cylinder. Heat will be supplied by introducing atmospheric steam into the chest. Pressure in the chest cannot exceed a few ounces per square inch since that pressure would lift the weight of the chest allowing the pressure to be vented to the atmosphere. Under these conditions, the maximum pressure in the cylinder would be limited to about 60 PSIG.

Adequate instrumentation will be provided to detect UF_6 leakage from the cylinder, the cylinder valve, and the UF_6 piping within the steam chest. In the event of UF_6 leakage, the steam flow will be turned off, the cylinder valve closed, and water sprays totalling between 50 and 100 gpm of water will be turned on to cool the cylinder.

After the UF_6 and the cylinder have been heated, the cylinder valve and downstream block valve will be opened to allow flow through the UF_6 discharge piping to the process. When the cylinder has been emptied the cylinder valve and the block valve downstream of the pressure gauge will both be closed. The space between the cylinder valve and the block valve will be pressured with nitrogen and the piping and valves will be leak-rated. The space will then be evacuated and leak rated under vacuum. The evacuated gases will be slowly vented through the UF_4 reactor. The pressurizing and evacuating procedure will be repeated a sufficient number of times to reduce the UF_6 concentration to a safe level for disconnecting the pigtail from the cylinder valve.

The cylinder will then be tare weighed and returned to the cylinder storage area.

16.1.6 UF_4 Reactor

The reactor consists of a small cyclonic type UF_6-H_2 mixer mounted on the top of the reaction chamber. The reaction chamber consists of a vertical cylindrical tube 15.75 inches O.D. by 20 feet long. The top 3-1/2 feet of the reaction chamber tapers to a 10 inch diameter at the top where a flanged connection allows bolting of the mixer to the reaction chamber.

The bottom of the chamber is flanged to allow connection to a cooling screw conveyor. The reaction chamber is enclosed in four clam shell vertical cylindrical 30-40 kw electric heaters approximately 18" I.D. x 5 ft. straight side. Each heater output is independently controlled using temperature sensors attached to the outside shell of the reactor tube. Room air is compressed by blower and introduced between each heater section and the reactor tube for cooling if and as required. Pneumatic vibrators are used to shake UF_4, which tends to cake, from the insides of the reactor walls.

The UF_6 flow rate from the UF_6 cylinders will be regulated by a flow controller. The dissociated ammonia flow rate will be controlled by another controller at 1.2 times the theoretical quantity required. The two streams enter the cyclonic mixer and discharge into the top of the reactor tube where the reaction takes place according to the equation:

$$UF_6(g) + 1.2H_2(g) + 0.4N_2(g) = UF_4(s) + 0.2H_2(g) + 0.4N_2(g) + 2HF(g)$$

The temperature of the reactor will be controlled at 1200°F (maximum) at the top, and about 850°F at the bottom using the electric heaters and/or cooling air as required. The bulk of the reaction will occur at the top of the reactor. The UF_4 formed will be a powdery solid. The UF_4 and the remaining gaseous reaction products will pass from the bottom of the reactor to the cooling screw conveyor.

16.1.7 Cooling Screw Conveyor

The cooling screw conveyor is 9 inches diameter and about 8 feet long and is mounted horizontally under the reactor. The conveyor will be provided with cooling water on the cooling jacket attached to the outside of the shell as well as through the shaft of the screw. Shaft penetrations on both ends of the conveyor will be sealed with mechanical seals which are purged with nitrogen gas to prevent release of UF_4 powder, H_2, or HF. The seals will be enclosed in hoods under negative pressure so that any release due to an upset will be captured and filtered through a high efficiency baghouse. This same philosophy will be used on all rotating mechanical seals in which radioactive or hazardous chemicals are contained.

Most of the solid UF_4 powder will disengage from the gaseous reaction products (off gases) and fall to the bottom of the conveyer. It is cooled to about 300°F and conveyed to a rotary valve.

The off gases will also be cooled to about 300°F and will exit from the top of the discharge end of conveyer. The off gases will entrain some fine UF_4 dust. The particle size distribution is estimated at roughly 31% in the 0 to 6 micron range, 56% in the 6 to 12 micron range, 8% in the 12 to 24 micron range, and 5% in the 24 micron and larger range.

16.1.8 Product UF_4 Pulverizing and Packaging

The UF_4 product will discharge from the rotary valve to a pulverizer to pulverize the material to specification size. The UF_4 will drop into a seal leg. The purpose of the seal leg is to prevent excessive leakage of off gases along with the UF_4 by maintaining a bed of UF_4 powder in the leg to prevent downward gas flow. Powder from the seal leg will drop into the product screw conveyor and be conveyed into 55 gallon product drums which will be filled to a net weight of 1400 lbs. The screw will drop the UF_4 into the drum through a ventilated hood resting on the drum. The product screw conveyor, hood, drum, and scale will be contained in a drumming station enclosure. Room air will be drawn into the enclosure through any openings in the enclosure to prevent escape of dust to the room. The air leaving the hood and enclosure will be filtered through a high efficiency baghouse which discharges to the atmosphere at an elevation of 631 feet MSL.

16.1.9 Off Gas Treatment

The off gases from the cooling screw conveyor will pass through two cyclones in series. The cyclones will remove about 97% of the total particulates larger than 5 microns. Two sintered metal filters in series will be provided after the cyclones to remove 99.9% of the remaining particulates. A chemical trap consisting of beds of activated charcoal held in monel containers will be provided after the filters to absorb any traces of unreacted UF_6 in the off gas stream. The off gas stream will have passed through a train of two cyclones in series, then two sintered metal filters in series, then one chemical trap. This train is duplicated for redundancy. Any UF_4 recovered by the cyclones or filters will be returned to the cooling screw conveyor by screw conveyor.

16.1.10 HF Recovery, H_2 Burning, and HF Scrubbing

After off gas treatment, the off gases will be passed through an off gas cooler where they will be cooled to 75°F using 65°F cooling water. The off gas cooler is a shell and tube heat exchanger with the off gas on the tube side. All parts in contact with the off gas are fabricated from monel.

The 75°F off gases next pass through a gas cooler where they are cooled to about 70°F by exchanging heat with minus 95°F off gases from the total HF condenser (described below). This gas cooler is a gas to gas heat exchanger fabricated of monel.

The 70°F off gases are passed through the partial HF condenser where they are cooled to minus 10°F in the process of which about two thirds of the contained HF is condensed to a liquid and drained to one of the two AHF storage tanks. The partial HF condenser is of the shell and tube type with minus 15°F refrigerant on the shell side.

The minus 10°F off gas stream will pass through a total HF condenser where it will be cooled to minus 95°F in the process of which most of the remaining HF is condensed to a liquid and drained to one of the two AHF storage tanks. The total HF condenser is of the shell and tube type with minus 100°F refrigerant on the shell side.

The minus 95°F off gases will then pass through the gas cooler (described above) and will be piped to the main conversion process building where they will be fed into the existing H_2-F_2 burner to burn the excess H_2, and then through the existing waste gas scrubber where the small amount of HF remaining will be removed. The amounts of H_2, HF, and total gases to be fed to this existing equipment will add only a few percent to the load and should easily be accommodated. The hydrogen load on the burner will be increased by less than 5 percent of design capacity. The HF and gas load increases will be about 2.3 percent and 1.3 percent respectively of the design capacity.

The recovered anhydrous HF in the two AHF storage tanks will be sampled and analyzed for purity before being transferred to the conversion facility AHF storage tanks.

16.1.11 Vacuum Cleaning System

Vacuum hose stations will be located on each level of the processing area which will be piped together through a cyclone followed by a filter and then through a vacuum compressor which discharges through the dust collector. The system will be used for clean up of any spills which may occur as well as for clean out of process equipment for inspection and maintenance. Any small amounts of process material collected in the cyclone and filter will be discharged to drums and stored for future recycle into the system.

16.1.12 Dust Collection System (Drawing 800-M-6404)

The dust collection system will consist of a dust collector which is a baghouse filter with a high efficiency filter medium, a dust collection fan, a rotary air lock on the baghouse which discharges the collected UF_4 dust to the drumming station via a screw conveyor, and a ductwork system to the various dust control points and to route the discharged air to a stack. Dust control points are the product drumming station hood, the product drumming station enclosure, and the hoods around stuffing boxes and mechanical seals.

16.1.13 Breathing Air System

Breathing air for use with full face masks will be supplied from the main conversion building breathing air compressor and piped to each level of the process area. Connections to this system for uses other than breathing air are prohibited in order to insure that this air cannot be contaminated.

16.1.14 Air Monitoring System

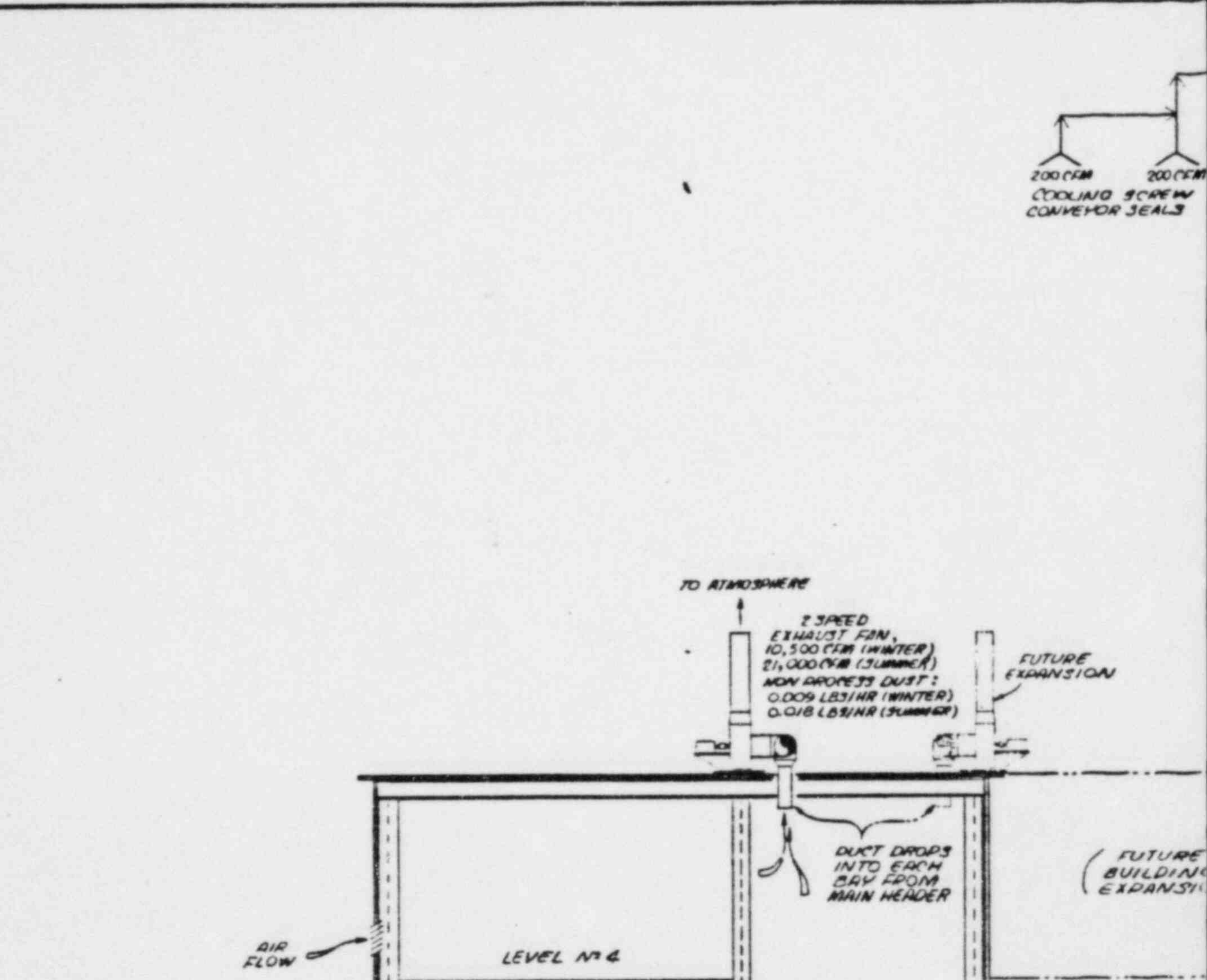
A system will be provided similar to that currently used in the main building. Filter heads will be provided in all areas as appropriate with these heads being piped to a vacuum compressor which discharges to the stack.

16.1.15 Water Supply

Process cooling water (CWE) will be provided by a pump to be installed at the Lake Tenkiller water supply settling basin located about 400 feet south of the depleted UF_4 building, and, by a pipeline to the depleted UF_4 building. This water will be used for:

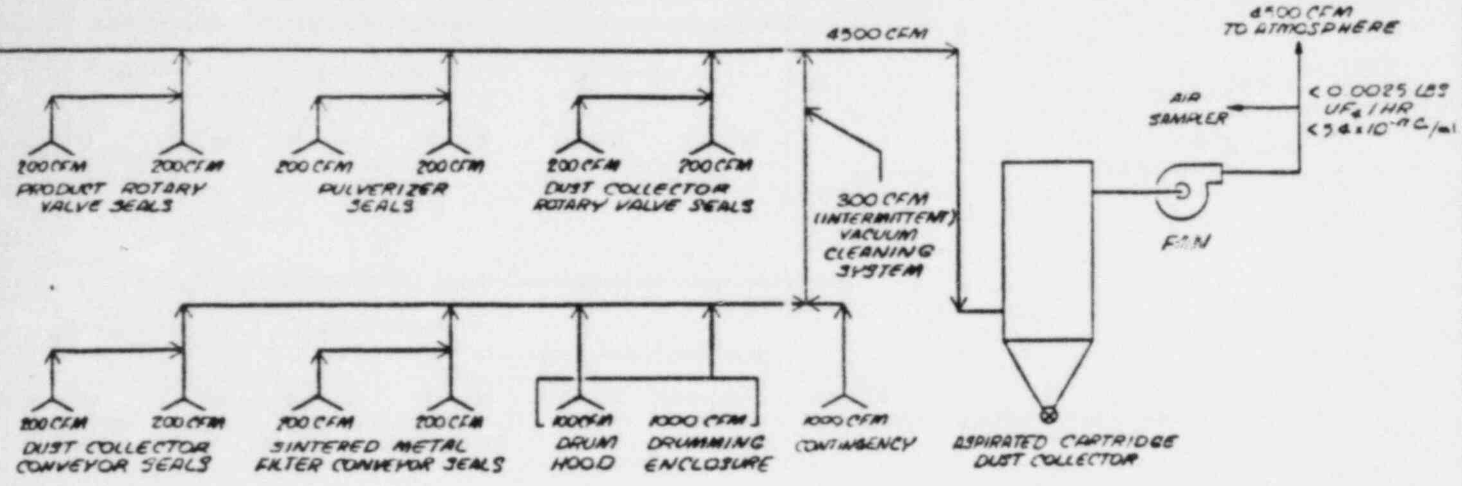
1. Cooling water on the cooling screw.
2. Cooling water on the off gas cooler.
3. Cooling water on refrigeration units.
4. Cooling water on the air compressor.

Potable water will be piped from the main building to the drinking fountain.



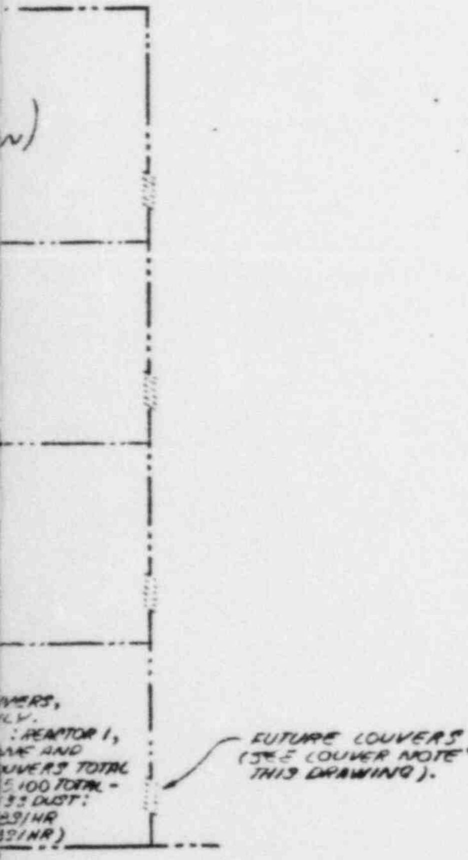
BUILDING VENTILATION SYSTEM

(ELEVATION)



DUST COLLECTION SYSTEM

TI APERTURE CARD



NOTES:
XXXX CFM = WINTER FLOW,
(XXXX CFM) = SUMMER FLOW.
2. WINTER FLOW = 6 AIR CHANGES PER HOUR, 15,000 CFM
3. SUMMER FLOW = 10.2 AIR CHANGES PER HOUR, (25,500 CFM)
4. FOR PROCESS OFF GAS FLOWS SEE "DEPLETED UF4 FLOW SHEET" DWG 800-M-1401.

DEPLETED UF_4 PLANT
AIR HANDLING FLOW DIAGRAMS

SEQUOYAH FUELS

A. ROBERTSON 10-9-84
L. HAMPTON 10-9-84
NONE
800-M-6404

8502200060-02

16.1.16 Liquid Effluents

Spent water from the drinking fountain in the control room will drain to the natural drainage course for rain water.

Spent cooling water for items 1 through 4 under paragraph 16.1.15 along with steam condensate from the steam chests and steam tracing on piping will be collected in a small sump and pumped to the plant water discharge stream piping located adjacent to the Lake Tenkiller water settling basin which is upstream of the discharge sampling point. In the event of a UF_6 leak in a steam chest, the sump pump will automatically be turned off and the small sump will overflow to a holding basin. The quench water on the steam chests will flow into and through the small sump and into the holding basin.

Since a large release of UF_6 into the steam chest is very improbable, physical facilities for handling condensate and quench water contaminated with uranyl fluoride (UO_2F_2) and HF will be limited to the holding basin. Any acidic water in the basin would be neutralized with lime. Planned treatment of any significant quantities of acidic water are to neutralize with lime, adjust the pH to 7.0 with sulfuric acid, and allow the solids to settle. The liquid would be decanted from the solids, (filtered if necessary) and pumped to the plant water discharge stream upstream of the discharge sampling point. This water will be of the same quality as the existing effuent from the main plant waste fluoride treatment clarification pond which currently flows into the plant water discharge stream upstream of the discharge sampling point.

The settled precipitated solids left after decantation will contain calcium diuranate, calcium fluoride, and calcium sulfate.

16.1.17 Waste Solids

The settled precipitated solids described in 16.1.16 will be periodically transferred to the existing CaF_2 sludge settling basins.

While it is anticipated that all of the UF_4 produced will be suitable for sale, some small amount may not be recyclable. This material will be sent to a licensed LSA disposal site.

The additional 2.48 lbs. HF per hour in the process off gases to be scrubbed in the existing HF scrubber when treated with lime will add about 2.3% to the waste calcium fluoride to be disposed of at the fuel design rate of the uranium hexafluoride production plant.

Spent adsorbant from the molecular sieve and spent activated carbon from the UF_6 chemical traps will be moved to the main plant and combined with other similar waste for disposal.

Other materials such as paper towels, dirty shop towels, waste basket refuse, worn equipment parts, etc., will also be moved to the main plant and combined with other similar waste for disposal.

16.1.18 Off Gases

Process off gases have previously been described under 16.1.7 and 16.1.9 and 16.1.10. Before release these gases will have been double cycloned, double filtered, passed through chemical traps to remove traces of UF_6, cooled to condense HF, burned to destroy hydrogen, and scrubbed to remove HF.

16.1.19 Power Failure

In the event of a power failure the instrumentation systems will automatically shut of the flow of UF_6 and dissociated ammonia to the reactor and steam to the steam chests. A nitrogen purge valve will open to purge any H_2, HF, and UF_6 from the reactor and off gas system to the H_2/F_2 burner and HF scrubber. The burner and scrubber will continue to operate on the emergency power system in the event of a general power failure. The nitrogen supply system requires no power and continues to operate in the event of a general power failure.

16.1.20 Process Controls

All important process controls, indicators, and alarms will be located in a control room from which the process and utilities will be operated. Instrumentation will be of the highest quality so as to provide a high degree of reliability. The degree of instrumentation will be commensurate with good design and operational practice. Duplicate control capability will be provided in the main plant central control room.

16.1.21 Process Streams Descriptions and Activities

Quantities of materials in each process stream are shown on the process flow sheet, Drawing 800-M-1401. Table I is presented as an aid in visualizing each stream's physical nature and activity.

TABLE I
ESTIMATED PROCESS STREAM ACTIVITIES
DEPLETED UF_4 PLANT
SEQUOYAH FUELS CORPORATION SEQUOYAH FACILITY

Stream Name	Physical Nature	Activity Ci/g	Activity Ci/ml
Dissociated Ammonia	Gas (Nitrogen & Hydrogen)	-0-	-0-
UF_6 to Premixer	Gas (UF_6)	3.22×10^{-7}	4.62×10^{-9}
Reactor Feed	Gas (UF_6, N_2, H_2)	3.10×10^{-7}	1.83×10^{-9}
Reactor Discharge	Gas with entrained UF_4, HF	3.10×10^{-7}	8.96×10^{-10}
UF_4 Product Streams	Solid powder	3.61×10^{-7}	1.11×10^{-6}
Off Gas from Cooler	Gas with small amount UF_4, HF	1.86×10^{-7}	1.29×10^{-8}
Off Gas from Cyclones	Gas with small amount UF_4, HF	1.91×10^{-11}	6.54×10^{-13}
Off Gas from Sintered Filters	Gas, trace of UF_4, HF	1.91×10^{-14}	6.54×10^{-16}
Off Gases to HF Recovery	Gases with HF	1.91×10^{-14}	6.54×10^{-16}
Recovered Anhydrous HF	Liquid	6.3×10^{-17}	6.3×10^{-17}
Off Gases to Burner & Scrubber	Gas	4.1×10^{-15}	2.2×10^{-15}
Spent Cooling Water (CWFD)	Water	Nil	Nil
Steam Condensate to Out Fall	Hot water	Nil	Nil
Treated Contaminated Condensate to Out Fall	Water, 10-20 u.g.U/1, 5-10 p.p.m.F	Both 4.7×10^{-15} to	9.4×10^{-15}
Dust Collector Discharge	Air	$<5.4 \times 10^{-14}$	$<5.4 \times 10^{-17}$

Reference is made to Drawing 800-M-1401, "Depleted UF_4 Flow Sheet." The above listed activities are calculated for the expected nitrogen in leakage of 300 SCF.

16.1.22 Sample Points and Primary Control Points

Product UF_4 will be sampled and analyzed for conformance to specifications. UF_6 from cylinders may be sampled for analysis using standard sampling procedures. Any steam condensate or quench water from the steam chests which has been contaminated by UF_6 will be sampled after treatment and before release to the plant water discharge stream. The plant water discharge stream is currently and will continue to be sampled downstream of the last plant addition to that stream. An isokinetic sampler is provided on the stack. Condensed HF from the AHF storage tanks will be sampled for purity and for uranium analysis.

Primary control points are listed below:

1. Dissociated ammonia supply pressure and flow rate.
2. UF_6 vapor pressure and flow rate.
3. Molecular sieve malfunction.
4. Pressure at the top and bottom of the reactor.
5. Reactor temperatures.
6. Level of powder in product seal leg.
7. Pressure drop on primary cyclone.
8. Pressure drop or sintered metal filters.
9. UF_6 analysis downstream of UF_6 chemical traps.
10. Temperature in UF_6 chemical traps.
11. Pressure drop on baghouse.
12. Powder level in dust collector hopper.
13. Temperature of off gas stream to primary cyclone.
14. Temperatures of all streams in and out of heat exchangers downstream of the activated carbon chemical traps.
15. Pressure of off gases leaving the building to the H_2-F_2 burner and HF scrubber at the main building.
16. Temperatures and pressures on refrigeration systems as recommended by the system vendor.
17. Pressure of nitrogen to insure supply to the various purges.
18. Detection of UF_6 leakage from cylinders and piping within the steam chests.
19. Pressure of water supply to UF_6 cylinder quench system.

16.1.23 Safety and Environmental Effects

The basic philosophy in preventing airborne radiation or toxic chemical exposure in the design and operation of the plant is to contain the process materials in tightly closed systems wherever possible, and to the degree practicable, to provide for inflow of nitrogen at potential points of leakage from process equipment under pressure, to provide ventilation hoods to caputure UF_4 dust or other chemicals at potential points of leakage, and to filter all process effluents containing radioactivity or other chemicals through equipment of proven capability. The same philosophy will provide for containment of hydrogen and capture and dilution of H_2 leakage. Pursuant to this the following provisions are made:

1. Removal of UF_4 from the reactor off gases by double cycloning, double, filtration through sintered metal filters, filtration and adsorption (for UF_6), burning of the excess hydrogen, and finally water scrubbing before release to the main plant stack.

2. A vacuum cleaning system to remove any UF_4 powder spills and to clean out equipment before inspection and maintenance.

3. A pressurized nitrogen seal system on mechanical seals and stuffing boxes on equipment on equipment containing HF_4, H_2, or HF.

4. A dust collector with a high efficiency filter medium on the dust collector system.

5. Equipment for the processing system (excluding packaging) with proven capability and reliability and of such construction as to be closed and leak tight.

The system consists of well known standard unit processes and unit operations for which process and safety control systems are well understood and proven. The plant is to be designed and constructed in full accordance with applicable federal and local laws, codes, and regulations.

Under the above conditions the plant will operate free from exposure of personnel to unsafe conditions and from excessive exposure of operating personnel as well as the environment to airborne chemical or radioactive material.

16.2 Safety Analysis of Each Step

16.2.1 General

As pointed out under 16.1.23 "Safety and Environmental Effects," "The system consists of well known standard unit processes and unit operations--in full conformance with applicable federal and local laws, codes, and regulations. A safety analysis of each step is not considered necessary since it has previously been discussed.

16.3 Safety Features of Each Step

16.3.1 General

For reasons previously stated, safety features of all the steps are not considered necessary for the purposes of this report. Also, since there are no fissile materials involved, criticality will not be considered.

Personnel at the Sequoyah Facility have had many years of experience in handling UF_4, UF_6, H_2, and HF, and in the vaporizing of UF_6 from UF_6 cylinders using steam chests. In so doing there have been no significant releases of radioactivity or toxic chemicals, no significant accidents, and no serious injury to personnel. In the depleted UF_4 plant the safety features to be employed will be equal to (or better than) those used in the main conversion process.

16.3.2 Fire

In general, the building, structures, and equipment are of non-combustible materials. There will be some fiberglass reinforced plastic equipment and plastic pipe, and wiring will have plastic covering (but routed through conduit). There are no organic processes or reagents used. Accumulation of combustibles will not be allowed.

There will be fire extinguishers strategically located within the building and a fire hydrant and hose(s) immediately outside which is supplied water through a buried 6" pipeline from the main plant fire water system.

Chapter 17 ACCIDENT ANALYSIS

Efforts have been made to minimize the occurrence of accidents in the plant through the incorporation of all practical safety features in the design, construction and operating procedures for the facility. Properly engineered handling equipment, installation of automatic safety devices and training of operator personnel add further to the safety of the operation and provide means to promptly mitigate the consequences of accidents.

The two most probable causes of accidents will be the unplanned release of hydrogen or the unplanned release of UF_6 during vaporization. These two unforeseen events have been examined and engineering has been developed to eliminate the hazard. In the event of a hydrogen release, dilution by plant ventilation air and equipment design would prevent the buildup of hydrogen in the plant interiors.

UF_6 accidentally released during vaporization would be collected in the steam chest and the UF_6 cylinder quench system described in 16.1.5, thus protecting the environment from an insult by HF or UO_2F_2.

Natural hazards such as the event of a tornado striking the plant would be mitigated by a warning system now in place at the Sequoyah Facility and prompt shut down of processing equipment.

No flood hazard exists since the plant is located well above the maximum flood level on the Arkansas Riverway. Coping with fires is covered by the Sequoyah Facility Standard Operating Instructions, No. E-0110.