MASTER

K/OA-4783
Revision 1

UCC-ND

NUCLEAR
DIVISION

UNION
CARBIDE

A DESCRIPTION OF THE PORTSMOUTH GAS CENTRIFUGE ENRICHMENT PLANT

Compiled by:

W. B. Arthur

Operations Analysis and Planning Division

Contributors:

W. B. Arthur
R. E. Perry
D. S. Pesce
J. E. Rushton

December 16, 1980

OPERATED BY
UNION CARBIDE CORPORATION
FOR THE UNITED STATES
DEPARTMENT OF ENERGY

DISTRIBUTION OF THIS DOCUMENT IS UNLIMITED

DISCLAIMER

This report was prepared as an account of work sponsored by an agency of the United States Government. Neither the United States Government nor any agency thereof, nor any of their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government or any agency thereof.

DISCLAIMER

Portions of this document may be illegible in electronic image products. Images are produced from the best available original document.

DISCLAIMER

This report was prepared as an account of work sponsored by an agency of the United States Government. Neither the United States Government nor any agency thereof, nor any of their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise, does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government or any agency thereof.

December 16, 1980

K/OA-4783
Revision 1

A DESCRIPTION OF THE PORTSMOUTH GAS CENTRIFUGE ENRICHMENT PLANT

Compiled by:

W. B. Arthur

Operations Analysis and Planning Division

Contributors:

W. B. Arthur
R. E. Perry
D. S. Pesce
J. E. Rushton

DISCLAIMER

This book was prepared as an account of work sponsored by an agency of the United States Government. Neither the United States Government nor any agency thereof, nor any of their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise, does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government or any agency thereof.

Oak Ridge Gaseous Diffusion Plant
Oak Ridge, Tennessee

Prepared for the U.S. Department of Energy
Under U.S. Government Contract W-7405 eng 26

DISTRIBUTION OF THIS DOCUMENT IS UNLIMITED

TABLE OF CONTENTS

A DESCRIPTION OF THE PORTSMOUTH GAS CENTRIFUGE ENRICHMENT PLANT

I. INTRODUCTION

The Portsmouth Gas Centrifuge Enrichment Plant (GCEP) will be located at the site of the Portsmouth Gaseous Diffusion Plant in Piketon, Ohio. The purpose of the facility is to provide enriching services for the production of low assay enriched uranium for civilian nuclear power reactors. The construction and operation of the GCEP is administered by the U.S. Department of Energy (DOE). The facility will be operated under contract from the U.S. Government. Control of the GCEP rests solely with the U.S. Government, which holds and controls access to the technology.

Construction of GCEP is expected to be completed in the mid-1990's. Many facility design and operating procedures are subject to change. Nonetheless, the design described in this report does reflect current thinking.

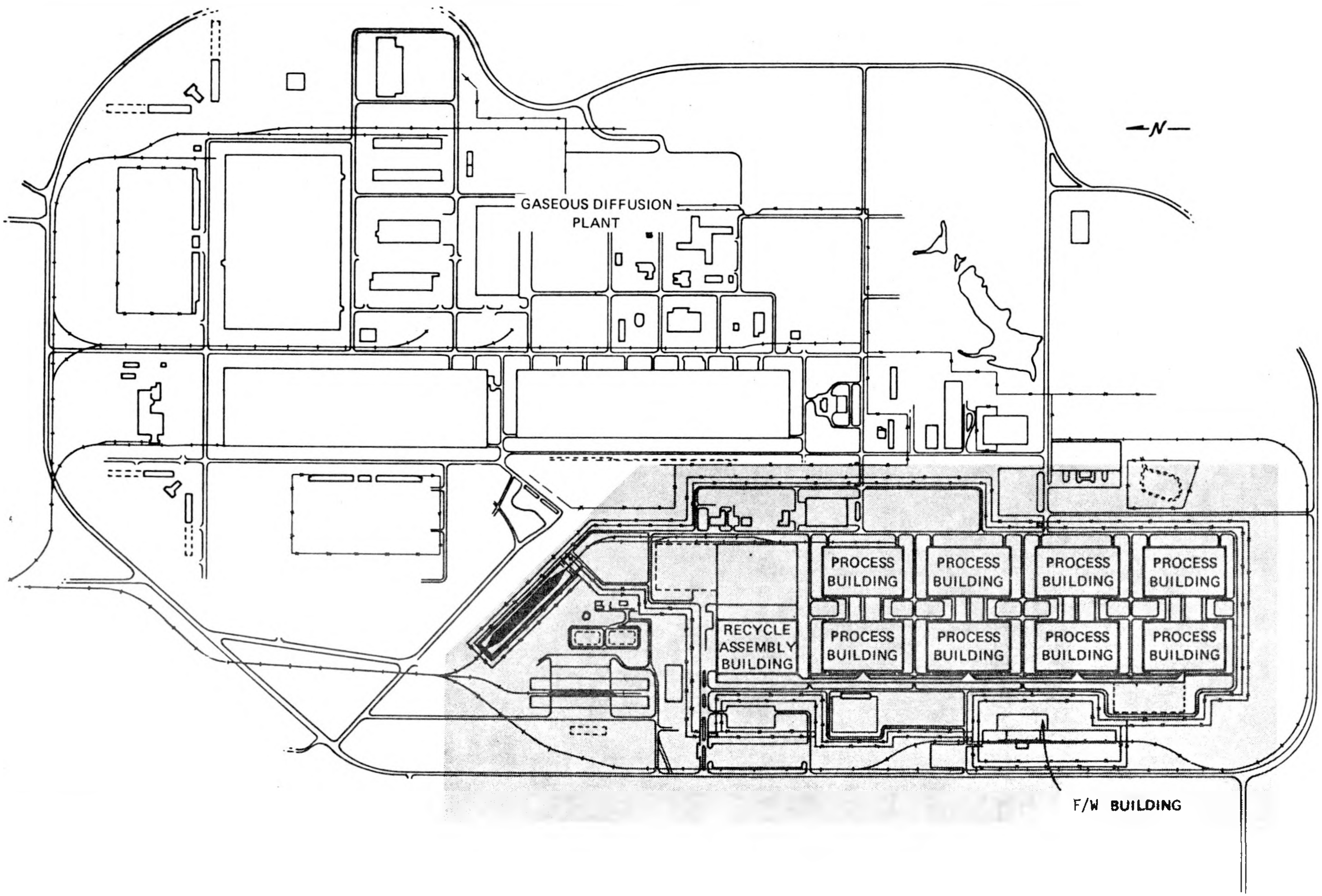
II. GENERAL FACILITY DESCRIPTION

The Portsmouth Gas Centrifuge Enrichment Plant (GCEP) will be constructed on a site adjoining the existing Gaseous Diffusion Plant (GDP) near Portsmouth, Ohio. The major buildings at the plant will be eight process buildings in which the gas centrifuge cascades will be located, a Recycle/Assembly (R/A) facility for assembling and repairing centrifuges, and a Feed and Withdrawal (F/W) building for feeding gaseous uranium hexafluoride at natural ^{235}U assay to the process buildings and for withdrawing the enriched product and the depleted (tails) material. These process-related buildings and their relationship to existing gaseous diffusion facilities are shown in Figure 1. When GCEP is complete, it will provide a nominal separative capacity of 8.8 million separative work units per year. GCEP employment should peak at 5000 persons during construction and will average about 2500 once construction is completed.

The area occupied by the GCEP facilities will be approximately 120 hectares (300 acres) with about 36 hectares (89 acres) under roof. With a few exceptions, notably the Feed and Withdrawal building, all of the GCEP facilities are expected to be enclosed within a perimeter fence. The Feed and Withdrawal building will be located outside, but adjacent to that fence and within its own security fence. Access to the GCEP facilities located within the perimeter fence will be through six vehicular and pedestrian portals and by one railroad access spur. All utility lines serving the plant (except steam) will be placed underground.

Site preparation work was started in 1978. Cascade operations are expected to begin in the mid-1980's. The first two process buildings currently are scheduled to be fully operational in the late 1980s.

Figure 1. Gas Centrifuge Enrichment Plant (GCEP)



III. CENTRIFUGE URANIUM ENRICHING PROCESS SUMMARY

The GCEP will be designed to process annually about 11,470,000 kg of natural uranium (0.711% ^{235}U) to produce 2,210,000 kg of uranium at an enrichment of 2.85% ^{235}U and 9,260,000 kg of depleted uranium (0.20% ^{235}U).* (A nominal GCEP flow sheet is shown in Figure 2.*) The enrichment plant, as designed, can produce at reasonable efficiencies a product ranging from 2.4 to 3.6% ^{235}U with tails assay of 0.20 to 0.25%. Currently the product is expected to be 2.85% ^{235}U. This product will be transferred to the adjacent gaseous diffusion plant. If higher concentrations of ^{235}U are necessary for commercial nuclear power plant fuel, further enrichment will be accomplished at the GDP.

Figure 3 illustrates the flow of uranium through the centrifuge enrichment process. The uranium hexafluoride (UF_6) feed for GCEP will arrive by rail or truck in 10- or 14-ton capacity steel cylinders (9,500 kg and 12,500 kg maximum net weight UF_6 respectively) and will be received at the F/W building or temporarily placed in the adjacent storage yard. Feed cylinders will be weighed and placed in steam autoclaves for sampling. After sample analysis is complete, the feed cylinders will be reinserted in the autoclaves to vaporize the uranium hexafluoride and to distribute the gaseous feed through pipes to the eight process buildings. When the feed gas enters a process building, it is distributed via piping headers to the enrichment cascades contained in that building.

The gaseous product (or tails) flows from the cascades into a product (or tails) header within each building, which then connects to inter-building pipe headers for transfer of the gaseous product (or tails) to the F/W building. (See Figure 4.) The product is desublimed in cold traps and transferred to 10- or 14-ton steel cylinders. The filled product cylinders are heated (to melt the contents), sampled, stored for cool-down (to solidify their contents), and transferred from the GCEP site. The tails material is liquefied by compressors and collected in accumulators which are then drained into 14-ton steel cylinders. Drain line samples probably will be taken as each tails cylinder is filled, and about 10 percent of the tails cylinders will have their contents homogenized and sampled before transfer from the GCEP site. (The GCEP plant has no laboratory for uranium assay or chemical analysis. All samples will be taken to the GDP laboratories for analysis.)

During the enrichment process some of the uranium from the centrifuges will enter the vacuum system. This uranium will be collected in chemical traps located in the process buildings. When the trapping agent becomes saturated, the trap (approximately 244 cms. high and 25 cms. in diameter) will be replaced by a fresh one and the old trap will be taken to the GDP for recycle or shipment off-site.

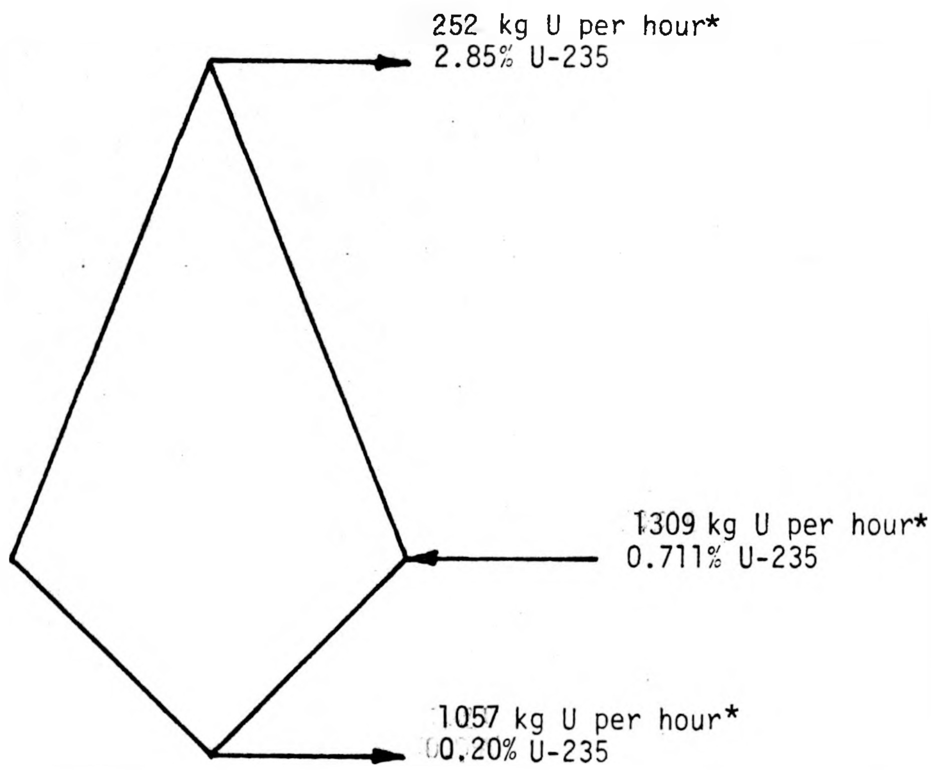
---

*Some relatively small process gas losses are ignored here.

FIGURE 2

TYPICAL FLOWSHEET FOR A GAS CENTRIFUGE ENRICHMENT PLANT

OF 8.8 MILLION SWU/yr.



*Hourly rates based on nominal annual production assuming operation 24 hours/day, 365 days/year.

Figure 3. **CENTRIFUGE URANIUM ENRICHING PROCESS**

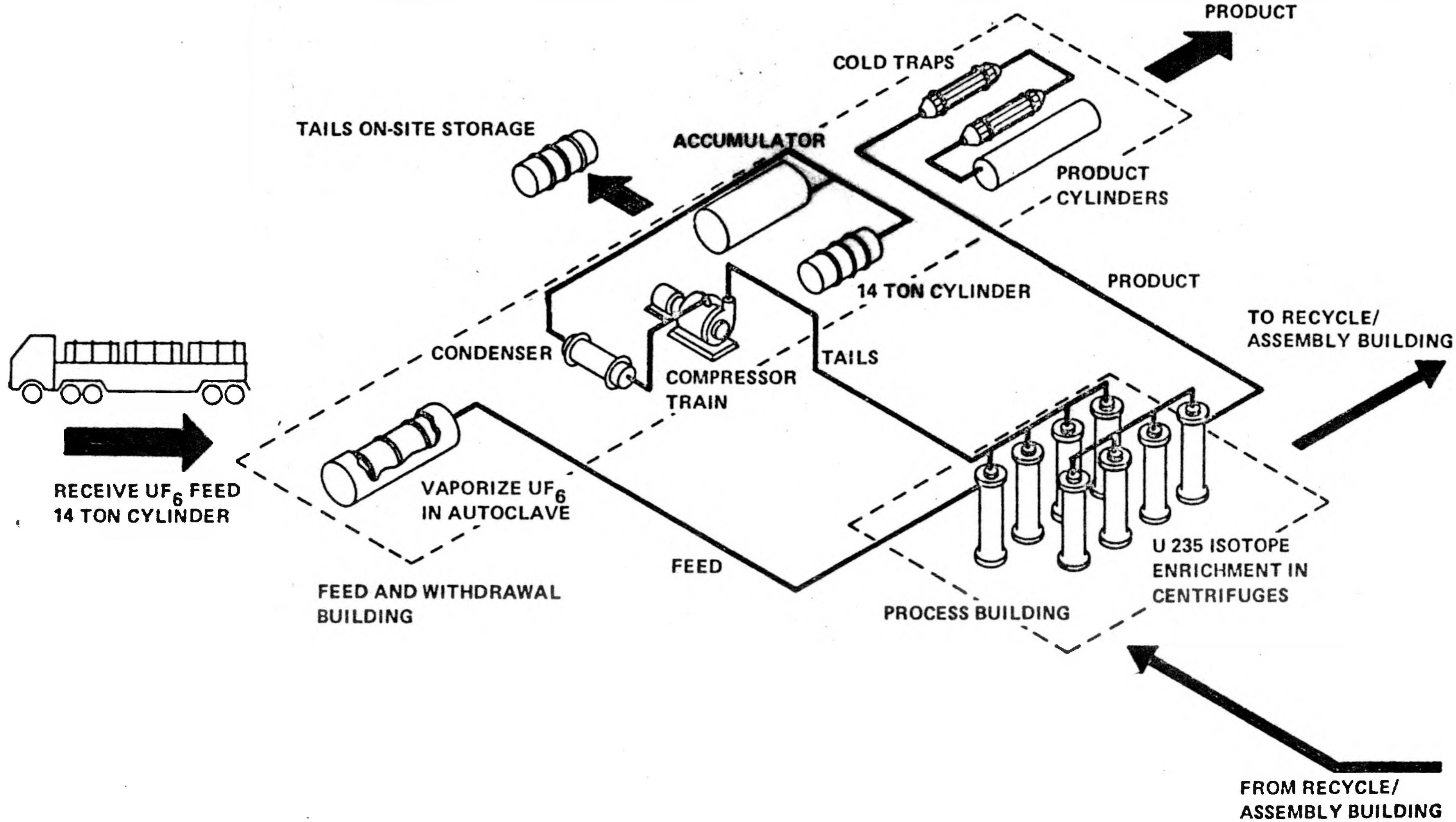
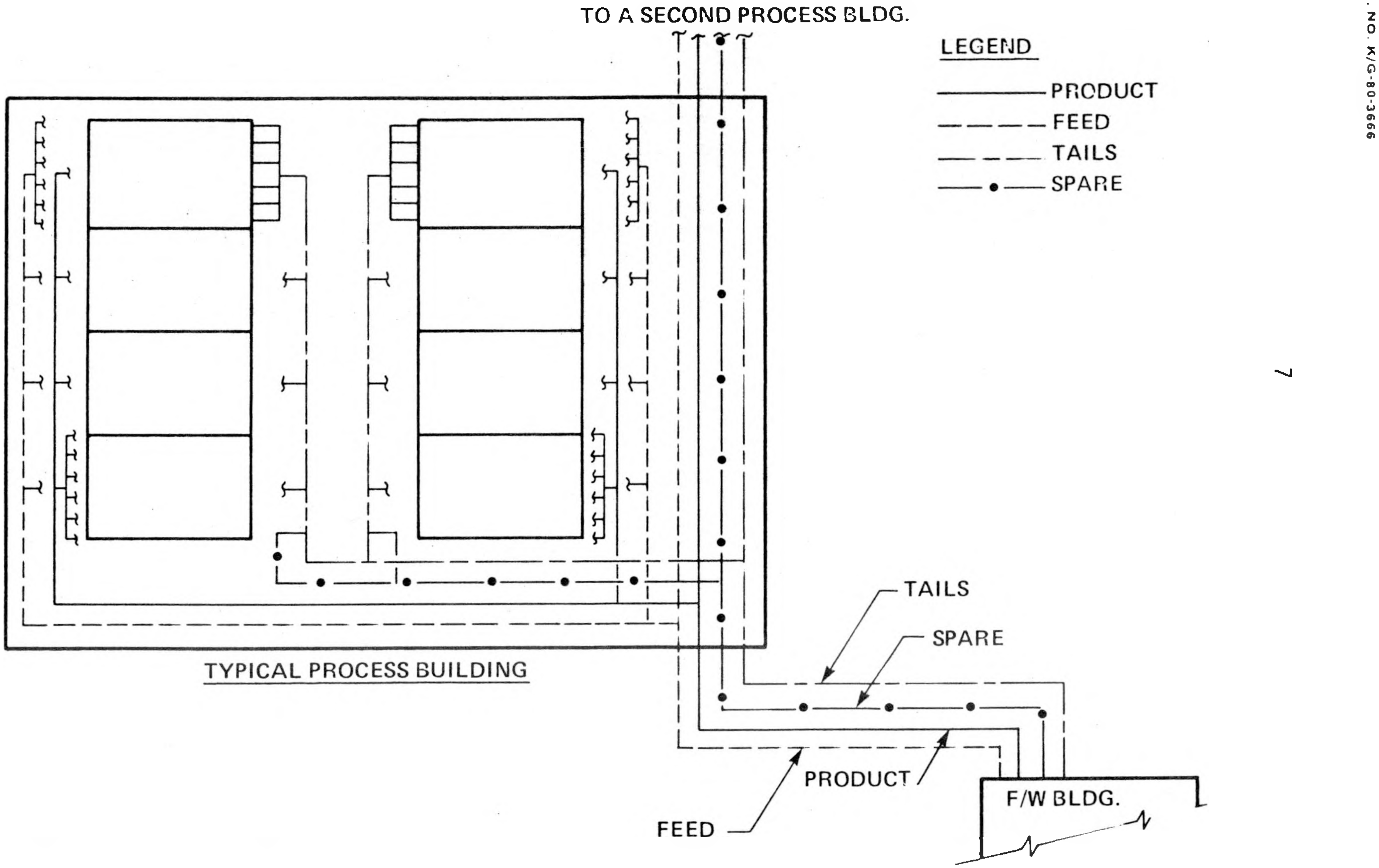


Figure 4. Gas Centrifuge Enrichment Plant Typical Process Piping Headers



Other than the process buildings and the F/W building, the only GCEP areas that are expected to use or process uranium are in the R/A building and the adjacent Centrifuge Training and Test Facility (CTTF). These areas include: (1) the decontamination areas, (2) the centrifuge test stands and (3) a training cascade.

Decontamination of centrifuges or their components will be done within designated areas of the R/A building. This decontamination will produce uranium-containing solutions which probably will be weighed and assayed prior to being sent from the R/A building. Uranium-contaminated solid waste (failed equipment, clothing, paper, etc.) will be transferred directly from the GCEP site for disposal in on-site contaminated, solid waste disposal grounds. Detailed procedures for handling the waste have not been developed. (The disposal grounds will be within fenced areas located outside the GCEP perimeter, but on the Portsmouth property owned by the U.S. Government.)

Test stands located in the R/A building will test and evaluate centrifuges and identify their operational problems. Some of the tests will involve operations with UF_6 gas. Each of these stands will have its own feed, withdrawal and waste process control systems. A relatively small amount of uranium hexafluoride is expected to be required for this testing.

The CTTF will provide training for GCEP process operators. Single machine operational training will be provided as well as training with combinations of machines that simulate portions of a cascade.

Uranium hexafluoride used for testing and training operations will be obtained from the GDP and may be recycled, but ultimately it will be removed in 200-kg cylinders* using cold-trap procedures similar to those used in the F/W building. Cylinders originating from these activites will be weighed and the isotopic concentration obtained by nondestructive assay (NDA) devices prior to shipment from the GCEP site.

The major flows of uranium into and out of GCEP will be in the form of solid uranium hexafluoride contained in large cylinders and processed through the F/W building. Other flows of uranium will be associated with: (1) waste and scrap material from the process buildings, the R/A building, the F/W building, and the CTTF, (2) decontamination solutions from the R/A building, and (3) the relatively small quantities of UF_6 necessary for the training of personnel and testing of centrifuges that will be used in the R/A building and the adjacent CTTF. Table 1 shows nominal flows of uranium on the GCEP site. Table 2 gives uranium cylinder data useful when reading Table 1. (Table 2 was copied from the DOE/ORO publication, "Uranium Hexafluoride: Handling Procedures and Container Criteria," ORO-651, Revision 4, July 1977.)

---

*Cylinder types 12A or 12B. See Table 2.

Table 1

EXPECTED URANIUM FLOWS FOR THE GAS CENTRIFUGE
ENRICHMENT PLANT SITE AT A CAPACITY OF 8.8 MILLION SWU/YR

	kg U/yr	kg UF_6/yr	No. of Cylinders	Cylinder Type (1)
F/W Building				
Feed	11.5×10^6	17.01×10^6	1800	48X or 48Y
Product	2.2×10^6	3.25×10^6	460	48X or 48Y
Tails	9.3×10^6	13.76×10^6	1200	48G
Secondary Cold Traps	< 6000	< 8900	< 50	12B
Samples	< 3000	< 4400	< 1400	2S
Process Buildings				
Chemicals from Traps	1100	---	---	---
R/A Building				
Training Operations	< 1000	< 1500	< 10	12B
Decontamination Solution	1300	---	---	---
Solid Waste	750	---	---	---

(1) Table 2 gives cylinder data from ORO-651, Revision 4.

Table 2

DOE UF_6 CYLINDER DATA*

Cylinder Model No.	Nominal Diameter, in.	Material of Construction[a]	Minimum Volume		Approximate Tare Weight (Without Valve Protector)		Maximum Enrichment, wt % Uranium-235	Fill Limit			
								Maximum,[b] UF_6		Minimum, UF_6	
			ft^3	liters	lb	kg		lb	kg	lb	kg
1S	1.5	Nickel	0.0053	0.15	1.75	0.79	100.00	1.0	0.45	45 g	0.045
2S	3.5	Nickel	0.0254	0.72	4.2	1.91	100.00	4.9	2.22	1	0.45
5A	5	Monel	0.284	8.04	55	25	100.00	55	24.95	11	4.99
8A	8	Monel	1.319	37.35	120	54	12.5	255	115.67	55	25
12A	12	Nickel	2.38	67.4	185	84	5.0	460	208.7	55	25
12B	12	Monel	2.38	67.4	185	84	5.0	460	208.7	55	25
30A	30	Steel	25.65	726.0	1,400	635	5.0[c]	4,950	2,245	2,300[d]	1,043
30B[e]	30	Steel	26.0	736.0	1,400	635	5.0[c]	5,020	2,277	2,300[d]	1,043
48A	48	Steel	108.9	3,084	4,500	2,041	4.5[c]	21,030	9,539	14,000	6,350
48X[f]	48	Steel	108.9	3,084	4,500	2,041	4.5[c]	21,030	9,539	14,000	6,350
48F	48	Steel	140.0	3,964	5,200	2,359	4.5[c]	27,030	12,261	21,000	9,525
48G[g]	48	Steel	139.0	3,936	2,600	1,179	Tails	28,000	12,701	--	--
48Y[f]	48	Steel	142.7	4,041	5,200	2,359	4.5[c]	27,560	12,501	21,000	9,525

[a] For packaging normal and depleted UF_6, cylinders of other materials, such as steel and Monel, may be substituted, provided they have equivalent strength.

[b] Fill limits are based on 250°F (121°C) maximum UF_6 temperature (203.3 lb UF_6/ft^3), certified minimum internal volumes for all cylinders, and a minimum safety factor of 5%. The operating limits apply to UF_6 with a minimum purity of 99.5%. More restrictive measures are required if additional impurities are present. The maximum UF_6 temperature must not be exceeded.

[c] Maximum enrichments indicated require moderation control equivalent to a UF_6 purity of 99.5%. Without moderation control, the maximum permissible enrichment is 1.0 wt % uranium-235.

[d] Shipments from ERDA and at the customer's request can be less than 2,300 lb (1,043 kg) in the 30A or 30B cylinders providing the UF_6 is transferred from a larger cylinder.

[e] This cylinder replaces the Model 30A cylinder.

[f] Models 48X and 48Y replace Models 48A and 48F.

[g] For UF_6 tails storage only. Fill limit is based on maximum UF_6 temperature of 235°F (113°C), certified minimum volumes and a minimum safety factor of 3%.

*DOE/ORO report, ORO-651, Revision 4

IV. DESCRIPTIONS OF MAJOR BUILDINGS

Figure 5 shows the layout of the GCEP site. The eight process buildings are shown along with several support facilities that include:

Centrifuge R/A building

Decontamination facility

Cooling tower and pumphouse

Air plant

Steam plant

Maintenance, service and training building

Feed and Withdrawal facilities

Administration building (offices, computer facility, dispensary, training facility, etc.)

Electrical switchyard

Fire water, heating water, and sanitary water pumping stations

Service buildings and facilities (fire, guard, and sewage)

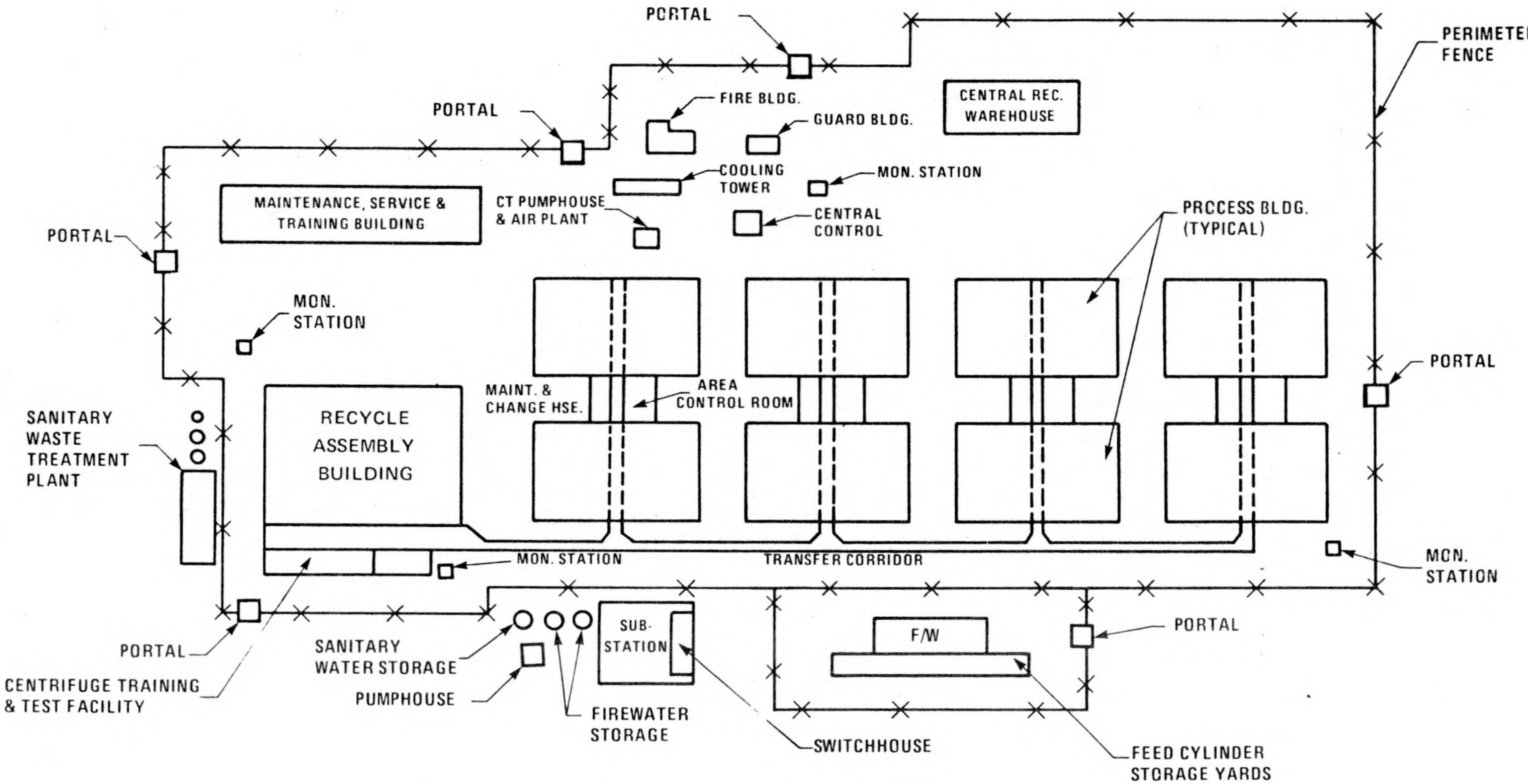
Technical service facilities (laboratories, test facilities, etc.)

Table 3 gives the approximate area of the building types. The major buildings or areas where uranium handling will occur are the process buildings, the F/W building, the R/A building with the adjacent CTTF and the uranium cylinder storage yards. These locations are described in more detail below:

A. Process Buildings

The eight process buildings on the GCEP site (each capable of producing 1.1 million SWU/yr) will contain all the equipment necessary for the enriching process with the exception of UF_6 feed and withdrawal facilities. When the GCEP is complete, the smallest

Figure 5. GCEP SITE - PLOT PLAN



DWG. NO. K/G-80-3670

Table 3

LAND AREA COVERED BY GCEP BUILDINGS

Facility	Area (Approx.)
Process Buildings (8)	22.7 hectares*
Process Support Buildings (4)	2.0 hectares
Intraplant Transfer Corridors	1.3 hectares
Recycle/Assembly Building	3.6 hectares
Feed and Withdrawal Building	1.0 hectares
Central Control Building	0.1 hectares
	30.7 hectares
Remaining Plant/Process Support Buildings	5.3 hectares
	36.0 hectares

*2.47 acres/hectare

practical unit that can be operated in an independent fashion (i.e. at a unique product assay) is a pair of process buildings.* However, during startup phases or maintenance operations, single cascades may be operated. Currently, it is expected that all buildings will operate at the same product assay. Figure 1 shows the GCEP site layout including the planned process building locations. Each building is approximately 213 meters by 130 meters and 27 meters high. Figure 6 shows these buildings and introduces the terminology used to distinguish the areas within and around the buildings. Each process building, as shown in Figure 7, is bisected by the transfer corridor (open central aisle) with four enriching trains located in each half of the building. A train consists of six parallel cascades. The cascades are made up of a number of centrifuges arranged in rows. Service modules are located between centrifuges and consist of arrays of piping, valves, electrical cabling, and instrument packages. All centrifuge piping and electrical wiring connect to the service module. (The centrifuge machines and service modules make the floor level of the process building very crowded except in the central aisle.)

At each end of the process building is a utility bay. Each utility bay serves the four trains located in its half of the building. This area contains heating and ventilating equipment, electrical distribution equipment, emergency generators, vacuum pumps, heat exchangers, and chemical traps for UF_6. A small aisle separates this area from the ends of the cascades.

---

*Between each pair of process buildings is a support building. Each Process Support Building is about 76 meters wide by 61 meters long and includes a main operational area and a maintenance area. The operational area consists of an area control room serving two process buildings, computer equipment room, assay instrumentation rooms, offices, lunchroom, restrooms, and equipment/utility rooms. The maintenance area consists of field maintenance shops, storage areas and changehouses.

A Central Control Building provides for integration of GCEP operations. Accommodations include office facilities, an emergency operation center, and operations control and monitoring equipment. The Central Control Building maintains overall surveillance of operations by monitoring the significant process variables in GCEP. Equipment is provided to remotely monitor and control selected variables in the electrical distribution system and certain utilities and services. Systems to monitor radiation alarms, building environment, fire alarms, feed and withdrawal information, and recycle/assembly information are provided. A communication center for both in- and out-of-plant communication is located in the building.

Figure 6. Process Buildings at the Gas Centrifuge Enrichment Plant

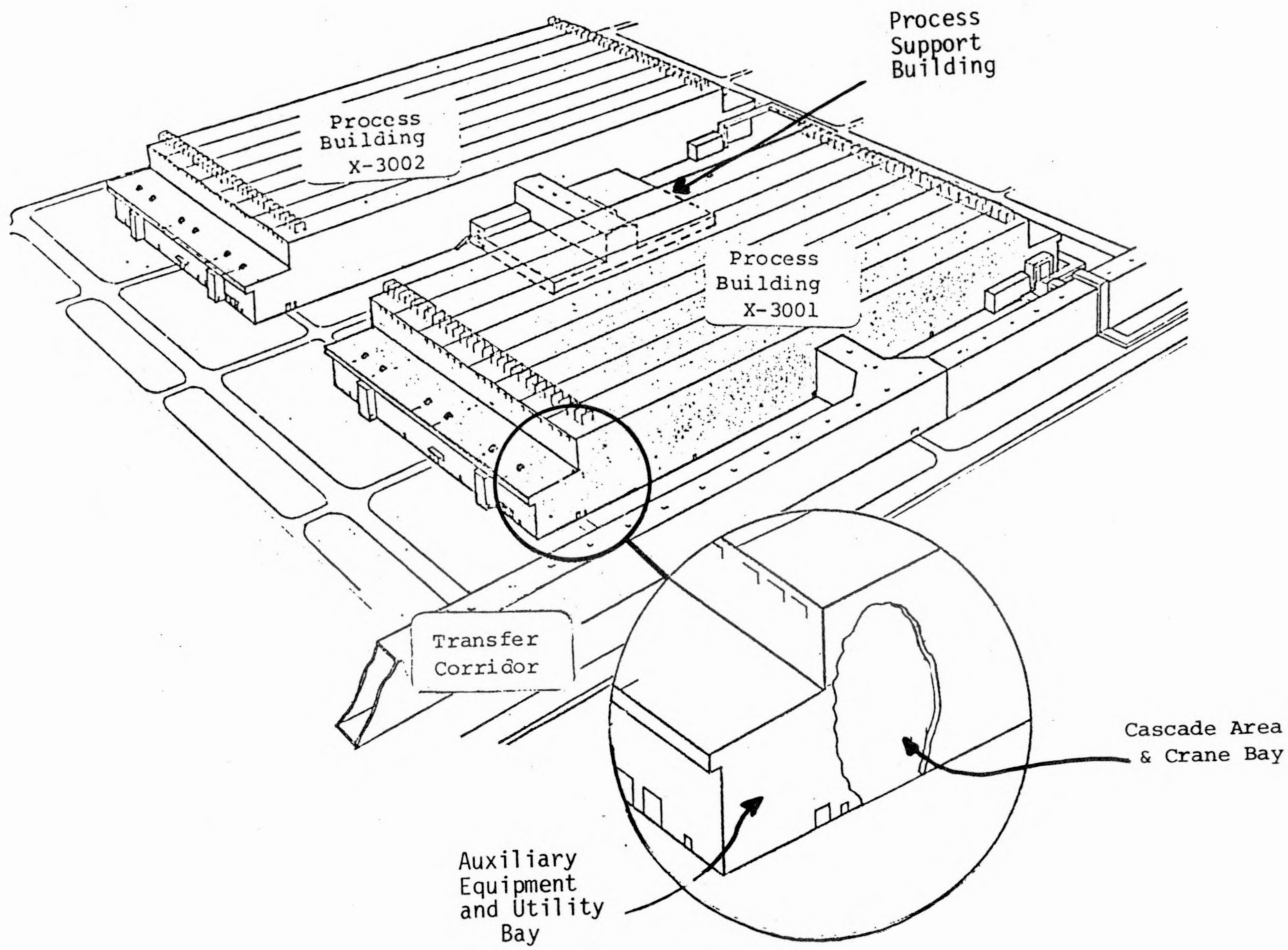
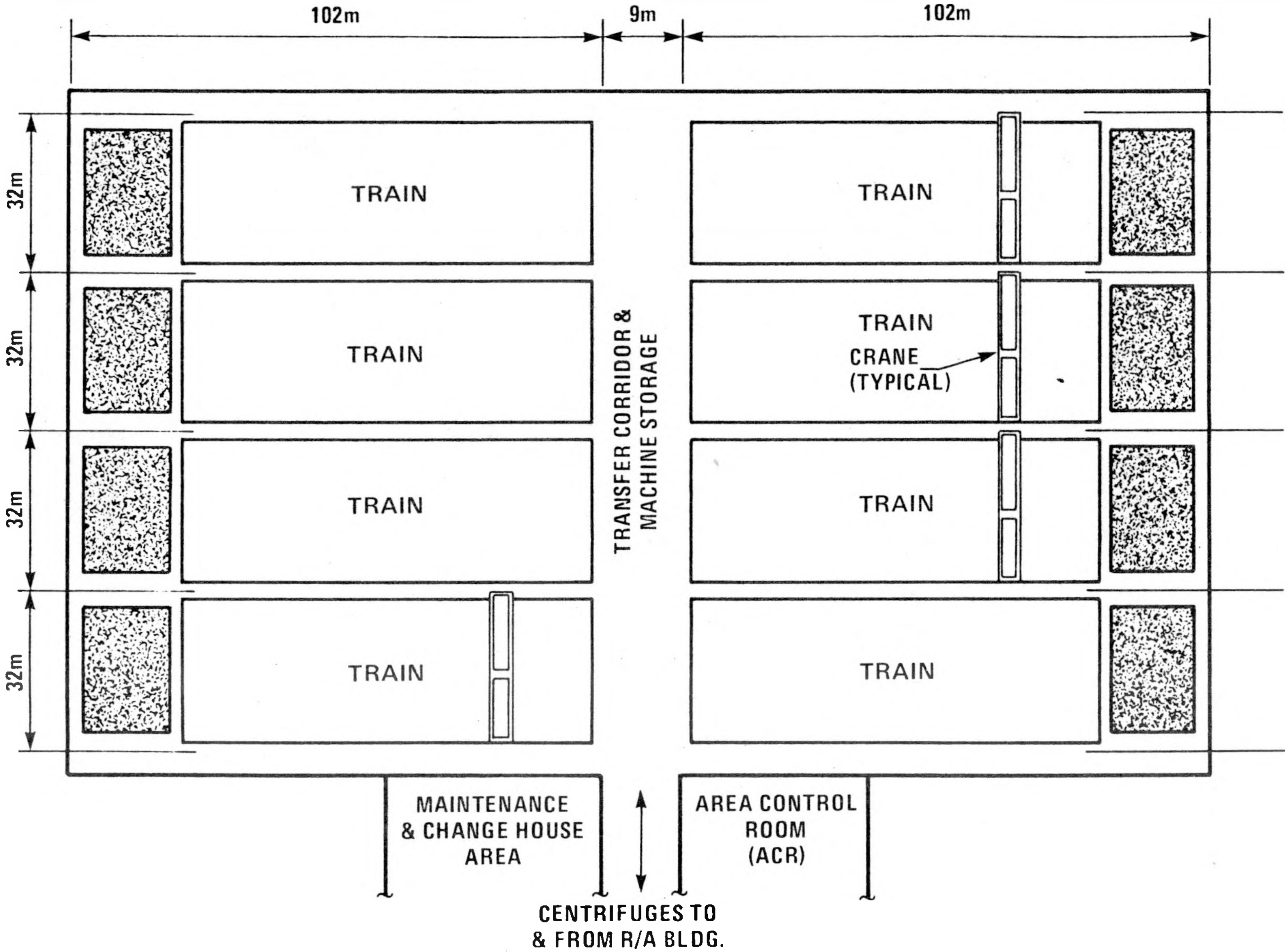


Figure 7. Gas Centrifuge Enrichment Plant Process Building Layout



DWG. NO. K/G-80-3668

B. Feed and Withdrawal (F/W) Building

As indicated in the site layout drawing (Figure 1) the F/W building is located near the GCEP perimeter, but at a distance from the principal process areas. The major areas of the F/W building are shown in Figure 8. Cylinders of UF_6 are received by truck or rail for enrichment processing. The cylinders are received, weighed, and sampled in the feed, sampling, and burping* area of the F/W building. The chemical analyses of the UF_6 samples will be performed in existing laboratories in the adjacent GDP.

Major equipment items located within the feed receiving and storage area include:

(1) Feed/sampling autoclaves for heating the UF_6 cylinders during the sampling operations.

(2) Precision scales for weighing cylinders.

(3) Radiation alarm systems to monitor for accidental releases.

Cranes are provided for handling the 10- or 14-ton cylinders inside the autoclave area, for transfer of full cylinders from outside storage to inside the building and for transfer of full or empty cylinders from inside the building to outside storage. Under-the-crane cylinder storage areas are provided at each end of the building.

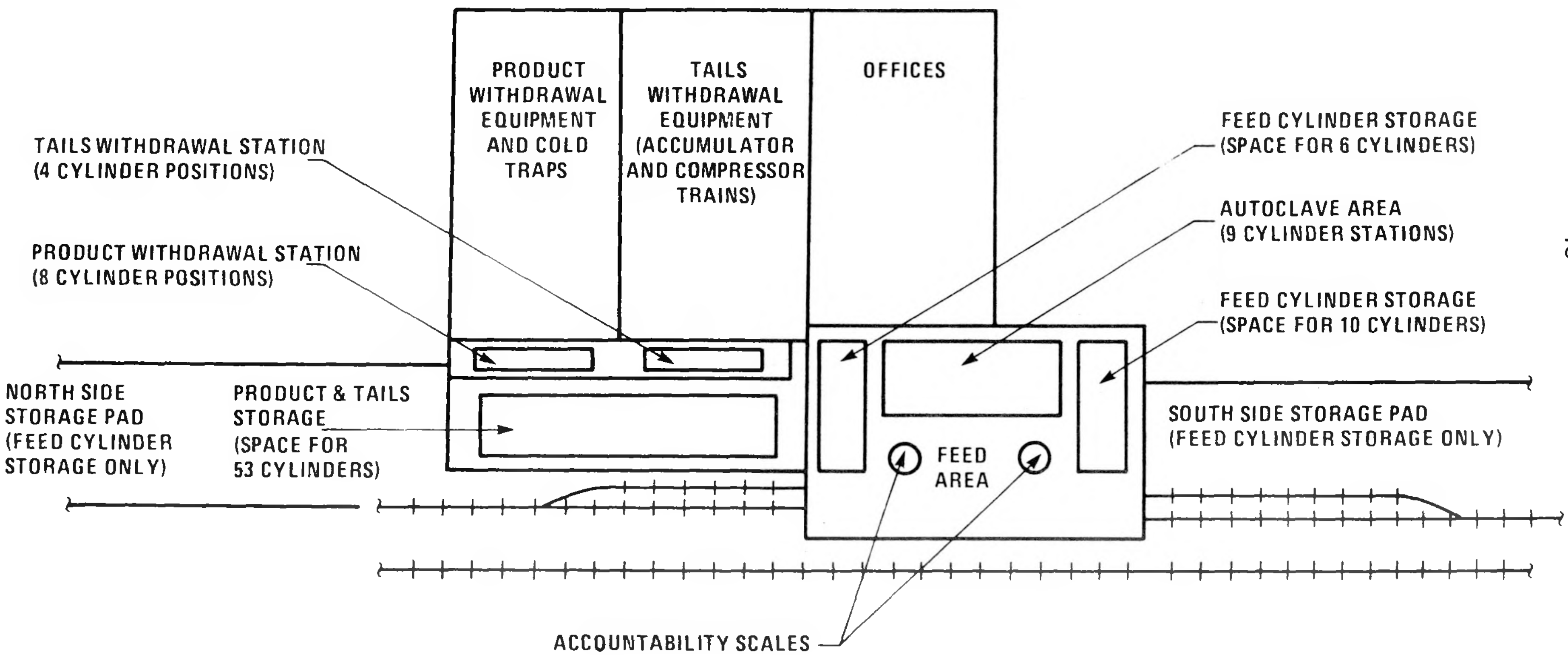
The feed, product and tails stations are located in the F/W building. These stations maintain the required flow of UF_6 process gas into and out of the centrifuge cascades. The UF_6 is received, shipped, and stored in steel cylinders that contain up to 14 tons of material. The UF_6 in the cylinders is normally in the solid state, but is liquefied and vaporized by heating in a steam autoclave for removal to the centrifuge cascades, for transfer to other cylinders, or for sampling.

Each feed station autoclave will house one 10-ton or one 14-ton feed cylinder. Steam is used to heat the autoclave to approximately 110°C at which temperature the pressure in the cylinder is approximately 0.55 MPa (80 psia). Under normal operating conditions, the only effluent from the feed equipment will consist of the condensate from the steam-heated autoclaves.

---

*"Burping" consists of removing the volatile contaminants contained in a cylinder of UF_6 by heating the cylinder until the contents liquefy and then withdrawing some of the gaseous material.

Figure 8. FEED AND WITHDRAWAL BUILDING SCHEMATIC



DWG. NO. K/G-80-3669

The primary product withdrawal system for each pair of process buildings consists of 48 primary cold traps of which 16 are spares that are shared with a second pair of process buildings. At any given time sixteen traps are receiving and freezing gaseous product from the cascades. Simultaneously, a parallel group of 16 traps is being heated to liquefy UF_6, burped to remove residual HF (if necessary), valved to drain the liquid UF_6 into 10- or 14-ton product cylinders and cooled down to be ready for the next fill cycle. Secondary cold traps collect any product that is not deposited in the primary traps. The product cylinders are sampled in the feed/sampling autoclaves, stored in the F/W building for cool-down, and transferred to the existing GDP.

The depleted tails stream is removed from the bottom stage of the production cascades into 14-ton steel cylinders. The tails withdrawal compression-liquefaction system for each four process buildings contains one in-line compressor train and a spare train. A condenser is located after the compressors to condense the gaseous UF_6 to the liquid state and drained to the 14-ton cylinder. After cool-down, sampling, and weighing the tails cylinders are moved via rail to the tails storage yard, which is located on U.S. government property outside the GCEP and GDP perimeters.

C. Cylinder Storage and Transfer

Figure 9 illustrates the overall flow of cylinders between feed suppliers, toll enrichment customers, GCEP and GDP. The primary feed storage areas for GCEP are two concrete storage pads (slabs) located on the north and south sides of the F/W building. (See Figure 8.) These pads will have a capacity of about 630 10- or 14-ton cylinders of which about 450 might be full at any given time.

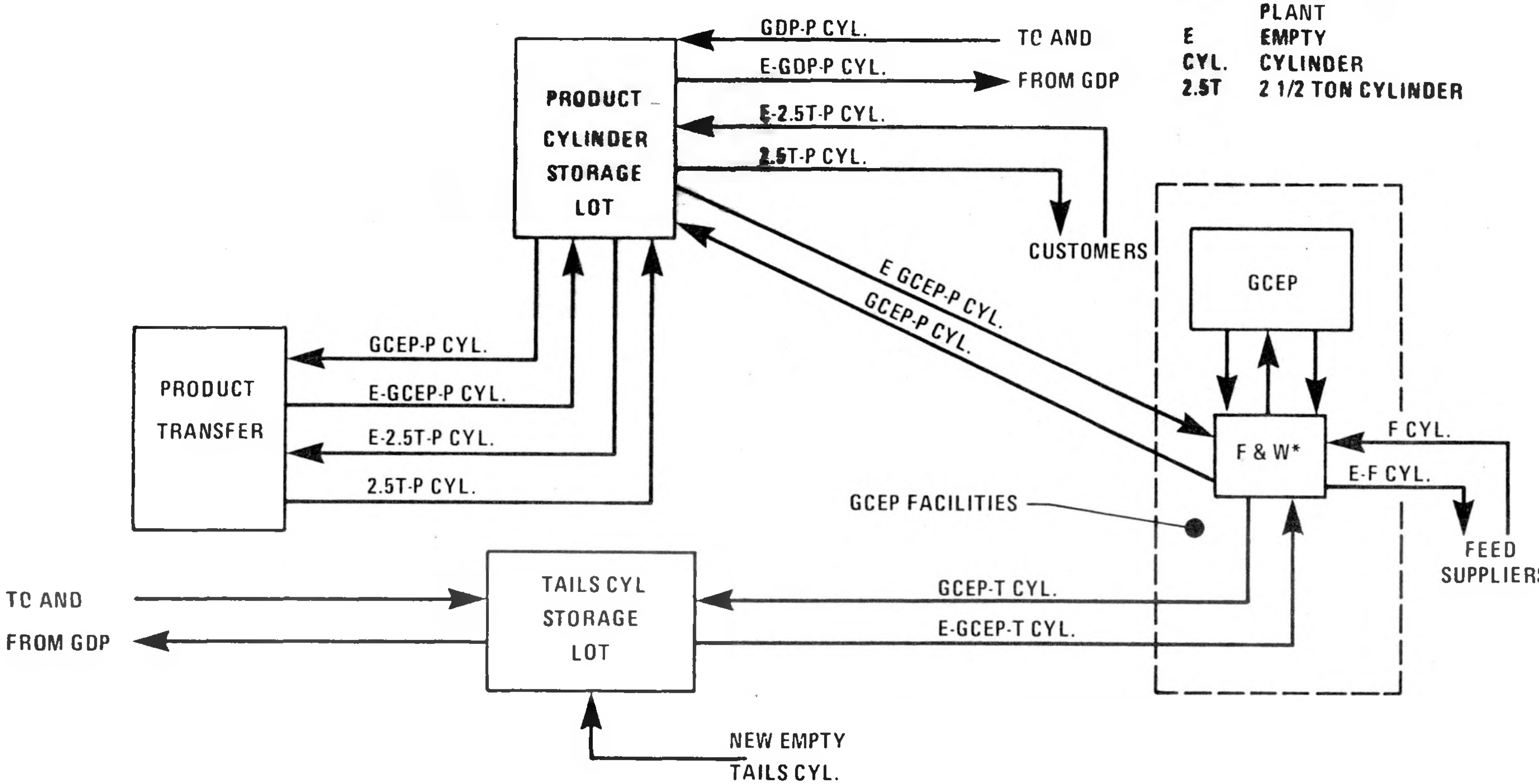
The total area of the main product storage yard will be approximately 25,500 square meters. The yard will be used for the temporary storage of 14-ton and 10-ton product cylinders. The area will be serviced by an existing railroad siding. Cranes and straddle buggies will be used for moving the cylinders from the railroad siding and adjacent truck areas.

The tails storage yard will consist of a fenced area of approximately 20 acres with paved access road, railroad service, area lighting, external patrol road and a concrete slab storage pad to provide for permanent storage of 14-ton tails cylinders. The total area of the slab has not been determined yet. The tails cylinders will be stacked two-high on treated wood saddles with aisles between every other row for inspection and inventory. The storage yard will be served by a railroad siding along one side of the slab. The cylinders will be removed from rail cars and stacked on the storage pad.

Figure 9. UF_6 FLOW AT THE PORTSMOUTH ENRICHMENT FACILITIES

LEGEND

F	NORMAL FEED
T	TAILS
P	PRODUCT
GCEP	GAS CENTRIFUGE ENRICHMENT PLANT
GDP	GASEOUS DIFFUSION PLANT
E	EMPTY
CYL.	CYLINDER
2.5T	2 1/2 TON CYLINDER



*SAMPLES OF FEED, PRODUCT AND TAILS WILL BE TAKEN IN THE F/W BUILDING AND SENT TO THE GDP LABORATORIES FOR ISOTOPIC ANALYSIS. THE DISPOSITION OF THESE SAMPLES AFTER ANALYSIS HAS NOT BEEN DETERMINED.

DWG. NO. K/G-80-3665

D. Recycle/Assembly Building

The initial function of the Recycle/Assembly (R/A) building is to provide a supply of centrifuges to fill the process buildings. The centrifuges are assembled from new components procured from commercial vendors. After the initial fill, the primary function of the R/A facilities will be maintenance of operating centrifuges by refurbishing those units which have failed in service. The R/A operations will replace major subassemblies or individual components as required.

The processes required to assemble new or repaired subassemblies are basically the same. However, to replace a subassembly, a certain amount of disassembly must be done before a new component can be installed and the centrifuge reassembled. All wrecked centrifuges will be disassembled, decontaminated and salvaged or prepared for disposal as appropriate in the R/A building.

To accomplish the intended functions, the R/A building is designed as a multi-level structure with transfer corridors, canopied areas, and outside ground storage areas. The ground floor of the main building has an area of about 36,000 square meters. There is a high bay area near the center of the building for vertical assembly and testing of centrifuges, and an intermediate bay area is adjacent to the high bay area. The remainder of the building is a low bay area. About half of the building is used primarily for assembling new centrifuges and supports the construction phase of the GCEP. The remainder of the building is designed for recycle activities and, along with portions of the assembly area, is used for repairing failed centrifuges.

The R/A building will contain centrifuge test stands. These test stands provide the capability to analyze problems identified in centrifuges. Testing will be conducted with and without process gas inventory. Each test stand will have its own independent feed, product, and waste process control system.

The R/A building is divided into functional areas for receiving and storing incoming parts. These areas include those for casings and balanced rotors, rotor uprighting and balancing stations, assembly areas with fixtures for final assembly and alignment of all major subassemblies, conveyors for moving all major subassemblies to final assembly, and vacuum testing stations. Facilities for receipt of subassemblies by either truck or rail are provided, and truck loading docks are located at strategic places in the buildings. Small subassemblies are stored within the building, and an open storage area is provided outside the building for selected subassemblies such as centrifuge casings. A cleaning area is furnished for segregation of materials for disposal. The R/A building also contains offices, changehouses, and building maintenance facilities.

A Centrifuge Training and Test Facility (CTTF) is adjacent to the R/A building. The CTTF provides the space and houses the equipment necessary for the training of GCEP process operators, process maintenance personnel, and R/A building operators. The CTTF will be completed before the R/A building. Openings between the two facilities will provide direct access from the CTTF to the transfer corridor of the R/A building, permitting movement of centrifuges or large components between the two buildings. The CTTF contains a small centrifuge cascade with UF_6 piping, all operating controls required for the centrifuge plant, the operator-training simulator, and all other major facilities required to train process operators and maintenance personnel to perform the functions of the R/A building except for decontamination.

V. ACKNOWLEDGEMENT

Preparation of this description of GCEP was supported by the U.S. Department of Energy's (DOE) Office of Safeguards and Security with the cooperation of DOE's Division of Uranium Resources and Enrichment. The contributors wish to express their thanks to Leon Parris, Steve Napolitan, Dave Swindle, and Mike Younkin of the Union Carbide Corporation-Nuclear Division for their many helpful comments.