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DPE 3547
December 1978

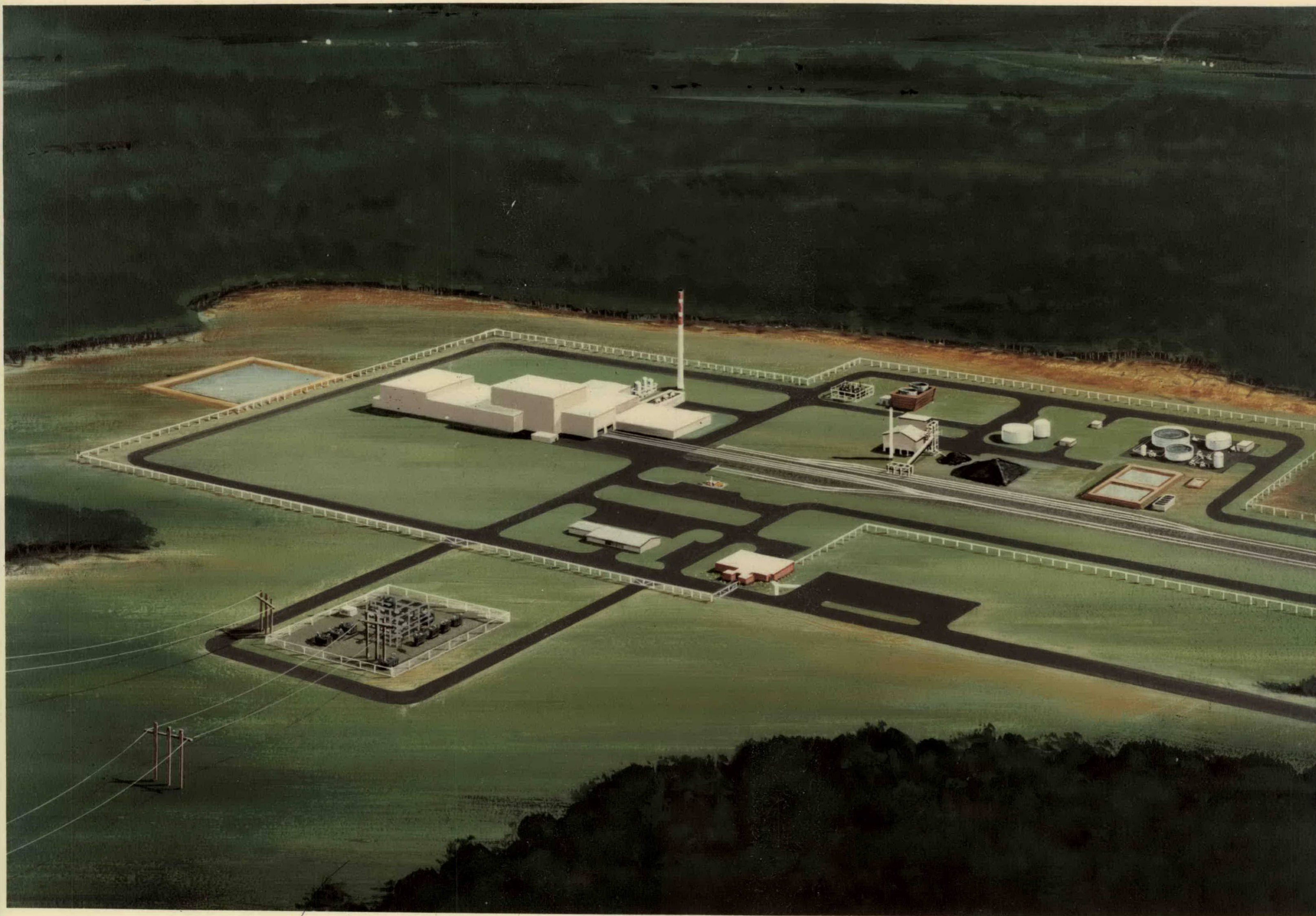
Conceptual Design Report

THE AWAY FROM REACTOR SPENT FUEL STORAGE FACILITY

SAVANNAH RIVER PLANT

E.I.Du Pont de Nemours and Co.
ENGINEERING DEPARTMENT
WILMINGTON, DELAWARE 19898

PREPARED FOR THE U.S. DEPARTMENT OF ENERGY



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CONCEPTUAL DESIGN REPORT FOR THE AWAY FROM REACTOR SPENT FUEL STORAGE FACILITY SAVANNAH RIVER PLANT

UNITED STATES DEPARTMENT OF ENERGY
BUDGET PROJECT 79-1-P
SAVANNAH RIVER PLANT

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WORK REQUEST 860762
ENGINEERING DEPARTMENT
E. I. DU PONT DE NEMOURS & COMPANY, INC.
WILMINGTON, DELAWARE

DECEMBER 1978

JW

NOTICE

SUMMARY

President Carter announced on April 7, 1977, that the United States would indefinitely defer reprocessing of commercial nuclear spent fuel to reduce risks of nuclear weapons proliferation. Eventually the spent fuel will either be reprocessed to recycle nuclear fuel or disposed of permanently. Pending future decisions, the spent fuel discharged from power reactors must be stored, protected and safeguarded.

The Department of Energy (DOE) requested that Du Pont prepare a conceptual design and appraisal of cost for Federal Budget planning for an away from reactor spent fuel storage facility that could be ready to store fuel by December 1982. This is one of several DOE options for the interim disposition of spent fuel.

This report describes the basis of the appraisal of cost in the amount of $270,000,000 for all facilities.

The proposed action is to provide a facility at the Savannah River Plant. The facility will have an initial storage capacity of 5000 metric tons of spent fuel and will be capable of receiving 1000 metric tons per year. The spent fuel will be stored in water-filled concrete basins that are lined with stainless steel. The modular construction of the facility will allow future expansion of the storage basins and auxiliary services in a cost-effective manner.

The facility will be designed to receive, handle, decontaminate and reship spent fuel casks; to remove irradiated fuel from casks; to place the fuel in a storage basin; and to cool and control the quality of the water. The facility will also be designed to remove spent fuel from storage basins, load the spent fuel into shipping casks, decontaminate loaded casks and ship spent fuel.

The facility requires a license by the Nuclear Regulatory Commission (NRC). Features of the design, construction and operations that may affect the health and safety of the work force and the public will conform with NRC requirements.

The facility would be ready to store fuel by January 1983, based on normal Du Pont design and construction practices for DOE. The schedule does not include the effect of licensing by the NRC.

To maintain this option, preparation of the documents and investigation of a site at the Savannah River Plant,as required for licensing, were started in FY '78.

CONCEPTUAL DESIGN REPORT

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SECTION I

PROJECT OBJECTIVES

PROJECT OBJECTIVES

The objective of this project is to provide all facilities necessary to receive and store 5000 metric tons of heavy metal (MTHM) of spent fuel from commercial power reactors at a rate of 3.3 MTHM per day. The storage capacity and receiving rate will be expandable. The facility will have an annual input of 1000 MTHM based on 300 days of operation and assuming 30% of the fuel is received by truck carrier and 70% by rail carrier. Ninety-percent of the fuel to be stored will be aged at least 5 years and 10% at least 2 years. The fuel will have a maximum exposure of 40,000 megawatt days per metric ton of uranium at a specific power of 30 megawatts per metric ton of uranium.

SECTION II

STANDARDS AND CRITERIA

STANDARD AND CRITERIA

The storage facility will conform to all applicable National Standards and Codes.

In addition, the nuclear installations are expected to be licensed by the Nuclear Regulatory Commission (NRC). Specific guidance for this Design was given by NRC as stated in their regulatory guides:

Stanford, R.E.L., Standard Format and Content of License Application for Storage of Spent Fuel in an Independent Spent Fuel Storage Installation (ISFS) (Water Basin Type): Working Paper "A", 3.24.1. United States Nuclear Regulatory Commission, May 2, 1978

Stanford, R.E.L. and H. Asher, Guidance on the Design of an Independent Spent Fuel Storage Installation (ISFS) (Water Basin Type): Working Paper "B", 3.24.3. United States Nuclear Regulatory Commission, May 2, 1978

Additional guidance given by NRC, parts of which may apply, are stated in the following Divisions of Nuclear Regulatory Guides:

Division 1 - Power Reactors
Division 2 - Fuels and Materials Facilities
Division 4 - Environmental and Siting
Division 5 - Materials and Plant
Division 8 - Occupational Health

A Quality Assurance Program will be used to assure the safety of nuclear facilities. The program will comply with the NRC Quality Assurance requirements of Appendix B to Title 10, Code of Federal Regulations, Part 50.

The following seismic and tornado criteria are based on Du Pont's interpretation of the Regulatory Guides:

FACILITIES MEETING SEISMIC AND TORNADO CRITERIA

- Building Structural Steel over Storage Pool
- Storage Pool Crane Structure
- Emergency Power Generator and Fuel Storage Tanks

FACILITIES MEETING SEISMIC AND TORNADO CRITERIA (continued)

- Key Water Level, Temperature, and Radiation Monitoring Instrumentation

- Water Treatment Facilities Requiring Containment of Radioactivity

FACILITIES MEETING SEISMIC CRITERIA

- Fuel Storage Pools
- Fuel Unloading Pool
- Emergency Cooling Water Pond

FACILITIES MEETING TORNADO CRITERIA

- Process Crane Structure and Building Steel Adjacent to the Storage Pool

SECTION III

APPRAISAL TRANSMITTAL LETTER

E. I. du Pont de Nemours & Company
INCORPORATED
Wilmington, Delaware 19898

ENGINEERING DEPARTMENT

CC: J. F. Proctor, AED-WT-700
A. S. Barab, AED-WT-700
J. E. Walls, AED-WT-700

October 10, 1978

J. F. PROCTOR, MANAGER
PROCESS SECTION
ATOMIC ENERGY DIVISION
PETROCHEMICALS DEPARTMENT
WT-700

ATTENTION: A. A. KISHBAUGH (2)

WORK REQUEST 860762 - SAVANNAH RIVER PLANT
AWAY FROM REACTOR SPENT FUEL STORAGE
CURRENT APPRAISAL OF COST FOR FY '80 BUDGET

Per your request we have prepared a current appraisal of cost in the amount of $270,000,000 for all facilities necessary to receive and store 5000 metric tons of heavy metal (MTHM) of spent fuel from commercial power reactors at the rate of 3.3 MTHM per day. This appraisal is suitable for Fiscal Year 1980 budget purposes only and not for project authorization. A detailed summary scope of work is attached.

This cost appraisal exceeds the venture guidance appraisal of $210,000,000 we sent you on December 27, 1977 for a similar facility but with services provided by an existing plant. The main differences are: The scope for process and service facilities increased even though the feed rate was reduced from 5.3 to 3.3 MTHM per day and services were provided by existing facilities. The incremental increase is due to:

Addition of power general & service facilities		$40,000,000
Increase in fuel storage equipment		$15,000,000
Increase in process building size		$ 5,000,000
	Total	$60,000,000

This appraisal is based on the technical data in your DPSTD-ISFS-78-7 and supplemented by your letters of July 27 and September 11, 1978 and your interpretation of regulatory guides. Although we understand these facilities may be licensed by the Nuclear Regulatory Commission (NRC) we have based our costs and schedule on normal Du Pont practice for SRP per the September 14 letter request of J. F. Proctor. As noted in this letter, the issues relating to licensing by NRC represent potential areas for added cost and extended schedules. As suggested these costs will be updated at the time the regulatory issues are more clearly defined. The most significant update will be at the time of the preparation of the authorization estimate. We also understand that you will continue to provide us with the interpretation of the regulatory guides.

This cost appraisal is based on our scopes of work dated July 27 through August 18, 1978 with total expenditures for conceptual design of approximately $900,000. The quality of the basic data and the appraisal is considered adequate for the intended use recognizing the uncertainties noted previously that relate to NRC licensing.

To prepare this appraisal we have assumed several key events that must occur to maintain schedule and cost.

- Sufficient firm design funds will be authorized in a Part I project by November 1978.

- The Technical Data Summary will be updated, basic data will be complete and project objectives will be defined by November 15, 1978.

- Approval will be received from DOE-SR in October 1978 to proceed with selection of an Engineering Contractor (EC) for a significant portion of the AFR design. DOE-SR will approve the resulting contract by May 1979.

- Funds for procurement of limiting equipment will be available during FY '79 as required.

- The remainder of the project funds will be authorized in a Part II project November 1979.

- Licensing by NRC if required, will not affect the schedule, as discussed above.

The appraisal is based on design and construction by the Engineering Department on a 40-hour work week. Construction would work two shifts per day. Based on the assumptions noted we would expect turnover of the first facilities in October 1982 permitting spent fuel to be received in January 1983 (Phase I). The remainder of the facilities are expected to be completed in July 1983 with final completion in January 1984. Wage and material escalation allowances are based on this schedule. This is consistent with your letter of September 18, 1978.

Under separate accounts we are continuing the site investigation and preparation of the necessary supplements to the quality assurance manual related to licensing. Pending your authorization of funds for FY '79 we are proceeding with engineering studies for site design and service and power facilities. Upon authorization of project funds we will start project design, preparation of equipment specifications for limiting procurement,and preparation of scopes for a current appraisal of cost for a FY '80 construction authorization and start EC firm design work in mid-1979. We will proceed with selection of an EC when the release of our invitation letter has been approved.

The Budget Estimate Summary, Cost and Obligation Schedule and Objective Project Schedule are being transmitted separately in the Conceptual Design Report DPE 3547.

DESIGN DIVISION
Atomic Engineering Section

L. F. Shafranek
Design Project Manager

RDK:hbd

SECTION IV

SUMMARY SCOPE OF WORK

SUMMARY SCOPE OF WORK

PROCESS FACILITIES

- Preparation Area including:
  - Building 83' x 85' x 45' High
  - Two Rail/Truck Carrier Positions
  - Lay Down Space for Cask Accessories
  - One 10-Ton Crane
  - Lifting Yokes and Yoke Storage
- Carrier Wash Down and Unloading Area including:
  - Building 85' x 96' x 78' High
  - Two Rail/Truck Carrier Positions
  - One 125-Ton Crane
  - Cask Lifting Yokes and Yoke Storage
  - Steam, Water, and Drains for Wash Down
- Fuel Unloading Area including:
  - Building 82' x 133' x 78' High
  - One Cask Decontamination Pit
  - One Elevator Platform to Facilitate Cask Cleaning
  - One 5-Ton Jib Crane to Facilitate Cleaning
  - Steam, Water, High Pressure Pumps and Drains
  - One Cask Cool Down and Wash Pit
  - One 5-Ton Jib Crane to Facilitate Cool Down Operations
  - One Stainless Steel Lined Seismic Resistant Fuel Unloading Pit with Space for Yoke and Failed Fuel Storage

PROCESS FACILITIES (continued)

- One 10-Ton Fuel Unload Crane

- Fuel Storage Area including:
  - Building 150' x 133' x 25' High
  - Two Stainless Steel Lined, Seismic Resistant Fuel Storage Pools
  - Two 10-Ton Fuel Storage Cranes, Seismic and Tornado Resistant
  - Two Pool Isolation Gates
  - Structural Steel Over Pools, Seismic and Tornado Resistant
  - One Year Supply of Poisoned Fuel Storage Baskets

- Fuel Storage Process Area including:
  - Building 147' x 133' x 35' High
  - Five Seismic and Tornado Resistant Shielded Process Cells
  - Three Shielded Process Cells
  - Two 10-Ton Cranes
  - Two Fuel Storage Pool Heat Exchangers
  - Three Filter and Ion Exchange Water Clean-up Systems
  - Four Storage Pool Water Recirculation Pumps
  - One Storage Pool Water Hold Tank
  - One Fuel Unloading Pool Water Hold Tank
  - Two Fuel Unloading Pool Recirculation Pumps
  - One Resin Dewatering and Resin Backwash System
  - One Resin Mix and Transfer System
  - One Shielded Decontamination and Maintenance Cell

PROCESS FACILITIES (continued)

- Process Area including:
  - Building 135' x 135' x 35' High
  - Two Seismic and Tornado Resistant Shielded Process Cells
  - Twelve Shielded Process Cells
  - One 10-Ton Service Crane
  - One 5-Ton Service Crane
  - One Cask Cool Down System
  - One Cask Decontamination Waste Water Collection System
  - One Resin Dewatering and Resin Backwash System
  - One Resin Mix and Transfer System
  - One Decontamination Solution Preparation System
- Waste Handling including:
  - One High Level Water Evaporator for Resin Back Flush Waste Water
  - One General Purpose Evaporator for Decontamination Waste Solutions
  - Building for Solid Waste Handling 30' x 150'
  - One Solid Waste Compactor
  - One 5-Ton Solid Waste Handling Monorail

SERVICE FACILITIES

- Process Area Support Facilities including:
  - Building 155' x 190'
  - Electrical and Instrument Control Rooms
  - Health Physics Facilities

SERVICE FACILITIES (continued)

- Clean and Regulated Maintenance Shops
- Clean and Regulated Personnel Change Facilities
- Water Control Laboratory
- Laundry
- Offices, Conference Room and Lunch Room
- Process Data Logging System

● Administration Building including:

  - Building 100' x 148'
  - Twenty Offices
  - One Conference Room
  - First Aid Facilities
  - Lunch Room

● Emergency Cooling Water Pond, Seismic Resistant, 30-Day Supply

● Two 18,000 Pound Per Hour Steam Generating Plants

● One Two-Cell Cooling Tower

● Two 1000-Gallon Per Minute Wells

● Sanitary Waste Treatment Facilities

● Clean Process Waste Treatment Facilities

● Electrical Substations

● One Diesel Driving Emergency Power Generator, 750 KW, Seismic and Tornado Resistant

● Diesel Fuel Storage Tank, Seismic and Tornado Resistant

● Road & Railroads

● Outside Overhead and Underground Lines

SERVICE FACILITIES (continued)

- Safeguards Facilities including:
  - Single Fence
  - Fence Lighting
  - Seven TV Cameras and Four Monitors
  - Guard Facilities
- One General Purpose Warehouse
- Fire Water Supply & Building Sprinkler Systems

The Summary Scope of Work is based on the scope of work given in Section XVI.

SECTION V

ASSUMPTIONS

ASSUMPTIONS

The appraisal includes the following assumptions:

- Funding will be timely.
- Existing technology will be applied. Some of the facilities are scaled 10 x from Allied Gulf Nuclear Services' and General Electric's reprocessing plant receiving basins at Barnwell, S.C. and Morris, Illinois, respectively and the Receiving Basin for Offsite Fuel (RBOF) at Savannah River Plant.
- There will be an adequate supply of shipping casks supplied by others.
- Radioactive waste will be solidified onsite by a commercial contractor and buried offsite at the contractor's burial site.

The appraisal does not include cost of decommissioning; however, the facility will be decommissioned by removing all contaminated equipment for burial offsite and filling the decontaminated pools with sand.

SECTION VI

UNCERTAINTIES

UNCERTAINTIES

The NRC provided the following guidelines for licensing purposes. Some of the guidance is taken from Regulatory Guides used for nuclear power plants and spent fuel reprocessing plants.

- BASIN
  - Regulatory Guide 3.24.3 Working Paper "B"
  - ANSI Standard N305
- AUXILIARY REACTOR/REPROCESSING PLANT GUIDES
  - Cranes
  - Safeguards
- POSSIBLE FUTURE GUIDANCE
  - ANS 57.7
  - 10CFR72

The following table shows the basis for this design as compared to guides that require interpretation. Acceptance of the design basis depends on future NRC actions.

ITEM	GUIDE	DESIGN BASIS
Radioactive releases	No uncontrolled	As low as reasonably attainable (ALARA)
Occupational dose (Mrem/hr)	1 at all locations	0.5 continuous occupancy 5 intermittent occupancy
Cooling water makeup	Reliable	Seismic resistant pond and 2 standard wells
Waste treatment	Onsite solidification	Onsite solidification; offsite licensed burial

ITEM	GUIDE	DESIGN BASIS
Power for cooling water recirculation pumps	Highly reliable implied	Two independent sources
Pool liner quality assurancy (QA)	Implies accordance with 10CFR50 Appendix B	As required by the Department of Energy QA Program

The following guides will be reviewed with the NRC. The differences between the guides and the appraisal present areas of uncertainty. This appraisal provides facilities that are considered safe.

ITEM	GUIDE	DESIGN BASIS
Normal water activity level (uCi/ml)	$1x10^{-4}$	$2x10^{-4}$
Ventilation system	For normal operation - No filtration. In an emergency - Filtration thru High Efficiency Particulate Air (HEPA) Filters	All operations except process equipment No filtration; exhaust thru 200' stack. For process equipment filtration thru HEPA. Filters and exhaust thru stack.
Cranes	Reactor grade per 10CFR50	Crane structure is seismic and tornado resistant
Safeguards	Reprocessing plant equivalent per 10CFR50	Single fence, fence lighting, TV monitoring guard house and guards
Time basins reach boiling after loss of cooling (days)	5	~2.2
Loss of water	Analysis required	Not credible
Offsite doses	40CFR190 ALARA	10CFR20 ALARA

SECTION VII

ENVIRONMENTAL ASSESSMENT

ENVIRONMENTAL ASSESSMENT

DESCRIPTION OF PROPOSED ACTION

The proposed action is to provide an "away from reactor" (AFR) spent fuel storage facility at the Savannah River Plant. The facility will have an initial storage capacity of 5000 metric tons of spent fuel and will be capable of receiving 1000 metric tons per year. The spent fuel will be stored in water-filled concrete basins that are lined with stainless steel. The modular construction of the facility will allow future expansion of the storage basins and auxiliary services in a cost-effective manner.

The facility will be designed to receive, handle, decontaminate and reship spent fuel casks; to remove irradiated fuel from casks; to place the fuel in a storage basin; and to cool and control the quality of the water. The facility will also be designed to remove spent fuel from storage basins, load the spent fuel into shipping casks, decontaminate loaded casks and ship spent fuel.

The facility will be licensed by the Nuclear Regulatory Commission. Features of the design, construction and operations that may affect the health and safety of the work force and the public will conform with NRC requirements.

Startup of the AFR facility is planned for January 1983, as shown in the Objective Schedule in Section X.

EXISTING ENVIRONMENT

Several alternative locations for the AFR facility on the Savannah River Plant have been reviewed; the proposed site location is north of road intersection 6 and C. This site is approximately 350 acres, of which 150 acres will be cleared. The location is near the geographical center of the Plant, a minimum of 6 miles from the nearest public zone. It is located away from Plant production areas, but adjacent to the Plant roads and railroad.

The Savannah River Plant site, a controlled-access Federal reservation, occupies an area of 192,000 acres on the South Carolina side of the Savannah River about 150 river miles from the river's mouth at Savannah, Georgia. Over 90% of the area of SRP is covered by pine and hardwood forests, and habitats range from infertile dry hilltops to continually flooded swamps. Animal life is abundant, including about 7,000 deer. Surface elevations at the site range from about 290 to 330 feet above mean sea level. These elevations are at least 100 feet above the postulated highest flood level of the river. The surface streams drain to the Savannah River. About 70,000 people consume river water processed by two water treatment plants near the river mouth.

The local water table is approximately 20 feet below the ground surface at the site. Rainfall migrates slowly down to the ground water and then laterally toward the surface streams. The regional Tuscaloosa aquifer is substantially deeper and is hydrologically isolated from the local water formations.

The climate at the SRP site is mild, with an average winter temperature of 48°F and an average summer temperature of 80°F. Average annual rainfall is 47 inches, and average relative humidity is 70%. Data on wind speed, direction and temperature taken every few minutes over a two-year period at elevations up to 1200 feet are used in calculating dispersion of effluents released to the atmosphere.

Atlantic Coast hurricanes seldom subject the site to high winds. Tornadoes of sufficiently high intensity to cause a minor release of radioactivity (4mCi) from the AFR facility have an estimated probability of 10^{-5}/year of striking the facility.

The site is in an area where moderate earthquake shocks are expected to occur infrequently. Analysis of plant structures including waste storage tanks has indicated satisfactory stability if subjected to the maximum expected ground acceleration of 0.2 g. The AFR design basis is 0.25 g as proposed by the NRC. Seismic monitors in SRP reactor buildings are set to alarm at 0.002 g and have never indicated a shock of this intensity in 25 years of site operation.

ASSESSMENT OF ENVIRONMENTAL IMPACTS

Construction

The primary construction impact on land use will occur where the principal structures are located and where adjacent areas are used for access, storage, office space and parking. Including temporary construction areas, about 150 acres will be modified for the AFR facility. Erosion controls recommended in Federal agency guides will be followed to prevent siltation of nearby streams.

Water use during construction will average 11 gallons per minute, which is within the known ground water supply at the site. Excavation for major structures may require dewatering. This dewatering will not affect the Tuscaloosa aquifer, and its effect on the near-surface water table will be confined to the Plant areas near the construction site.

Changes in the local ecology are expected during the disruption accompanying the construction activity with a reversal of some changes to a new equilibrium after completion of these activities. No endangered species of flora and fauna are known to inhabit the AFR facility site. Carefully controlled procedures will minimize the ecological effects during construction and maximize recovery.

The air pollution potential from dust during construction will be significant only in the immediate vicinity of construction activities. Normal measures, such as water spraying, will be used to reduce dust to an acceptable level. Noise levels during construction will be of the same magnitude as those for any similar project. Levels will be monitored and workers will be protected in accordance with OSHA regulations.

A peak employment of approximately 1500 construction workers is expected. The present population within 50 miles of SRP is 700,000, and many of the construction workers will be recruited from this local population. The migration of other workers and their families into this area should have only a minor impact on existing services, such as schools, medical facilities and sanitary services.

<u>Operations</u>

The radiation exposure of the public and the work force during normal operations of the AFR facility at the Savannah River Plant will be well within all Federal guidelines. Analyses indicate that a hypothetical individual residing continuously at the site boundary will receive a maximum annual dose of less than 0.5 mrem/year. The average annual dose to workers will be approximately 400 mrem/person.

An evaluation of risks to the offsite population from an abnormal event at an AFR facility is presented in the "Draft Environmental Impact Statement, Storage of U.S. Spent Power Reactor Fuel", DOE Report DOE/EIS-0015-D (August 1978). The report concludes the maximum risk would be from a criticality accident that would cause an exposure of 20 mrem to an individual 1/2-mile away. The minimum offsite boundary is 6 miles from the AFR facility.

Thermal and nonradioactive pollutant discharges to the Savannah River and its tributaries during operation of the new facility will meet the requirements of the National Pollution Discharge Elimination System (NPDES) permit for SRP. Nonradiological releases to the atmosphere will not exceed the limitations of Federal and State agencies.

The permanent operating force of 215 workers will have substantially less impact on community services than the construction force.

SITE RESTORATION

The facility will be decommissioned when it is no longer required. Remaining spent fuel will be removed from the basins and shipped from the facility. The relatively low surface contamination levels that are characteristic of spent fuel storage facilities will allow ready decontamination of the basins and auxiliary facilities. Radioactive waste will be shipped offsite The stainless steel basin liner will likely be salvageable. The concrete basins and other structures can be dismantled and the site returned to original condition.

COORDINATION WITH FEDERAL, STATE, REGIONAL OR LOCAL PLANS AND POLICIES

Construction of the AFR facility at SRP will not conflict with any Federal, State, regional or local land use plan. There are no known Federal, State or local policies or regulations that would prohibit the construction and operation of the facility at the Savannah River Plant.

SECTION VIII

SAFETY EVALUATION REPORT

SAFETY EVALUATION

A. SUMMARY

This Safety Evaluation identifies hazards and specifies types of safety-related systems and standards applicable to this conceptual design for the AFR Facility.

B. MAJOR OR SIGNIFICANT HAZARDS AND ASSOCIATED STANDARDS

Major health, safety and fire considerations associated with the facility and standards applicable to design are as follows:

1. Radiation

Several areas will have radiation hazards requiring shielding to meet radiation exposure limits. The design bases limits for radiation exposure are $\leq$ 0.5 mrem/hr in routinely occupied areas and 5 mrem/hr in intermittently occupied areas. These limits meet the requirements in 10CFR20 which specifies radiation limits and gives the ALARA criteria. Additional guidance is provided by: ERDA Manual Chapter 0524, Reg. Guide 3.24.3, American National Standard for concrete radiation shields, and ANS-11.13/N101.6-1972.

Specific areas requiring radiation shielding considerations are:

- Cask handling, cask vent, cooling and flushing systems
- Fuel unloading pools
- Fuel storage pools
- Filter-deionizer systems for the fuel unloading pools and fuel storage pools
- Liquid and solid waste systems

2. Fire

There will be no unusual fire hazards. The project will use no highly flammable or explosive chemicals or materials.

The design includes a fire detection and suppression system that complies with the following regulations and guides:

- NRC Regulatory Guide 3.24.3, 3.24.1, 3.38
- DOE standards
- Du Pont standard industrial practice

In addition, the following design criteria apply:

- Safety-related structures, systems and components are protected so that performance of their safety related functions will not be impaired under credible fire and explosive conditions.
- Noncombustible and heat resistant materials will be used wherever practical throughout the facility, particularly in locations vital to the functioning of confinement barriers and systems.
- Combustible gas monitoring, fire detection, alarm and suppression systems will be designed to be compatible with the radiation, chemical and temperature environment in which they function.
- The fire suppression system will be sized to quench the maximum credible fire.

Proposed Regulatory Guide 1.120, Fire Protection Guidelines for Nuclear Power Plants, provides additional design guidance.

3. Non-radioactive Hazardous Materials

There will be no unusual non-radioactive hazardous materials.

Liquid Chlorine (in cylinders) will provide water purification for domestic use and control of bacteria in cooling tower water and sodium hydroxide, sulfuric acid, sulfites and phosphate will provide boiler feed water treatment and demineralized water processing. Normal industrial practices are adequate to control the hazards associated with handling these chemicals.

4. Criticality

All the spent fuel handling transfer and storage operations will limit the fuel to a subcritical configuration. The design bases limit for minimum subcritical margin in 0.05 in K_{eff}. This means the fuel operations should not produce $K_{eff} > 0.95$.

Proposed regulation 10CFR72 requires use of a "double contingency principle" to ensure subcriticality. This principle states that occurrence of a nuclear criticality event requires failure of 2 independent barriers of the control methods. For the AFR project the control methods are:

- Geometrical - Design features (hardware) limit the reactivity by controlling 1) the spacing and 2) the degree of neutron absorption in the water and materials between fuel assemblies.

- Administrative - Procedures and personnel (software) ensure that 1) no unauthorized changes occur in the geometrical control and 2) the subcritical margin exists assuming absence of geometrical control.

Thus the 2 independent control barriers, which must fail to permit criticality, may be -

Geometrical and Geometrical, or
Geometrical and Administrative

Two independent administrative barriers are not acceptable.

The design will include the following features that provide favorable geometry control in all aspects of fuel operations. These features will provide acceptable control during normal and during off-normal operations, including extreme natural phenomena:

- Design of the fuel unloading pool will preclude cask tipping and spilling fuel assemblies.

- Design of fuel assembly storage baskets will provide adequate fuel assembly spacing to ensure the subcritical margin exists.

- Fuel basket design will prevent fuel assemblies spilling into an uncontrolled array if the basket drops during transport.

- Fuel basket arrays will be structurally compatible with seismic design criteria.

- Design of failed-fuel containers will provide adequate fuel assembly spacing to ensure the subcritical margin.

- Equipment servicing the unloading pools or the storage pools will not fail in a manner that disrupts fuel storage arrays during extremes of natural phenomena.

- A single failure of equipment servicing the unloading pool or the storage pool during normal operation will not crush or disrupt the fuel storage, causing a nuclear criticality event.

The design will include nuclear criticality monitors and alarms in areas where there is potential for nuclear criticality.

In addition to proposed Regulation 10CFR20, Regulatory Guide 3.24.3 and American Nuclear Society Standards ANS 8.1/N16.1-1975, ANS 8.7/N16.5-1975 provide general guidance for nuclear criticality controls.

5. Operating Errors

The design will ensure that no single operating error can cause an incident having unacceptable safety consequences. For example, fuel handling equipment will ensure that no single operating error causes a nuclear criticality event in the fuel storage arrays.

Proposed Regulation 10CFR72 (Section 72.91) requires a training and certification program for personnel to operate the facility. Manipulation of safety-related equipment and controls will be limited to trained personnel or, in an emergency situation with direct supervision, to an individual with adequate training in such operation. Supervisory personnel who direct the manipulation of safety-related equipment and controls will have a level of training in such operations comparable to that of trained operating personnel.

6. Seismic and Tornado

Proposed Regulation 10CFR72 requires that structures, systems and components important to safety be designed to withstand the effects of earthquakes and tornadoes, excluding tornado missiles.

Proposed Regulation 10CFR72 defines the design bases earthquake as a peak horizontal ground acceleration of not greater than 0.25g with a recurrence interval of at least 500 years. This recurrence interval is equivalent to a 90% probability of not being exceeded in 50 years. Regulatory Guide 1.60 gives the design response spectra for the design bases earthquake.

Regulatory Guide 1.76 gives the design requirements for tornadoes. The assumed location of the AFR project is at Savannah River Plant (SRP). SRP is in Region 1 of the USA and the design bases tornado has a maximum windspeed of 360 mph.

Specific areas that will require seismic and tornado consideration:

STRUCTURE SYSTEM OR COMPONENT

Fuel unloading and storage pool
Storage baskets/anchors
Cranes
Building structure above ppols
Emergency water makeup pool
  delivery system
Pool-level monitor instrumentation
Deionizers and filter systems
Evaporators concentrate Tanks

The design will prevent the crane from collapsing into storage pools or dropping heavy equipment onto stored fuel.

7. Respiratory

Normally no respiratory protective equipment will be necessary except for fuel cool down and cask decontamination operation and for performance of some maintenance and non-routine operating functions.

Abnormally high levels of activity in the pools could require the use of respiratory protection.

C. PRIMARY HEALTH, SAFETY AND FIRE PROTECTION SYSTEMS INCLUDED IN THE DESIGN

1. Radiation

Shielding and other design considerations that will be required to reduce personnel radiation exposure in the design listed in Section B-1 are as follows:

- Cask Handling, Cask Vent, Cooling and Flush System

  Typical radiation levels near the cask during the various cask handling operations will be low and will require no special design considerations beyond reducing exposure to hot cask surfaces after removal of impact structures, heat shields and other hardware.

The cask will vent to an off-gas system that contains a condenser, liquid collection tank, carbon absorption bed, HEPA filter and vent gas sampling system that permits radioactivity tests that may reveal unexpected fuel failures.

If the fuel requires cooldown prior to immersion in the fuel unloading pool, the cooling will be by injection of steam followed by water to reduce the temperature of the fuel gradually. The cooling water will be collected in a hold tank for subsequent disposal in the liquid waste system. Flushing the cask interior with water may be necessary to reduce the level of contamination prior to unloading in the fuel unloading pool. The vent, cooling and flush piping system and tank will have shielding that reduces radiation levels to below the design bases limits.

- Fuel Unloading Pools

Fuel handling outside the cask will be entirely underwater. An overhead crane unloads fuel vertically from the cask within the fuel unloading pool. The pool's water level systems provide 13 ft of water shielding over the fuel, limiting the radiation to $\leq$ 0.5 mrem/hr. Positive mechanical devices prevent the overhead crane from raising the fuel above a safe shielding depth of water.

The pool water may be a source of radiation because of small amounts of dissolved or entrained radioactive material released from failed fuel and from radioactive products ("crud") on the external surfaces of all fuel. A filter-deionizer system will remove particulates and dissolved radioactive contaminants and maintain the normal pool water activity at $\leq 2 \times 10^{-4}$ uCi/ml.

The pool water level control system will consist of monitors, alarm and automatic water makeup systems. The monitors will be float-activated switches which sound visual-audible alarms when the water level is low. Additionally, the design of inlet and outlet water lines for the pool will prevent siphoning of water from the pool.

The unloading pools will have a stainless steel liner. This liner will be the primary water containment envelope. Leak channels behind all welded joints will be monitored to signal a breach of the liner. The bottom of the pool has an impact structure that will prevent failure of the pool in the unlikely event a cask drops during handling operations.

- Fuel Storage Pools

All the special design considerations that C.1 described for the Fuel Unloading Pools apply also to the Fuel Storage Pools, except the impact structure is not required. In addition, the water recirculation system will include a heat exchanger to maintain the fuel storage pool water temperature below 40°C when the storage pools are filled with spent fuel to the design capacity. At the design bases, the decay heat load will cause the pool water to boil if there is no cooling in about 50-60 hours. Boiling will not affect safety. Evaporative loss of basin water equivalent to 60 to 75 gpm would occur under boiling conditions. Water would be added from wells, the emergency cooling water pond or from the Savannah River as necessary to maintain the water level.

The emergency water pond will provide makeup water lost from the fuel storage pools by boiling for 30 days. The emergency water pond will meet seismic and tornado design criteria.

- Filter-Deionizer Systems

The filter-deionizer and deionizer waste disposal systems for the fuel unloading and fuel storage pools will normally contain large amounts of radioactivity requiring shielding. These facilities will be in concrete shielded cells and will be operated by remote control. Contact (hands on) maintenance for some of these facilities will be possible after flushing and decontamination to reduce radiation levels. But equipment requiring extensive decontamination before contact maintenance will be replaced (to reduce downtime) and transferred to a shielded cell for decontamination.

- Liquid and Solid Waste Systems

Liquid Waste System

The liquid waste disposal system will have feed tanks, pumps and evaporators for collection and concentration of the various radioactive liquid wastes generated in this facility. These facilities will require moderate concrete shielding. Remotely operated valves will be used. Manual valves will be operated by extension handles through sleeves in the shield wall where feasible. Automatic valves will be used elsewhere. Contact maintenance will be possible after emptying and cleaning the equipment to reduce the radiation levels to below the design bases limit.

2. Fire Protection System

Fire Detection

Fire detection devices and alarms will be at strategic locations throughout the facility, as the reference standards require. Fire alarms will also be in the central control room and in the Security Headquarters building.

Fire Suppression Systems

Failure of any fire suppression system during design bases natural phenomena (earthquake, tornadoes, etc.) will not cause failure of safety-related equipment.

The design will include the following fire suppression systems:

TYPE	LOCATION
Water sprinklers	Administrative Building
	Basin building solid waste handling area. The area will be surrounded by a fire wall.
Halon system	Basin building electrical and instrument control rooms.
	Emergency diesel fuel oil storage and switchgear.
Portable fire extinguishers	Location per reference standards in Section B-2.
Fire hydrants and hose boxes	Location per reference standards in Section B-2.

3. Non-radioactive Hazardous Materials

No special design features will be necessary. Standard industrial design features and practices will be adequate for handling such materials as detergents, paints, solvents and such water treatment chemicals as chlorine, sodium hydroxide and sulfuric acid used for water treatment at the powerhouse.

4. Criticality

An echelon of controls will ensure compliance with the nuclear safety requirements of Section B-4. The overall criterion is that no single hardware failure or single operating error can cause a nuclear incident having unacceptable consequences. Implementation of this criterion will be by design feature and by a series of administrative controls.

Design provisions which will be incorporated for nuclear safety are as follows:

- The building structure will be fully resistant for natural phenomena, per design criteria in Section B-6, in areas where the fuel is out of a cask.
- Heavy structural members will support the crane rails and the roof.
- The roof and siding will be a standard type construction.
- Physical restraints will prevent the cask crane from passing over the storage pools.
- Transfer aisles (canals) and storage crane lifting limits will preclude movement of a loaded basket over other loaded baskets.
- The fuel handling cranes will have electrical and mechanical devices that will prevent lifting storage baskets above a safe shielding depth of water.
- The fuel unloading pool design will make tipping of a cask impossible to the extent that fuel assemblies will fall out.
- The project will have a Nuclear Incident Monitoring (NIM) system at locations of potential nuclear criticality events. Two NIM units will be in each fuel handling area. Local alarms will be at each NIM location. NIM recorders with alarms will be at a continuously occupied control room. At least one functioning NIM unit will be in service at each location or operations will be stopped.

5. Operating Errors

A formal training and certification program for operating personnel will comply with the requirements of proposed 10CFR72, as Section B-5 specifies.

The project operation will use a system of approved standard operating procedures as part of the administrative control system that minimizes operating errors.

6. Seismic and Tornado

Equipment and facilities that will withstand the design bases earthquake will be:

EQUIPMENT	PERFORMANCE CRITERIA
Fuel unloading and storage pools	No loss of functional integrity.
Storage baskets anchors	No loss of functional integrity.
Cranes	Cranes will not collapse into storage pools. Cranes will not drop heavy equipment onto stored fuel.
Building structure	Building structural steel will not collapse onto pools.
Emergency makeup pond and delivery system	No loss of functional integrity. Delivery system will be accessible for use following an earthquake.
Pool level monitoring instrumentation	No loss of functional integrity.

Equipment and facilities that will withstand a design bases tornado will be:

EQUIPMENT	PERFORMANCE CRITERIA
Fuel unloading and storage pools	No loss of functional integrity.
Storage baskets anchors	No loss of functional integrity. Damage of fuel from tornado missiles will not cause a radioactive release above federal guidelines.
Cranes	Cranes will not collapse into storage pools. Cranes will not drop heavy equipment onto stored fuel.
Building structure	Heavy building structural steel will not fall or be blown onto pools.

EQUIPMENT	PERFORMANCE CRITERIA
Emergency makeup pond	No loss of functional integrity.
Deionizers and filters	No dispersal of contaminated resin.
Evaporators	No dispersal of evaporator bottoms.
Solid Waste	Drums caged to prevent dispersal of drummed waste.

7. Respiratory

The project will have a breathing air system which includes a non-oil lubricated air compressor, after-cooler, receiver, filters and a piping distribution system. Compressed air cylinders will be the emergency backup for this system.

Portable respiratory protection equipment stations will store self-contained respiratory protection equipment (respirators, assault masks, and contained fresh air paks).

In addition to the facilities that will be provided to control the specific hazards, the following systems and considerations will be included in the design:

1. Emergency Power (Equipment and Lighting)

The design will include emergency power for lighting, communication systems and safety-related monitors, alarms, and equipment. In addition, emergency power will supply that process equipment deemed essential to safe shutdown of the facility on loss of normal power. Emergency power for the safety-related equipment will comply with IEEE std. 308-1975. American National Standard ANS-59-5 1/N195-1976 and IEEE Std. 387-1972 provide additional design guidance for emergency diesel-generator power sources.

- Emergency Diesel Generators

  An emergency diesel generator will provide electrical power for the following buildings and services:

Security Headquarters	- Emergency lighting security building - Emergency lighting for security fense and outside lights - Emergency alarm systems
Basin Building	- Emergency lighting

- Instrument air compressor
- Breathing air compressor
- AC-powered safety-related monitors and alarms

- Battery Operated System

Security Headquarters	- Battery operated wall mounted lights - Communications systems
Basin Building	- Battery operated wall mounted lights - DC-powered safety-related monitors and alarms - Communications systems
Other Buildings	- Battery operated wall mounted lights

2. Fire Life Safety Code

The building designs will comply with the National Fire Code Standard 101 issued by the National Fire Protection Association. This standard defines building entrance-exit requirements and related safety features.

3. Industrial Safety

There will be no unusual industrial safety hazards. Existing Du Pont industrial safety practices and design standards are adequate. Industrial safety features required by the Department of Energy (DOE) will be included in the design.

4. Detection and Monitoring Systems

The design will include the following radiation detection and monitoring systems.

- Radiation Monitors

  Radiation measuring and recording monitors will be located throughout the basin building.

- Air Monitors

  Facilities will be provided for sampling the ventilation air in the building and for monitoring airborne radioactive contaminants. A stack monitor will measure and record radioactive releases to the atmosphere.

- Basin Level Leak Detection System

  Basin water level and leak detection collection systems will provide a check on integrity of the stainless steel liners in the fuel unloading and fuel storage pools.

- Nuclear Incident Monitoring System

  A nuclear incident monitoring system will provide for detection of a criticality incident. The system will use redundant monitors at each potential criticality location. American National Standard ANS-8.3/N16.2-1969 provides additional design guidance.

- Environmental Monitoring Systems

  A system of monitoring stations and wells will permit sampling and monitoring vegetation, soil, surface and ground water for radioactivity.

5. Sanitary and Change Room Provisions

The design will provide separate sanitary and change room facilities for male and female employees in accordance with OSHA and Du Pont standards. These facilities will include clean (non-radioactive contaminated) and regulated (potentially radioactive contaminated) sanitary and change facilities for personnel working within the AFR building.

6. Ventilation

- Building Ventilation System

  The ventilation system design will comply with standard industrial practice to provide for protection, comfort and safety of operating personnel during normal operation. The system will restrict the spread of radioactive contamination within the facilities and the release of radioactive particulates to the environs will not exceed that allowed in the federal guidelines.

  The process areas ventilation system will provide once-through flow of air. Inlet air will pass through roughing filters to remove the bulk of particulate matter in ambient air. Air locks at entrances will control in-leakage of air. Flow of air will be from areas with lesser potential for radioactive contamination to areas with higher potential for contamination.

Comfort conditioning with temperature and humidity control will meet Du Pont standards for the normally "clean" areas including offices, lunch rooms, conference rooms and control rooms. The ventilation system will provide comfort conditioned air for the cask preparation and unloading area and for the regulated shops.

With a few exceptions, ventilation air from all areas of the building will exhaust unfiltered to the atmosphere via a 200-ft stack. The exceptions will be the shielded process areas, solid waste handling area and regulated shops. Exhaust air from these areas will pass through a single stage HEPA filter before discharge to the atmosphere via the stack.

- Process Off-Gas System

The cask vent system will have a carbon absorption bed for removal of volatile fission gases as well as a single stage of HEPA filters before discharging the off-gas to the stack. Failed fuel containers will collect and contain fission gases released from fuel assemblies which may develop cladding failures during storage. This collection system will tie into the cask vent off-gas system.

7. Occupational Illnesses

The design will have a medical station for emergency treatment of industrial accident victims and for remedial treatment of minor illnesses. A doctor and a nurse will provide the medical staff during day-shift operation, with call-in service for the other shifts. Accident victims will transfer to other more comprehensive medical facilities after emergency treatment. These other facilities may be community hospitals or the SRP main medical facility.

In addition to the medical station, the design will have first-aid stations and equipment at several locations. Trained operating personnel will provide first-aid before transferring victims to the medical station for emergency treatment.

8. Industrial Safety

The design will have features that deal with typical industrial hazards such as falls, slips, burns, pinch-points, drownings. And it will have special design features that deal with more catastrophic accidents:

- Falling Stack

  The 200' tall ventilation stack will not be seismic resistant. The design places the stack far enough from the other facilities that, during seismic event, the stack will not fall on buildings or areas where people normally congregate.

9. Chlorine Release

   The design will have liquid chlorine to purify water for domestic uses. The design will enclose the chlorine cylinders in a small building that will have an air change every 3 minutes. Chlorine detectors and alarms within the enclosure warn of chlorine leaks.

10. Oil Spill or Fire

    The underground diesel fuel oil storage tank will have a filling station designed to contain any spill. The containment will prevent spreading of fire to other facilities in the event spilled oil would catch fire.

11. Railway or Road Accidents

    The very slow speed that trucks and rail carriers will be moved on the plant site and in the process building reduce the probability and consequences of accidents. Bumpers capable of stopping moving loads will be provided at the ends of railroad and inside of the process building.

12. Compliance with DOE Chapter 0550 Standards

    The design will comply with applicable standards of DOE Manual Chapter 0550. This chapter encompasses a wide range of safety features and other design criteria.

SECTION IX

ENERGY CONSUMPTION

ENERGY CONSUMPTION

The energy requirements for this facility are estimated to be 93,000 equivalent barrels of oil per year, derived from following loads:

Peak Building Heating	11×10^6 Btu/hr
Peak Building Cooling	400 tons
Average Electrical-Lighting Cooling and Ventilation	1500 kW
Process Average Steam	20,000 lb/hr
Process Average Electrical-Pumps, cranes and other miscellaneous process	3800 kW

SECTION X

OBJECTIVE SCHEDULE

OBJECTIVE SCHEDULE

Schedule Assumptions

The basis for the appraisal schedule was a request by the Department of Energy to have facilities ready to receive and store fuel by December 1982. To meet this schedule, Du Pont would have an Engineering Contractor, experienced in designing fuel storage basins at reactor sites or reprocessing plants, design all facilities related to nuclear safety. Du Pont would design all remaining facilities such as site, sanitary and process waste treatment plants, wells, sewers, roads, railroads, steam plant, and purchased and power substations.

Construction would be by Du Pont on a 40-hour work week, working 2 shifts per day. The minimum facilities scope, shown in Figure 1, would be ready for receipt of fuel by January 1983. Remaining facilities would be turned over later, as shown. Although the facilities are expected to be licensed by the NRC, the effects of licensing and related Quality Assurance on the schedule are not included and the schedule is based on Du Pont's design and engineering practices. The schedule is considered very tight and it is judged that failure to meet the schedule shown in Section X, Sheet 4, will result in a later startup.

Although the effects of licensing on schedule are not included, Du Pont, with the agreement of the Department of Energy, has developed a licensing plan and is proceeding with the study of a site on the Savannah River Plant in accordance with Working Paper "A" Regulatory Guide 3.24.1, "Standard Format and Content of License Applications for the Storage of Spent Fuel in an Independent Spent Fuel Storage Installation (ISFS) (Water Basin Type)". This study is summarized in the Conceptual Design Plan shown in Section XV.

Schedule Development

The schedule was developed using a computerized network that showed the sequence of the significant activities and their inter-relationship. This schedule was validated by comparing it with schedules from other Du Pont projects of similar size and type.

FIGURE 1

AFR
MINIMUM FACILITIES REQUIRED FOR RECEIPT OF FUEL

- Preparation Area
- Carrier Washdown Area
- Fuel Unloading Area
- One Storage Pool
- Fuel Storage Pool Process Area
  - One Filter-Ion Exchange System
  - Fuel Unloading Pool Water Hold Tank and Recirculating Pump
  - Resin Dewatering and Resin Backwash System
  - Resin Mix and Transfer System
- Process Area
  - Decontamination Solution Waste Collection System
  - Cask Cool Down System
- Waste Handling Area
  - General Purpose Evaporator
  - Solid Waste Handling Facilities
- Emergency Cooling Water Pond
- One 18,000 Pound Per Hour Steam Generating Plant
- Cooling Tower
- Two 1000 GPM Wells
- Clean Process Waste Treatment Facility
- Electrical Substation
- Emergency Power Generator
- Roads & Railroads
- Safeguards
- Fire Water System

SCHEDULE[1]

FY		
78	12/77	Transmit Venture Guidance Appraisal
79	10/78	Transmit Current Appraisal for FY'80 Budget
	10/78	Authorize Funds for Design and Limiting Procurement
	10/78	Approve Start of Engineering Contractor Selection
	5/79	Approve Engineering Contractor
	6/79	Order Purchase Power Substation
	8/79	Order Steam Boilers
	9/79	Order Pool Liner Material
	9/79	Issue Well and Well Equipment Specifications
80	11/79	Authorize Construction Project
	11/79	Start Clearing and Grubbing Site
	12/79	Issue Site Design
	1/80	Start Full-Scale Construction
	6/80	Issue Pool Liner Design and Start Fabrication
	7/80	Release Fabrication of Structural Steel
81	1/81	Complete Design
	2/81	Complete Delivery of Structural Steel
82		
83	10/82	Turn Over Minimum Facilities to Receive Fuel
	1/83	Receive Fuel
	2/83	Turn Over Second Basin
84	1/84	Close Project

(1) Based on normal Du Pont practices for the Department of Energy at Savannah River and does not include the effects of licensing by the Nuclear Regulatory Commission.

SECTION XI

BUDGET APPRAISAL SUMMARY

SUMMARY ESTIMATE OF TOTAL COST

ITEM	Cubic Feet	(DOLLARS IN THOUSANDS) ITEM COST	TOTAL COST
1. Administrative Department, Engineering Construction and Engineering Design at 18% of Construction Costs (Definitions on next page)			31,300
2. Construction Costs			172,500
a. Storage Basin Building		65,600	
Total Building (6,050,000CF) consists of the following sections. Dimensions shown are Approximate.			
Section	Cubic Feet		
• Carrier preparation	350,000		
• Carrier Washdown	650,000		
• Cask Cool/Wash & Decon.	550,000		
• Fuel Unload Pool	500,000		
• Fuel Storage Pool	1,500,000		
• Fuel Storage Process Equipment	950,000		
• Cask Handling Process Equipment	750,000		
• Supplemental Facilities	800,000		
b. Equipment for Storage Basin Building		59,900	
• Receiving, Washing and Unloading	10,800		
• Fuel Storage	35,300		
• Pool Decontamination	1,900		
• Evaporators	7,000		
• General Support	4,900		

ITEM (continued)	(DOLLARS IN THOUSANDS) ITEM COST	TOTAL COST
c. PG&S Buildings and Equipment	47,000	
SUBTOTAL (Items 1-2)		203,800
3. Contingencies[(1)] at Approximately 32% of Above Costs		66,200
TOTAL PROJECT COST		270,000

(1) Contingencies include financial risk allowance ($47,300,000 and design allowance ($18,900,000).

DEFINITION OF TERMS:

1. Administrative Departments (AD) - Primarily the salary and expenses of the Energy and Materials Department procurement and expediting effort. Also includes, as appropriate, direct charges from other staff departments such as Transportation and Distribution plus Finance Department for auditing services.

2. Engineering Construction (EC) - Consists of the following:

- Construction Division Wilmington Office
- Quality Assurance Engineering (Inspection of equipment purchased from vendors)
- Cost of Engineering Department computer services
- Cost Accounting and Cost Control
- Estimating

3. Engineering Design (ED) - The cost chargeable to a project for design work.

SECTION XII

ESCALATION

ESCALATION INCLUDED IN APPRAISAL

Based on CY - 1978 dollars the escalation rates (% per year) for this project are as follows:

Calendar Year	1978	1979	1980	1981	Beyond
Labor	10	10	8	8	6
Material	7	6	6	6	6

The appraisal includes $42,484,000 for escalation.

SECTION XIII

EXCLUDED COSTS

EXCLUDED COST

The budget appraisal covers all facilities and equipment required, with the following exceptions:

- Baskets for storing 4000 of the 5000 MTHM. (Baskets for 1000 MTHM are included in the appraisal.)
- Office furniture and equipment. (Items will be furnished with cost funds.)
- Spare parts. (Parts will be provided as required on cost or plant capital projects.)
- Decommissioning (Funds will be provided by a future project.)

SECTION XIV

COST AND OBLIGATION SCHEDULE

CAPITAL COST[1] AND OBLIGATION SCHEDULE

	SPENDOUT[2] (DOLLARS IN THOUSANDS)		OBLIGATION[2] (DOLLARS IN THOUSANDS)	
	DESIGN	CONSTRUCTION	DESIGN	CONSTRUCTION
FY '79	5,000	0	5,000	6,000[3]
FY '80	11,000	10,400	26,300	45,000
FY '81	8,200	97,200	-	60,000
FY '82	4,400	79,100	-	78,000
FY '83	2,300	48,300	-	47,000
FY '84	400	3,700	-	2,700
	31,300	238,700	31,300	238,700

(1) See the Conceptual Design Plan for Study Cost.

(2) Spendout Cost and Obligation includes:

Design -- Administrative Departments, Engineering Construction, and Engineering Design.

Construction -- Indirect Field Costs, Contracts, Labor, Field Material, Wilmington Material and Contingencies.

(3) Cancellation charges for limiting equipment in the event the construction project is not authorized. Spendout is expected to be zero in FY '79 because there are no equipment deliveries in FY '79.

SECTION XV

CONCEPTUAL DESIGN PLAN

CONCEPTUAL DESIGN PLAN (Revised 9/26/78)

PROJECT TITLE: Away From Reactor Spent Fuel Storage Facility

ESTIMATED PROJECT COST: $270,000,000

CONTRACTOR: E. I. du Pont de Nemours & Company, Inc.

ESTIMATED CONCEPTUAL DESIGN COST FOR WORK REQUEST 860762:

FY '78	$925,000
FY '79	25,000
TOTAL	$950,000

ESTIMATED SITE STUDIES COST FOR WORK REQUEST 860815:

	Spendout	Obligation
FY '78	$ 120,000	$1,200,000
FY '79	1,080,000	--
TOTAL	$1,200,000	$1,200,000

ESTIMATED QA MANUAL SUPPLEMENT COST FOR WORK REQUEST 860839:

FY '79	$400,000
TOTAL	$400,000

ESTIMATED ENGINEERING STUDIES COST FOR WORK REQUEST 860874

FY '79	$500,000
FY '80	500,000
TOTAL	$1,000,000

DESCRIPTION OF PROPOSED WORK:

Conceptual Design activities include:

1. Investigate the following alternative cases for storage at Savannah River Plant of spent LWR fuels from commercial power reactors.

   - Use of R Reactor Basin
   - Construct an addition to RBOF
   - Construct an independent facility in the 200 Area
   - Construct an independent facility in a new area

2. Prepare venture guidance appraisals for the first three alternative cases. The appraisals will be based on information from SRL and preliminary building arrangement drawings.

DESCRIPTION OF PROPOSED WORK: (Continued)

3. Update the venture guidance appraisal for the new independent facility.

4. For the independent facility, prepare block flow diagrams, flow sheets, piping diagrams, building arrangement drawings.

5. Determine design requirements to meet licensing criteria.

6. Prepare Process and Specialist's scope of work.

7. Prepare a current appraisal of cost for FY '80 budget purposes.

8. Develop objective schedule for the construction project.

9. Prepare authorization papers for FY '79 Design and limiting equipment procurement projects.

10. Initiate formal QA assessments of facilities.

11. Initiate Engineering studies for the independent facility:

    - Verify Design assumptions, conformance to licensing criteria and cost allowances.
    - Study alternative processing concepts and material flow arrangements.
    - Determine vendor capabilities and limitations.
    - Develop design of specialized process and material handling equipment.

QA MANUAL SUPPLEMENTS INCLUDE:

1. Prepare manual supplements.

SITE STUDIES INCLUDE:

1. Regional Geologic Investigation

2. Site Survey

3. Site Geologic Investigation

4. Groundwater and Surface Water Hydrology Investigation

5. Vibratory Ground Motion

6. Surface Faulting

7. Geotechnical and Subsurface Investigation

8. Laboratory Testing

SITE STUDIES INCLUDE: (Continued)

9. Geophysical Investigation

10. Quality Assurance

11. Engineering Analyses

ENGINEERING STUDIES INCLUDE:

1. Prepare plans and schedules.

2. Prepare preliminary specifications for limiting equipment.

3. Continue engineering studies for the independent facility.

4. Provide information as required for the SAR.

5. Continue formal assessment of facilities.

CONCEPTUAL DESIGN PERFORMANCE SCHEDULE:

Transmit VGAs for alternate cases in December 1977.
Transmit CAB by September 1978.
Transmit Conceptual Design Report by December 1978.

SITE STUDIES PERFORMANCE SCHEDULE:

Complete site studies for integration in the SAR 5-6 months after the following approvals:

- D'Appolonia contract by DOE
- Driller contract by DOE
- Building location by AED and DOE

ENGINEERING STUDIES PERFORMANCE SCHEDULE:

Continue Engineering studies in FY '79 and FY '80.

QA MANUAL SUPPLEMENT PERFORMANCE SCHEDULE:

Prepare manuals supplements 9 months after Work Request authorization.

SECTION XVI

SCOPE OF WORK

CONTENTS

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A. INTRODUCTION

1. General Description

The Away-from-Reactor Spent-Fuel Storage (AFR) Facility at the Savannah River Plant will be a totally independent installation containing two pools, each capable of storing 2500 metric tons of heavy metal (MTHM) from pressurized-water-reactor and boiling-water-reactor commercial power plants. The design contains provisions for orderly expansion. When the AFR facility begins operation, it will receive and store spent-fuel assemblies at a rate of 3.3 MTHM per day. Plans for future expansion provide for increasing the processing rate and storage capacity. The spent fuel will be delivered by truck or rail carrier in special heavily shielded shipping containers (casks), and the facility will be equipped to handle the seven different types of cask expected.

2. Basis

This scope of work is based on a Technical Data Summary titled Spent Fuel Handling and Storage Facility for the International Spent Fuel storage Program, DPSSTD-ISFS-78-7. Information has also been used from National Lead Industries (NLI), Receiving Basin for Off-Site Fuel (RBOF) at the Savannah River Plant, Allied-General Nuclear Services (AGNS) at Barnwell, South Carolina, and the General Electric storage basin at Morris, Illinois.

3. Safety

The fuel-storage pools will contain radioactive fuel assemblies. Some radioactive contamination of the water in these pools will occur. This is partially due to the leaching of assembly surface contamination and leaking from damaged fuel assemblies. The radioactive contaminants will consist mainly of cesium and cobalt. These will be contained in the storage pool water which is required for shielding (13 feet minimum of water level from top of assemblies) at all times when assemblies have been or are being removed from their shipping casks. Also, to prevent excessive buildup of radioactivity levels in the pool water, it will be necessary to provide a water-purification system that can maintain the water quality and limit normal radioactivity levels to less than 2×10^{-4} curie per cubic meter.

The fuel assemblies must be stored in such a way as to prevent criticality. This will be accomplished by adequate spacing and the use of poison material (borated stainless steel or aluminum) in the fabrication of the storage basket.

The fuel storage baskets will be designed to withstand basin hydraulic effects during a seismic occurrence and will be secured to the bottom of the pools in a grid system that will prevent bumping and tipping.

Because of the presence of radioactive materials, it is essential that the pools and water-purification equipment be designed and built to withstand seismic and tornado occurrences as well as provide adequate shielding.

Backup power will be provided by an emergency diesel generator capable of producing 750kW. This will enable the plant to maintain operation of all critical monitoring and safeguard equipment. Also a backup water source will be provided consisting of a pond that contains a 30-day supply. This is based on a 75-gpm evaporation rate of the storage pools when boiling. These systems will maintain the safety of the plant and the environment in case of a seismic or tornado event.

The basis for isolating equipment containing radioactive materials using concrete walls is as follows:

- Shielding from personnel in normal operating and/or maintenance access areas. Exposure is limited to less than 0.5 mrem/hr.

- Shielding from personnel in restricted areas. Exposure is limited to 5 mrem/2 hrs (2.5 mrem/hr).

For the storage pools, this represents approximately 4-foot thick concrete and other shielded areas approximately 3-foot thick concrete.

4. <u>Safeguards</u>

Plant safeguards will consist primarily of a chain-link perimeter fence mounted on 2-inch pipe post imbedded in concrete with a 1-foot extension arm carrying barbed wire.

Two gates each with a guardhouse will be required, one for the rail system the other for truck and personnel access. Closed-circuit television monitors and floodlights will be installed along the fence to permit detection of intruders. The TV monitors will consist of seven units mounted in weatherproof housing and controlled from the main guardhouse monitoring station next to the Administration Building. Each monitor will include a pan and tilt motor and zoom lens controlled remotely with a switching capability for camera selection.

A patrol roadway will be provided along the fence with lighting consisting of 400-watt sodium-vapor fixtures mounted on 45-foot galvanized-steel tapered poles. All cables will be buried underground.

The safeguards will also be supplemented by a communication system consisting of:

- A public address system that will be plant wide.
- A security alarm system that will be independent of the public alarm system.
- Nuclear incident monitor Bell systems for evacuation alert in the event of a radioactive relase.

5. <u>Regulations</u>

The AFR facility will be licensed by the U. S. Nuclear Regulatory Commission (NRC); therefore, adherence to applicable codes and regulations will be maintained.

Design guidance has been given by the NRC in its Regulatory Guide 3.24.3. This, as well as other applicable guides, will be used in conjunction with the requirements of quality assurance and the Code of Federal Regulations (Title 10, Part 50, Appendices A, B, and P).

6. <u>Design-Area Identification</u>

Design area (DA) numbers have been assigned as follows:

	Design Area Number
. Buildings	B200-B299
. Process areas inside the AFR Building	B300-B399
. Supplementary process facilities inside the AFR building	B400-B499
. Waste-handling facilities	B500-B599
. Administration facilities	B700-B799
. Power, general, and service equipment	B900-B999

B. SITE

1. General Description

The AFR site is located at the Department of Energy (DOE) Savannah River Plant in Barnwell County, South Carolina designated B (in Figure 1), near the center of the site. The proposed location is north of the intersection of roads 6 and C. The selection of the site was based on the following criteria:

- Nearby roads and railroads
- Terrain
- Independence from existing sites
- Drainage
- Ample room for expansion
- No interference with the operation of other areas
- Visual isolation

Approximately 150 acres of this 330-acre site will be cleared. This will facilitate temporary construction facilities, area drainage, and the construction of the new facility.

The cleared site will be fenced as shown in the plot plan and as described in Section I.4, Safeguards. (Figure 2).

2. List of Buildings

The following buildings and facilities will be located on the site:

- AFR spent-fuel storage building (DA B240) including
    - The exhaust stack (DA B291)
    - Fan house (DA B292)
    - Radwaste storage and disposal facility (DA B541)
    - Radwaste evaporator facility (DA B542)
- Truck receiving, warehouse, and refrigeration building (DA B244)
- Sanitary treatment building (DA B252)
- Emergency diesel-generator building (DA B254)
- Waste treatment building and facilities (DA B258)
- Powerhouse and demineralized water treatment building (DA B284)

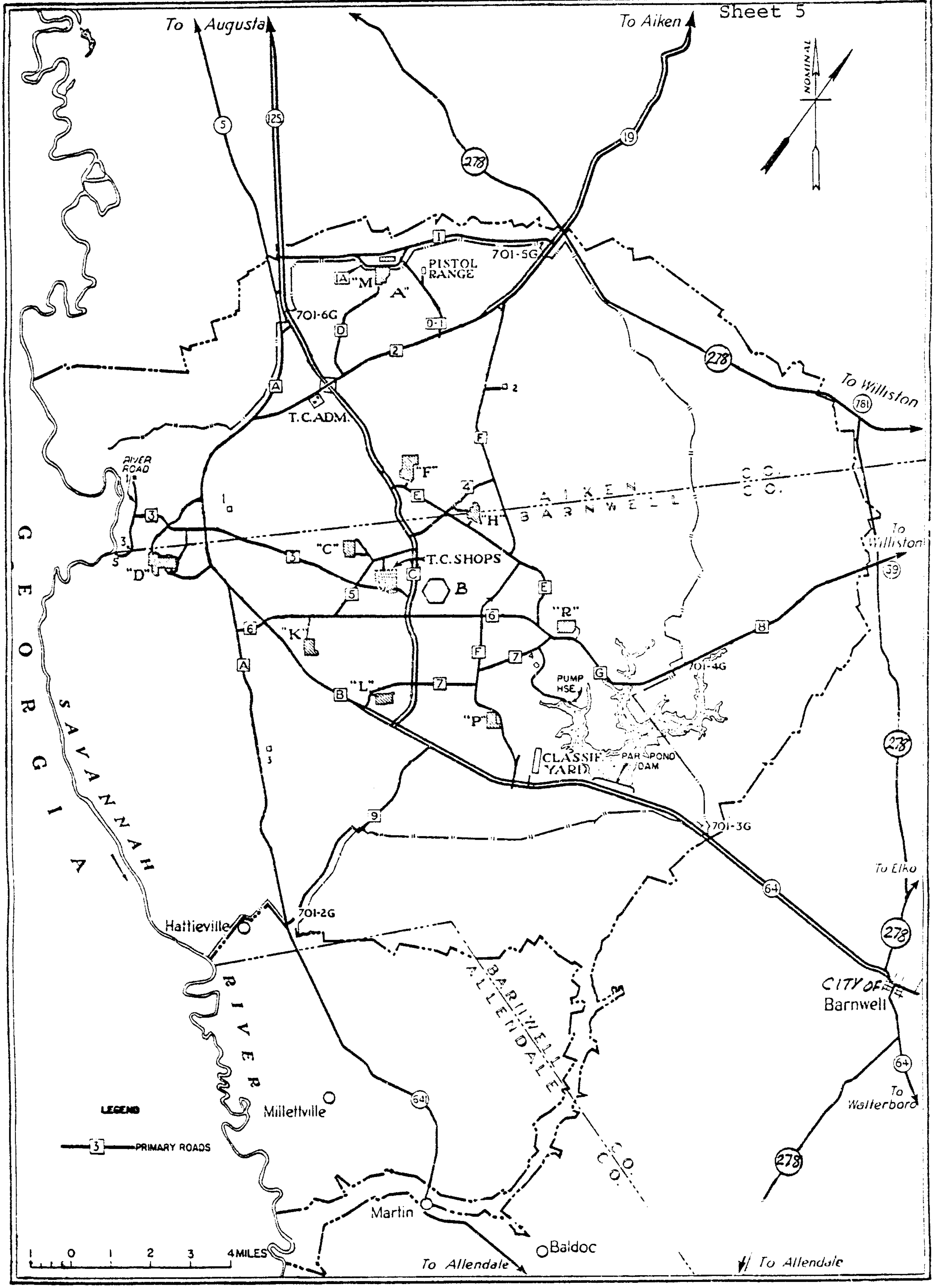

To Augusta
To Aiken
NOMINAL
To Williston
To Williston
To Elko
To Walterboro
To Allendale
To Allendale
PISTOL RANGE
701-5G
701-6G
701-4G
701-3G
701-2G
T.C.ADM.
T.C.SHOPS
RIVER ROAD
"M"
"A"
"F"
"H"
"C"
"D"
"K"
"L"
"P"
"R"
B
AIKEN CO.
BARNWELL CO.
BARNWELL CO.
ALLENDALE CO.
PUMP HSE.
CLASSIF. YARD
PAR POND DAM
GEORGIA
SAVANNAH RIVER
Hattieville
Millettville
Martin
Baldoc
CITY OF Barnwell
LEGEND
PRIMARY ROADS
4 MILES

Figure 1

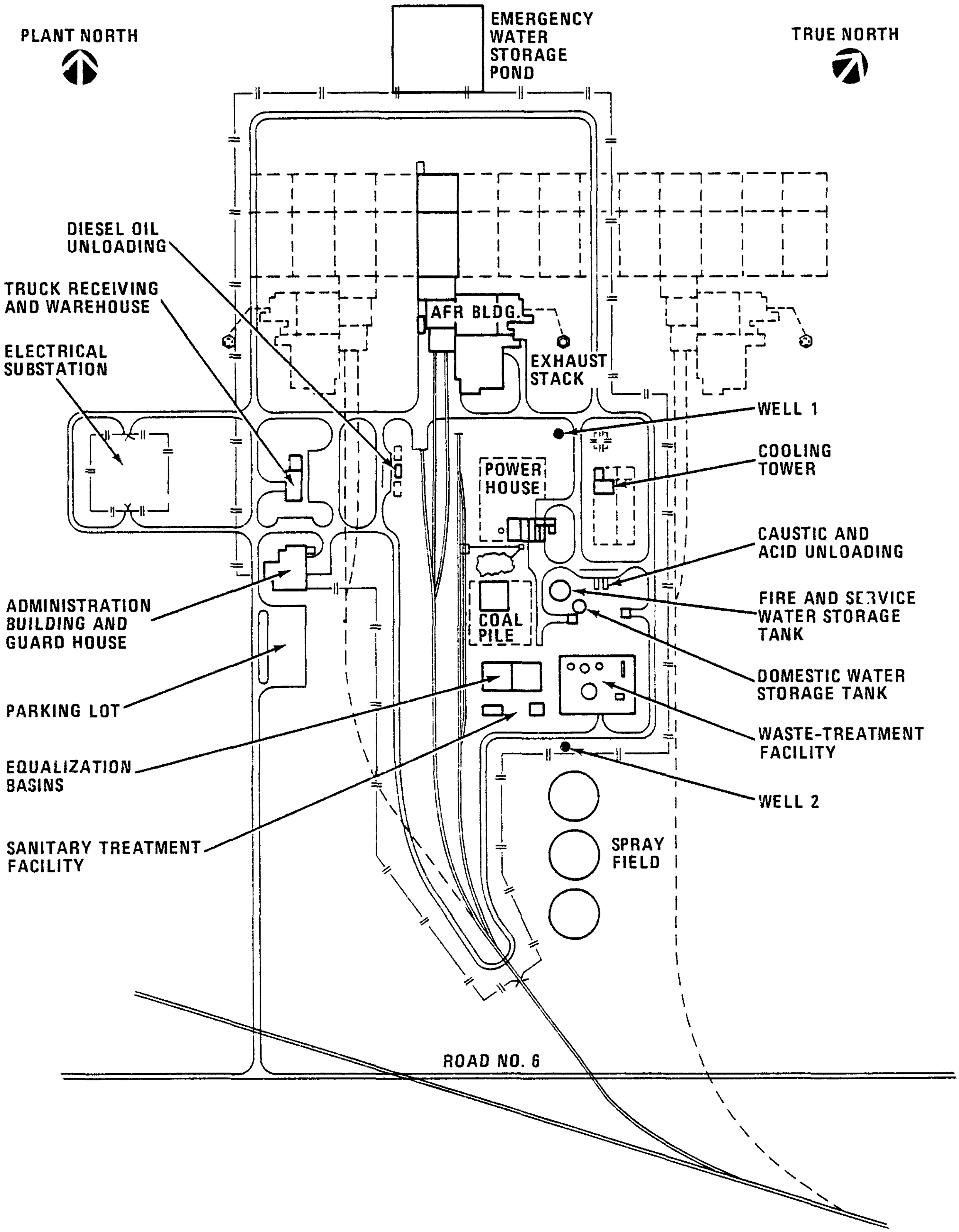

PLANT NORTH
EMERGENCY WATER STORAGE POND
TRUE NORTH
DIESEL OIL UNLOADING
TRUCK RECEIVING AND WAREHOUSE
ELECTRICAL SUBSTATION
AFR BLDG.
EXHAUST STACK
WELL 1
COOLING TOWER
POWER HOUSE
CAUSTIC AND ACID UNLOADING
FIRE AND SERVICE WATER STORAGE TANK
ADMINISTRATION BUILDING AND GUARD HOUSE
COAL PILE
DOMESTIC WATER STORAGE TANK
PARKING LOT
WASTE-TREATMENT FACILITY
EQUALIZATION BASINS
WELL 2
SANITARY TREATMENT FACILITY
SPRAY FIELD
ROAD NO. 6

Figure 2

- Water treatment building and facilities (DA B283)
- Cooling-tower structure (DA B285)
- Fire-water building (DA B287)
- Emergency water storage pond (DA B289)

3. Railroads

A standard-guage railroad track will be installed to service two unloading tracks at the AFR building and a coal-unloading siding with a bypass at the powerhouse. The plant track will be connected to the plant rail system.

The railroads to be provided (see Figure 2) will be designed to receive an average of two carriers per day, each weighing approximately 350,000 pounds. A head clearance of 15 feet (with a 9-foot clearance on each side) will be necessary for the track.

The carriers will be inspected at the gate, where two parking places will be needed outside the fence and two inside. They will then be moved with an on-site mover to the hold areas, where rails designed to accommodate five rail carriers will be provided. The hold area will be in the vicinity of the AFR building to permit hookup of interim cask-cooling systems.

4. Roads, Walks, and Parking Areas

The entrance to the facility will be from Plant Road 6. A 10-foot-wide lane with a shoulder will be added for 500 feet on each side of the entrance road. Plant Road 6 will also be raised to match the new railroad crossing. The entrance road and the service roads will be 20 feet wide and will be constructed of 2-inch-thick asphaltic concrete on a 12-inch sand-clay base course. Patrol roads (14 feet wide, 1-inch-thick asphaltic concrete on a 12-inch sand-clay base) will be provided on the inside of the perimeter fence.

A 10-car parking area (1-inch thick asphaltic concrete on a 6-inch sand-clay base) will be constructed inside the fence at the administration building; a similar area but large enough for 70 cars will be provided just outside the entrance gate. Truck parking and unloading areas will be constructed of 8-inch reinforced concrete. The latter will accommmodate five trucks and carriers outside the fence and 20 trucks and carriers in the hold area, to which the trucks will be moved after inspection and monitoring.

Walks will be provided for access to the administration building and operating areas.

A perimeter fence will surround all the facilities except the emergency water storage pond. The fence will consist of 84-inch chain-link fabric mounted on 2-inch pipe posts imbedded in concrete with a 1-foot extension arm carrying barbed wire. The same fence, but with a top rail, will be used for the electrical substations.

5. General Site Work and Landscaping

It will be necessary to remove all vegetation and organic material from the site. The area to be graded will be cleared of all trees and shrubs, and stumps and roots will be grubbed out. Marketable timber will be removed and stored.

The area will be cut and filled to line and grade. Erosion will be controlled, and special drainage ditches with diversions and filter berms will be installed as the grading progresses. Erodible areas will be covered with straw and/or stone, and storm runoff will be clarified by settling in detention basins.

Areas to be landscaped will be covered with topsoil, seeded with grass, and mulched. Areas other than lawns will be treated as erosion control.

6. Fire-Water System

Fire water will be provided at the site through a 10-inch diameter underground pipe loop system, supplied by a 500,000 gallon tank located with the powerhouse waste treatment facilities. The water will be pumped by one diesel and one electric pump each capable of supplying 1500 gallons per minute.

This system will provide water to the sprinklers in the various buildings and the hydrants throughout the site. Each hydrant can handle a flow of 250-300 gallons per minute and cover a radius of 150 feet. A total of 14 hydrants will be provided of which 5 will cover the AFR building.

7. Storm Sewers

Stormwater will be collected in a system of gravity-flow pipes and discharged to a surface stream to the northeast of the site.

The coal-storage area will be drained to the waste storage and disposal facility described under Item V.

8. Outside Lines and Supports

a. Outside Overhead Line Supports

A 14-foot-wide bridge supported every 20 feet will run from the powerhouse to the junction with a main bridge just south of the AFR building. Two support levels will be provided for piping at 8 and 14 feet above the ground. A third level at 19 feet above the ground is to be provided for electrical cable trays.

The services carried over this bridge will include steam export lines from the powerhouse steam generators and instrument-air export line from the powerhouse air compressors, acid and caustic transfer lines from the acid and caustic unloading and storage areas, and a caustic condensate-return line to the powerhouse, plant-air and instrument-air export lines from the process air compressors in the AFR building, and chilled-water supply and return lines from the refrigeration facility.

A bridge from the refrigeration facility to the junction with the main bridge just south of the AFR building will be required. A main north-south bridge will be installed between the junction of the two bridge runs described above and the south part of the AFR building. These bridges will be identical with that described above.

Single-pole runs with supports on 20-foot spacings will connect the main pipe bridge to areas near the powerhouse and to the cooling tower. A single-pole run from the administration and guardhouse building will also be provided.

b. Outside Underground Service Piping

Services transported underground from the powerhouse to the AFR building and the administration and guardhouse building will include the following:.

- Well water from the wells to the water-treatment area.

- Service water from the water-treatment area to the powerhouse, the AFR building and the emergency water storage pond.

- Demineralized water from the demineralized-water-treatment area to the AFR building.

- Domestic water from the water-treatment area to the AFR building, powerhouse, truck-receiving, warehouse, and refrigeration building, and the administration and guardhouse building.

- Cooling tower water from the cooling tower for the powerhouse, refrigeration building and the AFR building.

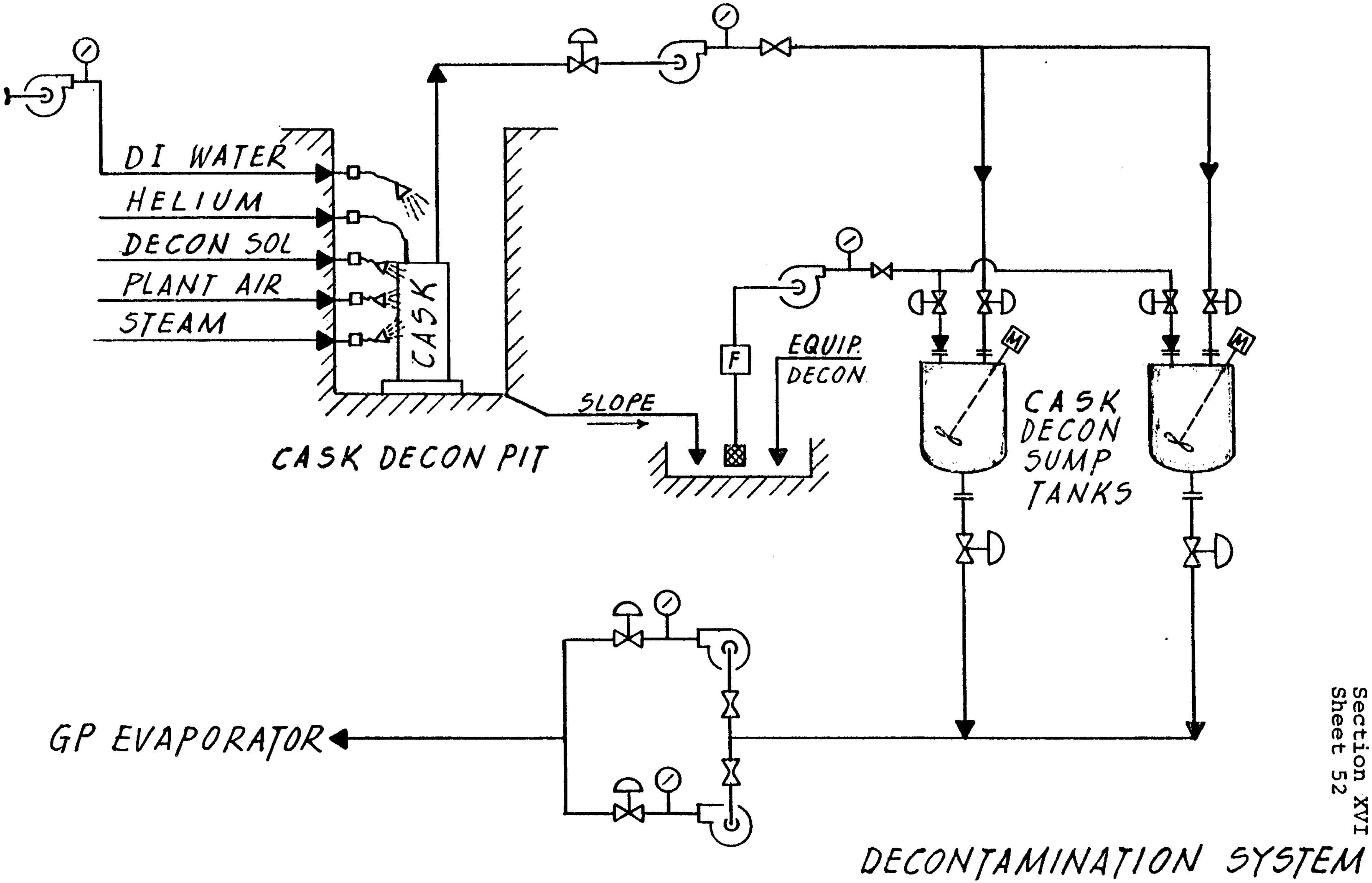


Figure 16

W-709892

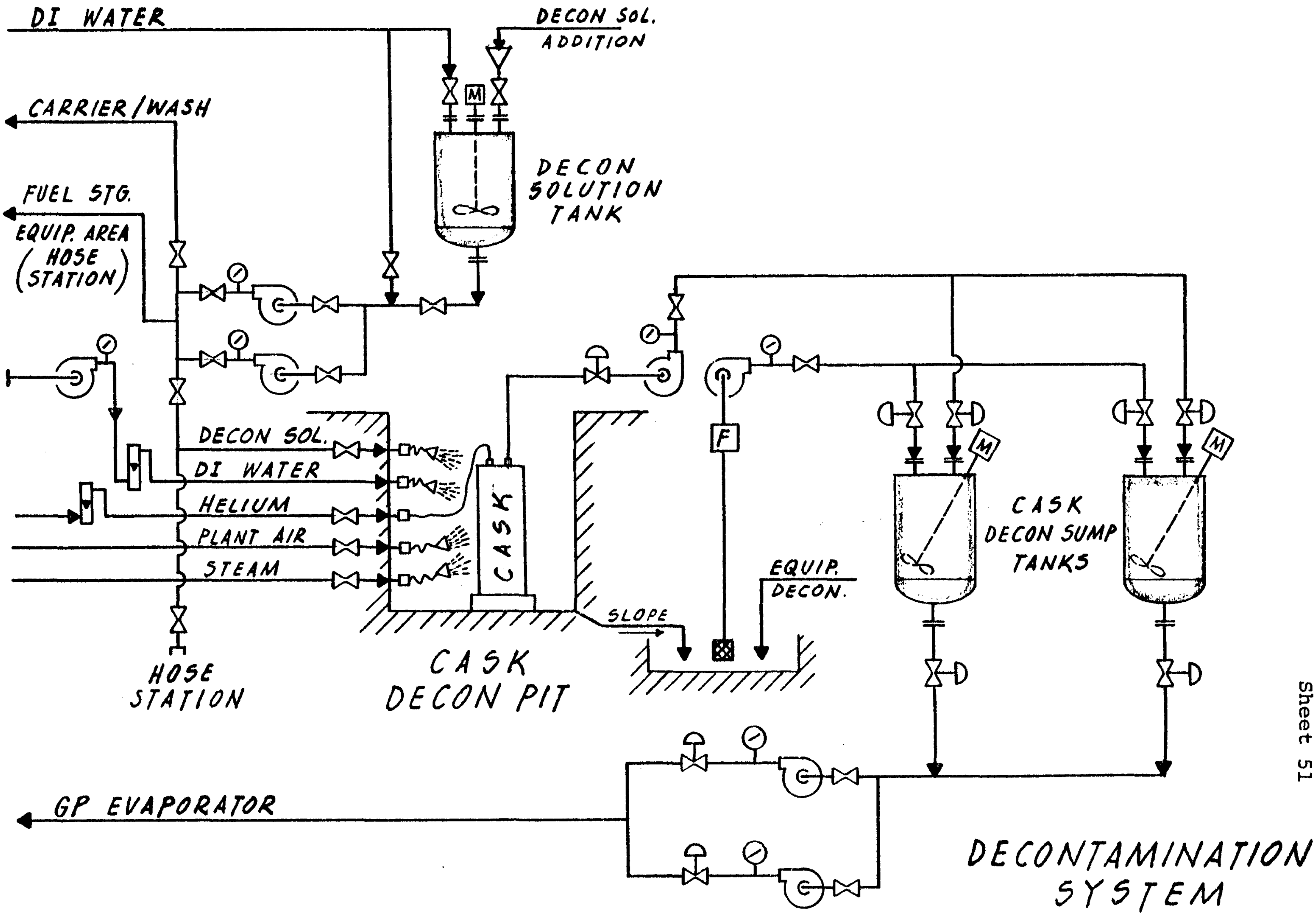


Figure 15

W-709892

C. AFR SPENT-FUEL STORAGE BUILDING (B240)

1. General Description

The AFR building will enclose two storage pools for spent fuel from pressurized-water-reactor and boiling-water-reactor commercial power plants. Each pool will be capable of storing 2500 metric tons of heavy metal.

Key Drawings 1 and 2 (see Section XVII) show the plan and section views, respectively, of this building; Key Drawing 3 shows the configuration of the storage pools.

2. Process Areas

The AFR building will house the following process facilities:

- Carrier-preparation area (B302)
- Carrier-washdown area (B304)
- Cask-cooling and washdown area (B306)
- Fuel-unloading pool (B308)
- Fuel-storage pools (B310)
- Cask-decontamination area (B316)
- Resin-mix facility (B314)
- Filter-regeneration facility (B316)
- Demineralized-water tank (B318)

In addition, two process-equipment areas will be provided: Area A at the end of the storage pools and area B next to the fuel-unloading area; the latter will contain equipment for carrier washdown, cask cooling and washdown, and cask decontamination.

An activity chart of the spent-fuel receiving and storage process is shown in Figure 3.

The carrier and cask with spent-fuel assemblies will be received in the carrier-preparation area (B302). Here each cask and transport carrier will be identified, inspected for shipping damage, and monitored for radiation. Peripheral equipment will be removed from the cask in this area.

The casks will be unloaded from the carrier in the carrier-washdown area (B304). Truck and rail cask carriers, stripped of all peripheral equipment, will be pushed into the carrier-washdown area. Radiation-measuring devices will be provided to check the radioactivity levels on the outside surfaces of the casks. Here also the carrier can be decontaminated if required and washed down to remove the road dirt.

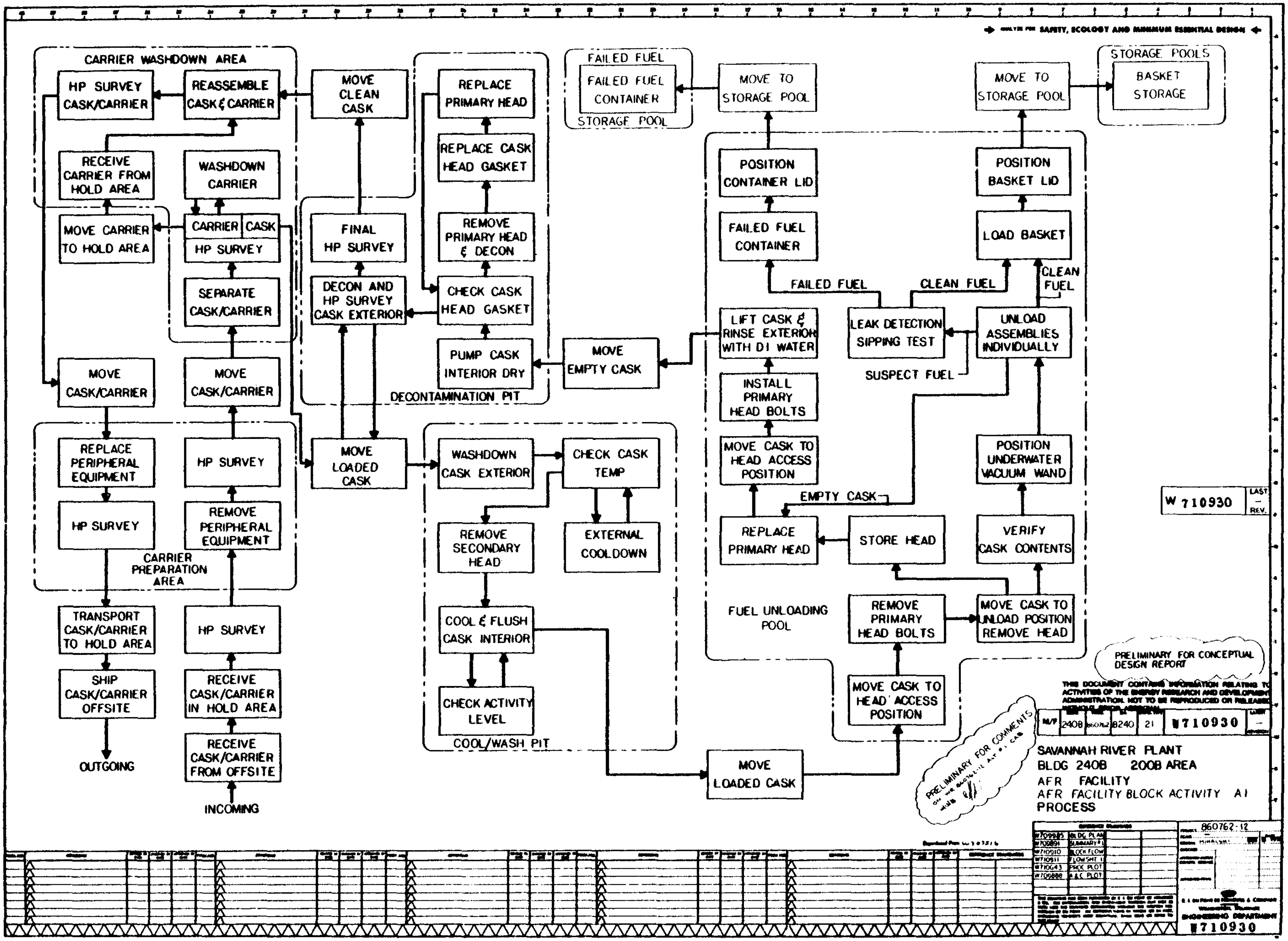

CARRIER WASHDOWN AREA
HP SURVEY CASK/CARRIER
REASSEMBLE CASK & CARRIER
MOVE CLEAN CASK
RECEIVE CARRIER FROM HOLD AREA
WASHDOWN CARRIER
MOVE CARRIER TO HOLD AREA
CARRIER | CASK HP SURVEY
SEPARATE CASK/CARRIER
MOVE CASK/CARRIER
MOVE CASK/CARRIER
REPLACE PERIPHERAL EQUIPMENT
HP SURVEY
HP SURVEY
REMOVE PERIPHERAL EQUIPMENT
CARRIER PREPARATION AREA
TRANSPORT CASK/CARRIER TO HOLD AREA
HP SURVEY
SHIP CASK/CARRIER OFFSITE
RECEIVE CASK/CARRIER IN HOLD AREA
RECEIVE CASK/CARRIER FROM OFFSITE
OUTGOING
INCOMING
FINAL HP SURVEY
DECON AND HP SURVEY CASK EXTERIOR
REPLACE PRIMARY HEAD
REPLACE CASK HEAD GASKET
REMOVE PRIMARY HEAD & DECON
CHECK CASK HEAD GASKET
PUMP CASK INTERIOR DRY
DECONTAMINATION PIT
MOVE LOADED CASK
MOVE EMPTY CASK
WASHDOWN CASK EXTERIOR
CHECK CASK TEMP
REMOVE SECONDARY HEAD
EXTERNAL COOLDOWN
COOL & FLUSH CASK INTERIOR
CHECK ACTIVITY LEVEL
COOL/WASH PIT
MOVE LOADED CASK
FAILED FUEL
FAILED FUEL CONTAINER
STORAGE POOL
MOVE TO STORAGE POOL
POSITION CONTAINER LID
FAILED FUEL CONTAINER
FAILED FUEL
CLEAN FUEL
CLEAN FUEL
LIFT CASK & RINSE EXTERIOR WITH DI WATER
LEAK DETECTION SIPPING TEST
UNLOAD ASSEMBLIES INDIVIDUALLY
SUSPECT FUEL
INSTALL PRIMARY HEAD BOLTS
MOVE CASK TO HEAD ACCESS POSITION
EMPTY CASK
REPLACE PRIMARY HEAD
STORE HEAD
POSITION UNDERWATER VACUUM WAND
VERIFY CASK CONTENTS
FUEL UNLOADING POOL
REMOVE PRIMARY HEAD BOLTS
MOVE CASK TO UNLOAD POSITION REMOVE HEAD
MOVE CASK TO HEAD ACCESS POSITION
MOVE TO STORAGE POOL
STORAGE POOLS
BASKET STORAGE
POSITION BASKET LID
LOAD BASKET
W 710930
PRELIMINARY FOR CONCEPTUAL DESIGN REPORT
PRELIMINARY FOR COMMENTS
SAVANNAH RIVER PLANT
BLDG 240B 200B AREA
AFR FACILITY
AFR FACILITY BLOCK ACTIVITY AI
PROCESS
W710930

Figure 3

The cask will then be unloaded and moved with a 125-ton bridge crane from the carrier into a 22-foot-deep cask cooling and washdown pit, (B306) where it will be further cleaned from road dirt and internally cooled with steam and water.

From the cask cooling and washdown pit the cask will be moved into the fuel-unloading pool (B308); there the cask head will be removed and the cask will be lowered to the 50-foot deep level to permit removal of the fuel from the cask into movable baskets.

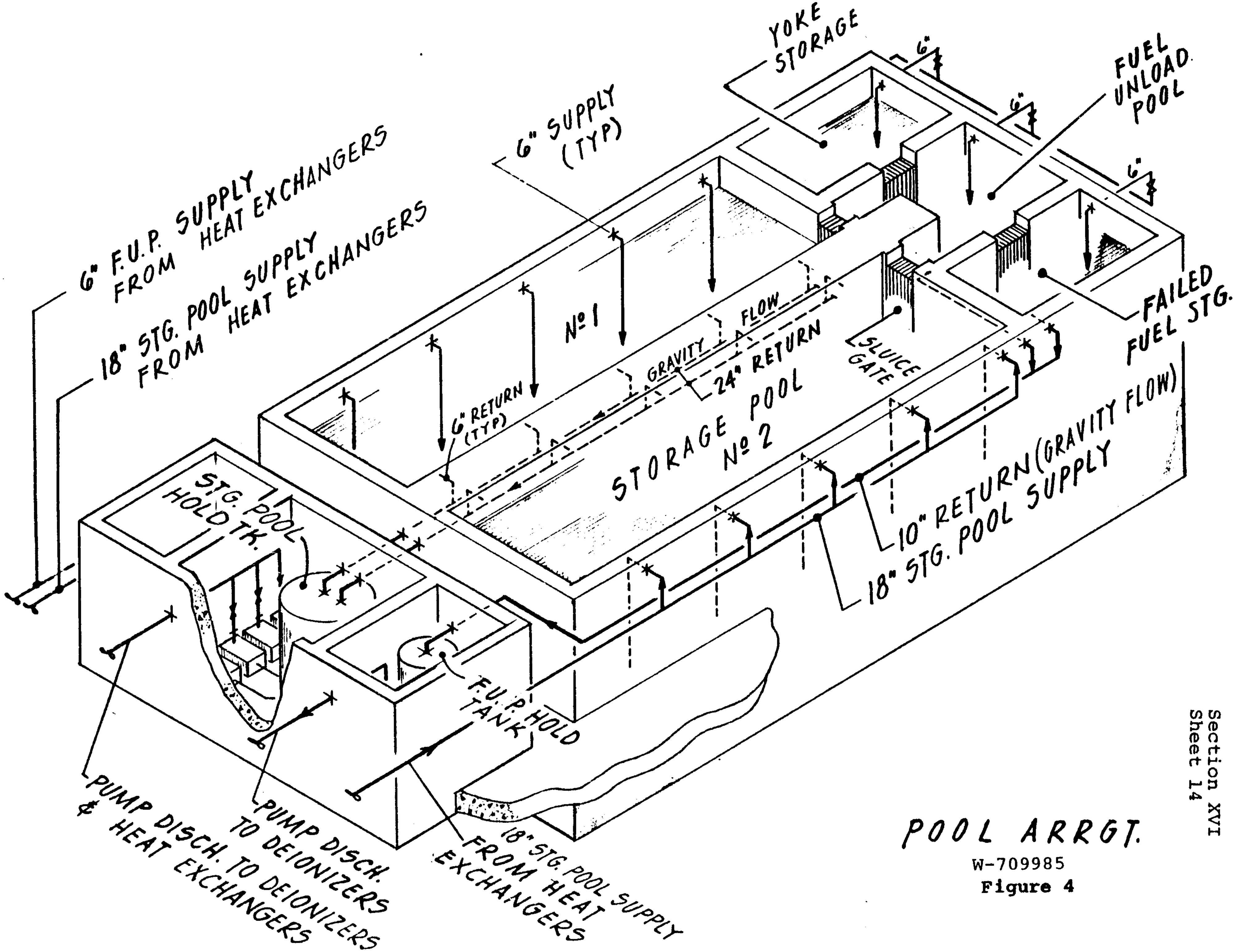
These criticality-safe baskets with fuel assemblies are then placed on the 33-foot deep ledge in the fuel-unloading pool (see Figure 4) from where they will be transferred underwater to a preassigned location in the storage pools (B310) by one of two 10-ton storage-pool cranes.

After the spent-fuel assemblies have been removed, the primary head will be replaced, and the empty cask will be transferred from the fuel-unloading pool to the decontamination pit (B312). There the secondary head will be replaced, and the cask will be decontaminated before being returned to the owner. In addition, a leak test with helium or air will be performed to ensure that the head and gaskets have been properly replaced.

The water in the fuel-storage pools as well as the washwater from carrier and cask preparation and washdown will be purified by means of ion-exchange resins. Two separate facilities will be provided for recharging these resins (see Key Drawings 4 and 5): one in process-equipment area A and one in process-equipment area B. A filter-regeneration facility for the prefilters of the cask-cooling ion-exchange resin system will also be provided. The effluents of the ion-exchange resin tanks will be pumped into a 10,000-gallon deionized water tank to provide a supply for pump seals and surge-tank makeup.

3. <u>Supplementary Process Facilities</u>

The AFR building will house the following supplementary process facilities required to support the functions of various operating areas:



POOL ARRGT.

W-709985

Figure 4

Section XVI
Sheet 14

- Gas-cylinder storage area (B403)
- Central control room (B407/B408)
- Air-compressor area (B420)
- Heating and ventilation room (B430/B436)
- Regulated maintenance shop (B441)
- Clean maintenance shop (B446)
- Electrical and instrumentation maintenance shop (B447)
- Equipment decontamination area (B450)
- Personnel decontamination area (B453)
- Health physics facilities (B454)
- Laboratory (B455)
- Change rooms (B461)
- Laundries (B464)
- Lunchroom, conference/training room, and offices

a. Gas-Cylinder Storage (B 403)

The gas-cylinder storage area will be at the northeast part of the AFR building, just south of the high-level-waste evaporator area. It will be used to store helium and breathing-air cylinders, with a manifold provided for each type of gas and adequate access for trucks.

b. Central Control Room (B407/B408)

The central control room (CCR) will consist of the instrument control room (ICR) and the electrical control room (ECR). The ICR (B408) will occupy approximately 900 square feet. The control center will consist of a semigraphic instrument panel with electronic information displays representing all major process and cooling requirements.

The ECR (B407) will contain electrical switchgear, motor control centers, control panels, and distribution systems that are critical to the continuous and safe operation of the cooling system and auxiliary equipment.

The main ECR will be located next to the ICR in the standard-construction portion of the AFR building. A backup ECR containing equipment for continuous operation will be located in a seismic- and tornado-resistant structure in process-equipment area A of the AFR building.

c. Air-Compressor Area (B420)

The air-compressor facility will provide plant air, instrument air, and breathing air. It will be located west of the cooling/washdown and decontamination area.

The instrument- and breathing-air compressors are to be continually operated; they will require emergency power and will be housed in a seismic-and tornado-resistant structure. Controls will be switched from the central-control-room panel to the auxiliary panel in the compressor room. The main instrument panel will be provided with pressure readouts and start/stop and running lights.

This facility will contain the following equipment as required:

- Air compressors, air storage receivers, foundations, and accessories.
- Drive motors, instrumentation, power-supply components, and circuitry.
- System air piping and coolant-water piping (up to distribution header system).

The process areas, including shops and maintenance facilities, will be served by the following compressed-air units and accessories:

- Plant-air compressor, capacity 320 cubic feet per minute (cfm), 90 psig, with an air receiver and a 75-horsepower motor.
- Two instrument-air compressors, 100 cfm, 90 psig, with air receivers, desiccant-type air dryers, 30-horsepower motors, and a backup electrical supply.

These units will be heavy-duty, water-cooled, minimum two-stage double-acting electric-motor-driven air compressors.

Also servicing the process area, for emergency use only, will be a breathing-air compressor, 100 cfm, with an air receiver, an air-cylinder backup system, a 30-horsepower motor, and a backup electrical supply. This unit will be a water-sealed rotary air compressor.

A cross-connection will be supplied beween the plant-air piping and the instrtument-air piping as a backup for either air system during maintenance outages.

All of the above compressed-air systems will be provided with the necessary sound-abatement equipment to meet industrial and OSHA standards for the mechanical equipment area.

d. Heating and Ventilating Room (B430/436)

The heating and ventilating facilities will be centered in the heating, ventilating, and air-conditioning fan room at the southeast corner of the service area. This room will house the ventilation unit for the process-equipment room and the waste area. The air-conditioning unit for the offices, laboratories, and other personnel areas will also be located here.

e. Regulated Maintenance Shop (B441)

The regulated maintenance shop will be used for low-level radioactive contamination work. The shop will be connected with other regulated areas through a regulated-access corridor in which equipment can be transferred. The shop, which is approximately 20 by 20 feet, will contain a tool crib 12 by 15 feet, regulated floor drains, sinks, and vent hoods. Lightweight equipment, welding machines, and tools will be used in this area.

f. Clean Maintenance Shop (B446)

The clean maintenance shop will be used for all nonregulated work. The shop, which is approximately 40 by 40 feet, will include a foreman's office (12 by 10 feet), a tool crib (20 by 20 feet), standard floor drains, sinks, and hoods.

The heating and ventilation requirements are similar to those of other operating areas.

g. Electrical and Instrumentation Maintenance Shop (B447)

The elecrical and instrumentation (E&I) maintenance shop will consist of the following:

- Clean E&I shop (30 by 20 feet)
- Regulated E&I shop (12 by 12 feet)
- Foreman's office (12 by 10 feet)
- Tool crib

The heating and ventilation requirements for the E&I shops will be similar to those other operating areas. The regulated shop will have hoods with doors for forced-exhaust ventilation.

h. <u>Equipment-Decontamination Area (B453)</u>

The equipment-decontamination area will be used to decontaminate equipment and tools used in regulated areas. This area, which is approximately 30 by 40 feet, will be provided with floor drains and splash curtains.

i. <u>Personnel-Decontamination Area (D453)</u>

The personnel-decontamination area, located adjacent to an airlock from the fuel-storage pools to the regulated corridor, will be used for personnel cleanup after exposure to radioactive contamination. It will contain the following:

- Toilet
- Hand lavatory
- Shower - oversize for seat and attendant
- Eye wash
- Cot or padded table
- Cabinet for first aid and supplies
- One monitoring instrument
- Cabinet for clean clothing and towels
- Receptacles for contaminated clothing and wipes
- Sloped floor to regulated drains

j. <u>Health Physics Facilities (B454)</u>

The health physics facilities will be located for access from the regulated corridor and will include two health physics offices with access to the non-regulated corridor and window access between. They will be used for the following:

- Radiation counting of film badges, rings, etc., and record-keeping.

- Radiation counting of cleanup wiping materials.

- Instrument calibration.

- Portable health physics monitoring instrumentation in process areas.

- Locked storage for instruments.

The health physics facilities will contain the following portable and laboratory instruments:

Portable Instruments

Item	Quantity
Beta-gamma continuous air monitors	3
Portable GM survey meter (Victoreen Thyac Model 496 with 489-40 probe and N 112F GM tube or equal)	20
Portable ion-chamber survey meter (Eberline RO2 or equal)	20
Portable beta-gamma GM survey meter with telescoping probe (Eberline Telector 6117 or equal)	4
Portable low-energy ion-chamber survey meter (Victoreen Model 440 or equal)	4
Portable alpha scintillation survey meter (Ludlum Model 3 with Eberline AC-3 probe or equal)	8
Portable neutron REM counter (Eberline PNR or equal)	2
Tritium monitor	4
Direct-reading dosimeters (Stevens or equal)	150
Dosimeter charger (Stevens or equal)	2
Portable count rate meters with probes (Eberline RM15 count rate meter, Eberline HP210 probe, or SRP probe drawing S5-G-334 or equal)	25
Hand and foot monitors (Ray Industries with SRP modifications)	2
Air-velocity monitor (Alnor or equal)	1

Laboratory Instruments

Automatic alpha-beta-gamma smear counter	1
Alpha detectors with scalers (Eberline RD-14 alpha scintillation detector with MS-3 scaler or equal)	3
Beta-gamma detectors, shields, and scalers (Eberline RD-15 detector and shields with MS-3 scaler or equal)	3
Pulse-height-analyzer system (Northern Pulse Model TN-1705, Printer ASR-33 TN 1101, Plotter TN 1141D, NaI crystal 3 x 3-inch TN 1162, Shield TN 1190 or equal)	1

k. Laboratory (B455)

The laboratory will be used for controlling the quality of the water for the storage pools and power facilities. It will occupy an area approximately 20 by 20 feet.

l. Change Rooms (B461)

The change rooms will accommodate a four-shift operation of 40 persons each. They will consist of the following:

- Two clean change rooms with full-size lockers and benches--one for 105 men and one for 35 women.
- Two regulated change rooms with half-size lockers and benches--one for 105 men and one for 35 women.
- Separate clean sanitary facilities for men and women.
- Separate regulated sanitary facilities for men and women.

m. Laundries (B464)

Separate laundries will be provided for clean and regulated service, with two washing machines and dryers for clean laundry and two washing machines and dryers for regulated laundry.

The laundry rooms will be large enough to accommodate storage bins for clothes, sorting tables, contamination-checking facilities, and sewing equipment.

n. Lunchroom, Conference/Training Room, and Offices

A lunchroom will be provided for approximately 40 people and is to include the following:

- Access from the clean area
- Vending machines
- Tables and chairs
- Cabinets
- Four burners (208 volts) in counter cook top
- Sink with hot and cold water
- Vent hood
- 110-volt electrical service
- Lunch refrigerator
- Electric water cooler with hot-water dispensers

The conference/training room will accommodate approximately 42 people and is to include:

- Conference tables for 20 people
- A chalkboard
- Projection screen
- Chart pad holder
- Storage closet for table and chairs

Fifteen offices will be provided, each approximately 10 by 12 feet.

4. Radioactive Waste Disposal Facilities (B541-B542)

The process waste to be treated may be classified as follows:

- Clean liquid waste
- Clean solid waste
- Liquid radioactive waste
- Solid radioactive combustible waste
- Radioactive spent high-efficiency particulate filter cartridges
- Radioactive metal and glass waste

The clean liquid waste may be disposed of in the storm sewers; the solid waste will be collected in bins for removal by an outside contractor.

The liquid radioactive waste will be collected and transferred to the evaporator system.

a. <u>Solid-Radwaste Storage and Disposal Facility</u>

This facility will consist of a receiving area, a solid-waste compactor, a radioactivity-assay area, and a shipping area for offsite disposal.

Solid radioactive waste will be collected in drums and boxes in all regulated areas and transferred to the solid-waste-receiving area, where it will be sorted for direct packaging or compacted and capped inside drums. The drums will be manually decontaminated with a detergent spray solution and then surface smeared. All waste in drums and packaged boxes will then pass through a beta-gamma assay, where radioactivity levels will be measured and recorded. A lag-storage area will receive all waste from the assay before disposal by an outside contractor. The drums will be handled by a 0.5-ton monorail system.

Among the items of equipment provided for this facility will be the following:

- Shielded and unshielded forklift trucks
- Drum compactor
- Remote-control drum capper
- Drum decontamination turntable and spray ring
- One 1500-gallon stainless steel drum decontamination solution tank with agitator and transfer pump
- One 1500-gallon stainless steel drum decontamination sump tank with agitator and transfer pump

b. <u>Evaporator Facility</u> (See Figure 5 and 6)

Two evaporators will be required for the liquid radioactive wastes: a general purpose evaporator and a high-level-waste evaporator.

The general purpose evaporator will be housed in a standard-construction area containing vertical and horizontal tanks, grating platforms, stairs, supports, and a curbed concrete slab 105 feet long by 37 feet wide at one end and 18 feet wide at the other.

The high-level-waste evaporator will be housed in a shielded area containing tanks, platforms, stairs, concrete shielding wells, and a ground floor slab 46 feet long and 67 feet wide.

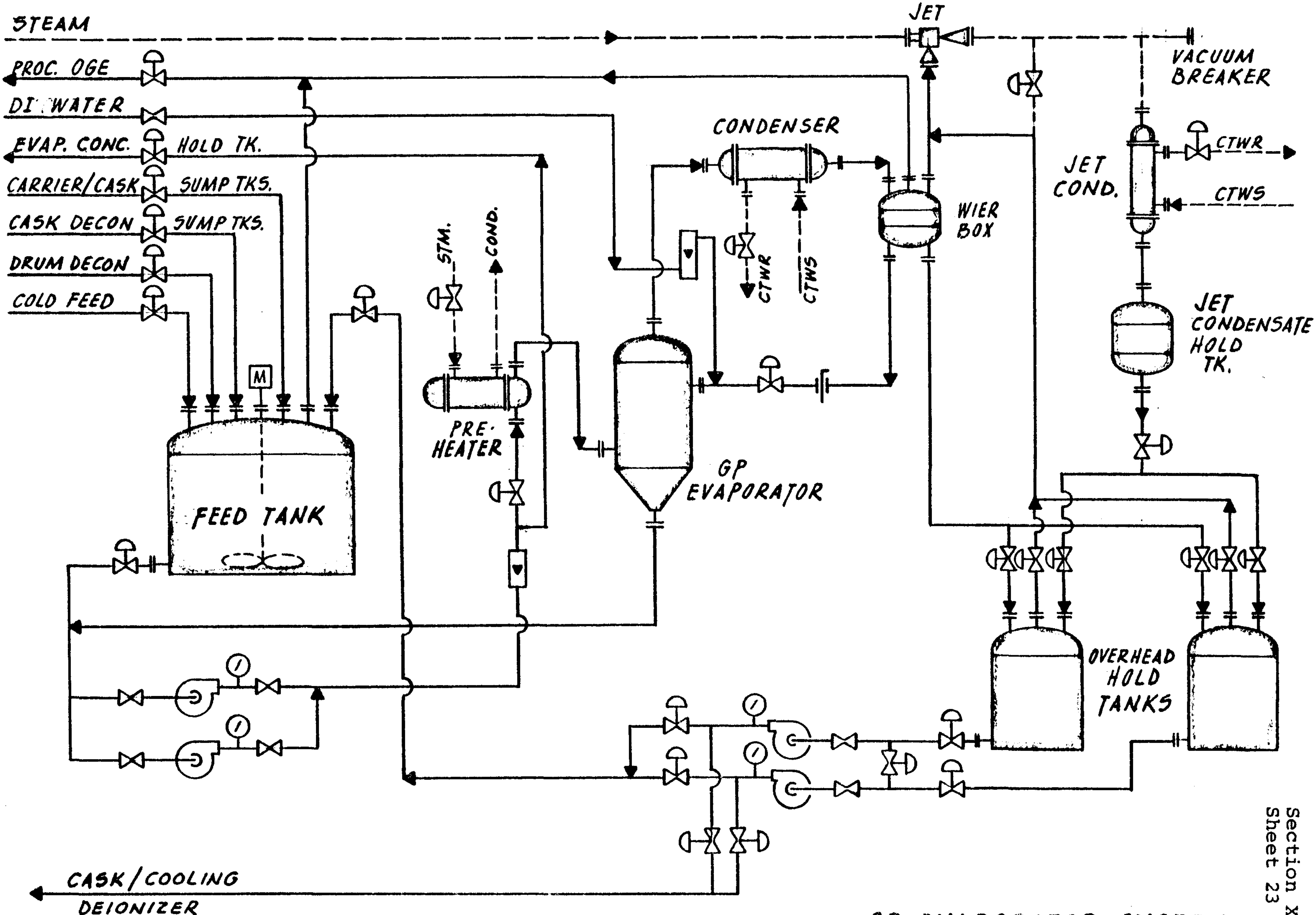


Figure 5

GP EVAPORATOR SYSTEM

W-709896

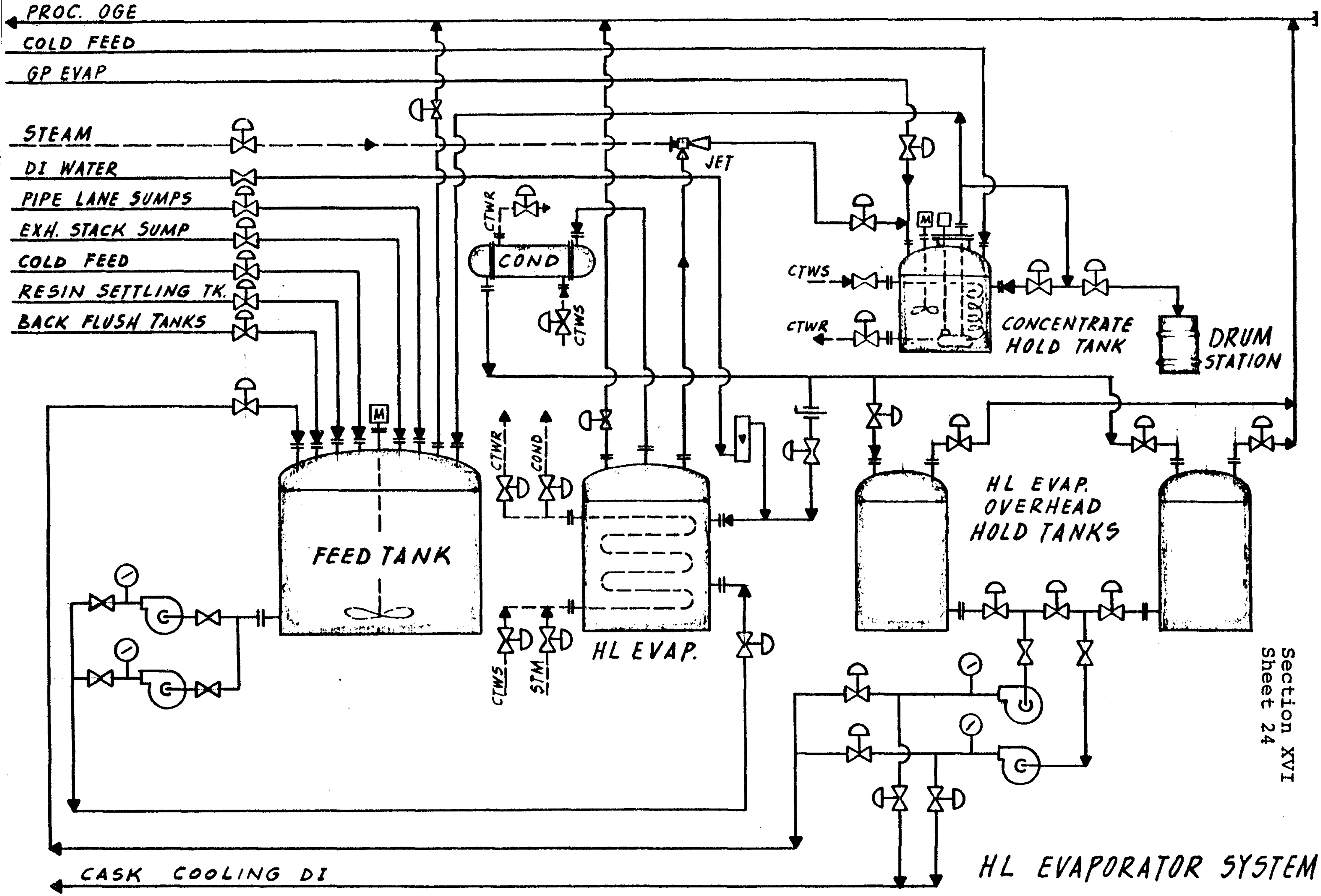


Figure 6

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The high-level-waste evaporator will receive the liquid effluent from the ion-exchange-resin tanks and filter backwash, which will be first collected in an agitated holding tank. The water will be evaporated, condensed, and collected in two 3000-gallon stainless-steel receiving tanks for contamination monitoring. If the results indicate that additional treatment is required, the effluent can be recirculated into the high-level-waste evaporator feed tank or to the cask-cooling and washdown ion-exchange-resin tank. The evaportator concentrate will be circulated and sampled for eventual disposal into 55-gallon drums, which will be shipped off the site for burial in a licensed burial ground.

The general purpose evaporator will be used for effluents containing detergents from the cask preparation, unloading, washdown, and decontamination pits; these will be first collected in agitated holding tanks. This unit will operate like the high-level-waste unit in that the overheads will be condensed, collected, and transferred to the cask-cooling and washdown ion-exhcnage resin tank or recirculated. The concentrates will be recirculated, sampled, and eventually packaged as dry waste in 55-gallon drums.

Equipment common to both evaporators will include the following:

- One 1000-gallon stainless steel caustic feed tank with agitator and pump
- Evaporator steam generator (surface area 1500 square feet)
- One 500-gallon carbon steel separator with 500-gallon flash tank
- One 1500-gallon stainless steel evaporator concentrate holding tank with agitator and pump
- Drum filling station

Equipment for the general-purpose evaporator will include:

- One 3000-gallon stainless steel feed tank with agitators and pump
- Preheater (carbon steel shell, stainless steel tubes), with an area of 100 square feet

- Stainless steel evaporator, 3.5 feet in diameter and ten feet high
- Evaporator condenser, carbon steel shell, stainless steel tubing with a surface area of 300 square feet
- Evaporator reflux weir, stainless steel, 100-gallon capacity
- Two receiving tanks, stainless steel, 1500-gallon capacity
- Vacuum steam jet sized to handle 150 pounds per hour, suction pressure 3 pounds per square inch, with condenser and 100 gallon stainless steel collection tank

The equipment provided for the high-level-waste evaporator will include the following items:

- Stainless steel feed tank, 500-gallon capacity, with agitator and pump
- Evaporator, 5 feet in diameter and 15 feet high, with internal stainless steel coil (surface area 1200 square feet), demister pads, and evaporator-bottom steam siphons
- Condenser, carbon steel shell, stainless steel tubing with a surface area of 100 square feet
- Two stainless steel receiving tanks, 3000 gallon capacity

Radiation monitors and assay instrumentation will be provided. All controls for the evaporators will be located in the central control room.

5. Architectural and Civil Construction

The AFR building will be a one-story structure covering an area of 116,755 square feet, with a total volume in excess of 6,000,000 cubic feet. The foundations will vary from heavy concrete slab to standard spread footings and piers. The ground floor will be reinforced-concrete slab varying in thickness from 3 feet to 4 inches. The building frame above grade will be galvanized structural steel of varying design:

- Seismic- and tornado-resistant construction is required for the fuel-unloading pool, and the fuel-storage pools. The standard-construction roof above the top of the steel frame will not be resistant to seismic or tornado loads. In these areas, concrete walls with a minimum thickness of 4 feet will be required for shielding between the pools and pipe alleys. Shielding walls with a minimum thickness of 4 feet will also be required for the fuel-unloading pool.

  Seismic- and tornado-resistant construction will also be provided for process cells in process-equipment areas A and B that contain water-purification equipment. These cells will have at least 3-foot-thick concrete shielding.

- Standard construction modified for tornado resistance will be used for process-equipment areas A and B and the carrier-washdown area. Here all structural steel members, including girts and bracing and cranes, will be so constructed as not to be dislocated by a tornado.

- Standard construction will be used in the remainder of the building.

- Shielded construction will be required for the waste-treatment areas.

a. Carrier Preparation Area (B302)

This area, which will be 85 feet long, 83 feet wide, and approximately 45 feet high, will have a ground floor slab 2 feet thick, thickened under the rail tracks, and sloping to drains. The roof structure will consist of open-web joists framing into 83-foot-span rigid-frame north-south girders. The roof, which will slope a minimum of 0.25 inch per foot, will be constructed of built-up coal-tar bitumen on insulation board supported on 1.5-inch-deep 20-gage metal roof deck supported on solid web steel beams. The metal siding down to grade will be 2-inch insulated sandwich wall panel (24-gage metal) painted on both sides. The interior partitions (north and east walls) will be constructed of sheet-metal ribbed siding painted and faced with smooth metal sheet on both sides.

The carrier-preparation area will serve as an airlock. Two motorized aluminum roll-up doors, 14 feet wide and 16 feet high, will be provided at the north and at the south sides of the area, centered on each of the two rail tracks that will be embedded in the concrete floor. Each door will have a hollow-rubber air gasket that will be expanded by air pressure to seal off the area.

Each area is to accommodate either truck or rail carriers. Culverts, pipe trenches, and laydown areas must accommodate a gross vehicle weight of approximately 80,000 pounds. The rail tracks are to accommodate a carrier weight of 350,000 pounds and will be equipped with removable rail stops.

A tool crib, a rack for yoke storage, steel cribbing for peripheral equipment laydown, and an office will also be provided.

To handle washdown effluents, the area will be equipped with 24 floor drains leading to a stainless-steel-lined sump pit 4 feet square and 4 feet deep. The effluents will be pumped out to holding tanks in the process-equipment area.

b. <u>Carrier-Washdown Area (B304)</u>

This area, which is to be 96 feet wide, 85 feet long, and 78 feet high at the high point of the roof, will have a ground floor slab 2 feet thick. The roof will slope 0.24 inch per foot to the east and west. The roof construction and exterior metal sandwich siding will be the same as described above for the carrier-preparation area. The roof structure will consist of solid-web purlins framing into the solid web of 100-foot-span rigid-frame east-west girders. Girts will frame into the web of columns as required. Separate columns tied to the building columns will be provided to support the rails for a 125-ton-capacity crane. The north wall will consist of open structural bracing with a minimum opening of 20-foot width at the cask-transfer aisle.

This section of the AFR building will be of standard construction, with structural steel and crane supports so secured that they cannot fall into the spent-fuel storage pools during a tornado.

All openings will have airlocks. The north wall will have a minimum opening of 20-foot width at the cask-transfer aisle. Man doors to the south and east of this area will be furnished with airlocks consisting of a metal partition and a concrete roof. Because this area, like the carrier-preparation area, will require accommodations for two duel purpose carriers, roll-up doors and rail tracks will be required; a permanent stop will be provided at the work end of each track. Four splash curtains, each 10 feet high and 65 feet long, are to be provided.

c. Cask-Cooling and Washdown Area, Fuel-Unloading Pools, and Cask-Decontamination Area (B306, B308, and B312)

The building area housing these faciiitie will be 96 feet wide, 79 feet long, and 78 feet high. The roof constructuction will match that used for the carrier-washdown area, as described above. The east and west exterior walls will be 2-inch insulated sandwich wall panel (24 gauge metal) painted on both sides. The north wall above the roof of the fuel-storage pool will also be metal sandwich siding. The north interior wall will be interior sandwich metal siding.

Cask-Cooling and Washdown Area (B306)

This facility will contain a pit, 25 feet square and 22 feet deep. At the base of the pit a 3-foot-deep and 13-foot-square indentation will be required for an energy-absorbing pad of the same dimensions. The pad and its supports will be capable of supporting the impact of a 100-ton cask dropped from a height of 25 feet without structural damage to the concrete. The concrete walls of the pit will be painted to facilitate decontamination.

The bottom of the pit will be sloped to permit gravity drainage, through an underground drain line, to a stainless-steel-lined sump pit, 6 feet square and 5 feet deep, in process-equipment area B to the north.

All underground lines will be of stainless steel. Leak detection boxes will be provided to monitor the lines, the pit, and the sump.

A pipe trench running from the pit to process-equipment area B will be covered with a minimum of 1 foot of concrete for shielding. The concrete floor capable of withstanding the impact of a cask dropped from a height of 3 feet will be thicker.

Fuel-Unloading Pool (B308)

The fuel-unloading pool will be 30 feet square and 50 feet deep in the center. One part of the pool will be 14 feet deep and will provide a ledge supporting the cask with the head above water. The ledge, 25 feet long and 10 feet wide, will also be used as a shelf for storing the cask head; it will be designed to hold a weight of approximately 125 tons. An 8-foot-high barrier will prevent the cask from tipping Another part of the pool, 50 feet deep, will be used for loading the baskets.

The fuel-unloading pool will have 4-foot-thick concrete walls lined with stainless steel plate and will be equipped with leak-detection devices behind the liner. Energy-absorbing pads at the ledge 15 feet below grade and at the bottom of the pool 50 feet below grade will be designed to absorb the energy of a free-falling 100-ton cask dropping from a height of 3 feet above grade without damage to the concrete structure.

Two separate pools on either side of the fuel-unloading pool will be provided, one for storing yokes and the other for failed fuel assemblies. They will also act as passages to future storage pools. They are to be 30 feet long, 29 feet wide, and 33 feet deep. They will be lined with stainless steel plate and equipped with leak-detection devices.

The fuel-unloading pool has two gates opening into the storage pool to the north. The gates, fabricated of stainless steel plate and structural elements, will be hinged, equipped with an air-inflated gasket, leaktight, and capable of withstanding the hydraulic head of the water level. They will be operated with a hand wheel above the water level. Two sluice gates will connect to the yoke-storage and failed-fuel-storage pools. The gates will be 33 feet high and 4 feet wide; they will be equipped with gasketed seals and will be capable of resisting hydrostatic forces when one pool is emptied for maintenance purposes. Concrete knockout sections of the wall will be provided to allow the canals to be extended in the future as transport ways to additional storage baisins.

The water level in the fuel-unloading pool will be maintained by gravity-drain overflow lines running through a pipe lane into a holding tank located in process equipment area A.

Cask Decontamination (B312)

The decontamination pit, 25 feet square and 22 feet deep, will be constructed like the cask-cooling and washdown pit. It will be equipped with a movable platform to permit manual access to the cask.

d. Basement Area

South of the fuel-unloading pool, a basement area will be provided to accommodate two north-south halls (each 10.5 feet wide) between the cask-cooling and washdown area and the cask-decontamination area as well as a 4-foot-wide east-west hall between the cask-decontamination area and the pipe lanes in the process area. On the east side, a 4-foot-wide pipe lane will connect with the process pit area. This basement complex will serve as an underground area for pipe runs from the pits and pools and for personnel access to the pit areas through doors. The poured concrete roof over this area will be designed to resist the impact of a 100-ton cask falling from a height of 3 feet.

e. Fuel-Storage Pool (B310)

This area will have a roof sloping 0.25 inch per foot and consisting of built-up coal-tar bitumen on a combination of insulation board supported on 1.5-inch-deep 20-gage galvanized metal roof deck supported on solid-web steel beams. The roof structure will consist of solid-web structural purlins framing into the solid-web east-west structural rigged frame. This frame will be seismic and tornado resistant.

Fuel-Storage Pools

Two spent-fuel pools will be provided, each lined with 1/4-inch-thick stainless steel plate. Each pool will be 33 feet deep, 44 feet wide, and 137 feet 6 inches long. A common concrete wall separating the pools will be 6 feet thick; the outside concrete walls will be 4 feet thick for shielding purposes. Gates will be provided for transferring fuel assemblies from the unloading pool. Pools and gates will be so designed that one pool may be pumped out for maintenance purposes. The bottom of the pools will have a grid-work system for securing the fuel storage baskets.

North-south pipe lanes 12 feet wide will run adjacent to the full length of the pool area, with the north end of each lane connecting into the process area, and providing access for maintenance. The south end of the pipe lane will have ladder access from the floor. The pipe lanes will be covered with a concrete slab 3 feet thick. The floor will be concrete, sloped to the north to a stainless-steel-lined sump. Grating platforms for access will be furnished in the lanes. An 8-foot-wide lane will be provided at the north end of the area with a floor elevation of 33 feet below grade.

Process-Equipment Area A

This area will be due north of and adjoining the storage pools. It will consist of an area 33 feet deep over the full width of the building and 37 feet wide in the north-south direction. This area will contain process-equipment surge tanks in an enclosure with a minimum shielding of 3 feet of concrete. The pool area will be separated from this area by a metal partition.

North of this area will be a concrete floor that will support water-purification equipment tanks in a 15-foot-high concrete enclosure that will be shielded as well as seismic and tornado resistant. Also supported at this level will be a reinforced-concrete-block wall, 15 feet high, that will enclose the electrical and instrument backup control panel. Concrete pads will be provided in this area to support seven tanks and various process equipment, including the heat exchangers, pumps, resin-mixing tanks, and filter-regeneration equipment.

Two sump pits, each 5 feet square, 5 feet deep, and lined with stainless steel, will serve this area and the fuel-storage-pool pipe lanes.

A light roof over the entire 155- by 133-foot area will be supported by a rigid frame. The roof will consist of built-up coal-tar bitumen on a combination of insulation board supported on a 1.5-inch deep 20-gage metal roof deck supported on solid-web steel beams. The solid-web beams will be supported on a solid-web rigid frame. Insulated metal sandwich siding will be used for the walls.

f. Process-Equipment Area B for Carrier Preparation, Carrier Washdown, Cask Cooling and Washdown, Fuel-Unloading Pool, and Cask Decontamination

This area, which will contain process equipment associated with contaminated liquid wastes from the adjacent areas to the south and west, will be approximately 135 feet square and 39 feet high. It will be covered with a roof of built-up coal-tar bitumen on a combination of insulation board supported on 1.5-inch-deep 20-gage metal roof deck supported on purlins framing into ridged frames with a span of 98 feet 6 inches. The south part of the structure will be similar except that it will have a span of 33 feet 6 inches.

This area will contain five platforms with stair access, miscellaneous concrete pads of supporting equipment, and as series of compartments for process equipment (13 cells of various size and one pit with a shielded roof). All of the cells will have concrete walls and roofs with a minimum thickness of 3 feet and some of these cells will be seismic and tornado resistant. The roofs will have removable concrete hatches and 17 plugs for viewing periscopes in the walls. Additional shielding walls will be required at the entrances to the cells in order to block radiation at the entrance opening. Each cell will have a man access door.

g. Supplementary Process Facilities

The area housing the supplementary process facilities (194) feet long and (160 feet wide) in the northeast corner of the AFT building will have a roof sloping from a high point of elevation 19 feet to a low point of 15 feet. The roof will consist of built-up coal-tar bitumen on insulation board supported on 1.5-inch-deep 20-gage metal roof deck supported steel purlins. The exterior walls on the north, east, and west will be 2-inch insulated sandwich wall panel (24-gage metal). The interior walls will be concrete block, except in the office areas, where gypsum wallboard on wood studs will be used. A 1-foot-thick shielding concrete wall 18 feet high will be required for the storage and shipping room in the northwest corner of the area and also for the incoming-waste room along the sets edge of the area.

h. Fan House (B292)

An enclosed fan house will be required to contain the exhaust fans, filters, casings, heat-recovery systems, and process offgas system. This building, located just west of process-equipment area B, will be 70 feet long, 60 feet wide, and 31 feet high. It will be of standard construction.

On the east side, the fan house will have an extension that will form a duct over a 10- by 12-foot grating cover on the concrete exhaust tunnel leading to the stack. The extension will be 16 feet high, and 36 feet wide, and will extend 12 feet to the east. The construction will be the same as that described for the balance of the building.

A 10- by 12-foot underground heating and ventilation concrete-tunnel duct will extend 265 feet to the stack and will enter the stack below grade. The bottom of the tunnel will slope toward a stainless-steel-lined sump at the base of the stack. This tunnel will be coated with epoxy. The exterior walls of the tunnel will be damp-proofed.

6. Heating and Ventilation

The main process areas will be provided with a ventilation, heating, and air-conditioning system designed with air flows from areas with lesser to higher potential for radioactive contamination. The comfort requirements are as follows:

- Minimum comfort conditioning for humidity control.
- Average summer temperatures to be maintained at 80°F.
- Average winter temperatures to be maintained at 72°F.

These comfort requirements will be maintained up to an elevation of 15 feet from grade. Above 15 feet the air temperature will be allowed to rise to 100°F. The air will be exhausted above these areas to prevent stagnation.

Only high-occupancy areas will be air-conditioned for comfort as specified above. A once-through ventilation system, to be exhausted through a 200-foot stack, will be adequate for the remaining process areas.

Exhaust-air filtration will not be required for the main process areas. However, the regulated areas, waste storage, and process-equipment areas will pass through one stage of high-efficiency particulate air filtration. A roughing filter is to be provided for the air-supply system.

Air will be recirculated from offices and shop areas where practical to conserve energy.

a. <u>Carrier-Preparation, Carrier-Washdown, Cask-Cooling and Washdown, and Fuel-Unloading and Cask Decontamination Areas (B302, B304, B306, B308 and B312)</u>

These areas will be air-conditioned for operator comfort. The air-conditioning unit will be a packaged blow-through multizone system consisting of a three-zone outlet, dampers, a chilled-water-cooling coil, a steam-reheat coil, fan suction with drive and guard, a water-preheat coil, and an automatic roll filter, all sized for 100% outside air (capacity 30,000 cubic feet per minute). Ductwork outside the building will be insulated. A condensate receiver with dual pumps will be supplied to return the condensate to the main flash tank in the evaporator area.

Air will be distributed to the area by ducts running approximately 12 feet above the floor along the east and west walls. Registers will supply air downward and to the center of the working spaces. Each of the main supply ducts and branches will be provided with air flow monitors having gauges reading directly in CFM. The ducts will be run at the middle of the area with respect to the supply to provide a sweeping action and to minimize stagnation in the upper levels.

The exhaust from the carrier-preparation area will rise through the roof in the center of the area and run to the east, where it will drop through the roof in the process-equipment room and connect with the header from the storage pools. The exhaust from the washdown and cooling areas will be similar to the above and will connect to the same header below the roof.

Air-flow monitors and gages will be provided in the exhaust ductwork similar to the supply system.

Separate exhaust ducts will be run at the base of the decontamination and washdown pits. These ducts will have outlets on the inside of the pits to pull room air down through the pits. This duct will rise through the roof and connect to the main exhaust header.

A separate supply duct will run to the basement area around the washdown and cooling area.

An air-conditioning unit will require 225 tons of refrigeration (600 gallons per minute, 50°F chilled water) and 1500 pounds of low-pressure steam per hour.

b. Fuel-Storage Pools (B310)

The fuel-storage pools and the adjacent process-equipment area A will be ventilated only. A 6-minute air change to an effective height of 10 feet will be provided.

The ventilation unit (capacity 709,000 cubic feet per minute) will be a packaged blow-through zoning system consisting of fan suction with drive and guard, two-zone discharge, dampers, steam-reheat coil, water-preheat coil, automatic room filter, and outside air louver, sized for 100% outside air. The unit will be located on the roof of process-equipment area A at the north end of the building.

There will be two separate exhaust systems serving the area:

- Process-equipment area exhaust: the exhaust from this area will pass through the high-efficiency particulate air filter system before discharge to the atmosphere. Exhaust will be taken from just below the roof by an exhaust header running along the south wall.

- Storage-pool area exhaust: The exhaust will consist of two headers, one on the east and one on the west wall, running just under the roof to the stack tunnel.

c. Supplementary Process Facilities

The primary electrical control room (ECR) will be ventilated to keep the temperature from exceeding 90°F. Conditioned air will be supplied by the AC unit located in the heating and ventilation fan room. The back-up ECR will be ventilated by air from the supply duct in process-equipment area A.

The central control room will be comfort conditioned, and the back-up instrument panel room will be ventilated from the same supply header as the back-up electrical control room.

The nonregulated areas will be heated and ventilated in accordance with standard industrial practice for office facilities. The regulated areas will have a once-through air system that is exhausted through the stack, with filtering through high-efficiency particulate air filters.

Air-conditioning provisions in the supplementary process facilities will meet standard industrial requirements for control rooms and other personnel areas.

d. Solid-Radwaste Storage and Disposal Facilities

The solid-radwaste storage and disposal area will be ventilated only. A supply branch from the vent unit will serve the area.

A special exhaust system will be provided for this area because of the potential for spreading contamination. Exhaust will be taken from the compactor hood and the general area through a high-efficiency particulate air filter and housing to separate exhaust fans. Two fans will be provided (one a spare).

e. Exhaust Stack

A 200-foot-high concrete stack will be provided for discharging the various exhaust systems to the atmosphere. This stack will be designed to accommodate future expansion for four modules.

The stack will have an internal diameter of 12 feet at the top. An underground concrete duct (10 by 12 feet) will serve the stack and enter it through its base. An octagonal base foundation will be required. The internal diameter at the base of the stack (top of octagonal foundation) will be 16 feet. A sump will be provided at the base of the stack. The stack will be of standard construction.

7. Mechanical Equipment

The AFR building will be equipped with the following cranes:

- One pendant-operated 10-ton overhead bridge crane in the carrier-preparation area
- One 125-ton overhead bridge crane radio controlled
- Two 5-ton jib cranes
- One 10-ton transfer crane in the fuel-unloading pool area
- Two 10-ton transfer cranes in the fuel storage pool area
- Two 10-ton overhead bridge cranes in process-equipment area A
- One 10-ton and one, 5-ton overhead bridge crane in process equipment area B

The pendant-operated 10-ton-capacity overhead bridge crane in the carrier-preparation area will be used to remove peripheral equipment. Appropriate yokes and/or slings and two air-operated portable impact wrenches will be provided for use with this crane.

The 125-ton-capacity overhead bridge crane with a span of approximately 85 feet will be used in the carrier-washdown area, cask-cooling and washdown area, the fuel-unloading pool, and cask-decontamination area. This radio-controlled crane with integral maintenance platform and powered rotating block will be equipped with a load cell to detect when a cask has reached the bottom of a pool or pit. Auxiliary equipment will include cask yoke attachments for each of the seven different types of cask expected at the AFR facility and a 25-ton crane sling.

The pendant-operated 10-ton-capacity transfer crane in the fuel-unloading pool area will be supported from the floor on one end and from support steel at the other end. Because the fuel-unloading pool will be filled with water that might be contaminated, the crane hook must be so designed that it will not touch the water. Extension rods will be used to transfer the spent fuel from the cask to the baskets. A platform on the crane will permit removal of the cask primary head as well as observation over the pools. The crane will be provided with grapples capable of the following operations:

- Removing and storing the primary head.
- Engaging the spent-fuel assemblies in the cask.
- Removing the spent-fuel assemblies from the casks without interfering with other cask internals.
- Indexing the spent-fuel assemblies in a specified opening of the basket.
- Raising the fuel baskets from minus 50 feet to minus 33 feet.
- Lowering the spent-fuel assemblies into the basket.
- Releasing the spent-fuel assembly.
- Withdrawing from the basket.

The two 10-ton-capacity cranes (one crane for each pool) in the fuel storage pool area will have a powered rotating hook block for handling fuel baskets under water.

The two 10-ton-capacity pendant-operated overhead bridge cranes with integral maintenance platforms for use in process-equipment area A will be used to handle periodic maintenance or replacement of water purification equipment.

One of the two 5-ton-capacity pendant-operated jib cranes will be used in cask decontamination area; the other wil be at the corner of the cask-cooling and washdown pit.

A movable platform will be provided for the decon-tamination pit.

Operations in the fuel-unloading-pool area will require the use of the 125-ton overhead bridge crane used also in the carrier-washdown and cask-cooling and washdown areas, a 10-ton pendant-operated fuel-unloading-pool gantry crane, and two storage-pool cranes. The overhead bridge crane will transfer a cask with the primary head only from the cooling and washdown pit and set it to rest on a concrete ledge 14 feet below the water level in the fuel-unloading pool, with the head of the cask remaining above water. This crane will then proceed to the crane-maintenance area to store the cask yoke unless it is required for another operation.

By positioning the fuel-unloading-pool crane above the cask, the remaining nuts from the primary head will be removed with an air-powered torque-controlled wrench. The fuel-unloading-pool crane will then be returned to its maintenance position until needed.

The cask, now ready for unloading, will be lowered to the floor of the 50-foot-deep pool by the 125 ton cask handling crane. To prevent lowering the crane hook into the water, an extended yoke taken from the fuel-unloading-pool underwater storage location will be used. After the cask has been properly placed, the extended yoke will be returned to the underwater storage location. The 10 ton fuel unload pool crane will move into position to perform the following functions:

a. Remove the primary head from the cask and store it on a ledge 14 feet underwater by using a grapple assembly from the underwater pool yoke storage area.

b. Remove individual fuel assemblies from the cask by using a fuel-handling grapple from the underwater pool yoke storage area and insert them into criticality-safe baskets for the later storage.

c. Lift filled baskets from the unloading level at 50 feet below the water level to 33 feet below the level. A basket yoke extension from the underwater pool yoke storage area will be used to perform this lift. Steps b and c will be repeated until all fuel is removed from the cask.

d. Replace the cask primary head with the grapple assembly and then return to its maintenance position until needed.

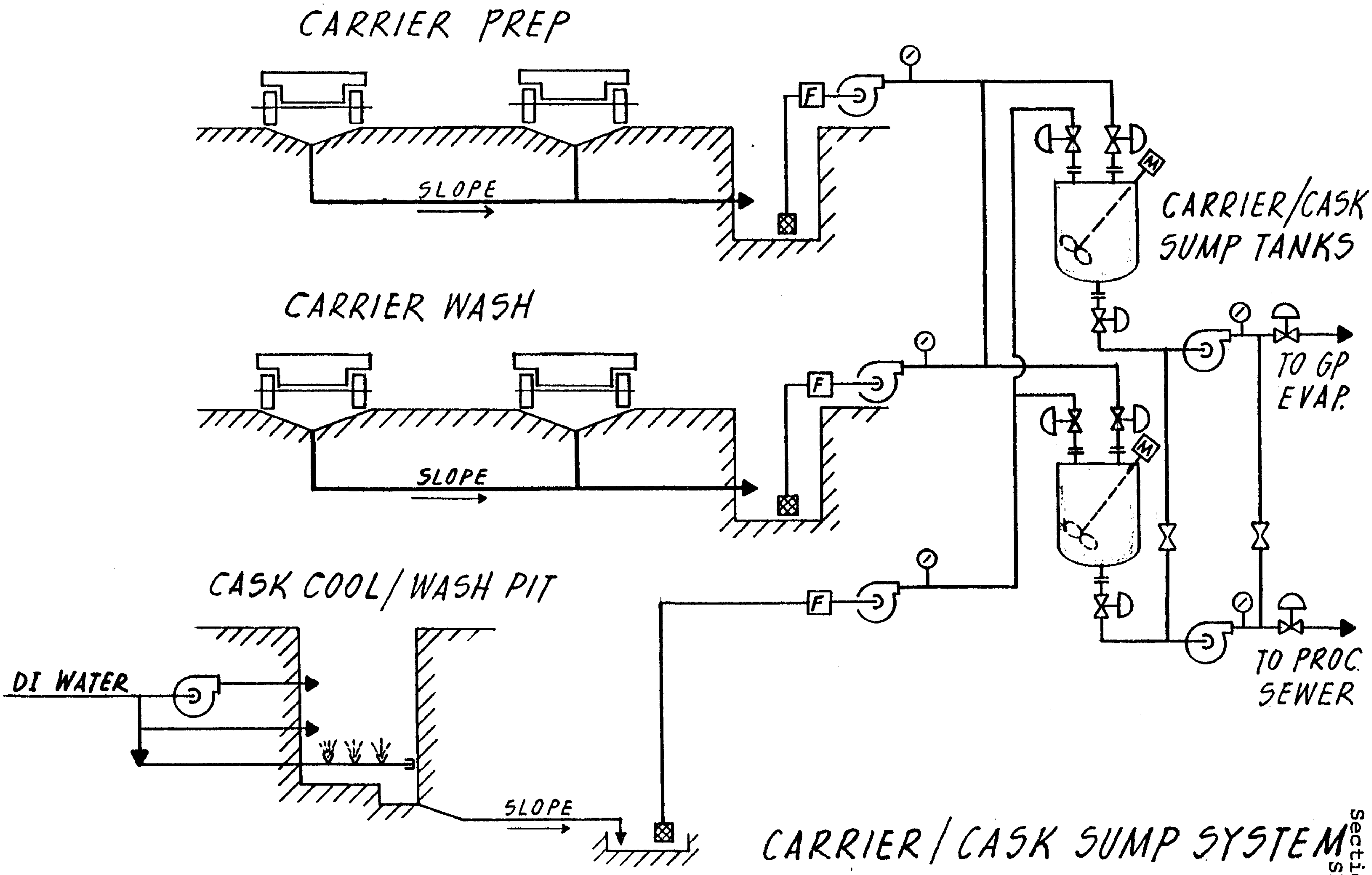
The fuel-storage pool cranes will first move the fuel baskets, one at a time, to a preassigned storage location. Then empty casks with the primary head in place will then be lifted and transferred, either directly to the decontamination pit or to the ledge in the fuel-unloading pool by the overhead brige crane. Once the cask has been removed from the fuel-unloading pool, the fuel-unloading-pool crane will be moved to its maintenance position.

8. Process Systems

a. Carrier Preparation, Cask/Carrier Washdown and Cask Cooling and Washdown Areas
Ref. Figures 7,8,9 and 10

Cask and carrier washdown effluent will be collected in sump pits and pumped to holding tanks in process-equipment area B. (See Figure 7) The liquid will be examined for contamination and, if negative, released to the process sewers. (Effluent from the process sewers, in this case process washwater, will be treated in the wastewater-treatment facility). If contamination is present, the washdown effluent will be transferred to agitated holding tanks. It will be subsequently transferred to the general-purpose evaporator, where the overhead will be evaporated, condensed, collected, and transferred to the cask cooling/washdown deionizer system or recirculated. The concentrate resulting from the evaporation process will be recirculated, sampled, and eventually disposed of as solid waste in 55-gallon drums.

Cooling water for the cask cooling and washdown pit will be passed through a separator and then through a heat exchanger, from which the non-condensible vapors will go through carbon and HEPA filters into the heating and ventilation stack. The liquids will be condensed and pumped through deionizers for eventual reuse in the deionized water storage tank. (See Figure 8).



CARRIER / CASK SUMP SYSTEM

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Figure 7

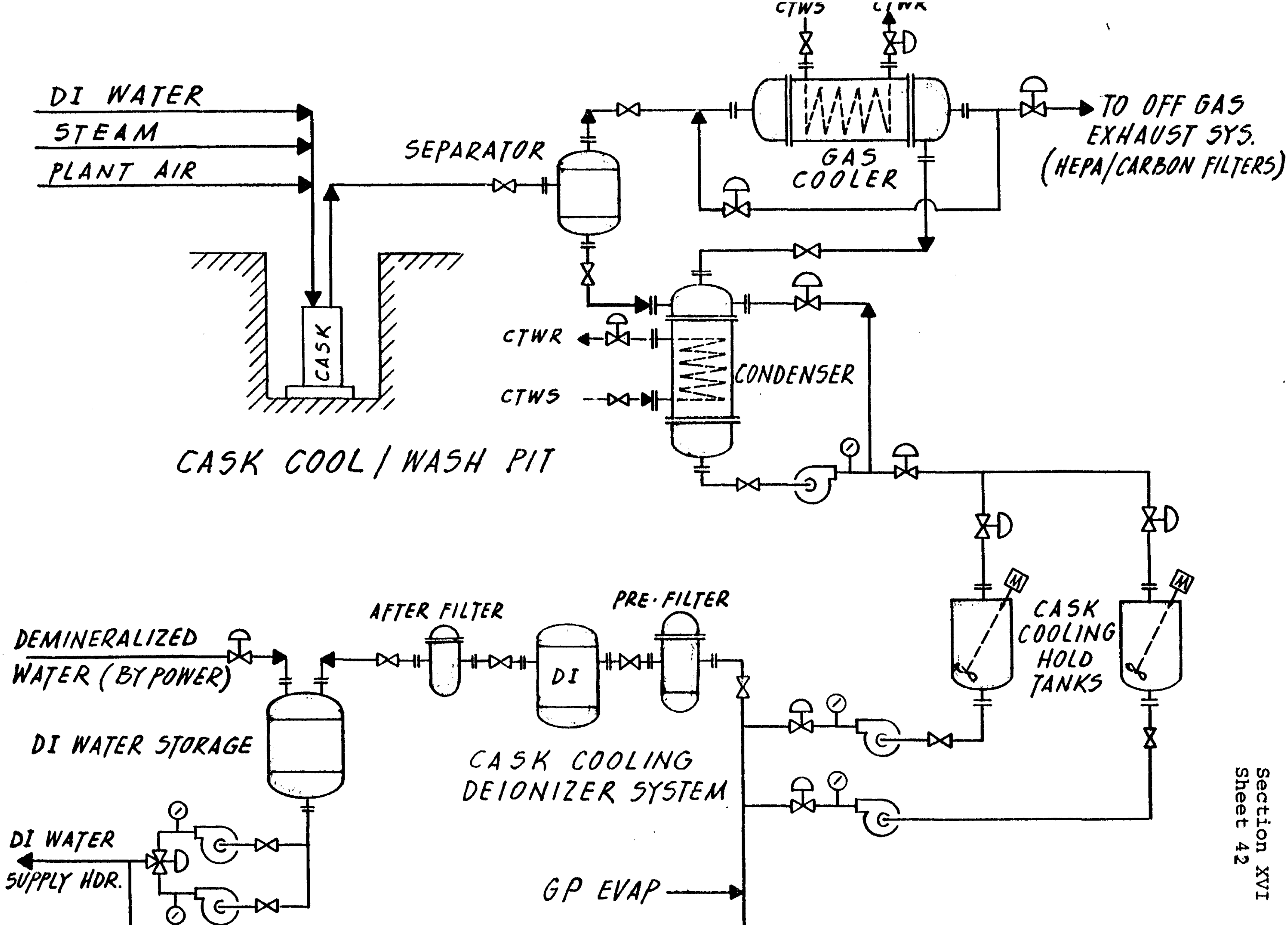

Figure 8

CASK COOL / WASH SYSTEM

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A resin-mix system (See Figure 9) consisting of cation, anion, and Zeolon-100 will be provided for the periodic recharging of the deionizer. All used resin will be disposed of through a settling tank/decanter. The water will be decanted for reuse or disposed via the high level evaporator. (Separate resin-mix facilities will be provided for the fuel-storage-pool deionizer system).

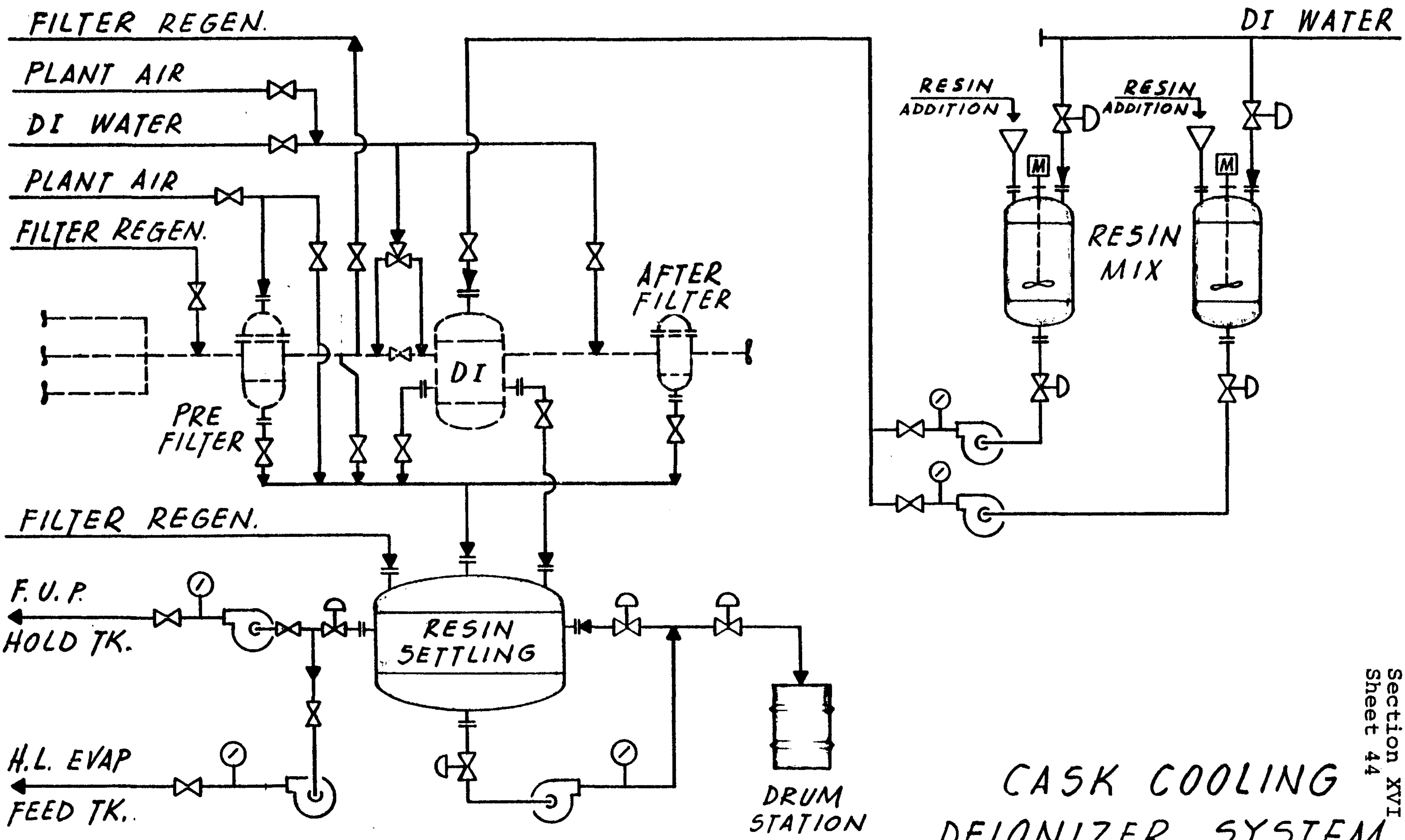
Liquid entering the cask-cooling deionizer system will be passed through prefilters that also required periodic recharging. Dedicated filter-recharging equipment will be provided for this purpose. (See Figure 10) On completion of a filter regeneration cycle, all used filter material will be backwashed into settling tanks and the water will be decanted for eventual disposal through the high-level-evaporator system. (Separate recharging facilities will be provided for the prefilters of the fuel storage pool deionizer system).

The liquid effluent from deionizer and liquid filter back-wash will be collected in an agitated hold tank. The waste will be subsequently transferred to the high-level (HL) waste evaporator, where the overheads will be condensed, and collected in receiving tanks for a contamination check. If results of the check indicate that additional treatment is required, the effluent can be recirculated into the HL evaporator feed tank or to the cask wash/cooldown area deionizer system. The concentrate will be sampled and disposed as solid waste in 55-gallon drums, which will be shipped off the site for burial.

b. <u>Fuel Unloading and Storage Pools</u>
<u>Ref. Figures 11,12,13 and 14</u>

The fuel storage and unloading pools are provided with water-treatment systems similar but larger to those described for the cask cooling/washdown and decontamination areas. (See Figure 11).

Water from the fuel unloading and storage pools will be circulated through heat exchangers and three parallel deionizer systems. Two will be in continuous operation and one a standby. Dedicated filter recharging and resin-mix facilities will be provided for the fuel-storage-pool deionizers. Spent resins from the deionizers will be disposed of through a settling tank and the high-level-evaporator system, as described for the cask cooling/washdown facilities. (See Figures 12 and 13).



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CASK COOLING DEIONIZER SYSTEM

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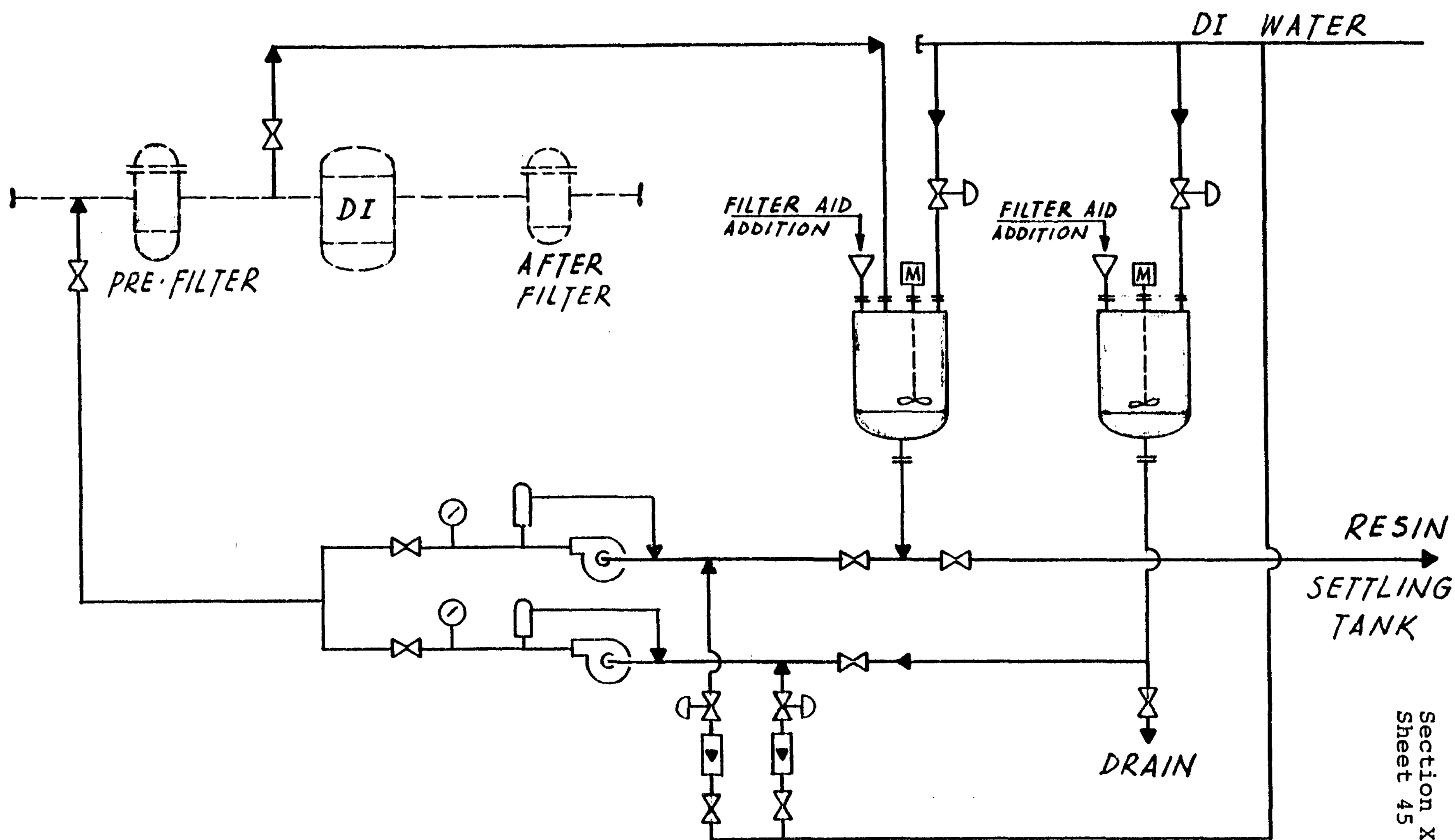
Figure 9



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CASK COOLING
DEIONIZER FILTER REGENERATION

Figure 10

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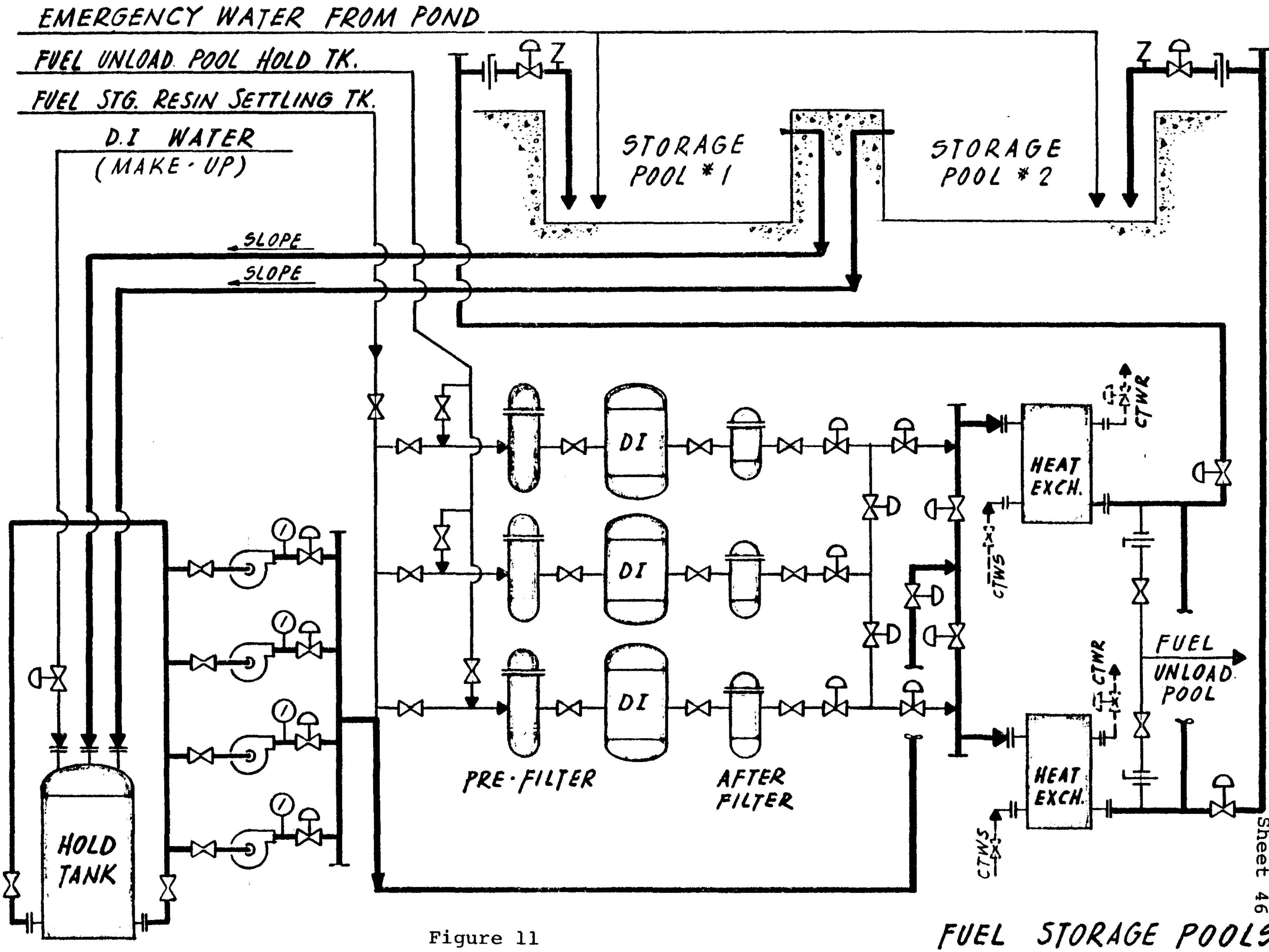

Figure 11

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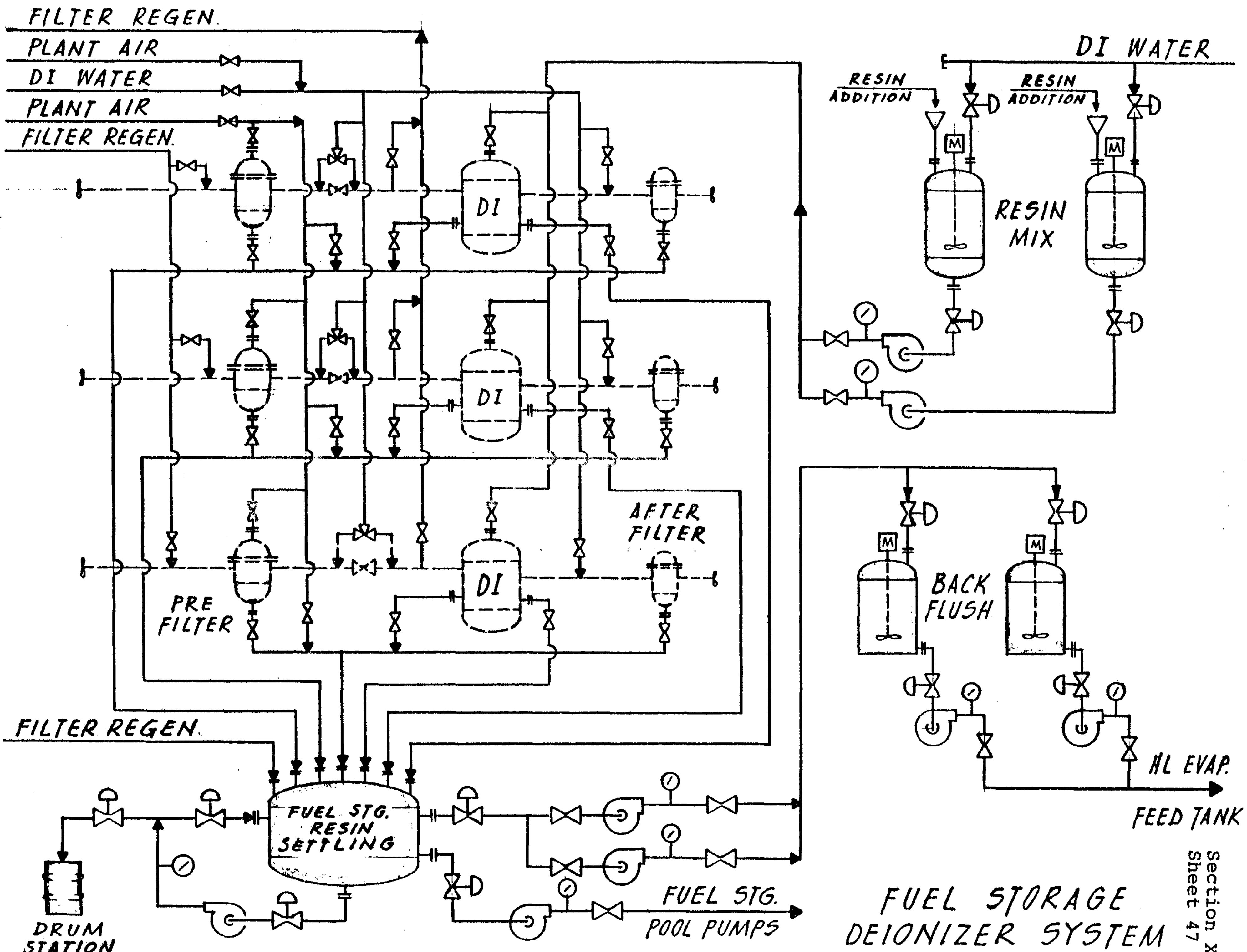

FUEL STORAGE DEIONIZER SYSTEM

Figure 12

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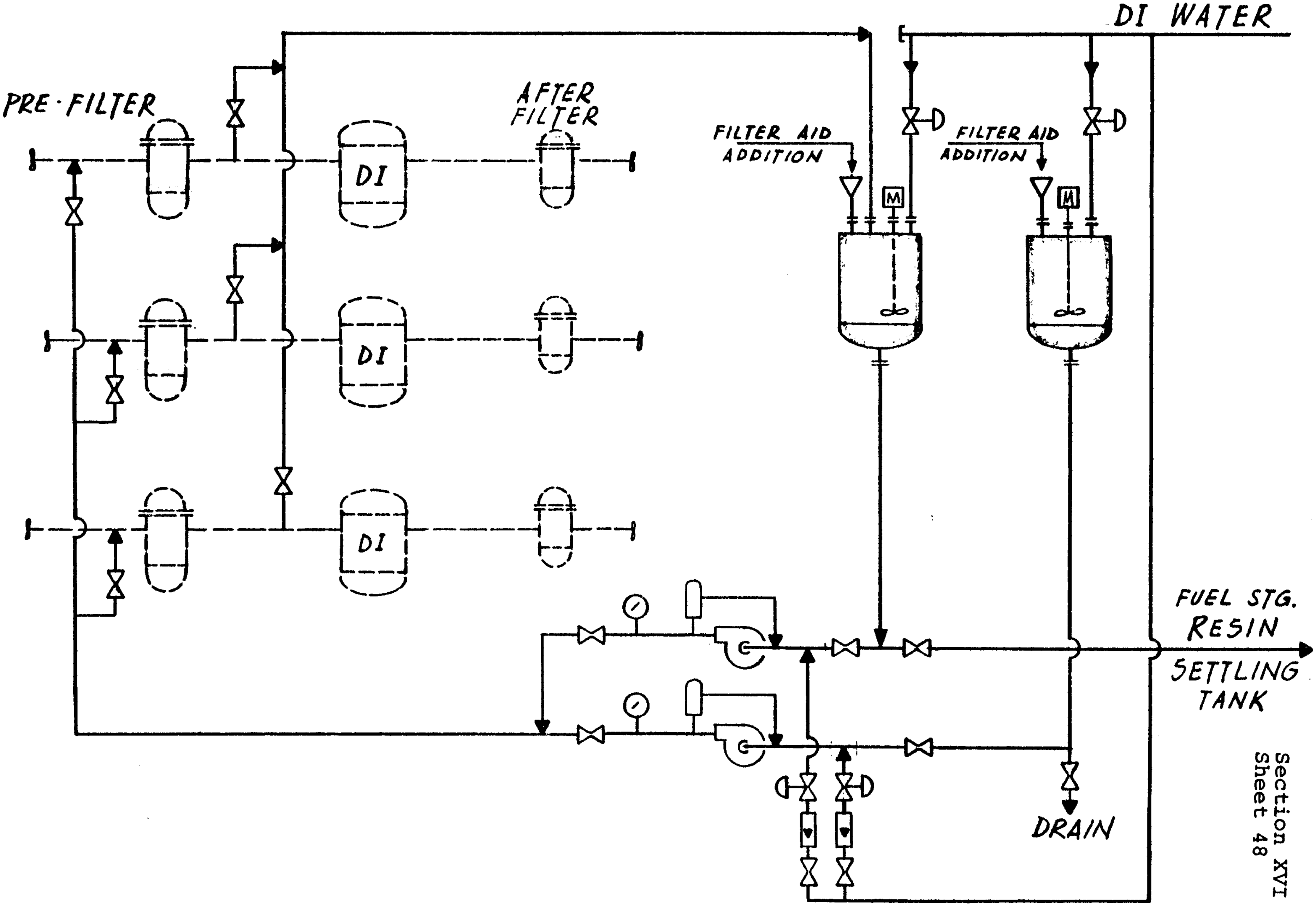

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Figure 13

FUEL STORAGE
DEIONIZER FILTER REGENERATION
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Approximately 25% of the water circulation flow will be deionized to maintain a normal water quality of 2 x 10^{-4} Ci/m^3. Capability exists to clean the fuel-unloading pool independently through the spare deionizer system. (See Figure 14).

The process equipment to be provided will include the following:

- One 30,000-gallon stainless steel holding tank.
- Four stainless steel 3000-gpm, 250-horsepower cooling pumps.
- Two stainless steel plate heat exchangers consisting of 279 plates and having a surface area of 6000 square feet.
- Two 1000-gallon stainless steel resin mix tanks with agitators and transfer pumps for the cask-cooling deionizers.
- Two 1000-gallon stainless steel resin mix tanks with agitators and transfer pumps for the fuel-storage-pool deionizers.
- Two 2000-gallon stainless steel resin settling tanks with transfer and recycle pumps (one tank each for the cask-cooling deionizers and fuel-storage-pool deionizers).
- Two 10,000-gallon waste holding tanks with agitators and transfer pumps.
- Three 7000-gallon stainless steel deionizers with a flow rate of 1500 gpm.
- Three deionizer prefilters with a flow rate of 1500 gpm.
- Three deionizer afterfilters with a flow rate of 1500 gpm.
- One 1000-gallon stainless steel precoat tank with agitator and transfer pump.
- One 2000-gallon stainless steel admix tank with agitator and transfer pump.

c. Cask Decontamination
Ref. Figures 15 and 16

After fuel is unloaded from the cask, the 125-ton crane will move the cask into a decontamination pit 22 feet deep and 25 feet square. The pit will have a movable platform with a spray ring to facilitate decontamination of the cask. The decontaminants will consist of a detergent solution, steam and hot water. The effluents will be collected in hold tanks for eventual disposal through the General Purpose Evaporator system. Helium or plant air can be used to test the cask head gasket. (See Figures 15 and 16).

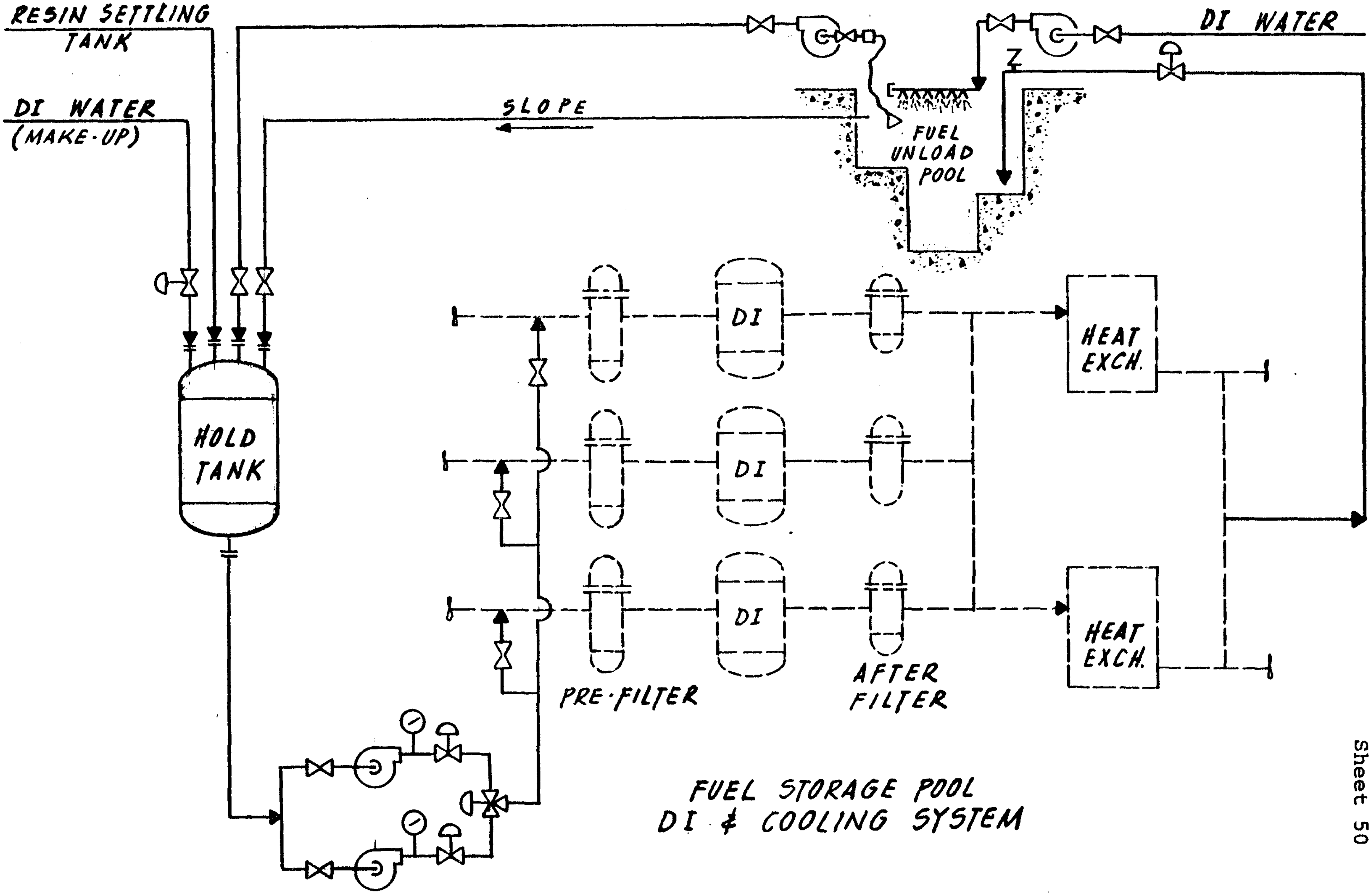

Figure 14

FUEL UNLOAD POOL SYSTEM

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9. Electrical and Instrumentation Systems

a. Electrical Equipment

The following electrical equipment will be supplied for operating the spent-fuel storage pool equipment and auxiliaries:

- Nominal 460-volt, three-phase, 60-hertz power supply, and crane control system for the pool cranes.
- Nominal 460-volt, three-phase, 60-hertz power supply, to the auxiliary bridge cranes. Power is also to be provided for the area ventilation fans, lighting, and other auxiliary equipment.
- Two electrical cable trays will be supported on the floor to receive power feed cable from the storage pool crane cable reels.

b. Closed-Circuit Television Systems

Three closed-circuit television systems will be used for (a) observing fuel-unloading operations and internal inspections and (b) identifying spent fuel assemblies in the storage pools for both admission and retrieval.

The television cameras under consideration will be radiation resistant, designed specifically for underwater use with an integral annular lighting system.

TV monitors and camera controls will be assembled on mobile carts for poolside operation. Remote monitors will also be provided in the control room.

Twelve multipin video receptacles will be provided for use with the portable pool cameras. These will be wired back to the central control room and will also interface with the mobile cart.

c. Electrical and Instrument Control Philosophy

A backup panel separated from the central control room will be provided in a seismic and tornado resistant structure. The storage-pool water level, temperature, and radioactivity levels will be continuously monitored on this panel. This structure will also contain at least one instrument and one breathing air compressor. All other instrumentation inside cells and other shielded areas will be controlled from the standard-construction central control room.

Instrumentation will be permanently installed to monitor various areas. It will consist of radiation detectors that sense radiation to which personnel might be exposed. The following systems will be provided:

- Nuclear incident monitors (NIM) to sense high Gamma-ray levels and include an audible and visible alarms.
- Gamma ion chamber system or Kanne chamber to sense gamma radiation from normal background up to 10 R/hr.
- Continuous air monitors to sense radioactive dust in the air using a vacuum system.
- Filter paper samplers to sense radioactive materials in the air.

These will be supplemented by portable units:

- Beta-gamma continuous air monitors
- Portable GM survey meter
- Portable ion chamber survey meter
- Portable beta-gamma survey meter
- Portable low-energy ion chamber survey meter
- Portable alpha scintillation survey meter
- Portable neutron REM counter
- Tritium monitor
- Direct reading dosimeter
- Dosimeter charger
- Portable count rate meter
- Hand and foot monitors
- Air-velocity monitors

10. Fire Protection

Fire protection will be in accordance with standard industrial practice. An ionization-type fire-detection system will be provided for the offices and process sections of the building. This system will consist of ceiling- or duct-mounted detectors that will alarm at a control panel in the central control room. This panel will have standby batteries for emergency use.

The waste storage and disposal area will he only area to be protected by a sprinkler system. Adequate drainage facilities will be provided to handle fire-water runoff.

Areas containing supplementary process equipment will be provided with ionization and/or thermal detection alarm systems and fire extinguishers.

D. TRUCK-RECEIVING, WAREHOUSE, AND REFRIGERATION BUILDING (B231 AND B244)

This facility will house a general purpose warehouse, 50 feet long, 100 feet wide, and 18 feet high at the eaves; a truck-driver waiting area to accommodate three truck drivers simultaneously, with sanitary facilities; an office area; and a refrigeration facility, 40 feet long, 35 feet wide, and 12 feet high.

1. Architectural and Civil Construction

The building is a one-story irregularly shaped structure containing approximately 8500 square feeet of floor space. The frame of the building oconsists of a column, girder, and open-web joint system. The refrigeration area will have a 6-inch concrete slab with 2-foot thick isolated pads (5 by 8 feet) under the refrigeration machines. The warehouse floor slab will be 8-inch concrete. The floor in the office-service area wil be a 4-inch concrete slab.

The roofs over each area will be at a different elevation and will consist of 1.5-inch galvanized metal deck, 2-inch rigid composite insulation, and four-ply built-up roofing with slag or gravel surface. Exterior walls in the office and service area will be 4-inch brick, 1-inch polystyrene, and 4-inch concrete block. The remainder of the building will be insulated factory-assembled metal panels on a girt system. All interior partitions will be 8-inch concrete block. Two vertical rolling, electrically operated doors will be provided in the warehouse.

2. Heating and Ventilation

Minimum heating and ventilation will be required for the warehouse; however, personnel comfort will be provided for the truck-driver waiting area and warehouse office.

The refrigeration facility will be heated in the winter and ventilated in the summer. Two roof ventilators with automatic inlet and outlet louvers will be provided. A thermostat will start the fans and open the louvers when the temperature rises to 80°F. Four steam unit heaters will maintain a 55°F ambient temperature inside the building during the winter. Each unit heater will be complete with its own thermostatic control.

The refrigeration facility will house the refrigeration machines and accessories that will provide chilled water to the heating, ventilating, and air-conditioning (HVAC) system.

The refrigeration equipment will consist of two 250-ton chilled-water refrigeration machines complete with compressor, condenser, chiller, interconnecting piping, chilled-water pumps, surge tank, hermetic motor, electrical power, local control panel, and local instrumentation. Electrical and instrumentation items to be provided include a fault alarm circuit back to the powerhouse control room, a level sight glass for the surge tanks, four orifices in 10-inch lines for flow test points, and two temperature-control loops for 10-inch valves. A prepackaged instrument panel will be furnished with the equipment.

In addition, at least 5 kilowatts of power will be available for operating the ventilation-fan motors.

E. SANITARY TREATMENT FACILITIES AND SEWERS (B252)

This facility will treat and dispose of all liquid sanitary waste; it will not be enclosed in a building. Equipment to be provided includes the following:

- An 8000-gallon-per-day prefabricated, extended-aeration waste-treatment plant, including a comminutor and a chlorinator.
- A 50,000-gallon surge basin, lined with polyvinyl chloride plastic.
- Three spray ponds.
- Two spray pumps.

The sanitary waste treatment facility will be sized on the basis of a preliminary personnel population of 200 people per day. A package treatment plant will consist of communitor, sludge-holding basin, aeration chamber, clarifier, and a chlorine contact chamber will be provided for 8000-gallon-per-day capacity. This is based on an allowance of 40 gallons of sewage per person per day.

The effluent from the treatment plant will be directed to three spray ponds. A 50,000-gallon surge basin will be provided for holdup during unfavorable weather conditions.

The sludge will be pumped out of the sludge-holding basin and transported away from the site.

F. EMERGENCY DIESEL-GENERATOR BUILDING (B254)

A standby diesel-generator will provide power for designated loads in the event of a complete commercial power failure. The diesel-generator and peripheral equipment will be housed in an independent seismic and tornado resistant structure in the vicinity of the AFR building. With walls and roof of reinforced concrete, it will be 39 feet long and 25 feet wide. It will cover an area of 975 square feet, with a total volume of 17,025 cubic feet. An attached building, 16 feet long and 10 feet wide, will house a 275-gallon day fuel tank.

A Halon fire-suppression system will be provided for the diesel day-tank area. This system, which will provide a 5% concentration of Halon within 10 seconds of activation, will be complete with detectors, alarms, a control panel, and Halon bottles. (A spare bottle will be included.) The control panel will be wired to sound an alarm at the area gatehouse.

A second Halon system, similar to the one above, will be provided for the emergency electrical switchgear room.

A 750-kilowatt diesel generator will furnish power to the emergency loads and will be activated by loss of normal power. Loads will be transferred by an automatic transfer switch in the seismic- and tornado resistant area. A manual transfer switch will also be provided for maintenance.

The instrumentation associated with the emergency diesel generator will be furnished by the vendor. Additional instrumentation to be provided includes a level-measurement loop for the diesel fuel tank, for display in both the powerhouse and the central control room. In addition, an opacity meter will be provided for monitoring the diesel-generator exhaust.

Other facilities associated with this structure are a diesel-truck unloading station and a seismic resistant diesel-fuel underground storage tank.

A paved road area will be provided with dikes to contain the spill of a 4000-gallon tank truck. In addition, a concrete pad will be provided for the unloading pump. Drainage from the road and pad will be accumulated in a sump for pump-out or valved drainage to the storm sewer.

An underground enclosure will be provided for a diesel-oil storage tank. This 10,000-gallon tank and its supports will be designed as a seismic- and tornado-resistant structure consisting of a 4-foot-thick octagonal concrete mat (17 feet across flats), poured with the bottom of the mat 12 feet below grade. Each face of the octagonal structure will be a 3-foot thick concrete wall, with a 3-foot thick roof poured after the tank is in place. Final elevation of the roof pad will be 3 feet above grade. A ladder and hatch will be provided to permit access to the pumps at the base of the tank.

G. POWERHOUSE AND DEMINERALIZED WATER-TREATMENT BUILDING (B284)

The function of the powerhouse building is to provide space for steam-generation and auxiliary equipment. The powerhouse will also contain demineralized-water treatment equipment. The boilerhouse is to be a semi-enclosed installation with two boilers, the access platforms and the coal handling bunkers. The operating areas are completely enclosed. Integrated into the powerhouse building will be the power-area electrical and instrument control rooms. The power compressed-air system, boiler feedwater, and steam auxiliaries will also be contained within this building.

1. Architectural and Civil Construction

This standard-construction building will be enclosed from the basement to the coal bunker penthouse in the bunker bay. It will also be enclosed in the two-level boiler auxiliary bay, where locker rooms, maintenance shop, control rooms as well as boiler auxiliaries and compressed-air equipment will be located. Space will be included under the second floor to support service piping and to locate distribution manifolds for steam and boiler feedwater. The electrical control room and maintenance shop will be on the ground level. The electrical substation will be located in its own structure adjacent to the electrical control room. The instrument control room, offices, and locker rooms will be on the second level.

The boilers will be partially enclosed with a roof and side partitions extending from the roof down to 8 feet above the floor. The deaerating heater and storage tank will be located out-of-doors on the auxiliary bay roof.

An outside pad, 15 by 55 feet, will be provided on the east side of the building for part of the demineralized-water-treatment area. A 100-foot-high stack, 5 feet in inside diameter, will be located south of the powerhouse structure.

This building covers an area of 14,000 square feet, with a total volume of 267,000 cubic feet. The overall dimensions are as follows:

- The section containing the firing aisle and bunkers will be 70 feet long, 50 feet high and 12 feet wide.

- The section over the boilers will be 50 feet wide, 70 feet long, and 30 feet high.

- The section containing the control rooms, offices, lockers and maintenance rooms, and boiler auxiliaries will be 70 feet long, 32 feet high, and 31 feet wide.

- The adjacent attached building section containing the electrical control room, electrical substation, and maintenance shop will be 30 feet wide, 60 feet long, and 22 feet high.

- The instrument control room will be 20 feet by 20 feet, with a 10-foot ceiling. There is sufficient room for ductwork above this ceiling.

The roof over the coal-bunker area will slope to the east and will consist of built-up coal-tar bitumen on insulation board supported on 1.5-inch-deep 20-gauge metal roof deck supported on purlins and girders. The roof over the boiler auxiliary area will be treated as an operating floor supporting the deaerators and miscellaneous platforms; it will slope to the east and consist of a 5-inch structural slab poured on metal deck forms and supported by a beam-and-girder system. A membrane and a 2.5-inch-thick concrete topping with wire mesh will be placed on the slab, with insulation added under the steel beams. Support steel for the deaerators will be designed for a live load of 100 pounds per square foot plus the weight of the equipment.

The roof of the demineralized-water-treatment area and the maintenance shop and substation area will be both light and the same as that described above for the roof over the coal-bunker area. The roof and siding over the boiler area will be single sheet to match the outer siding of the sandwich walls.

The upper floor concrete area in the coal bunker bay will be sloped to floor drains to facilitate washdown. A grating floor will be provided at elevation 40 feet. Drainage will be collected in a ground-floor sump. These upper floors will be poured on metal deck forms supported on a structural frame. They will be designed for a live load of 100 pounds per square foot plus the conveyor weight and two 25-ton-capacity coal bunkers.

The ground floor slab will cover the entire area of the building and, with the exception of the substation, will be sloped to drains, with the drainage system carried to an acid-proof-brick-lined sump 6 feet square and 6 feet deep, with the discharge carried to the waste-treatment area.

The stack will have an octagonal foundation 24 feet across flats and 4 feet thick, with a reinforcing density of 150 pounds per cubic yard.

The 100-foot-high stack will have an inside diameter of 5 feet (7 feet 6 inches at the base). The concrete walls will be 12 inches thick, with a reinforcement density of 150 pounds per cubic yard and a brick liner with an average thickness of 7 inches. Platforms and a sampling station (elevation 75 feet) with access ladder will be included.

2. Heating and Ventilation

The offices, change rooms, control rooms, maintenance area, etc., will be comfort conditioned by a 20-ton, self-contained recirculating air-conditioning unit supplying 7000 cfm to the area. This unit will be complete with an air-handling section, filters, direct expansion cooling coil, steam-reheat coil, piping, controls and motors. Also included will be an air-cooled refrigeration compressor-condenser package complete with fans, motors, piping, and controls. The refrigeration package will be mounted on a pad outside the building. Ducts to and from the building will be insulated.

The demineralized-water area will be heated to 55°F in the winter and ventilated in the summer. Two roof ventilators and two steam unit heaters will be provided.

Automatic controls (thermostats) will be provided to maintain the temperature at 55°F in winter The thermostat will also start the roof ventilators and open the wall louvers when the indoor temperature reaches 80°F.

The boiler auxiliary and air-compressor areas will be treated in the same manner as the demineralized-water area. Two unit heaters, two wall fans, louvers, and controls will be provided as above.

The boiler area proper will be provided with four roof ventilators (thermostatically controlled at 80°F) to vent the area above the boilers.

3. Facilities, Equipment, and Operation

Sprinkler fire protection will be provided inside the powerhouse buildings, including the bunker bay penthouse.

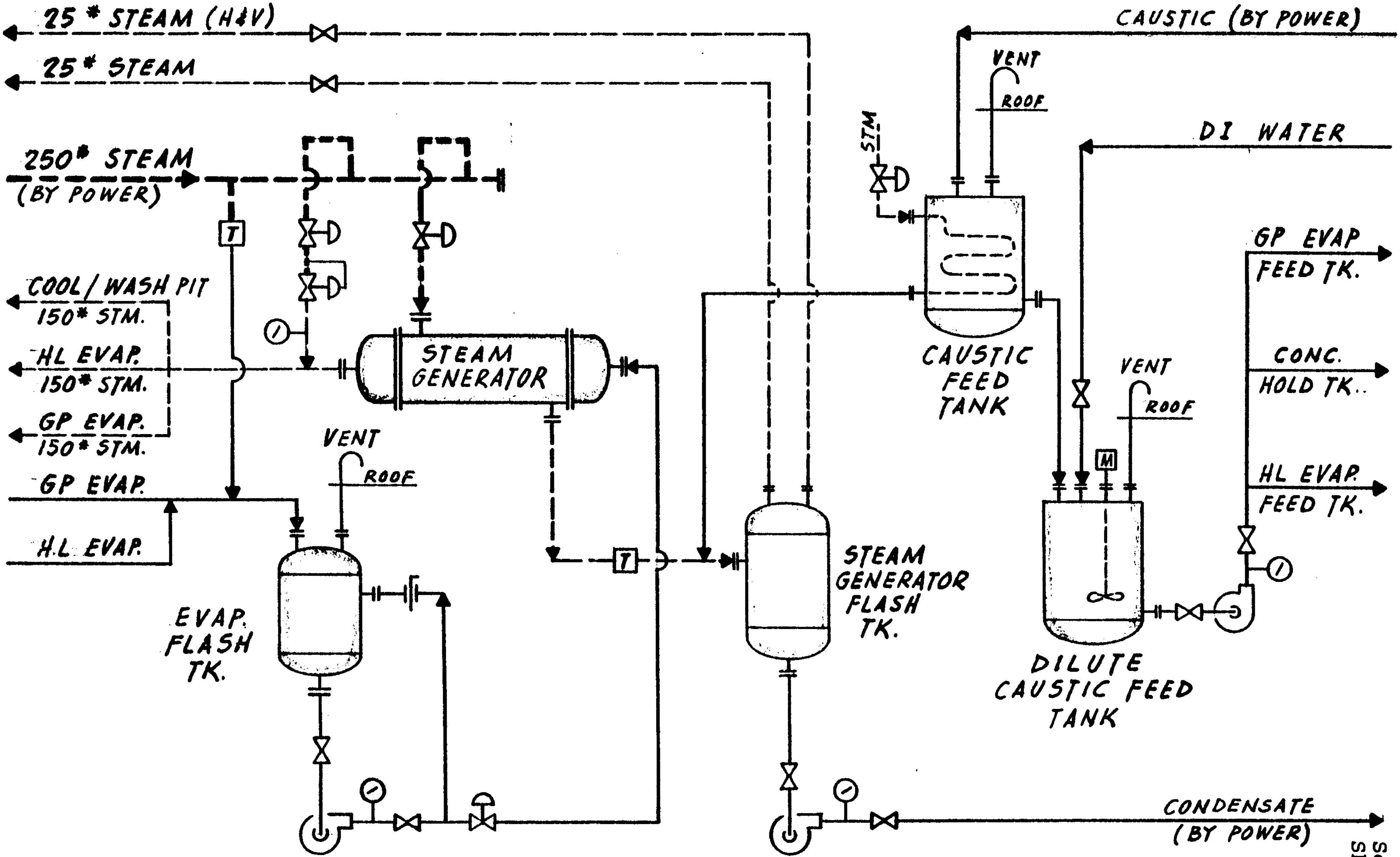
Facilities to be included in, or associated with, the powerhouse are the following:

- Steam-generation equipment, controls and auxiliaries.
- All steam, feedwater, and service piping, complete with auxiliary components, to powerhouse battery limits.
- Coal storage and handling facilities.
- Ash collection and disposal facilities.
- Atmospheric pollution-abatement facilities, as required to meet existing State and Federal particulate emission limits.

A central, coal-fired, steam-generating facility complete with coal handling and storage, ash collection and disposal, and air pollution-abatement facilities will be provided. The facility will be in compliance with all State and Federal atmospheric pollution-abatement regulations in effect at the start of construction.

Steam from this facility will be exported for process use and building heating requirements. The maximum connected process steam load requirement is 20,000 pounds per hour of 150-psig steam. The building heating load will have a maximum steam requirement of 10,000 pounds per hour of 25-psig steam. Steam will be exported at 250- and 25-psig levels. The 150-psig process steam load will be generated in a process heat exchanger using 250-psig steam to provide 150-psig steam. This will enable most of the condensate to be returned to the powerhouse. (See Figure 17).

Saturated steam at 250 psig will be generated by two factory-assembled, fire-tube, chain-grate stoker boilers, with coal being the only fuel. Each of these boilers will be capable of producing 250-psig steam at the rate of 18,000 pounds per hour. The loss of either one of these two boilers due to malfunction or scheduled annual overhaul will not require the curtailment of plant production.



EVAPORATOR COLD FEED & STEAM GENERATOR

Figure 17 W-709895

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4. Coal Handling

The coal-handling system will utilize run-of-mine coal received by railroad and dumped into a two-hopper track hopper. The track hoppers will discharge onto two unloading feeders (there will be two feeders, one for each hopper of the two-hopper track) and onto a belt conveyor for transfer to the crusher. After passing through the crusherhouse, the coal will be elevated by a bucket elevator. It will then be transported to a stock-out pile or, if crushed, to the bunkers. The stock-out pile is sized for 30 days' storage of coal. A long-term storage pile capable of containing up to 5 months' storage of coal will be mainteained to the southeast of the stock-out pile. Runoff from the coal pile will be collected in a holdup sump and pumped to the proces sewers. From the bunkers, the coal will be fed by a nonsegregating coal distributor to the chain-grate stoker and into the boiler. The coal-handling system will be complete with belt scale, belt cleaners, magnetic separator, etc. Air blasters will be supplied to free coal in the bunkers.

5. Ash Disposal

The ash from each of the two boilers will be continuously discharged into an ash hopper designed for 12-hour storage capacity and constructed of mild-steel plate completely lined with refractory. The ash hopper will operate intermittently, and ash will be discharged from the hopper compartment through a vertical feed gate to a sizing grate and into a pneumatic ash system, where it will be transported to a storage silo for later disposal.

Fly ash from the dust collectors will be pneumatically conveyed to the ash silo. Automatic valves will be used to enable the fly ash to be intermittently removed.

6. Boiler Water Blowdown and Blowoff

A common blowoff tank that is vented to the atmosphere will be provided and will collect blowoff water from the boiler. This tank will allow the boiler water to flash to atmospheric pressure and then will drain to the sewer. This equipment will be installed at the powerhouse ground-floor level.

Continuous blowdown will be taken from the boiler to minimize boiler-water solids concentration and to provide sample water for testing and control. The continuous blowdown will run from the boilers to a blowdown flash tank, where 25-psig steam will be flashed off, and then the water will continue through a blowdown heat exchanger to a sewer. This equipment will be installed at the powerhouse ground-floor level.

Continuous sampling will be maintained from the two boilers, as mentioned above, as well as from the main steam line and from boiler feed pump suction at the deaerator outlet.

7. Boiler Feedwater

The boiler feed will go through two stages of heating. Makeup water (demineralized water) to the deaerating heater will pass through the blowdown heat exchanger, where it will absorb heat from the continuous-blowdown water. In the head of the deaerator, the makeup water will also be heated by direct contact with 25-psig steam. An overflow vent tank will be provided on the deaerator overflow so that overflow from the deaerator can be flashed to atmospheric pressure and the remaining water discharged to the sewer. In the boiler area, powerhouse condensate will be collected in a condensate tank along with returning condensate from selected process and heating and ventilation (H&V) users. All H&V condensate will be returned to the powerhouse, and only the condensate from the 150-psig process steam heat exchanger will be returned. Condensate will be pumped from the condensate tank to the deaerating heater.

Three boiler feed pumps, each capable of carrying the full load, will be provided. To support the powerhouse heat balance, to obtain the benefits of energy conservation, and to make the generation of steam as independent as possible, two of the three boiler feed pumps will be turbine driven. The remaining feed pump will be motor driven and will be used as a standby pump ready for automatic operation at any time the boiler feed system malfunctions, cannot provide satisfactory feedwater pressure, or whenever the powerhouse heat balance requires it. Parallel headers will be run from the boiler feed-pump discharge to the boilers. This will enable one header to be taken out of service for maintenance or expansion.

The boiler feedwater must be conditioned to remove dissolved oxygen and maintain a proper pH. This is required to prevent solids buildup on the boiler heating surfaces. The treatment will be accomplished by pumping chemical solutions under controlled conditions to the deaerator discharge and the boiler drums. Sulfite will be pumped directly to the deaerator discharge; phosphate will be pumped to the boiler drum proper. Batching and pumping equipment will be provided in the powerhouse chemical area.

A standby boiler feed makeup will be provided from the fire-water system, which will be connected to the suction header of the boiler feed pumps.

8. Electrical

In addition to the process and building auxiliary loads, the powerhouse load center also includes the following: the water-treatment facilities, domestic water system, well equipment, air compressor, the demineralized-water facilities, and other miscellaneous loads.

The connected load will be approximately 1463 kVA and will be served by one 1500 kVA substation. The operating load will be 1000 kVA.

9. Instruments

The instrument control room, 20 by 30 feet, will be on the second level. The instrumentation will be pneumatic and packaged in two 10-foot instrument panels. Controls will be provided for a stoker spreader and the coal-fired boilers. The panel will include a semigraphic that utilizes electronic alarm cards. It will include indicators and recorders, smoke-opacity transmissometer electronics, and various other miscellaneous controls. An additional opacity meter will be provided for dedicated stack use.

10. Heating and Ventilation Loads

Low-pressure steam will be required for heating service as follows:

- 200 pounds per hour for the offices, change rooms, control rooms, and maintenance area.
- 100 pounds per hour for the demineralized-water area.
- 100 pounds per hour for the boiler auxiliary and air-compressor area.

11. Powerhouse Compressed-Air System

The powerhouse will be serviced by the following compressed-air units and accessories:

- A plant-air compressor (90 psig, capacity 100 cubic feet per minute) with an air receiver and 40-horsepower motor.

- An instrument-air compressor (80 psig, capacity 100 cubic feet per minute), with an air receiver, a dessicant-type air dryer, and a 40-horsepower motor.

These units will be heavy-duty, water-cooled, minimum two-stage, double-acting electric-motor-driven air compressors.

A cross-connection will be supplied between the instrument-air piping and the plant-air piping as a backup for the instrument-air system during maintenance outages.

All of these compressed-air systems will be provided with the necessary sound-abatement equipment required to meet industrial SRP and OSHA standards.

Pressure transmitters and panel readout will be provided in the central control room; running lights and start/stop controls will be provided in the powerhouse instrument control room. Local pressure gages will be furnished with the equipment.

12. Demineralized-Water Equipment

The purpose of this equipment is to provide demineralized water to process users, storage-pool makeup, and boiler feedwater makeup. The equipment described here will be located in the powerhouse and open on the slab on the east side of the building. The equipment to be included as required will consist of:

- Treatment equipment, storage tank, foundations, and accessories.

- Resin-regeneration equipment, instrumentation power-supply components, and circuitry.

- Systems water piping and regeneration piping.

An octagonal concrete foundation pad (30 feet across flats, 12 inches thick) will be provided for a 100,000-gallon storage tank. A similar pad (20 feet across flats, 12 inches thick) will be provided for the 25,000-gallon waste-neutralization collection tank.

A 10- by 10-foot curbed acid-proof brick pad will be provided next to this tank for caustic and acid mixing pumps. A 4-foot-high concrete dike wall will be constructed around the neutralization tank, with a 4-inch-thick slab inside the dike. The slab will be thickened at the edge to support the dike wall.

The demineralized-water system will receive water from the service-water system. The system will consist of two trains of counterflow anion-cation exchange units, each train being capable of treating 500 gallons per minute (gpm).

Also included in this area will be the resin-regeneration facilities. These will consist of a 500-gallon caustic day tank with two feed pumps and a 500-gallon sulfuric acid day tank with two feed pumps; each feed pump will be capable of providing 2000 pounds of caustic or acid per day.

The pumping and storage equipment will consist of a 100,000-gallon storage tank and four demineralized-water pumps: two with a 500-gpm capacity at a total developed head of 150 feet and two with a 50-gpm capacity at a total developed head of 100 feet. Four motors (two 30 horsepower and two 5 horsepower) will be supplied.

The waste-neutralization system will collect the regeneration water and neutralize it before releasing it to the process sewer. The waste-neutralization system will consist of a 25,000-gallon collection tank with one mixing pump with a 100-gpm capacity at a total developed head of 100 feet. Caustic or acid will be injected to adjust the pH of the wastes.

The demineralized-water system will be supplied complete with controls and instrumentation by the vendor. Sight-gage level readouts of both tanks will be provided.

A pH-control loop will be provided, with automatic valves for caustic and acid injection. Indication of pH will be provided in the powerhouse instrument control room.

A temperature-control loop will be provided for controlling 25-pound steam flow into the heat exchanger. Indication of the steam flow will be provided in the powerhouse instrument control room.

Flow control loops, utilizing pressure-differential cells, will be provided for controlling the addition of acid and caustic (one loop for the caustic tank and one for the acid tank).

H. WATER-TREATMENT BUILDING AND FACILITIES DA B283

The water-treatment facility will treat the domestic water, fire water, and service water. The water-treatment building will enclose a portion of the water-treatment equipment (the chemical treatment equipment). The balance of the equipment will be located on outdoor support pads and frames.

This building will be 20 feet long, 15 feet wide, and 13 feet high; it will be constructed of 8-inch-thick concrete block.

An interior partition 15 feet long up to the roof will isolate the 15- by 8-foot section of the building housing the chlorination equipment. A 15- by 12-foot area of the building will have an acid-proof brick floor, with a perimeter brick curb turned up against the block walls.

Six caustic feed pumps will sit on the brick floor on adjustable legs. Four brick pads will be provided to support the day tanks.

A separate structure will be provided adjacent to this building to support a 1500-gpm decarbonator. An open-frame galvanized steel support structure 20 feet high, with bracing, will be provided.

The water-treatment building will be continuously exhausted by a wall fan in the chlorinator section. A 3-minute air change will be provided. A steam unit heater will be furnished to maintain a temperature of 55°F in the building.

The following instrumentation will be provided in or adjacent to the water-treatment building, for control of the water-treatment processes:

- Level control loops for a 12-inch butterfly valve and a 4-inch butterfly valve for local installation.

- A recorder will be installed in the powerhouse instrument control room to record flow. A pressure-differential cell and orifice for a 4-inch pipe will be included.

- Two pH control loops will be provided for the domestic water and service-water tanks for local installation. Acid and caustic feeds will be incorporated into this control loop.

- A local level readout will be provided for the caustic and acid day tanks.

- A temperature control loop will be provided for the 2-inch steam valve feeding the caustic steam heating coil.

In addition, electrical power will be required for two 0.5 horsepower motors.

Low-pressure steam, at 50 pounds per hour, will be required for operating the unit heater.

I. COOLING TOWER (B285)

One cooling tower will be provided to serve the process and heating and ventilation cooling requirements. Its function is to remove the heat generated by the spent fuel in the storage pools and to supply coolant to evaporator-condensers, to the cask coolers and condensers, and to the refrigeration-machine condensers.

This will be a double-cell, induced-draft cooling tower of standard construction. Each cell will be capable of removing the heat generated by all of the stored spent fuel. The design basis for each cell is a wet-bulb temperature of 80°F, a dry-bulb temperature of 98°F, leaving cold water temperature of 89°F, and a capacity of 9000 gpm. Two 100-horsepower motors are required for the induced-draft fans.

A concrete basin with inside dimensions of approximately 39 by 49 feet and 4 feet deep will be required.

Adjacent to the cooling tower basin will be a pump pit with a roof slab supporting three 9000-gpm pumps. It will be 20 feet long, 10 feet wide, and 6 feet deep.

The pumping system will consist of three vertical turbine pumps. Each pump will have a capacity of 9000 gpm at a total developed head of 150 feet.

The cooling-tower water treatment will consist of caustic feed for pH adjustment and chlorine addition to inhibit the growth of bacteria. This approach in conjunction with design for corrosion prevention is the most economical method of complying with existing and proposed statutes pertaining to blowdown-water treatment. Design for corrosion protection will require cement lining for piping 3 inches and larger and epoxy lining for such items as valves, pump casings, and condenser water boxes. Small piping will be of nonferrous materials such as copper or plastic. For heat exchangers, cupronickel (90-100%) or stainless steel tubing will be used. Every attempt will be made to keep the cooling water on the tube side of the heat exchangers since it will result in lower heat-exchanger costs.

The chlorinator system will have a maximum intermittent chlorination capacity of 2000 pounds per day, automatic switchover capability, a residual-chlorine analyzer and chart recorder, and a timer for intermittent chlorination.

Two caustic feed pumps will be provided for pH adjustment. Variable-speed and variable-stroke features will be incorporated into a feed forward-feedback control system.

The cooling tower and basin will be located north of the powerhouse. The equipment for pH adjustment and chlorine treatment will be located adjacent to the tower. A level-control loop will be provided for maintaining the water level of the cooling-tower basin.

Manual control will be provided for a 3-inch valve for cooling-tower basin blowdown. This equipment will be housed in the basin area on a local panel.

The cooling tower is required to handle process requirements of 12,000 gpm. In addition, a pond with a 30-day inventory for evaporation makeup is to be provided. These facilities are to meet the NRC guidelines stated in Regulatory Guide 3.24.3. Demineralized water makeup will be provided by wells.

The 12,000 gpm process cooling-tower water supply is based on a temperature difference of 89-98°F for the following uses:

- 9000 gpm storage-pool cooling
- 1000 gpm fuel-unloading pool cooling
- 1000 gpm evaporator condensers
- 1000 gpm cask-cooling cooler and condenser

An automatic sprinkler system will be provided to protect the cooling-tower structure, particularly during maintenance periods.

J. FIRE-WATER BUILDING (B287)

A fire-water building (with an adjacent storage tank) will be provided to serve sprinklers and fire-hose stations for the entire facility.

The fire-water building will be a prefabricated structure with insulated siding; it will be 20 feet long, 20 feet wide, and 12 feet high. The building is to be mounted on a thickened-edge 4-inch-thick concrete slab, and two 3-foot-thick foundations measuring 5 by 12 feet will be provided for the diesel- and electric-driven fire pumps.

A steam unit heater and thermostat will be provided for winter heating. A thermostatically controlled wall fan with automatic discharge and inlet louvers will also be provided. An outside air makeup louver will be installed for diesel combustion air.

A minimum electrical service capacity of 2 kilowatts will be required for operating the ventilation fan. Power will also be required for auxiliaries and lighting service.

Steam for the unit heater will be available at the pipe bridge approximately 150 feet away. Fifty pounds per hour of low-pressure steam will be required.

K. EMERGENCY WATER STORAGE POND (B289)

The function of this facility will supply a reliable source of water to the fuel storage pools in emergency situations.

A seismic and tornado-resistant storage pond will provide pool makeup water during emergency situations. The pond is sized to provide 30 days of makeup water to the AFR spent-fuel storage pool. The pond is 300 feet long, 300 feet wide, and 10 feet deep and lined with an elastomer liner.

A 13-foot deep seismic and tornado-resistant pit will be provided to support two portable diesel-driven pumps. These portable emergency water pumps will be stored in the AFR building. In the event that emergency water will be needed, the portable pumps and lines will be manually assembled to insure the makeup directly to the storage pools.

L. WELL SYSTEM (B295)

The purpose of this facility will provide the quantities of water required by the water-treatment systems. Two vertical turbine pumps, with 150-horsepower motors, will be provided. A 5- by 10-foot pad, 2 inches thick, will be provided for each pump/well.

The well system will not be designed for seismic and tornado resistance.

The wells will be sized to meet all makeup water requirements, with an additional 500 gpm for process use. The water requirements will be supplied by the following wells and accessories:

- Two deep wells (850-foot deep), 100 gpm

- Two vertical turbine pumps, 1000 gpm at a total developed head of 400 feet

A local motor starter will be provided at each well for the 150-horsepower pump motor. A magnetic flow meter will be installed on the outlet line from each well, with flow indication provided in the powerhouse instrument control room. The flow meters will be powered by auxiliary circuits from the local motor starters.

M. WASTE-TREATMENT BUILDING AND FACILITIES

The process sewers will be used for treating non-radioactive wastes from the AFR building and the powerhouse area. The effluent flow rates are expected to be as follows:

Source	Total Flow (gallons per minute)
Power blowdown: Boiler blowdown Floor flushes	150
Intermittent coal-pile rainwater runoff	50
Safety showers, cooling-tower blowdown, liquid chemical spills from caustic tank unloading, storage, and pumping facilities	50
Non-radioactive process washwater from casks	15

The principal items of equipment for the wastewater-treatment system will consist of the following:

- Equalization tank: 500,000 gallon capacity, 60-foot diameter, 24 foot depth, equipped with air-distribution system
- Backup storage tank: 1-500,000 gallon capacity, 65 foot diameter, 24 foot side-wall depth
- Caustic (20%) storage tank 10,000 gallon capacity, 12-foot diameter, 12 foot side-wall depth
- Water dilution system consisting of a water break tank (1000 gallon) and a 250 gpm dilution water pump
- Neutralizaton tank: 2000 gallon capacity, 7-foot diameter, 7-foot side-wall depth
- Clarifier: 47-foot diameter, 15-foot side-wall depth, with rake-arm center feed, bottom sludge discharge, and peripheral effluent overflow
- Filter feed tank: 20,000 gallon capacity, 15-foot diameter, 15-foot side-wall depth
- Belt filter: 6-foot diameter, 6-foot wide

The equipment will also include a 75-horsepower, 700 cfm air blower and various types of pumps.

The belt filter and filter-feed tank will be enclosed in a block building 30 feet long, 20 feet wide, and 15 feet high. No facilities will be needed for disposing of filter cake from the pressure filter; the filter cake will be removed and disposed of by a contract operator.

N. ADMINISTRATION AND GUARDHOUSE BUILDING

1. General Description

The administration and guardhouse building will house the administration offices, medical facilities, guard facilities, and a cafeteria. It will be a one-story structure with 14,860 square feet of enclosed area.

The office area will include the following:

- Eighteen private offices
- Men's and women's toilets
- Mail and reproduction room
- Record-storage vault and a record-storage area
- Visitors' seating area
- Conference room for 20 people

The principal facilities provided in the medical area will be:

- Waiting area
- Nursing station
- First aid and test area
- Doctor's office and examination room
- Cot and treatment ward
- Toilets and shower
- Medical laboratory

The cafeteria area will consist of:

- A seating area for 64 people
- A vending and serving area
- A food-preparation area
- Dry-food storage
- Refrigerated storage
- Toilet
- Receiving dock
- Garbage and disposal room

The guard facilities will include:

- Guard area
- Lieutenant's office
- Clerical office
- Men's and women's toilets, lockers, and showers

An electrical/telephone room will be provided; it will also house an emergency electrical generator. Heating, ventilation, and air-conditioning equipment will be installed in the mechanical room.

2. <u>Architectural and Civil</u>

The building will have a steel frame (columns, girders, and open-web steel joists) designed to resist and transmit to the foundation a wind load of 20 pounds per square foot, in accordance with the Standard Building Code. The frame will be moment connected. The building will be of standard construction and will not be designed for seismic or tornado forces. The roof steel will be designed to support a live load of 20 pounds per square foot.

The ground floor slab will be 4-inch reinforced concrete, on grade, in all areas. The roof will be constructed of 1.5 inch metal decking, a 2-inch composite insulation, four-ply built-up roofing, and gravel surfacing. It will be sloped to internal roof drains.

The exterior walls in the kitchen, mechanical room, electrical room, and guard room will be as follows: from strip footing to grade, 10-inch solid concrete block; from grade to precast-concrete coping, 4-inch face brick and 1.5-inch polystyrene insulation backed with epoxy-painted 4-inch concrete block. In all other areas, the exterior walls will be as follows: from strip footing to grade, 10-inch solid concrete block; from grade to precast-concrete coping, 4-inch face brick, 0.75-inch polystyrene sheathing supported on 6-inch metal studs, and 3.5-inch fiberglass insulation lined with 0.5-inch gypsum board.

Interior partitions around the guardhouse will be 8-inch concrete block furred on each face with gypsum board to the ceiling. Partitions around toilet rooms and mechanical and elecrical rooms will be 8-inch concrete block furred with painted gypsum board on one face to ceiling and painted with epoxy on one face. Partitions in toilet rooms and kitchen will be 6-inch concrete block painted to the ceiling with epoxy. All other partitions will be 3.5-inch metal stud with 2-inch painted gypsum board to the under side of roof.

3. <u>Heating and Ventilation</u>

All areas will be conditioned for personnel comfort, using roof-top type, factory-fabricated air-conditioning unit(s). Manually adjustable automatic control setback and/or shutdown devices will be provided. Centrifugal exhaust fans will be provided for the conference room, cafeteria food-preparation area, and toilets.

Halon 1301 fire-extinguishing systems will be provided for the record storage, and the electrical control room. An automatic wet-pipe sprinkler system will be provided for all other areas.

4. Services and Electrical Power

The following services will be required at the building:

- Low-pressure steam
- Instrument air
- Fire water (sprinkler)
- Domestic water
- Chilled water

The source of electrical power for this building will be substation 5, located adjacent to this building. The electrical power will be distributed by three 480-volt feeders terminated at distribution centers located in the building.

- Fire alarm
- Bell telephone
- Safety alarm

The cafeteria and medical areas will be furnished with equipment and furniture. Other areas will not be furnished on this project.

O. ELECTRICAL POWER

The power required for the AFR site will be furnished from a new 115-kilovolt (kV) substation to be located on the site. The substation will be serviced from the existing SRP 115-kV transmission lines nearby.

The distribution scheme for the site will follow the rationale established for the existing SRP installation. Two independent sources of 115 kV voltage will be required to service the main transformers. Two transformers of equal capacity (10 mVA), both capable of carrying full plant loads, will be furnished. The units will be triple rated by providing for future fans and external heat exchangers for the insulating oil to increase the capacity by approximately 50% over the base rating.

The primary substation will contain the main oil circuit breaker, isolating switches, 13.8 kV secondary switchgear, and tie circuit breakers. The primary equipment will be arranged in an outside yard.

The secondary 13.8 kV switchgear will be housed in a 52- by 30-foot block structure within the site. This station will reduce the voltage from 115 to 13.8 kV for distribution by dual underground power feeders to each of five substations.

Two new transmission lines will be routed to the site from an existing lateral of the SRP grid system. The lines will require a 100-foot right-of-way through some timbered areas and will be of the same design as the existing 115 kV line. Three wood-pole structures will be used throughout.

Associated with the 115 kV transmission system will be a supervisory control system that will serve the system's dispatcher by providing remote supervision, control, telemetering, and communication facilities from an operating switchboard in Building 751. This station will be interconnected with all other 115 kV substation control houses throughout SRP through a multipair cable that runs parallel to, and 50 feet from, from the 115 kV transmission line.

1. Load Centers

Five substations are required to service the load centers of the AFR Facility:

- Process loads and pool area: substation 2A
- Process load for waste treatment and evaporators, including emergency power loads: substation 2B
- Cooling tower and circulating pumps: substation 3
- Powerhouse and associated equipment: substation 4
- Administration, support areas, and grounds: substation 5

All load centers will be sized and apportioned so that a single rating can be common to all units, thereby minimizing the number of spare units.

2. Substation 2A: Process Loads and Pool Area

The net process load, including the circulating pumps, will be 1555 horsepower. Transposing this into kVA and appying a demand factor, the estimated operating load is 960 kVA. To this will be added lighting loads (150 kVA), crane loads (70 kVA), heating and ventilation loads (215 kVA), and a 25% growth factor. This results in a load of 1200 kVA, necessitating one 1500-kVA substation.

3. Substation 2B: Waste Treatment and Evaporators

This substation will serve the waste-treatment equipment and evaporators, shops, heating and ventilation, and emergency loads. It will also provide alternative power feeders for the circulating pumps. The total load will be 1322 kVA, and one 1500-kVA substation will service this load center. A 25-kVA uninterruptible power source will provide power to critical controls and instrumentation. It will include a DC power source, inverter, and a battery bank for 1-hour capacity.

A 750 kilowatt diesel generator will furnish power to the emergency loads and will be activated by loss of normal power. The load transfer will be accomplished by an automatic transfer switch in the seismic and tornado-resistant area. A manual transfer will also be provided for maintenance.

4. Substation 3: Cooling Tower and Circulating Pumps

This load center will serve pumps and cooling-tower fans, which remove the heat from the fuel-storage pools. The connected load will be approximately 1730 kVA; the operating load will be approximately 1000 kVA. This load center will be served by one 1500 kVA unit.

5. Substation 4: Powerhouse and Associated Equipment

This load center will also include the following loads in addition to the powerhouse: the emergency electrical generation facilities and supporting equipment, water-treatment facilities, domestic water system, well equipment, air compressor, the demineralized water facilities, and other miscellaneous loads.

The connected load will be approximately 1463 kVA and will be served by one 1500-kVA substation. The operating load will be 1000 kVA.

6. Substation 5: Administration, Support Areas, and Grounds

The administration and support load center will include the administration and guardhouse building, maintenance areas, truck maintenance, area lighting, fence lighting, and refrigeration units. The loads are apportioned as follows: building loads, 400 kVA; fence and roadway lighting and safeguard loads, 50 kVA; refrigeration loads, 800 kVA.

One 1500 kVA substation will serve this load center.

P. FIRE DETECTION AND SUPPRESSION SYSTEMS

1. Fire-Detection System

Fire zones have been defined throughout the facility; fire detectors in individual zones will be electrically connected to a central control and alarm panel located in the central control room. Adjacent to the control panel will be an auxiliary ligh panel to indicate which room within a given zone is in an alarm condition.

Alarms received at this control panel will be simultanelously annunciated in the guardhouse, through auxiliary relay contacts.

Power for the various components of the fire-detection system will be supplied from the central control panel a backup battery power supply will permit full operation of the system in the event normal power is lost.

The fire detectors furnished will be either thermal or ionization detectors, depending on the expected environment and combustibles in the room being serviced. To monitor large areas, ventilation-duct-mounted ionization detectors will be provided.

2. Fire Suppression Systems

Sprinkler Systems

Automatic sprinkler systems will be provided as described under their associated design areas. Sprinkler systems will be designed for ordinary hazard protection with a calculated system based on a coverage of 0.25 gallon per minute per square foot over the most remote 3000 square foot area. Sprinkler heads will be of the "Aquamatic" or "on-off" type to minimize the amount of water that must be collected and monitored for contamination.

The sprinkler system will be supplied by the fire-header system, which loops all of the process buildings, the AFR building, the refrigeration, truck receiving and warehouse building, and the administration and guardhouse building. Also supplied by the header will be 14 fire hydrants, strategically located throughout the plant.

Halon 1301 Extinguishing Systems

Halon 1301 fire-extinguishing systems will be provided for the primary and secondary central control rooms, the electrical control rooms, the diesel-fuel day storage tanks, and the automatic switchgear room for the emergency diesel generator.

The Halon systems will be designed to produce a 5% concentration in the area within 10 seconds of activation. Automatic dampers will be provided on any supply or exhaust ducts to seal off the area during a fire.

The systems will be complete with either thermal or ionization detectors, audible and visible alarms, central control panels with battery backup, distribution nozzles, remote manual activation stations, and a spare Halon charge.

All systems will have auxiliary relays to simultaneously actuate alarms in the central control room and the area guardhouse.

All units will be furnished with a Freon charge for initial performance tests. The units will be recharged with Halon on completion of the performance tests.

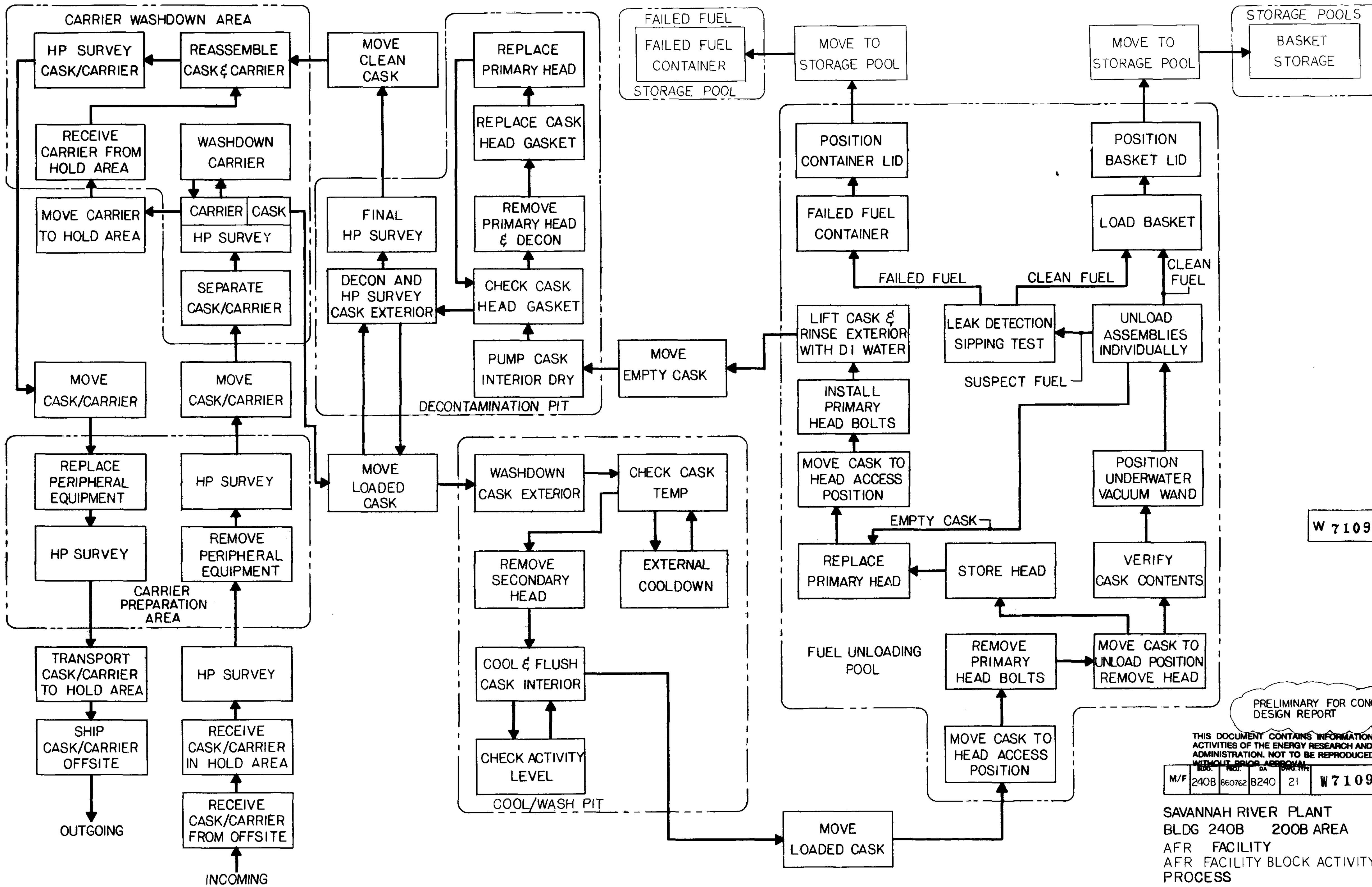
SECTION XVII

KEY DRAWINGS

DRAWING INDEX

W-710930	-	Activity Diagram
W-710643	-	Plot Plan
W-709985	-	Building Plan
W-709986	-	Building Sections
W-710048	-	Equipment Arrangement Plan
W-710049	-	Equipment Arrangement Sections
W-710153	-	Equipment Arrangement Plan
W-710154	-	Equipment Arrangement Sections
W-710132	-	Building Expansion Plan
W-709891	-	Piping Summary Sheet 1
W-709892	-	Piping Summary Sheet 2
W-709893	-	Piping Summary Sheet 3
W-709894	-	Piping Summary Sheet 4
W-709895	-	Piping Summary Sheet 5
W-709896	-	Piping Summary Sheet 6
W-711024	-	H&V Supply Air Flow
W-711025	-	H&V Air Exhaust Flow
W-709127	-	H&V Heat Recovery Flow
W-710835	-	Power Block Flow Steam
W-710834	-	Power Block Flow Water
W-710836	-	Power Block Flow Cooling Water
W-711420	-	Electrical Purchased Power Substation

ANALYZE FOR SAFETY, ECOLOGY AND MINIMUM ESSENTIAL DESIGN



W 710930 LAST – REV.

PRELIMINARY FOR CONCEPTUAL DESIGN REPORT

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M/F	BLDG.	PROJ.	DA	DWG. TYPE		LATEST REVISION
	240B	860762	B240	21	W710930	–

SAVANNAH RIVER PLANT
BLDG 240B 200B AREA
AFR FACILITY
AFR FACILITY BLOCK ACTIVITY AI PROCESS

REFERENCE DRAWINGS	
W709985	BLDG. PLAN
W709891	SUMMARY 1
W710910	BLOCK FLOW
W710511	FLOWSHT. I
W710643	PROC. PLOT
W709888	A&C PLOT

PROJECT 860762-12
DRAWN MIHALSKI OCT 6 1976
CHECKED
APPROVED-INITIAL CONSTR. RELEASE
APPROVED-FINAL

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REVISIONS | REFERENCE STANDARDS

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WILMINGTON, DELAWARE
ENGINEERING DEPARTMENT
W710930

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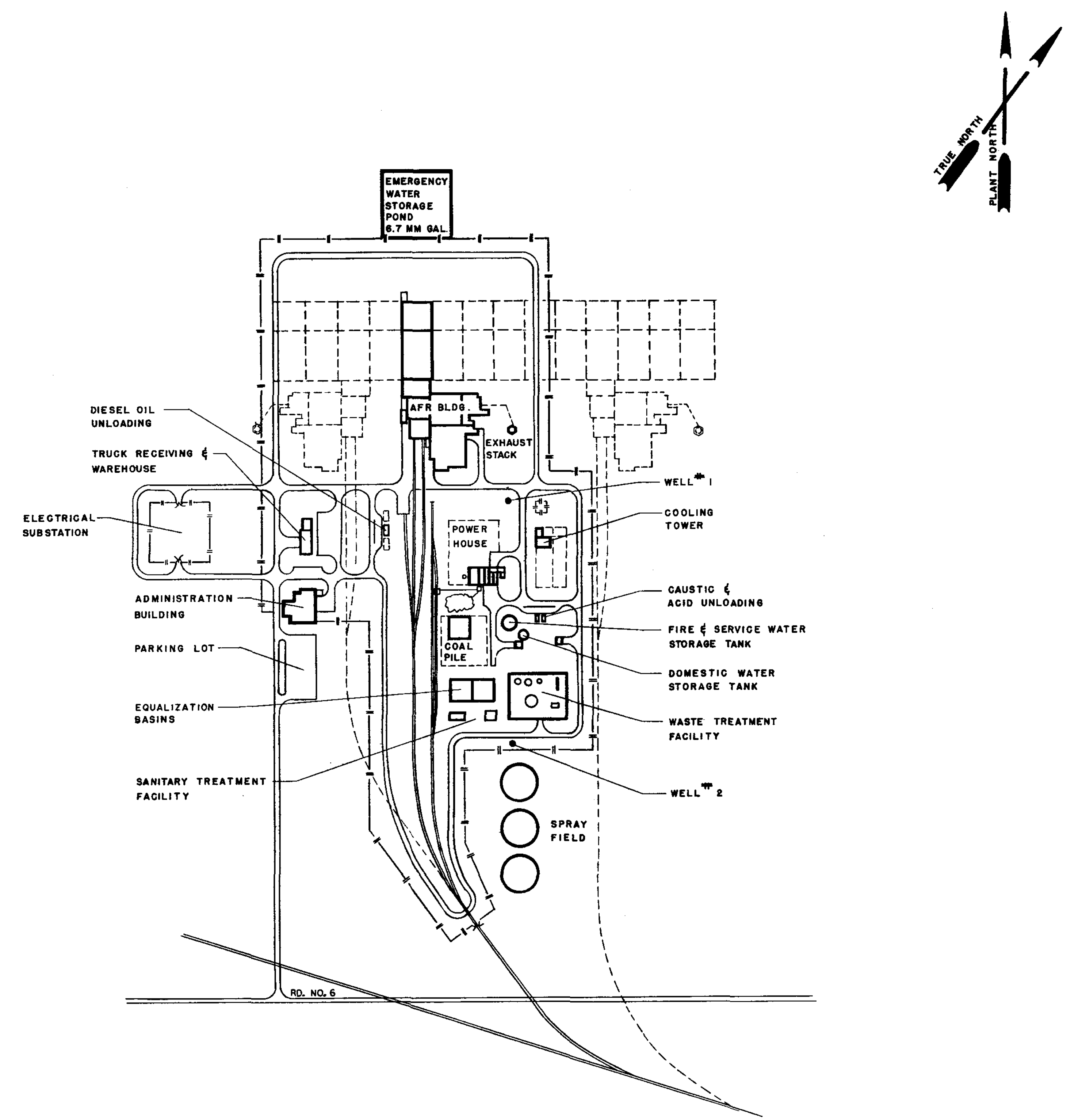

W 710643 LAST REV.

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M/F	BLDG.	PROJ.	DA	TYPE		LAST REV.
	ALL	860762-12	B240	24	W 710643	—

SAVANNAH RIVER PLANT
BLDG-ALL 200B AREA
A.F.R. FACILITY
PROC AFR FAC PLOT PLAN A1
PROCESS

PROJ	NO.	REVISION	RVSD	CHKD	APPD	DATE	PROJ	NO.	REVISION	RVSD	CHKD	APPD	DATE	PROJ	NO.	REVISION	RVSD	CHKD	APPD	DATE	PROJ	NO.	REVISION	RVSD	CHKD	APPD	DATE

STANDARDS		REFERENCE DRAWINGS	
		W709988	AFR BLDG-PLAN
		W709888	A & C PLOT PLAN

		DATE
PROJECT	860762-12	
SCALE	1"-200'	
DRAWN	R. PIRAGOW	SEP 1 1978
CHECKED		
APPROVED-I.C.R.		
APPROVED-FINAL		

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W 710643

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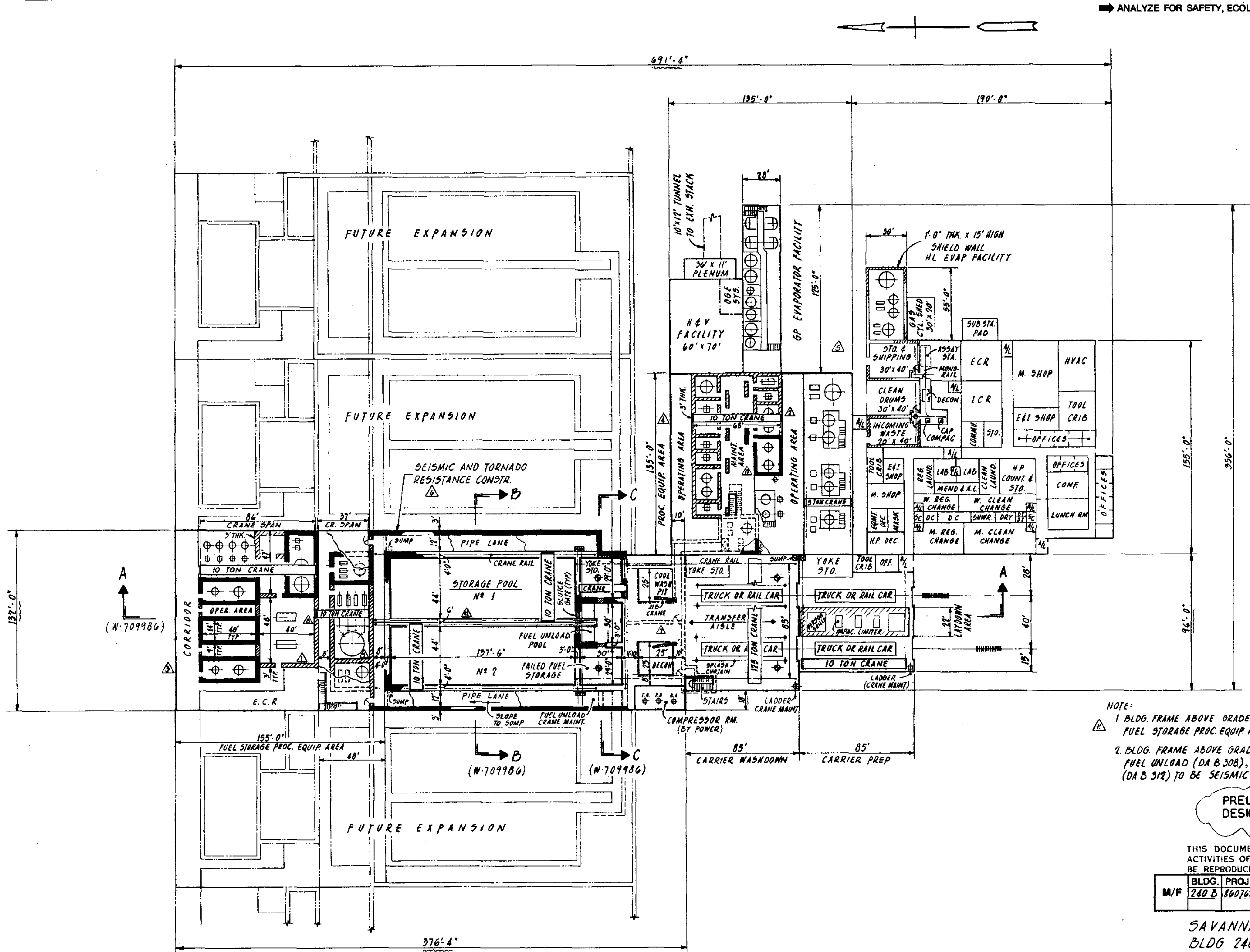

NOTE:

1. BLDG. FRAME ABOVE GRADE IN CARRIER WASHDOWN (DA B304) AND FUEL STORAGE PROC. EQUIP. AREA TO BE TORNADO RESISTANCE CONSTR.
2. BLDG. FRAME ABOVE GRADE IN CASK COOL/WASHDOWN (DA B306), FUEL UNLOAD (DA B 308), FUEL STORAGE (DA B 310) AND CASK DECON (DA B 312) TO BE SEISMIC & TORNADO RESISTANCE CONSTRUCTION.

PRELIMINARY FOR CONCEPTUAL DESIGN REPORT

M/F	BLDG.	PROJ.	DA	TYPE		LAST REV.
	240 B	860762	B240	24	W 709985	12

SAVANNAH RIVER PLANT
BLDG 240 B 200 B AREA
AFR FACILITY
AFR BLDG STUDY SCHEME "M" PLAN
PROCESS

PROJ	NO.	REVISION	RVSD	CHKD	APPD	DATE
860762	12	DELETED LINER 8" ANNULUS - ADJUSTED DIMS. ACCORDINGLY	RCM 9-21-78	F.CSER 9-22-78	[illegible] 9/29/78	
860762	1 & 2	CELL WALLS WERE NOT MAX. RESIS.	RCM 8-10-78	MIHALSKI 8-11-78	[illegible] 8-11-78	
	3 & 4	WALLS WERE 3' THK. SHIELD WALLS				
	5	DELETED OH EVAPORATOR	MIHALSKI 8-10-78			
	6/7	DELETED 25' SEISMIC & TORNADO RESISTANCE WALLS ABOVE GRADE	R.C. Martin 9-21-78	F.CSER 9-22-78	[illegible] 9/29/78	
	8/9	CELL WALLS WERE SEISMIC AND TORNADO RESISTANCE.				
	10	REV. ARRGT. & CELL WALLS WERE SEISMIC & TORNADO RESIST.				
	11	ADDED NOTES.				

REFERENCE DRAWINGS	
W-709986	SECTIONS
W-710132	70,000 ARRGT.
W-710048	F.S. EQ. ARR
W-710153	PROC EQ ARR
W 709888	PLOT PLAN

		DATE
PROJECT	860762 - 12	
SCALE	1" = 30'	
DRAWN	R.C. Martin	6-28-78
CHECKED	W.E. ROSE	7-26-78
APPROVED-I.C.R.		
APPROVED-FINAL		

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W 709985

ORIGINAL DRAWING MADE ON DU PONT POLYESTER FILM

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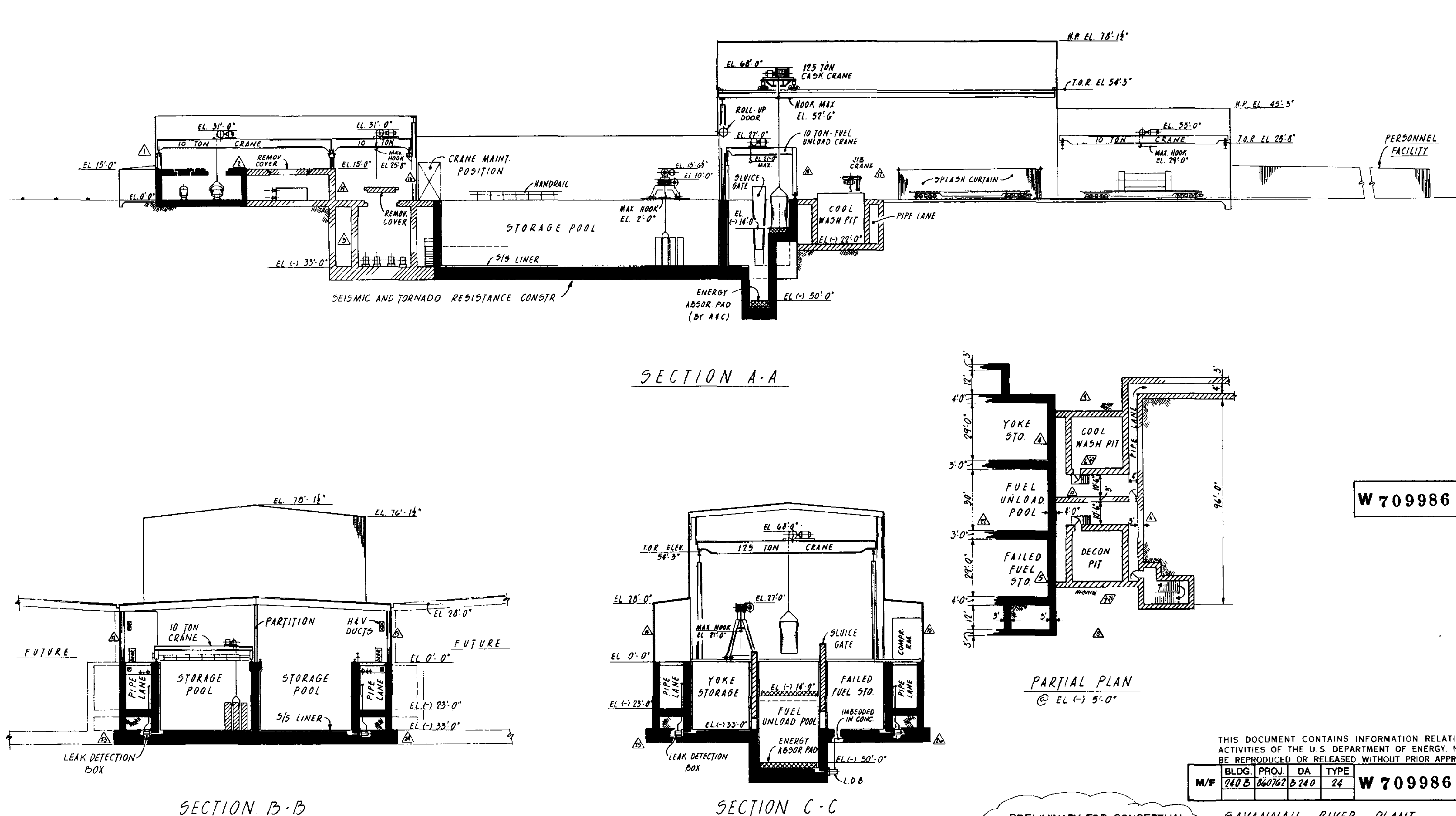

W 709986 | LAST 26 REV.

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M/F	BLDG.	PROJ.	DA	TYPE		LAST REV.
	240 B	860762	B 240	24	W 709986	26

PRELIMINARY FOR CONCEPTUAL DESIGN REPORT

SAVANNAH RIVER PLANT
BLDG 240 B 200 B AREA
AFR FACILITY
AFR BLDG STUDY SCHEME 'M' SECT.
PROCESS

PROJ	NO.	REVISION	RVSD	CHKD	APPD	DATE
860762	22	DELETED LINER 8" ANNULUS - ADJ. DIMS. ACCORD.	RCM	F. CSER 9-22-78		9/29/78
↓	23-26	ADD EXTENSION OF MAT				
860762	1	SHORTENED CRANE SPAN	R.C.M. 8-10-78	W. Rose 8-10-78		8-11-78
	2&3	CELL WALLS WERE NOT MAX. RESIS.				
	4&5	WALL WAS 3'-8" THICK				
	6&7	ADD. LINER & REVISED WALLS				
	8&9	REMOVED MAX RESIS. WALLS	R.C. Martin 9-14-78	F. CSER 9-22-78		9/29/78
	10&11	WALLS WERE MAX. RESIS. CONSTR.				
	12/18	DELETED 25' MAX. RESISTANCE WALLS ABOVE GRADE.				
	19	WALLS WERE MAX. RESIS. CONSTR.				
↓	20-21	DELETED LINER - REVISED WALLS				

STANDARDS	REFERENCE DRAWINGS	
	W-709985	PLAN

PROJECT 860762-12
SCALE 1" = 20'
DRAWN R.C. Martin — DATE 7-24-78
CHECKED W.E. ROSE — DATE 7-26-78
APPROVED-I.C.R.
APPROVED-FINAL

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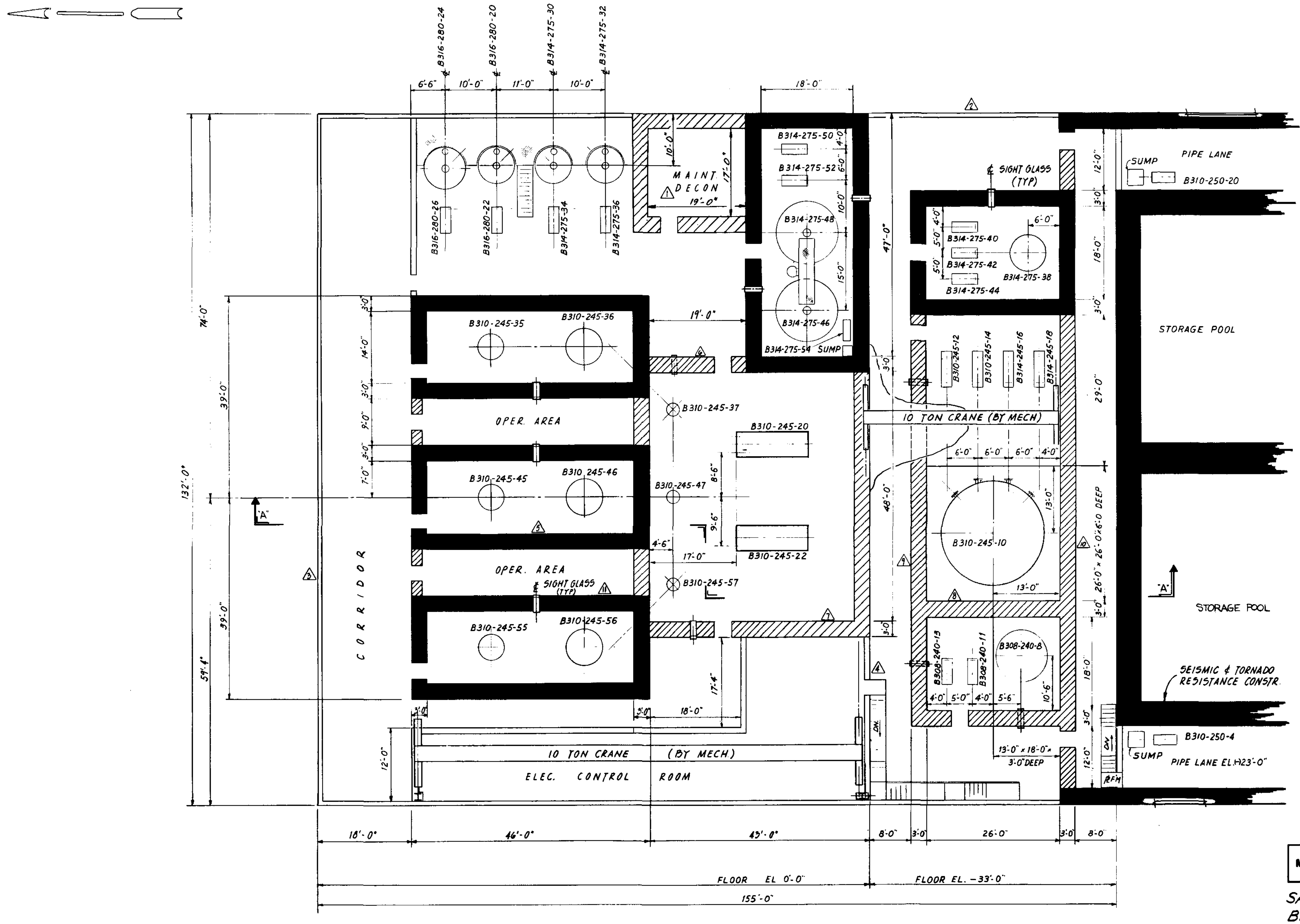
ENGINEERING DEPARTMENT
W 709986

ORIGINAL DRAWING MADE ON DU PONT POLYESTER FILM

➡ ANALYZE FOR SAFETY, ECOLOGY, AND MINIMUM ESSENTIAL DESIGN ⬅



(FUEL STG EQUIP ARRGT PLAN FOR BLDG SCH "M" W-709985)

PRELIMINARY FOR CONCEPTUAL DESIGN REPORT

THIS DOCUMENT CONTAINS INFORMATION RELATING TO ACTIVITIES OF THE U.S. DEPARTMENT OF ENERGY. NOT TO BE REPRODUCED OR RELEASED WITHOUT PRIOR APPROVAL

M/F	BLDG.	PROJ.	DA	TYPE	W 710048	LAST REV.
	240B	860762	9999	24		11

SAVANNAH RIVER PLANT
BLDG 240B 200B AREA
AFR FACILITY
FUEL STG. EQUIP. ARRG'T SCH. "E" - PLAN
PROCESS

PROJ	NO.	REVISION	RVSD	CHKD	APPD	DATE
860762	1	ADDED MAINT./DECON AREA	RCM 8-4-78	W.E. ROSE 8-8-78		8-9-78
	2-4	WALLS WERE 3' THK. CONCRETE				
	5	CELL WALLS WERE NOT MAX. RESIST.				
	6-10	CELL WALLS WERE MAX. RESIST.	RCM 9-22-78	F.CSER 9-25-78		9/29/78
	11	REPLACED SHIELD WINDOWS W/SIGHT GLASS				

STANDARDS	REFERENCE DRAWINGS	
	W710049	FUEL STG. EQUIP. ARR. SCH. E SECS.
	W709985	BLDG. ARR. SCH. M

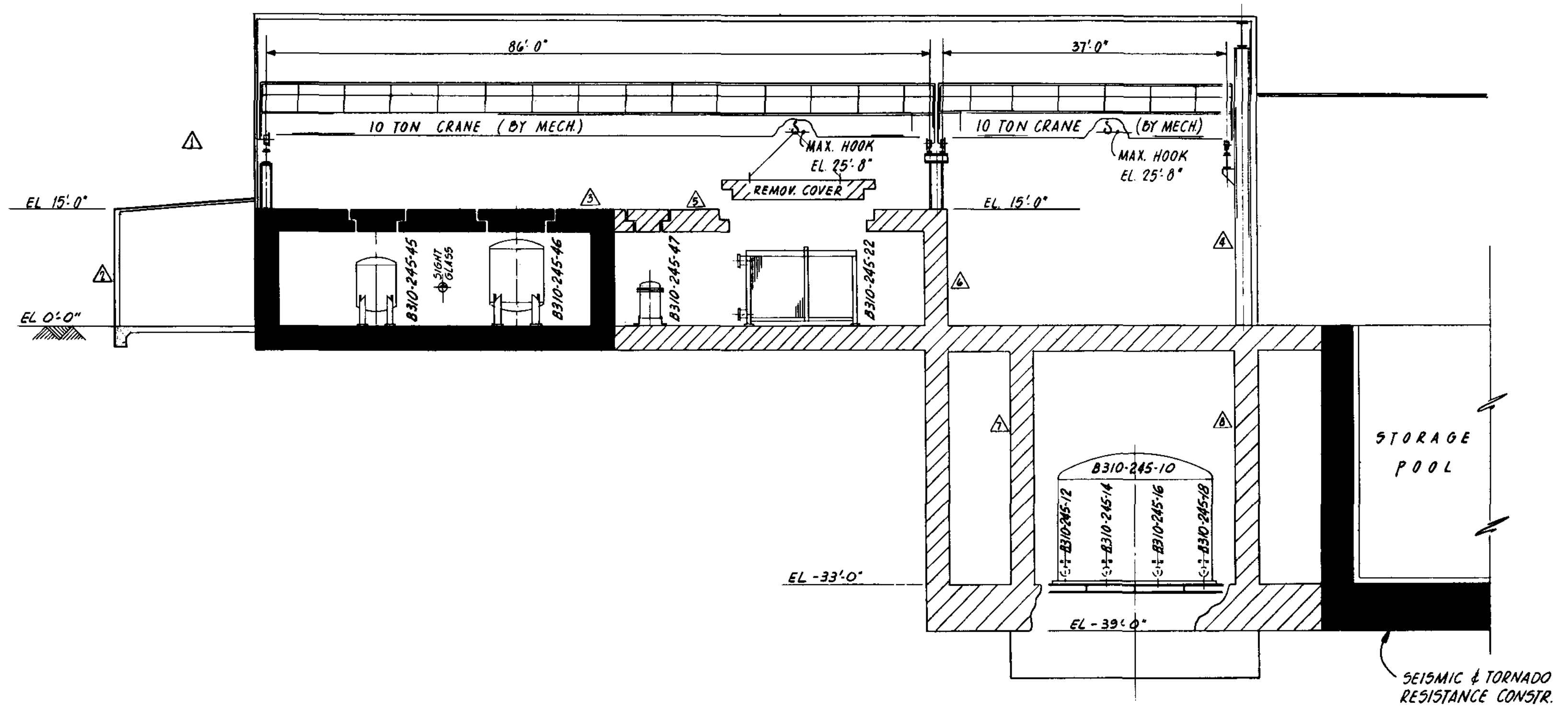
		DATE
PROJECT	860762-12	
SCALE	1/8" = 1'-0"	
DRAWN	L. FEDERICO	7/14/78
CHECKED	W. E. ROSE	7-28-78
APPROVED-I.C.R.		
APPROVED-FINAL		

E. I. DU PONT DE NEMOURS & CO., INC.
WILMINGTON, DELAWARE
ENGINEERING DEPARTMENT

W 710048

ORIGINAL DRAWING MADE ON DU PONT POLYESTER FILM

ANALYZE FOR SAFETY, ECOLOGY, AND MINIMUM ESSENTIAL DESIGN



SECTION A-A
W710048

(FUEL STG EQUIP ARRGT SECT FOR BLDG SCH "M" W-709985)

W 710049 LAST 8 REV.

PRELIMINARY FOR CONCEPTUAL DESIGN REPORT

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M/F	BLDG.	PROJ.	DA	TYPE	
	240B	860762	9999	24	W 710049 LAST 8 REV.

SAVANNAH RIVER PLANT
BLDG 240B 200B AREA
AFR FACILITY
FUEL STG EQUIP ARRGT SCH "E"-SECT
PROCESS

PROJ	NO.	REVISION	RVSD	CHKD	APPD	DATE
860762	1	SHORTENED CRANE SPAN	REM 8-4-78	W.E. ROSE 8-8-78		8/9/78
	2	WALL WAS 3' THK. CONC.				
	3	CELL WALLS WERE NOT MAX. RESIS.				
	4	DELETED 25' MAX. RESIS. WALL ABV. GRADE	REM 9-18-78	F. CSER 9-25-78		9/29/78
	5-8	CELL WALLS WERE MAX. RESIS.				

STANDARDS

REFERENCE DRAWINGS	
W710048	FUEL STG EQUIP ARR SCH "E" PLAN

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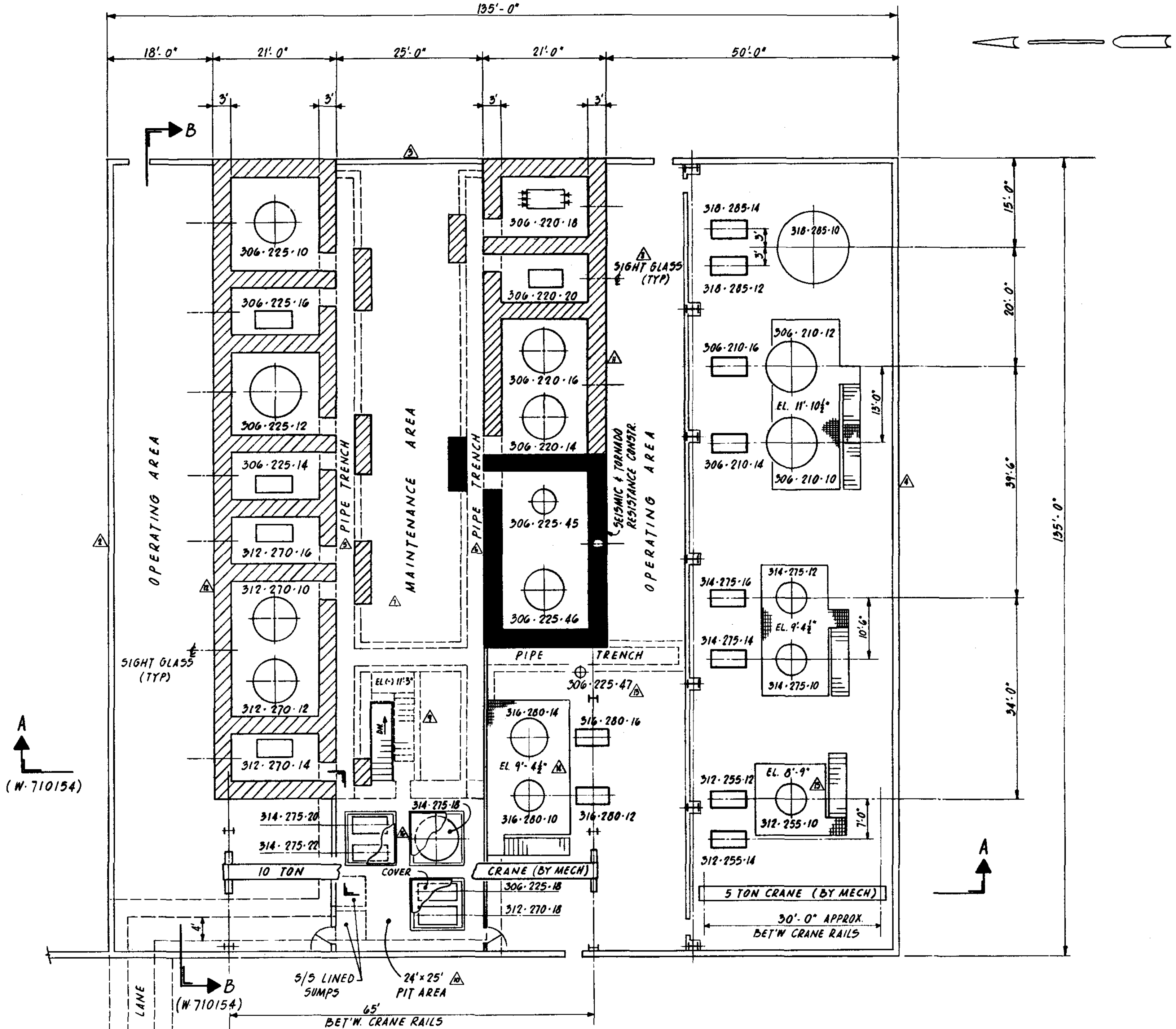
		DATE
PROJECT	860762-12	
SCALE	1/8" = 1'-0"	
DRAWN	G. ROLLINS	8-1-78
CHECKED	W. E. ROSE	8-4-78
APPROVED-I.C.R.		
APPROVED-FINAL		

E. I. DU PONT DE NEMOURS & CO., INC.
WILMINGTON, DELAWARE
ENGINEERING DEPARTMENT

W 710049

ORIGINAL DRAWING MADE ON DU PONT POLYESTER FILM

➡ ANALYZE FOR SAFETY, ECOLOGY, AND MINIMUM ESSENTIAL DESIGN ⬅



(PROCESS EQUIP. ROOM ARRGT.
PLAN FOR BLDG SCH."M" - W-709985)

PRELIMINARY FOR CONCEPTUAL DESIGN REPORT

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M/F	BLDG.	PROJ.	DA	TYPE		LAST REV.
	240 B	860762-12	9999	24	W 710153	16

SAVANNAH RIVER PLANT
BLDG 240 B 200B AREA
AFR FACILITY
PROC. EQUIP. RM. ARRGT. SCH."J" PLAN
PROC.

PROJ	NO.	REVISION	RVSD	CHKD	APPD	DATE
860762-11	16	RELOC EN 312-275-18, 20 & 22 (TO PIT)				
860762-12	1-4	WALLS WERE 3' THK. CONCRETE	C. SIMMERMON 8-3-78	W. ROSE 8-7-78		8-9-78
	5-6	ADDED PIPE TRENCH				
	7	CELL WALLS WERE NOT MAX. RESIST. CONST.				
	8	REPLACED SHIELD WINDOWS W/SIGHT GLASS	R.C. Martin 9-19-78	F.C. SER 9-26-78		9/27/78
	9	ADDED STAIRS TO PIT				
	10	PIT SIZE WAS 15'×25'				
	11-12	ALL CELL WALLS WERE MAX RESIST.				
	13	RELOC. EN 306-225-47				
	14	RELOC. EN 316-280-10, 12, 14 & 16				
	15	RELOC. EN 312-255-10, 12 & 14				

STANDARDS	REFERENCE DRAWINGS	
	W 709985	BLDG PLAN
	W 710154	EQUIP. ARRGT. SECTIONS

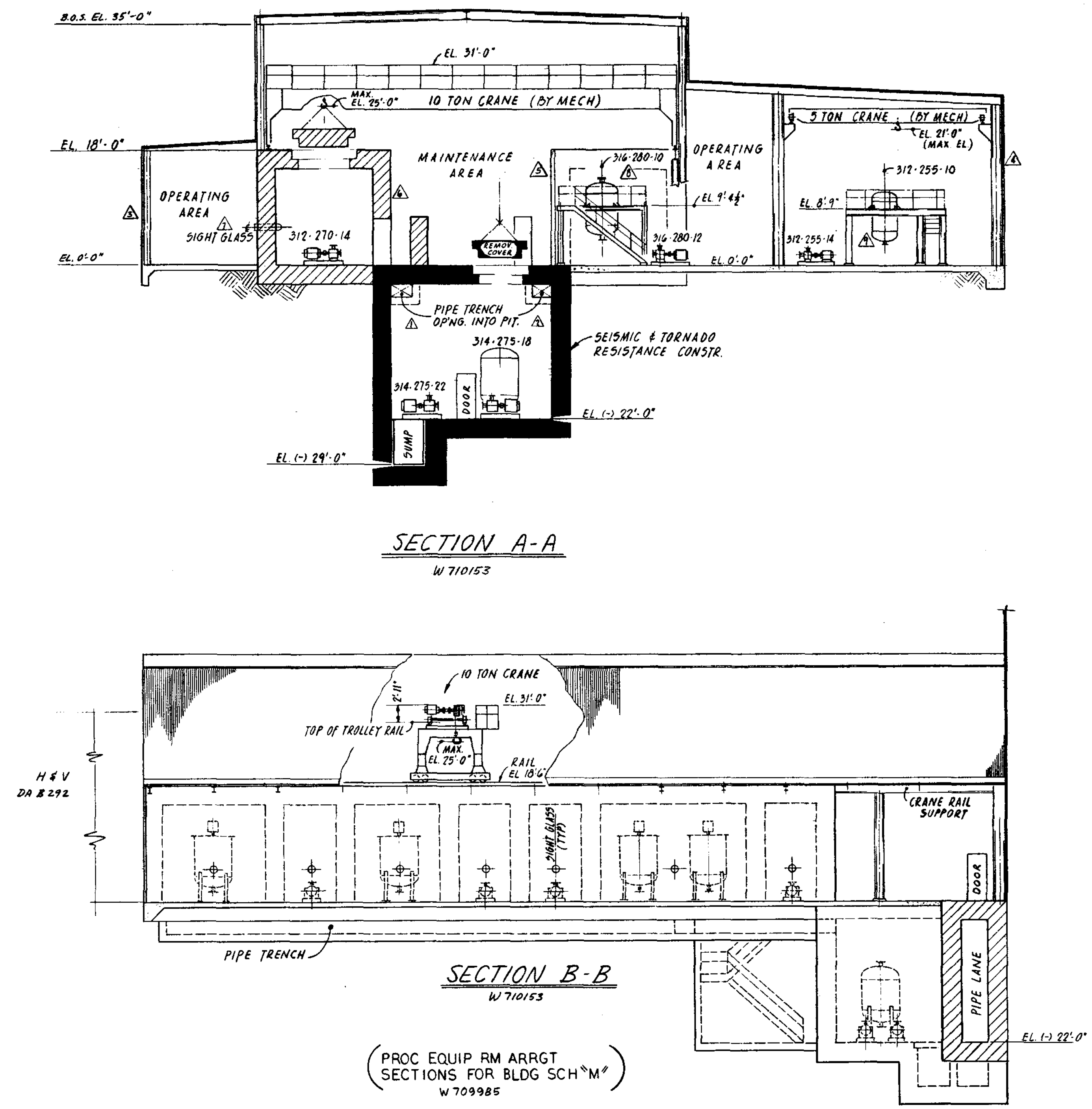
		DATE
PROJECT	860762-12	
SCALE	1/8" = 1'-0"	
DRAWN	C. SIMMERMON	7-21-78
CHECKED	W. E. ROSE	7-26-78
APPROVED-I.C.R.		
APPROVED-FINAL		

E. I. DU PONT DE NEMOURS & CO., INC.
WILMINGTON, DELAWARE
ENGINEERING DEPARTMENT

W 710153

ORIGINAL DRAWING MADE ON DU PONT POLYESTER FILM

ANALYZE FOR SAFETY, ECOLOGY, AND MINIMUM ESSENTIAL DESIGN



SECTION A-A
W 710153

SECTION B-B
W 710153

(PROC EQUIP RM ARRGT SECTIONS FOR BLDG SCH "M")
W 709985

PRELIMINARY FOR CONCEPTUAL DESIGN REPORT

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M/F	BLDG.	PROJ.	DA	TYPE		LAST REV.
	240 B	860762-12	9999	24	W 710154	9

SAVANNAH RIVER PLANT
BLDG 240 B 200 B AREA
AFR FACILITY
PROC. EQUIP. RM. ARRGT. SCH. "J" SECTIONS
PROC.

PROJ	NO.	REVISION	RVSD	CHKD	APPD	DATE
860762-12	1-2	ADDED PIPE TRENCH				
	3-4	WALLS WERE 3' THK. CONCRETE				
	5	CELL WALLS WERE NOT MAX. RESIST. CONST.				
	6	CELL WALLS WERE MAX RESIST. CONST.				
	7	REPLACED SHIELD WINDOW W/ SIGHT GLASS				
	8	RELOC. EN 316-280-10 & 12				
	9	RELOC. EN 312-255-10 & 14				

STANDARDS	REFERENCE DRAWINGS	
	W710153	EQUIP. ARRGT. PLAN

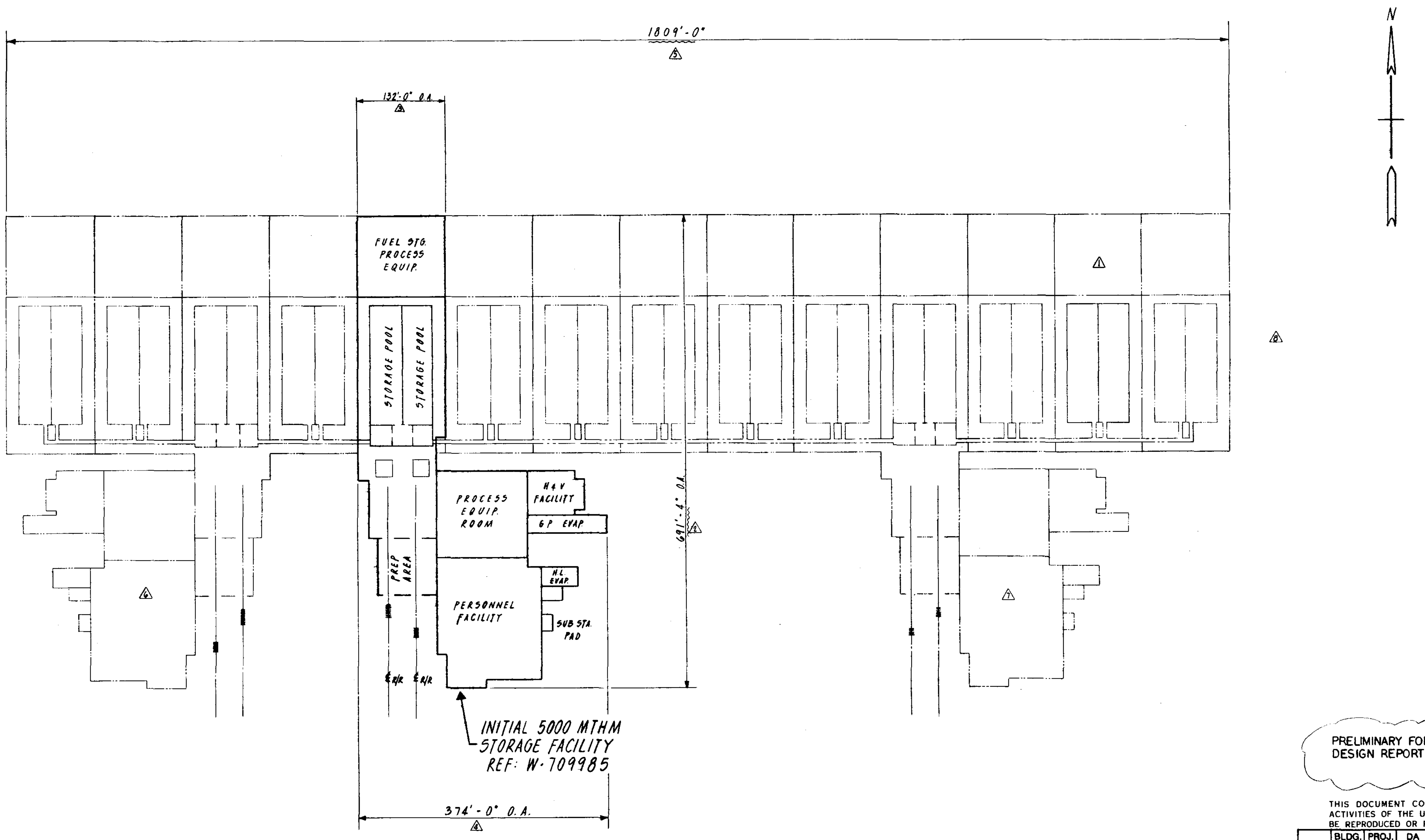
PROJECT 860762-12
SCALE 1/8" = 1'-0"
DRAWN C. SIMMERMON — DATE 7-26-78
CHECKED W. E. ROSE — 7-26-78
APPROVED-I.C.R.
APPROVED-FINAL

E. I. DU PONT DE NEMOURS & CO., INC.
WILMINGTON, DELAWARE
ENGINEERING DEPARTMENT

W 710154

ORIGINAL DRAWING MADE ON DU PONT POLYESTER FILM

➡ ANALYZE FOR SAFETY, ECOLOGY, AND MINIMUM ESSENTIAL DESIGN ⬅



W 710132 LAST 8 REV.

PRELIMINARY FOR CONCEPTUAL DESIGN REPORT

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M/F	BLDG.	PROJ.	DA	TYPE		LAST REV.
	240 B	860762	B 240	24	W 710132	8

SAVANNAH RIVER PLANT
BLDG 240 B 200 B AREA
AFR FACILITY
BLDG ARRGT PLAN 70,000 MTHM SCHEME "M" PROCESS

PROJ	NO.	REVISION	RVSD	CHKD	APPD	DATE
860762	1	RELOCATED INITIAL 5000 MTHM FAC.	R.C.M.	W.E.R.		
	2	DIM. WAS 694'-0"	R.C. Martin 9-22-78	F.C.S.E.B. 9-22-78		
	3	DIM. WAS 133'-4"				
	4	DIM. WAS 364'-4"				
	5	DIM. WAS 1827'-4"				
	6/7	RELOCATED FUTURE STORAGE POOL SERVICES FACILITIES.	R.C.M. 9-28-78	F.C.S.E.B. 9-28-78		
	8	RELOC. FUTURE STORAGE POOL				

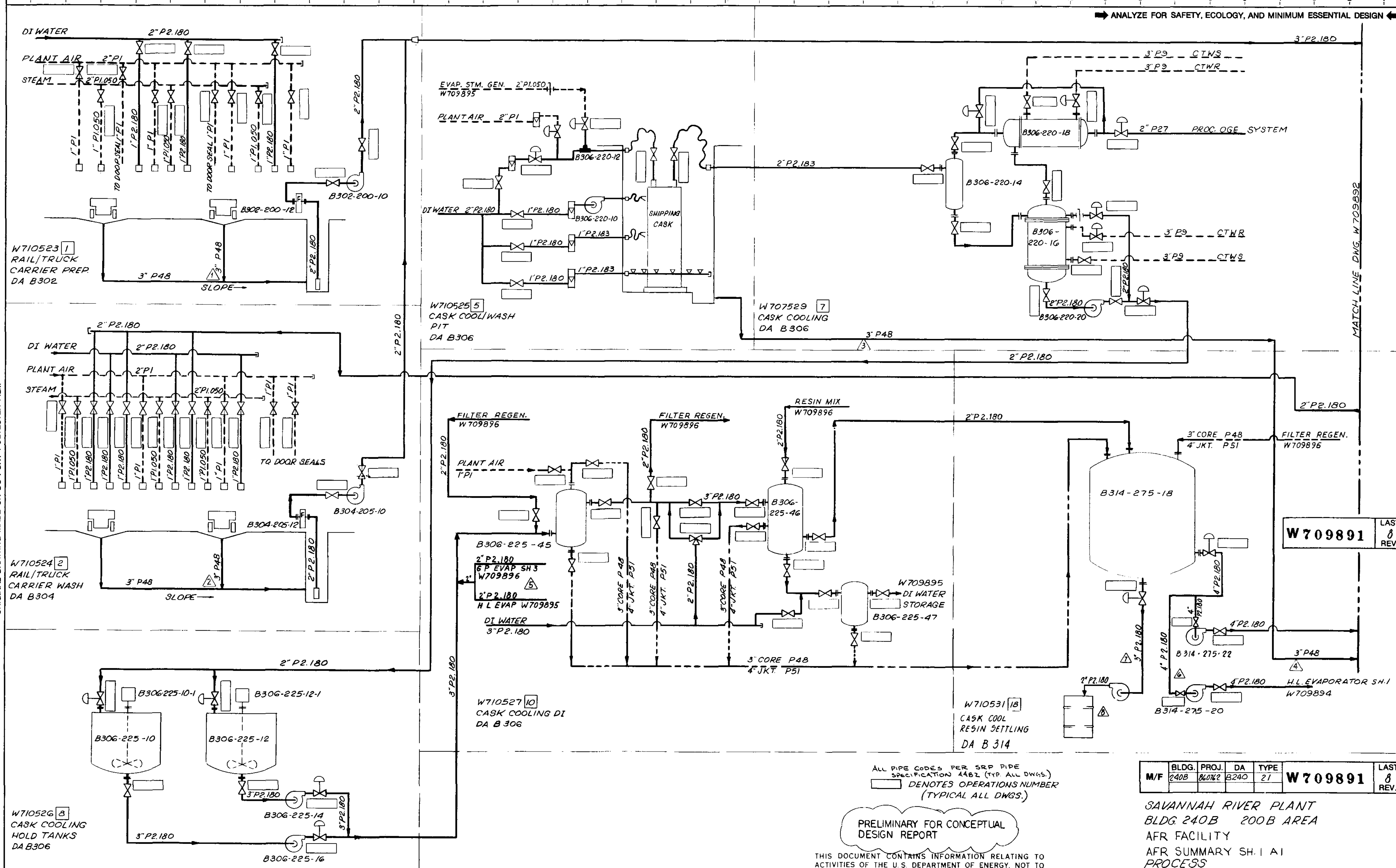
STANDARDS	REFERENCE DRAWINGS	
	W709985	5000 MTHM BLDG ARRGT
	W709888	PLOT PLAN

PROJECT 860762-12
SCALE 1"=60'-0"
DATE
DRAWN R.C. Martin 7-20-78
CHECKED W.E. ROSE 7-26-78
APPROVED-I.C.R.
APPROVED-FINAL

E. I. DU PONT DE NEMOURS & CO., INC.
WILMINGTON, DELAWARE
ENGINEERING DEPARTMENT

W 710132

ANALYZE FOR SAFETY, ECOLOGY, AND MINIMUM ESSENTIAL DESIGN



ALL PIPE CODES PER SRP PIPE SPECIFICATION 4482 (TYP. ALL DWGS.)

[box] DENOTES OPERATIONS NUMBER (TYPICAL ALL DWGS.)

PRELIMINARY FOR CONCEPTUAL DESIGN REPORT

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M/F	BLDG.	PROJ.	DA	TYPE
	240B	860762	B240	21

W709891 LAST 8 REV.

SAVANNAH RIVER PLANT
BLDG. 240B 200B AREA
AFR FACILITY
AFR SUMMARY SH. 1 A1
PROCESS

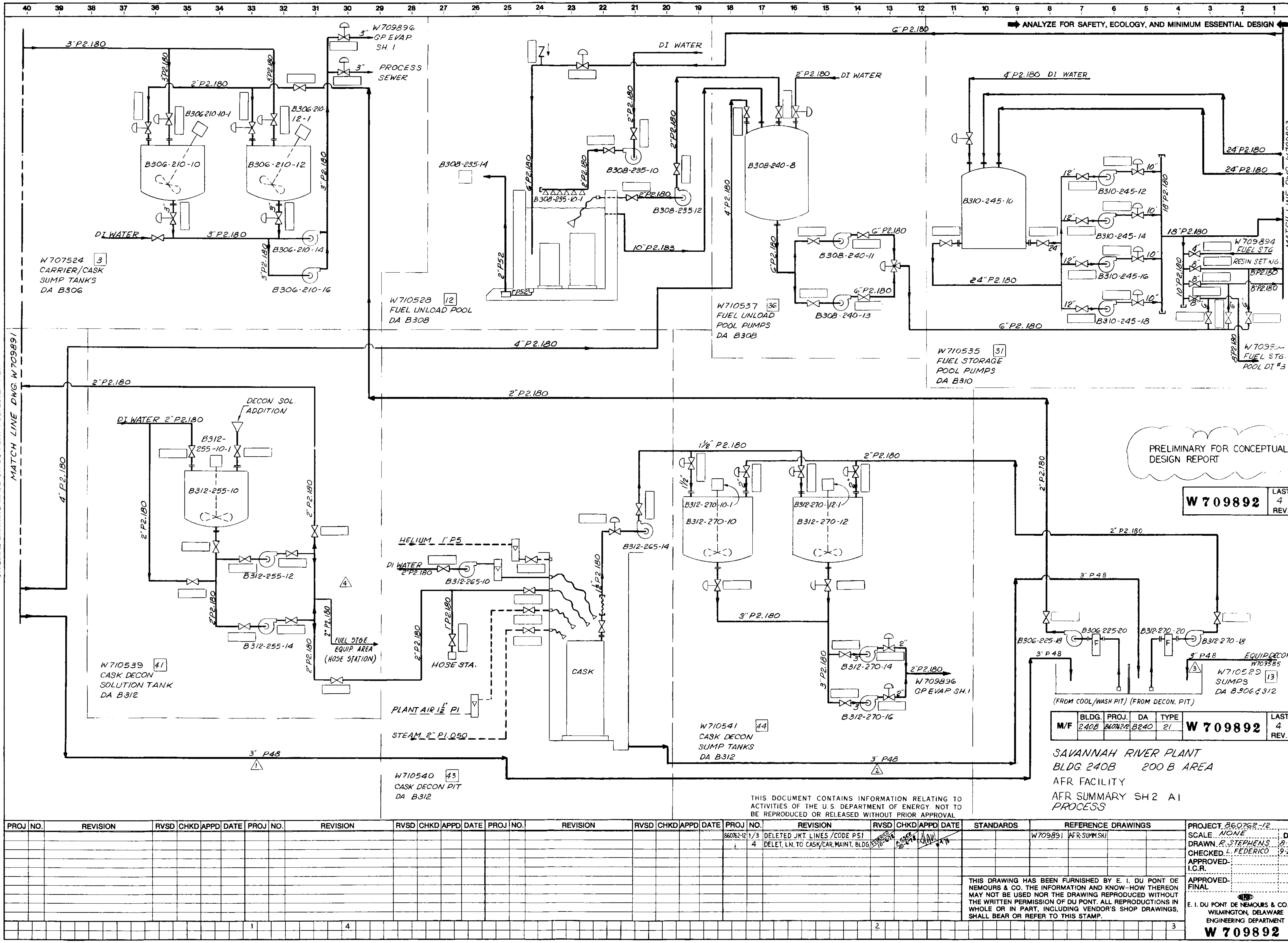
PROJ	NO.	REVISION	RVSD	CHKD	APPD	DATE
860762-12	1/4	DELETED JKT'D LINES-P51 CODE	FEDERICO			
	5	ADDED LINE FROM H L EVAP.				
	6	PUMP SUCTION WAS OFF BOT OF TK.				
	7	LINE SIZE WAS 4"				
	8	ADDED DRUM FILLING STA.				

STANDARDS	REFERENCE DRAWINGS			
	W709885	AFR-BLDG. M	W709896	AFR-SUMM SH.6
	W709892	AFR-SUMM SH2		
	W709893	" " SH3		
	W709894	" " SH4		
	W709895	" " SH5		

PROJECT 860762-12
SCALE NONE | DATE
DRAWN R. STEPHENS 8-2-78
CHECKED L. FEDERICO 9-25-78
APPROVED-I.C.R.
APPROVED-FINAL

E. I. DU PONT DE NEMOURS & CO., INC.
WILMINGTON, DELAWARE
ENGINEERING DEPARTMENT

W709891



ANALYZE FOR SAFETY, ECOLOGY, AND MINIMUM ESSENTIAL DESIGN
ORIGINAL DRAWING MADE ON DU PONT POLYESTER FILM
MATCH LINE DWG. W709891
MATCH LINE DWG. W709893
W707524 3
CARRIER/CASK SUMP TANKS
DA B306
B306-210-10
B306-210-12
B306-210-14
B306-210-16
DI WATER
3" P2.180
2" P2.180
W709896 GP EVAP. SH. I
PROCESS SEWER
W710528 12
FUEL UNLOAD POOL
DA B308
B308-235-14
B308-235-10
B308-235-12
B308-240-8
B308-240-11
B308-240-13
10" P2.183
4" P2.180
6" P2.180
W710537 36
FUEL UNLOAD POOL PUMPS
DA B308
B310-245-16
B310-245-12
B310-245-14
B310-245-16
B310-245-18
24" P2.180
18" P2.180
4" P2.180 DI WATER
W709894 FUEL STG
RESIN SETNG.
W710535 31
FUEL STORAGE POOL PUMPS
DA B310
FUEL STG. POOL DI #3
DECON SOL. ADDITION
DI WATER 2" P2.180
B312-255-10-1
B312-255-10
B312-255-12
B312-255-14
FUEL STGE EQUIP AREA (HOSE STATION)
W710539 41
CASK DECON SOLUTION TANK
DA B312
HELIUM 1" P5
DI WATER 2" P2.180
B312-265-10
B312-265-14
HOSE STA.
PLANT AIR 1 1/2" P1
STEAM 2" P1.050
CASK
1 1/2" P2.180
B312-270-10-1
B312-270-10
B312-270-12-1
B312-270-12
B312-270-14
B312-270-16
3" P2.180
W709896 GP EVAP SH. I
W710541 44
CASK DECON SUMP TANKS
DA B312
3" P48
W710540 43
CASK DECON PIT
DA B312
B306-225-18
B306-225-20
B312-270-20
B312-270-18
EQUIP DECON W709585
W710529 13
SUMPS
DA B306 & 312
(FROM COOL/WASH PIT) (FROM DECON. PIT)
PRELIMINARY FOR CONCEPTUAL DESIGN REPORT
W709892 LAST 4 REV.
M/F BLDG. 240B PROJ. 860762 DA B240 TYPE 21
SAVANNAH RIVER PLANT
BLDG. 240B 200 B AREA
AFR FACILITY
AFR SUMMARY SH 2 A1
PROCESS
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PROJ NO. REVISION RVSD CHKD APPD DATE
860762-12 1/3 DELETED JKT. LINES/CODE PS1
4 DELET. LN. TO CASK/CAR. MAINT. BLDG.
STANDARDS
REFERENCE DRAWINGS
W709891 AFR-SUMM. SH1
PROJECT 860762-12
SCALE NONE DATE
DRAWN R. STEPHENS 8-7-78
CHECKED L. FEDERICO 9-25-78
APPROVED-I.C.R.
APPROVED-FINAL
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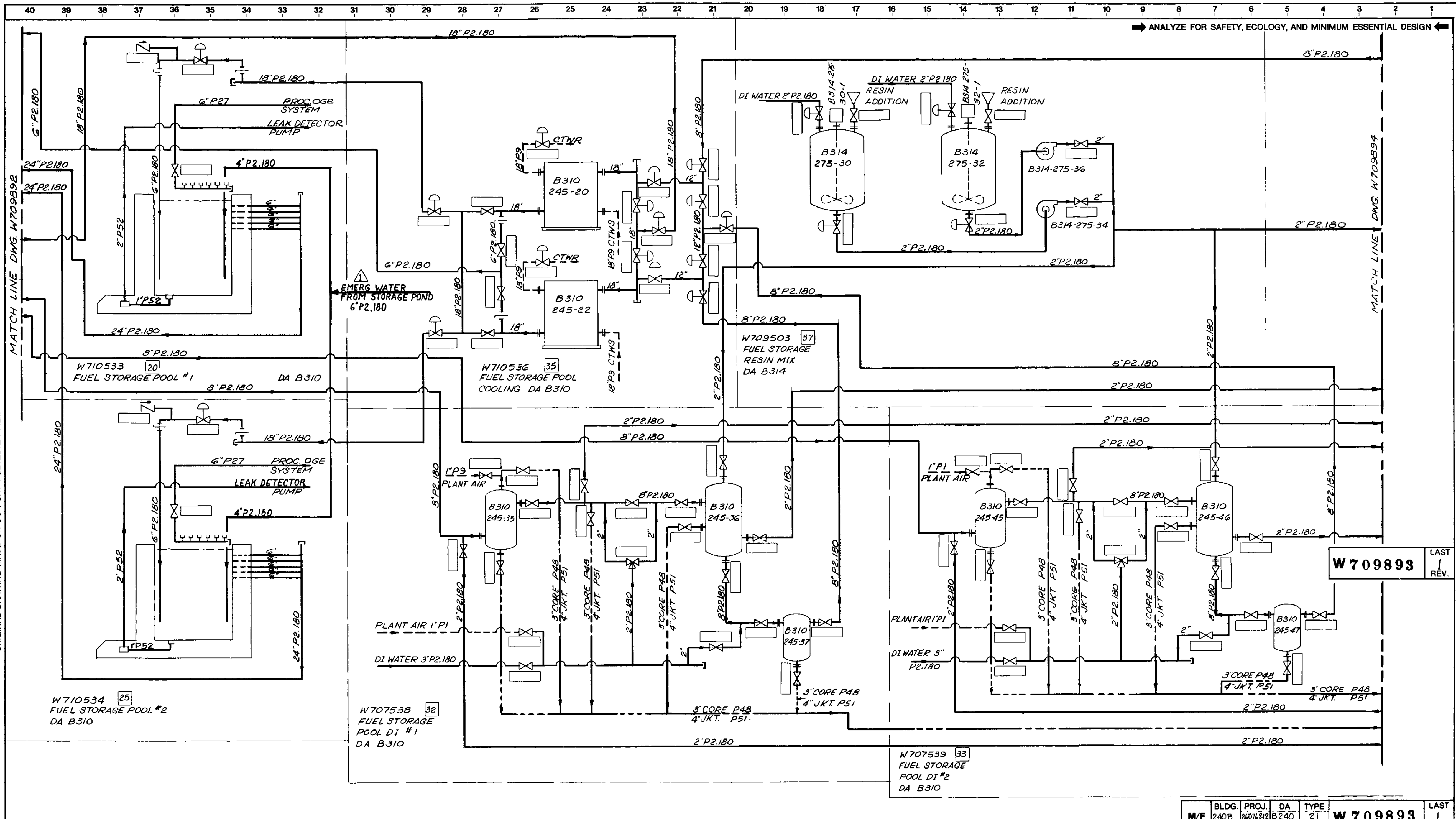
E. I. DU PONT DE NEMOURS & CO., INC. WILMINGTON, DELAWARE ENGINEERING DEPARTMENT
W 709892



M/F	BLDG.	PROJ.	DA	TYPE
	240B	860762-12	B240	21

W709893 LAST 1 REV.

SAVANNAH RIVER PLANT
BLDG. 240B 200B AREA
AFR FACILITY
AFR SUMMARY SH. 3 AI
PROCESS

PRELIMINARY FOR CONCEPTUAL DESIGN REPORT

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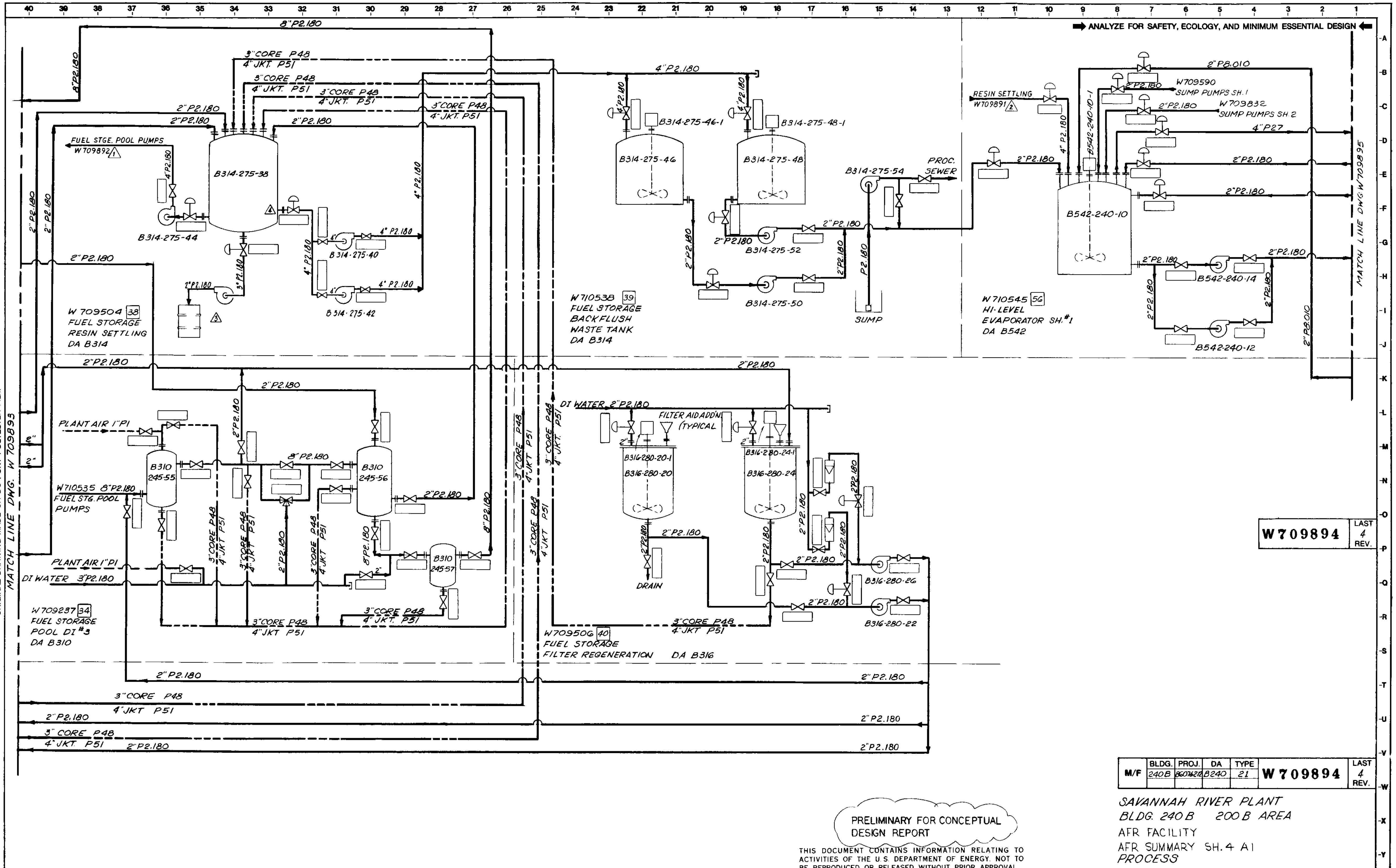
PROJ	NO.	REVISION	RVSD	CHKD	APPD	DATE
860762-12	1	ADDED EMERG WATER LINES		RCM		

STANDARDS	REFERENCE DRAWINGS
	W709891 AFR SUMM. SH. I

PROJECT 860762-12
SCALE NONE
DRAWN R. STEPHENS DATE 8-24-78
CHECKED L. FEDERICO 9-25-78
APPROVED-I.C.R.
APPROVED-FINAL

E. I. DU PONT DE NEMOURS & CO., INC.
WILMINGTON, DELAWARE
ENGINEERING DEPARTMENT
W 709893



W709894 LAST 4 REV.

PRELIMINARY FOR CONCEPTUAL DESIGN REPORT

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M/F	BLDG.	PROJ.	DA	TYPE
	240B	860762	B240	21

W709894 LAST 4 REV.

SAVANNAH RIVER PLANT
BLDG. 240 B 200 B AREA
AFR FACILITY
AFR SUMMARY SH. 4 A1
PROCESS

PROJ	NO.	REVISION	RVSD	CHKD	APPD	DATE
860762-12	1&2	RELOCATED LINES	FEDERICO			
	3	ADDED DRUM FILLING STA				
	4	PUMP SUCTIONS WERE OFF BOT OF TK.				

STANDARDS

REFERENCE DRAWINGS: W709891 AFR-SUMM. SH.1

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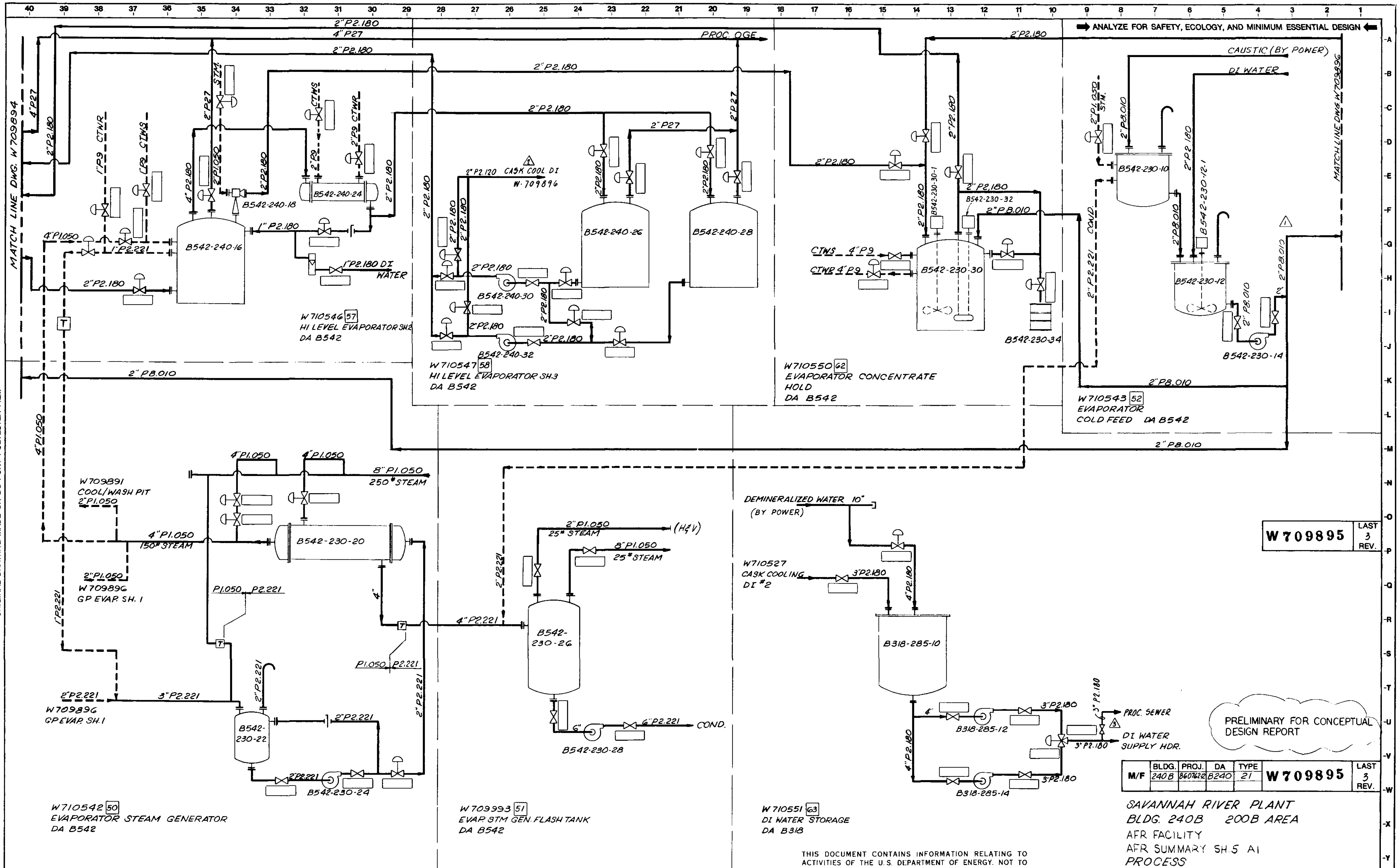
PROJECT 860762-12
SCALE NONE
DRAWN R. STEPHENS DATE 8-24-78
CHECKED L. FEDERICO 9-25-78
APPROVED-I.C.R.
APPROVED-FINAL

E. I. DU PONT DE NEMOURS & CO., INC.
WILMINGTON, DELAWARE
ENGINEERING DEPARTMENT
W 709894

ORIGINAL DRAWING MADE ON DU PONT POLYESTER FILM



M/F	BLDG.	PROJ.	DA	TYPE
	240B	860762	B240	21

W709895 LAST 3 REV.

SAVANNAH RIVER PLANT
BLDG. 240B 200B AREA
AFR FACILITY
AFR SUMMARY SH.5 A1
PROCESS

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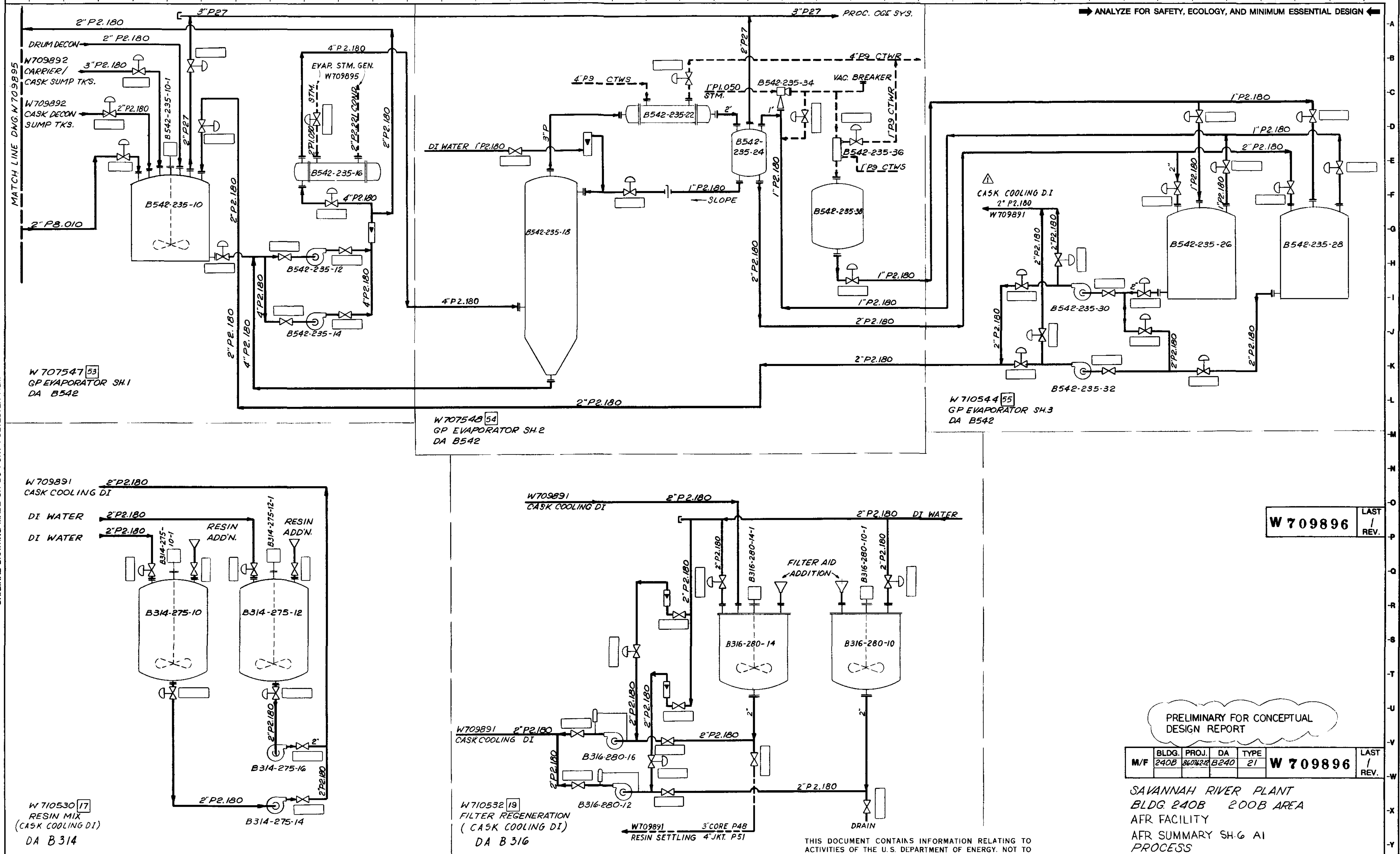
PROJ	NO.	REVISION	RVSD	CHKD	APPD	DATE
860762-12	1	DELETED LINE TO COOL'G TOWER	FEDERICO	[illegible]	[illegible]	[illegible]
	2	LN. WAS TO GP EVAPORATOR	RCM	[illegible]	[illegible]	[illegible]
	3	ADDED LN TO PROC SEWER				

STANDARDS	REFERENCE DRAWINGS	
	W709891	AFR SUMM SH.1

		DATE
PROJECT	860762-12	
SCALE	NONE	
DRAWN	R. STEPHENS	9-7-78
CHECKED	L. FEDERICO	9-25-78
APPROVED-I.C.R.		
APPROVED-FINAL		

E. I. DU PONT DE NEMOURS & CO., INC.
WILMINGTON, DELAWARE
ENGINEERING DEPARTMENT
W 709895

ORIGINAL DRAWING MADE ON DU PONT POLYESTER FILM



W 709896 LAST 1 REV.

PRELIMINARY FOR CONCEPTUAL DESIGN REPORT

M/F	BLDG.	PROJ.	DA	TYPE	W 709896	LAST 1 REV.
	240B	860762-12	B240	21		

SAVANNAH RIVER PLANT
BLDG. 240B 200B AREA
AFR FACILITY
AFR SUMMARY SH. 6 A1
PROCESS

THIS DOCUMENT CONTAINS INFORMATION RELATING TO ACTIVITIES OF THE U.S. DEPARTMENT OF ENERGY. NOT TO BE REPRODUCED OR RELEASED WITHOUT PRIOR APPROVAL.

PROJ	NO.	REVISION	RVSD	CHKD	APPD	DATE
860762-12	1	DELETED 3" LN. FROM H.L. EVAP	RCM			

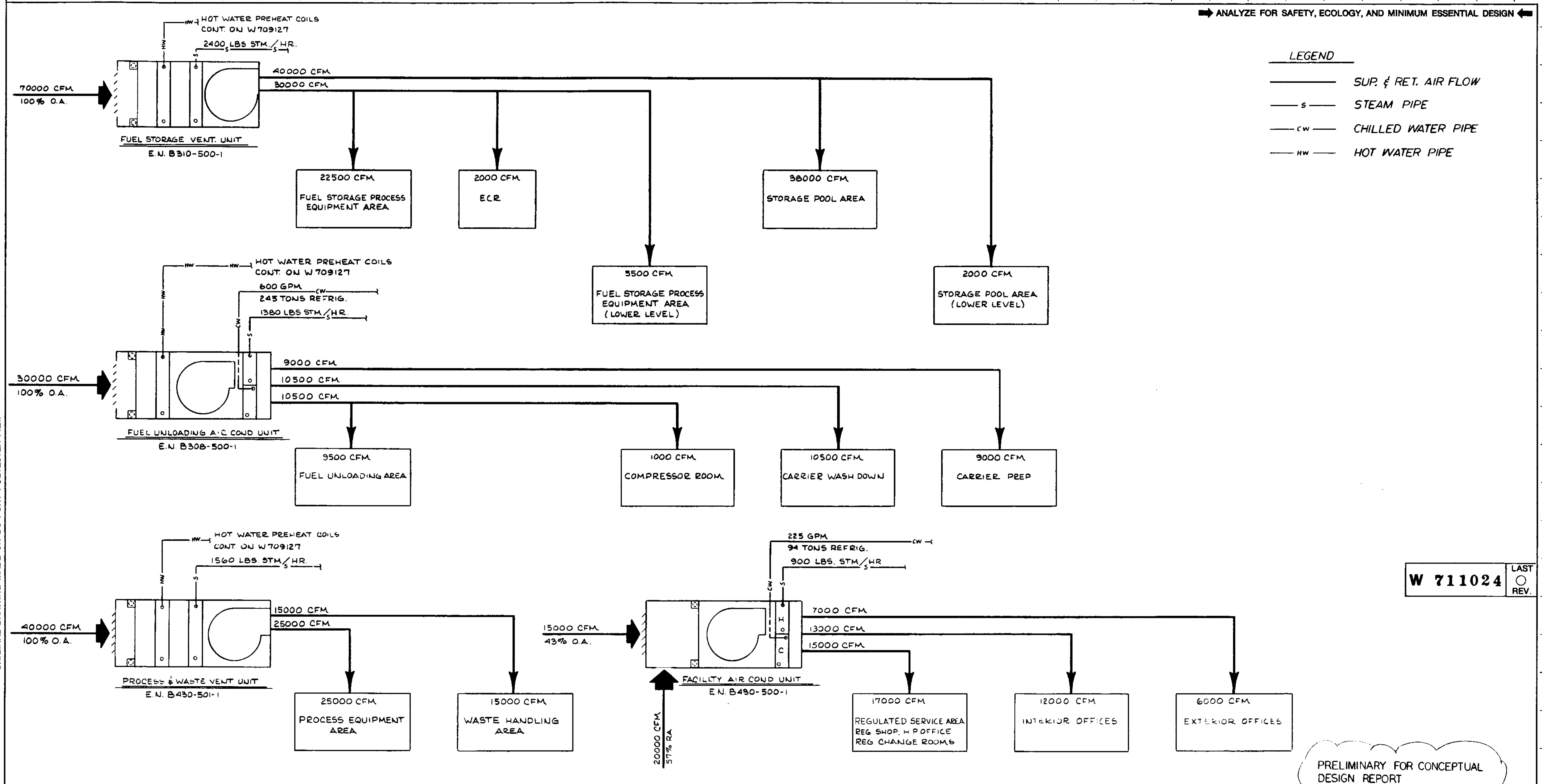
STANDARDS	REFERENCE DRAWINGS	
	W709891	AFR-SUM.SH.1

PROJECT 860762-12
SCALE NONE
DRAWN R. STEPHENS DATE 9-14-78
CHECKED L. FEDERICO 9-25-78
APPROVED-I.C.R.
APPROVED-FINAL

E. I. DU PONT DE NEMOURS & CO., INC.
WILMINGTON, DELAWARE
ENGINEERING DEPARTMENT
W 709896

ORIGINAL DRAWING MADE ON DU PONT POLYESTER FILM

ANALYZE FOR SAFETY, ECOLOGY, AND MINIMUM ESSENTIAL DESIGN



W 711024 LAST 0 REV.

PRELIMINARY FOR CONCEPTUAL DESIGN REPORT

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M/F	BLDG.	PROJ.	DA	TYPE
	240 B	860762	S291-292 B436	52

W 711024 LAST 0 REV.

SAVANNAH RIVER PLANT
BLDG. 240 B - 200 B AREA
A F R FACILITY
SUPPLY AIR FLOW DIAGRAM
H & V

PROJ	NO.	REVISION	RVSD	CHKD	APPD	DATE	PROJ	NO.	REVISION	RVSD	CHKD	APPD	DATE	PROJ	NO.	REVISION	RVSD	CHKD	APPD	DATE	PROJ	NO.	REVISION	RVSD	CHKD	APPD	DATE	STANDARDS

REFERENCE DRAWINGS

EXHAUST AF	W711024
HEAT RECOV PIPING DIAG	W709127

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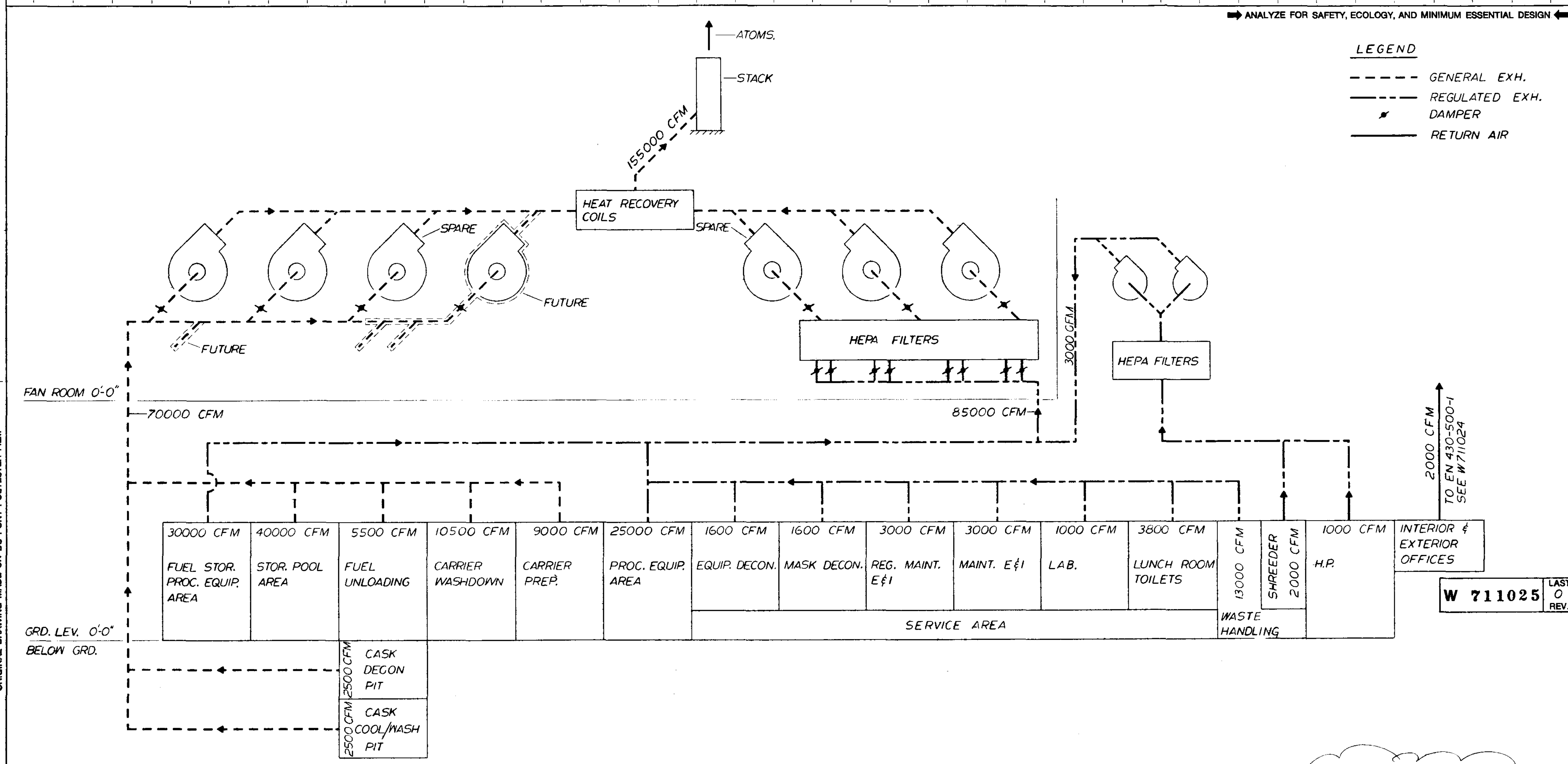
PROJECT 860762-12
SCALE NONE
DATE
DRAWN E.T. FULLER OCT 5 1978
CHECKED
APPROVED-I.C.R.
APPROVED-FINAL

E. I. DU PONT DE NEMOURS & CO., INC.
WILMINGTON, DELAWARE
ENGINEERING DEPARTMENT

W 711024



W 711025 LAST 0 REV.

PRELIMINARY FOR CONCEPTUAL DESIGN REPORT

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M/F	BLDG.	PROJ.	DA	TYPE
	240B	860762	8291-292 8436	52

W 711025 LAST 0 REV.

SAVANNAH RIVER PLANT
BLDG 240B -200 AREA
AFR FACILITY
EXHAUST AIR FLOW DIAGRAM
H & V

PROJ	NO.	REVISION	RVSD	CHKD	APPD	DATE	PROJ	NO.	REVISION	RVSD	CHKD	APPD	DATE	PROJ	NO.	REVISION	RVSD	CHKD	APPD	DATE	PROJ	NO.	REVISION	RVSD	CHKD	APPD	DATE

STANDARDS

REFERENCE DRAWINGS	
W 711024	SUP AF DIAG
W 709127	HEAT RECOV PIPING DIAG

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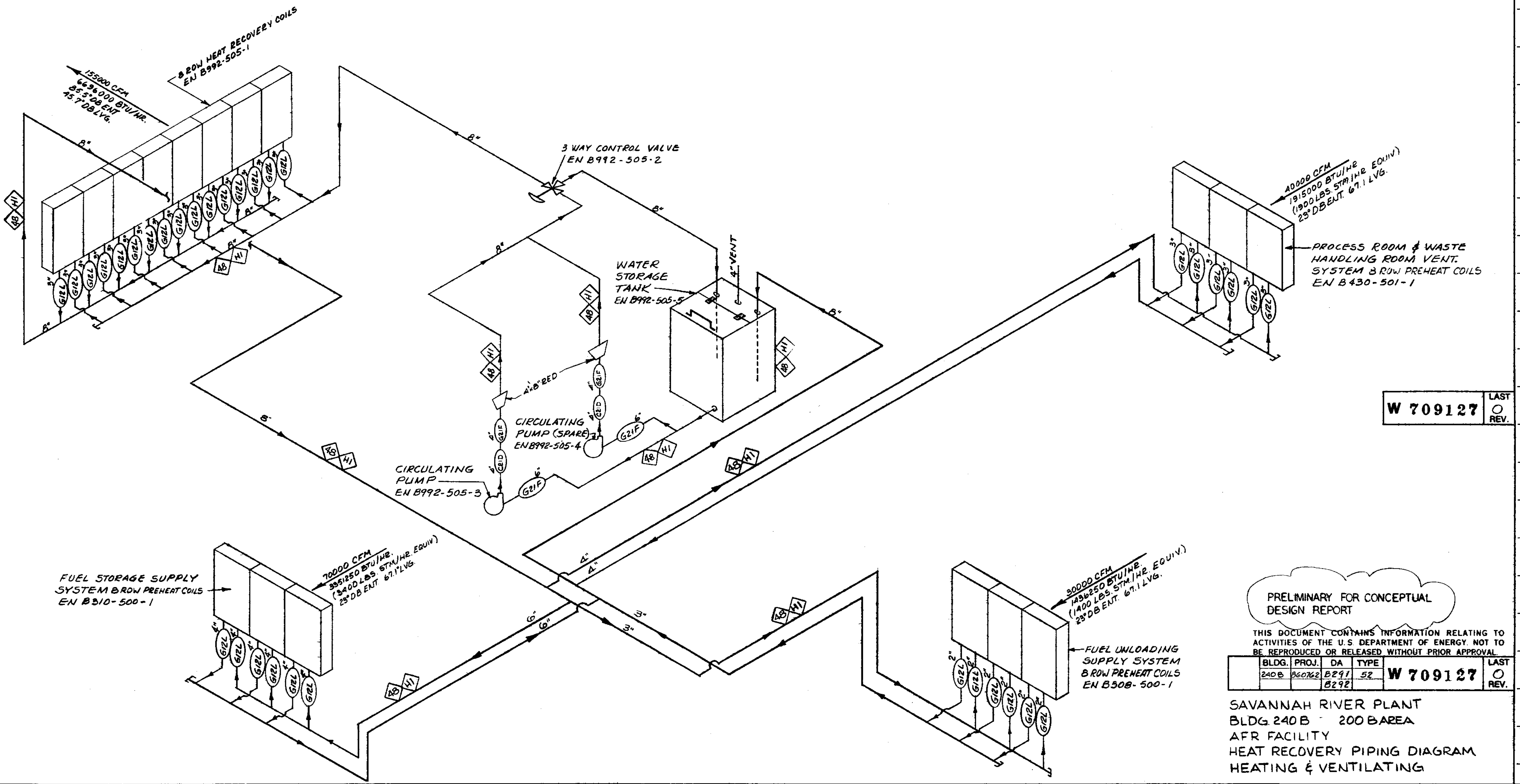
PROJECT 860762-12
SCALE NONE
DRAWN L. B. GUMPP DATE OCT. 5 1978
CHECKED
APPROVED-I.C.R.
APPROVED-FINAL

E. I. DU PONT DE NEMOURS & CO., INC.
WILMINGTON, DELAWARE
ENGINEERING DEPARTMENT

W 711025



W 709127 LAST O REV.

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BLDG.	PROJ.	DA	TYPE
240B	860762	B291 B292	52

W 709127 LAST O REV.

SAVANNAH RIVER PLANT
BLDG. 240 B - 200 B AREA
AFR FACILITY
HEAT RECOVERY PIPING DIAGRAM
HEATING & VENTILATING

ORIGINAL DRAWING MADE ON DU PONT POLYESTER FILM

PROJ	NO.	REVISION	RVSD	CHKD	APPD	DATE	PROJ	NO.	REVISION	RVSD	CHKD	APPD	DATE	PROJ	NO.	REVISION	RVSD	CHKD	APPD	DATE	PROJ	NO.	REVISION	RVSD	CHKD	APPD	DATE	STANDARDS

REFERENCE DRAWINGS	
W711024	SUPPLY AIR FLOW DIAG.
W711025	EXHAUST AIR FLOW DIAG.

PROJECT 860762-12
SCALE NONE DATE
DRAWN B. LEACH MAY 18 1978
CHECKED
APPROVED-I.C.R.
APPROVED-FINAL

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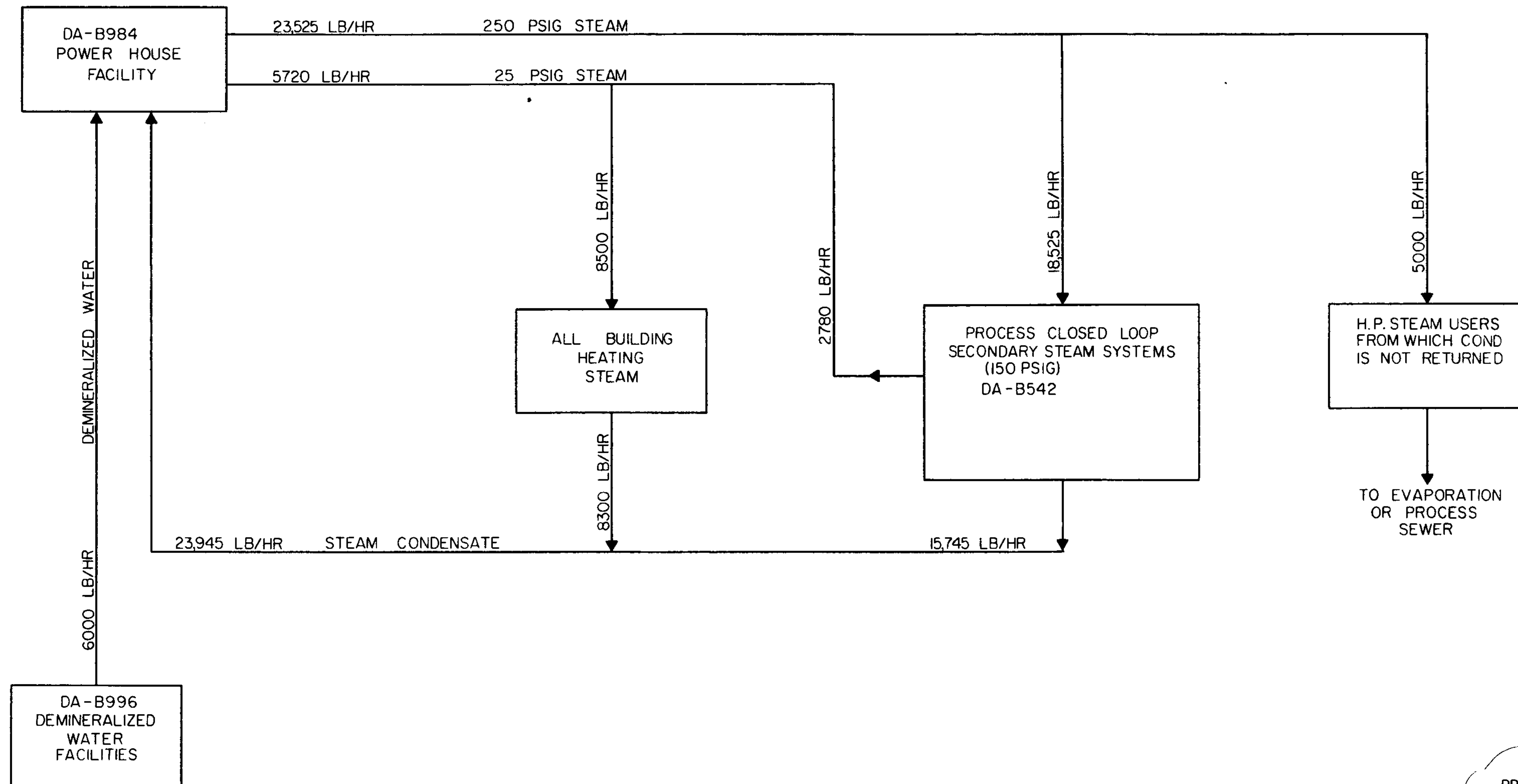
E. I. DU PONT DE NEMOURS & CO., INC.
WILMINGTON, DELAWARE
ENGINEERING DEPARTMENT

W 709127

ANALYZE FOR SAFETY, ECOLOGY, AND MINIMUM ESSENTIAL DESIGN



ORIGINAL DRAWING MADE ON DU PONT POLYESTER FILM

W 710835 LAST 0 REV.

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M/F	BLDG.	PROJ.	DA	TYPE
	B284	860762	B984	51

W 710835 LAST 0 REV.

SAVANNAH RIVER
A.F.R. FACILITIES - AREA "B"
STEAM SYSTEM
BLOCK DIAGRAM
POWER

PROJ	NO.	REVISION	RVSD	CHKD	APPD	DATE	PROJ	NO.	REVISION	RVSD	CHKD	APPD	DATE	PROJ	NO.	REVISION	RVSD	CHKD	APPD	DATE	PROJ	NO.	REVISION	RVSD	CHKD	APPD	DATE

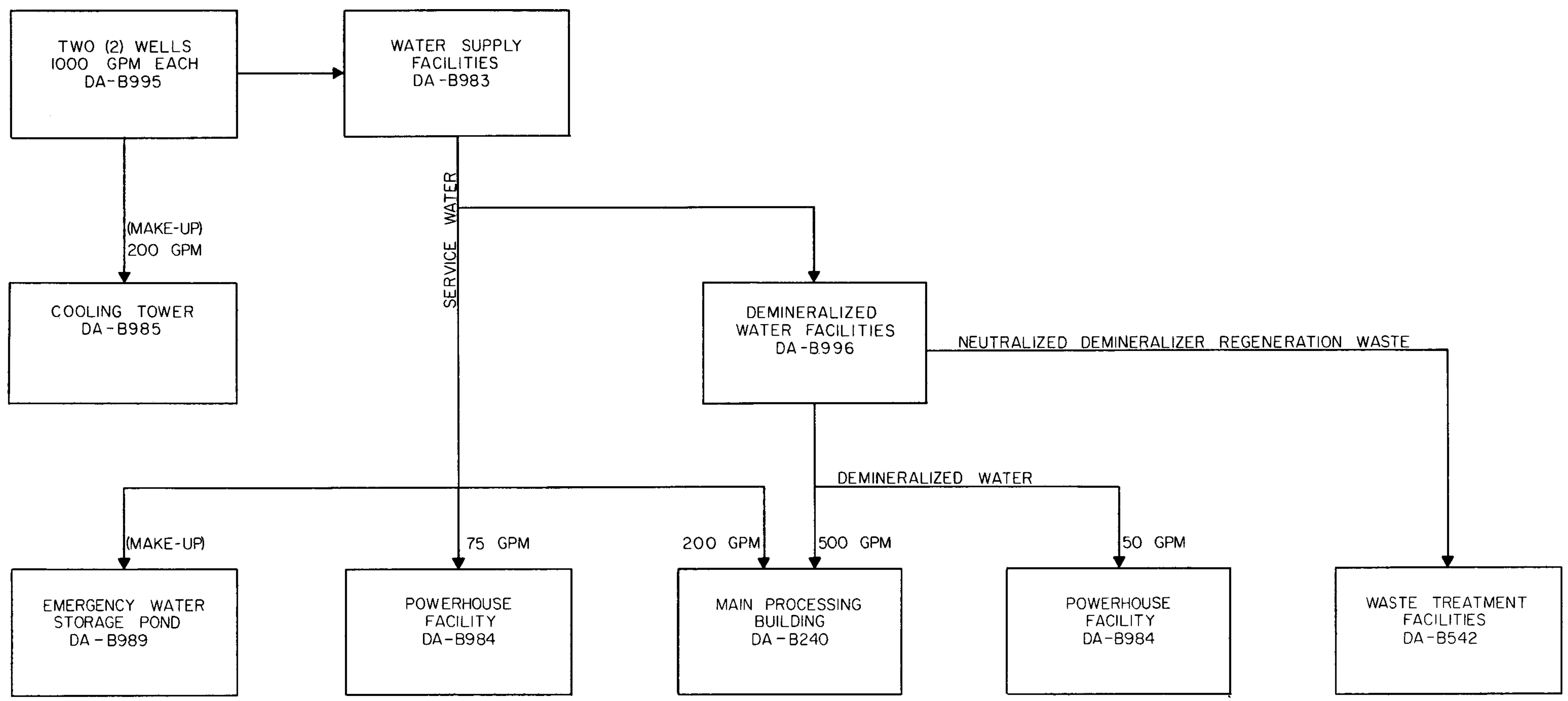
STANDARDS | REFERENCE DRAWINGS

PROJECT 860762
SCALE NONE
DRAWN S. H. BAK
DATE SEP 15 1978
CHECKED
APPROVED- I.C.R.
APPROVED- FINAL

E. I. DU PONT DE NEMOURS & CO., INC.
WILMINGTON, DELAWARE
ENGINEERING DEPARTMENT

W 710835

ANALYZE FOR SAFETY, ECOLOGY, AND MINIMUM ESSENTIAL DESIGN



ORIGINAL DRAWING MADE ON DU PONT POLYESTER FILM

W 710834 LAST REV.

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M/F	BLDG.	PROJ.	DA	TYPE		LAST REV.
	8284	860762	B983 B995 B996	51	W 710834	0

SAVANNAH RIVER
A.F.R. FACILITIES - AREA "B"
WATER SYSTEMS
BLOCK DIAGRAM
POWER

PROJ	NO.	REVISION	RVSD	CHKD	APPD	DATE	PROJ	NO.	REVISION	RVSD	CHKD	APPD	DATE	PROJ	NO.	REVISION	RVSD	CHKD	APPD	DATE	PROJ	NO.	REVISION	RVSD	CHKD	APPD	DATE	STANDARDS	REFERENCE DRAWINGS

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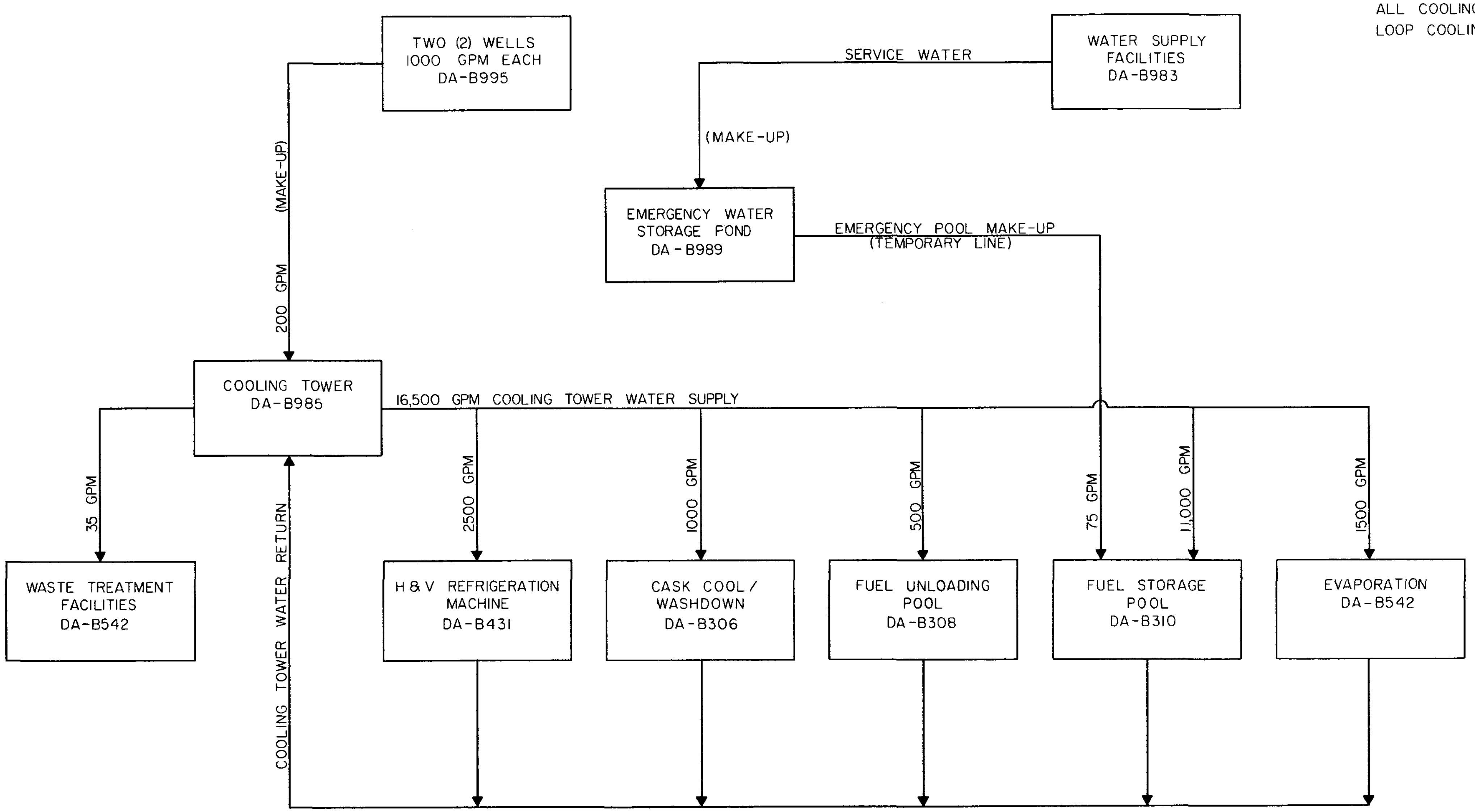
PROJECT 860762
SCALE NONE DATE
DRAWN S. H. BAK SEP. 15 1978
CHECKED
APPROVED-I.C.R.
APPROVED-FINAL

E. I. DU PONT DE NEMOURS & CO., INC.
WILMINGTON, DELAWARE
ENGINEERING DEPARTMENT

W 710834

➡ ANALYZE FOR SAFETY, ECOLOGY, AND MINIMUM ESSENTIAL DESIGN ⬅

NOTE
ALL COOLING TOWER WATER SERVES A CLOSED LOOP COOLING WATER SYSTEM.



W 710836 LAST 0 REV.

PRELIMINARY FOR CONCEPTUAL DESIGN REPORT

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M/F	BLDG.	PROJ.	DA	TYPE	
		860762	B985	51	W 710836 LAST 0 REV.

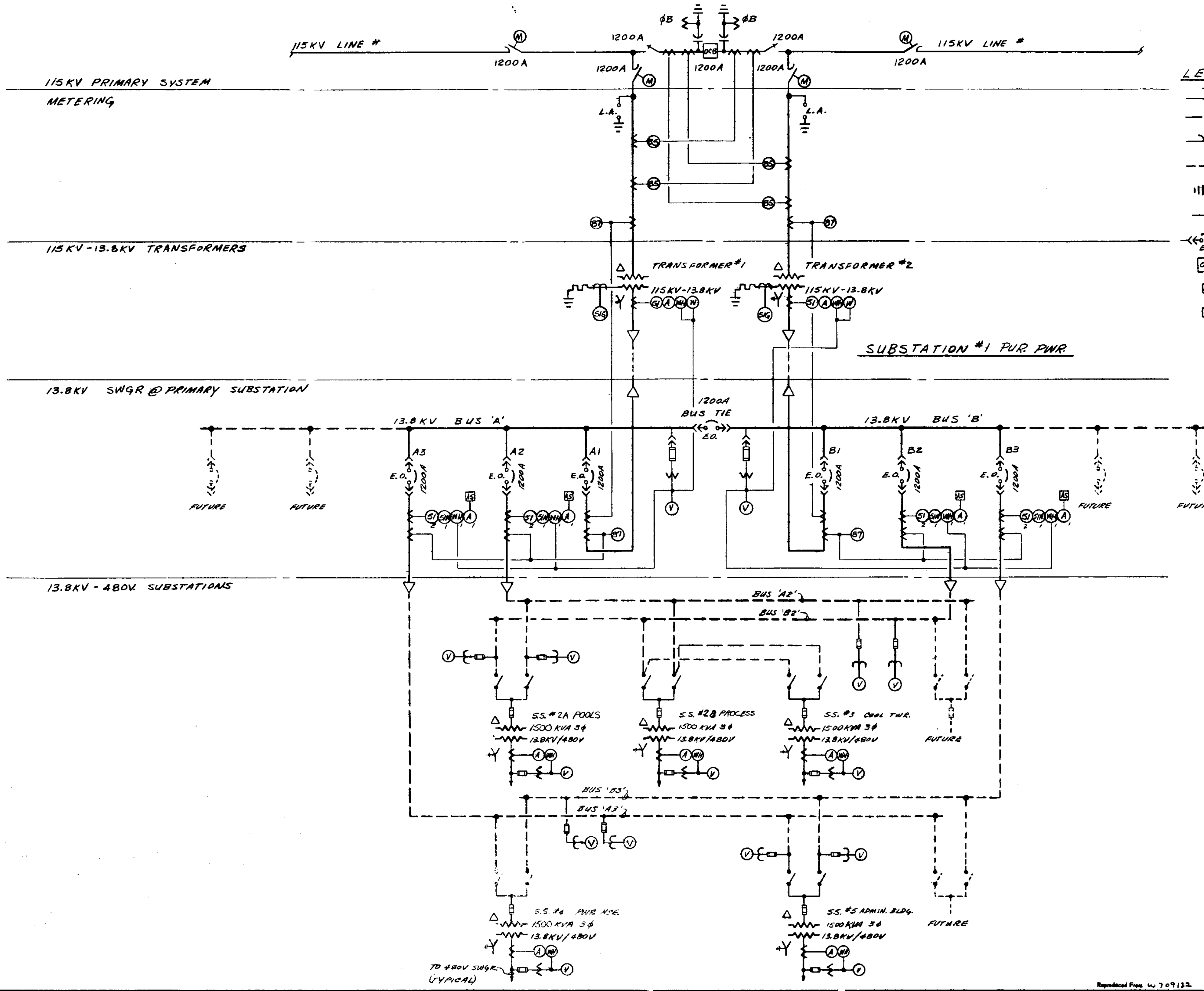
SAVANNAH RIVER
A.F.R. FACILITIES - AREA "B"
COOLING WATER SYSTEM
BLOCK DIAGRAM
POWER

PROJ	NO.	REVISION	RVSD	CHKD	APPD	DATE	PROJ	NO.	REVISION	RVSD	CHKD	APPD	DATE	PROJ	NO.	REVISION	RVSD	CHKD	APPD	DATE	PROJ	NO.	REVISION	RVSD	CHKD	APPD	DATE	STANDARDS	REFERENCE DRAWINGS

PROJECT 860762
SCALE NONE
DRAWN S. H. BAK DATE SEP 15 1978
CHECKED
APPROVED-I.C.R.
APPROVED-FINAL

E. I. DU PONT DE NEMOURS & CO., INC.
WILMINGTON, DELAWARE
ENGINEERING DEPARTMENT
W 710836

➡ ANALYZE FOR SAFETY, ECOLOGY, AND MINIMUM ESSENTIAL DESIGN ⬅



LEGEND

- FUSE DISCONNECT SWITCH
- AIR BREAK SWITCH MANUAL OPERATED
- AIR BREAK SWITCH, HORN GAP, REMOTE OPERATED (THE SMALL CIRCLE WITH 'M' INDICATES MOTOR OPERATED)
- FROM OVERHEAD TO UNDERGROUND
- L.A. LIGHTNING ARRESTOR
- POTHEAD OR TERMINAL
- E.O. DRAWOUT TYPE CIRCUIT BREAKER ELECTRICALLY OPERATED
- O.C.B. OIL CIRCUIT BREAKER
- LD CONTROLLED FROM LOAD DISPATCHER PANEL
- S CONTROLLED FROM SWITCHGEAR
- 51 OVERCURRENT RELAY
- 85 PILOT WIRE RELAY
- 87 DIFFERENTIAL RELAY

W 711420 LAST REV.

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M/F	BLDG.	PROJ.	DA	TYPE
	200B	860762	B951	61

W 711420 LAST REV.

SAVANNAH RIVER PLANT
AFR FAC 200B AREA
SUBSTA. #1 PURCHASED POWER
13.8 KV S/L DIAG.
ELECTRICAL

Reproduced From W 709132

PROJ	NO.	REVISION	RVSD	CHKD	APPD	DATE	PROJ	NO.	REVISION	RVSD	CHKD	APPD	DATE	PROJ	NO.	REVISION	RVSD	CHKD	APPD	DATE	PROJ	NO.	REVISION	RVSD	CHKD	APPD	DATE	STANDARDS	REFERENCE DRAWINGS

PROJECT 860762-012
SCALE NONE
DATE
DRAWN OCT 30 1978
CHECKED
APPROVED-I.C.R.
APPROVED-FINAL

E. I. DU PONT DE NEMOURS & CO., INC.
WILMINGTON, DELAWARE
ENGINEERING DEPARTMENT

W 711420