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3 IN A SERIES OF 8

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Commercial Electric Power Cost Studies

Prepared for the U.S. Nuclear Regulatory Commission and the U.S. Department of Energy by United Engineers & Constructors Inc.

Capital Cost: High and Low Sulfur Coal Plants— 1200 MWe

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Capital Cost: High and Low Sulfur Coal Plants-1200 MWe

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Prepared for the U.S. Nuclear Regulatory Commission under contract No. AT (49-24)-0351 and the U.S. Department of Energy under contract No. EY-76-C-02-2477 by United Engineers & Constructors Inc., 30 South 17th Street, P.O. Box 8223, Philadelphia, Pa. 19101

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PREFACE

This Commercial Electric Power Cost Study for 1200 MWe (Nominal) high and low sulfur coal plants consists of three volumes. The high sulfur coal plant is described in Volumes I and II, while Volume III describes the low sulfur coal plant.

The design basis and cost estimate for the 1232 MWe high sulfur coal plant is presented in Volume I and the drawings, equipment list and site description are contained in Volume II. The reference design includes a lime flue gas desulfurization system. A regenerative sulfur dioxide removal system using magnesium oxide is also presented as an alternate in Section 7 of Volume II.

The design basis, drawings and summary cost estimate for a 1243 MWe low sulfur coal plant are presented in Volume III. This information was developed by redesigning high sulfur coal plant for burning low sulfur sub-bituminous coal.

These coal plants utilize a mechanical draft (wet) cooling tower system for condenser heat removal. Costs of alternate cooling systems are provided in Report No. 7 in this series of studies of costs of commercial electrical power plants.

ACKNOWLEDGEMENTS

The information used in the preparation of this report was obtained from various sources, including United Engineers' records and files. Special recognition is given to the following organizations who contributed specific design, performance and/or cost information.

Company	Plant System
o The Babcock & Wilcox Co.	Pressurized Furnace Steam Generator
o The Babcock & Wilcox Co. Wheelabrator-Frye Inc.	Electrostatic Precipitators
o Brown Boveri Corporation	Cross-Compound Steam Turbine Generators
o Allen-Sherman-Hoff Co	Ash Handling System
o Marley Company	Cooling Towers
o David M. Spillane Co.	Condensers & Feedwater Heaters
o Delaval Turbine Inc.	Boiler Feed Pump & Turbine Drive
o Dravo Corporation	Bucket/Wheel Stacker Reclaimer

Background information was obtained from AEP on the 1200 MWe plants in their system.

TABLE LIST

1243 MWe LOW SULFUR COAL PLANT

DRAWING LIST

1243 MWe LOW SULFUR COAL-FIRED PLANT

Drawing Number	Title
6515.002-LSC-1	Symbol Legend for Flow and Block Diagrams
6515.002-LSC-2	Plot Plan
6515.002-LSC-3	General Arrangement Plan "A-A" at El. 18'-0"
6515.002-LSC-4	General Arrangement Plans - El. 43'-0" and 73'-0"
6515.002-LSC-5	Flow Diagram-Forced Draft System
6515.002-LSC-6	Steam Heat Balance Diagram (Maximum Guaranteed)
6515.002-LSC-7	Flow Diagram - Main Steam Hot Reheat and Cold Reheat System
6515.002-LSC-8	Flow Diagram - H.P. & I.P. Extraction Steam System
6515.002-LSC-9	Flow Diagram - L.P. Extraction Steam System
6515.002-LSC-10	Flow Diagram - Condensate and Feedwater System
6515.002-LSC-11	Flow Diagram - Heater Drains and Vents System
6515.002-LSC-12	One Line Diagram - Unit Electrical Distribution
6515.002-LSC-13	One Line Diagram d-c Distribution System
6515.002-LSC-14	Flow Diagram - Auxiliary Steam System
6515.002-LSC-15	Flow Diagram - Coal Handling System
6515.002-LSC-16	Flow Diagram - Bottom Ash Handling System
6515.002-LSC-17	Block Diagram - Plant Fire Protection System
6515.002-LSC-18	Block Diagram - Waste Water Treatment System

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COMMERCIAL ELECTRIC POWER COST STUDY
HIGH AND LOW SULFUR COAL PLANTS - 1200 MWe

INDEX

VOLUME III 1243 MWe Low Sulfur Coal Plant

SECTION 8

SUMMARY FOR LOW SULFUR COAL PLANT

SECTION 8

SUMMARY FOR LOW SULFUR COAL PLANT

8.1 INTRODUCTION

This Commercial Electric Power Cost Study for the 1243 MWe Low Sulfur Coal Plant is presented in Volume III of the three volume series. This volume contains the Legal Notice, Preface, Summary for Low Sulfur Coal Plant, Plant Description, Cost Estimate, Drawings, Equipment List and Site Description.

8.2 MAJOR STUDY GROUND RULES

In addition to the "Site Description" presented in Section 13, the major criteria used in the low sulfur coal plant study are as follows:

- The plant design incorporates a once-through supercritical pressure single reheat type steam generator to supply steam to a cross compound eight flow turbine. The heat balance shown on drawing 6515.002-LSC-6 (Volume III, Section II) reflects steam conditions for a 1200 MWe nominally rated plant.

- Key plant parameters for the steam supply system, and the steam and power conversion system are shown in Tables 9-1 and 9-2 respectively.

- The steam generator is designed for a low sulfur western coal. The coal selection criteria are discussed in Section 9.2.2. The characteristics of the design basis coal seam and the design basis coal specification are presented in Tables 9-3 and 9-4 respectively.

- The plant coal handling system is designed to unload a 100 car coal unit train in four hours. The design provides indoor coal storage silos with a capacity sufficient for eight hours consumption at full load and an outdoor storage area with a capacity sufficient for 60 days consumption at full load.

- A full complement of environmental and siting criteria circa January 1, 1976 are utilized. Structural design criteria for the major structures are addressed in Section 9.2.3.

- o The main heat rejection system incorporates mechanical draft wet cooling towers.
- o The design provides a connection to the utility grid at two different voltage levels; 500 kV for the generator connection and 230 kV for the reserve auxiliary transformer connection.
- o The cost estimate is developed for a single unit, with sufficient land area to accommodate an identical second unit.
- o The cost estimate is developed in accordance with a Code of Accounts as expanded from that presented in the USAEC Report NUS-531.
- o Cost data is based on prices effective as of July 1, 1976.
- o Escalation and interest during construction are not included in the cost estimate.
- o The plant design life is 40 years during the first part of which it will be baseloaded.

8.3 COST SUMMARY

The estimated total base construction cost for the 1200 MWe (Nominal) Low Sulfur Coal Plant reference design is $402,825,229 or $324/kW based on July 1, 1976 prices. A summary of the Cost Estimate at the two digit account level is shown in Table 8-1. The cost estimate does not include normal contingency costs for the equipment, material and labor components of the total base construction cost; nor does it include escalation and interest during construction. Other items not included in the cost estimate are listed in the beginning of Section 10, Cost Estimate. As noted in the Foreword in Volume I, for a specific site, this baseline cost estimate must be adjusted for regional variations in material and labor rates, different construction schedule lengths, and escalation and interest rates incurred during construction.

A comparison of the high sulfur coal plant with the low sulfur coal plant is presented in Volume I, Section 1.4.

8.4 COMPARISON WITH WASH-1230 RESULTS

The total base construction cost for the coal-fired power plant (1000 MWe net output) reference in WASH-1230 which did not have flue gas desulfurization is approximately $174,000,000 or $174/kW, based upon prices effective January 1971. Thus, this 1977 study indicates approximately a 87.9 percent increase in the cost of the plant in terms of $/kW. The principal factors contributing to this increase are as follows:

- o Cost escalation from January 1971 to July 1976.
- o Environmental consideration affecting the magnitude of the plant design, analysis and siting requirements.

These result in increased engineering, management, labor, equipment and material costs due to escalation, increased scope and lengthened schedules.

The increase in direct construction costs of the current plant design over those estimated in WASH-1230 are directly related to increases in the quantities of the various construction materials required for compliance with environmental and siting criteria circa January 1, 1976, and the fact that the current plant is larger, with a net output approximately 24 percent greater than the power plant referenced in WASH-1230.

Following are examples of the differences in the quantities of some of these construction materials:

	WASH-1230 Coal Plant 1000 MWe Net Output (1/71)	Low Sulfur Coal Plant 1243 MWe Net Output (1/76)
Concrete, cu yds.	76,000	81,600
Reinforcing Steel, lbs.	7.5×10^6	11.8×10^6
Structural Steel, lbs.	32.0×10^6	47.0×10^6

Table 8-2 is a summary breakdown of the direct craft labor costs and hours for this 1243 MWe reference design. The total direct craft labor cost of approximately $88,000,000 corresponds to a weighted average hourly rate of $12.38. Approximately 7,146,000 craft labor manhours average 5.8 manhours/kW. These compare to averages of $9.08/hour and 5.6 manhours/kW respectively for the earlier 1000 MWe design reported in WASH-1230.

TABLE 8-1
COST ESTIMATE SUMMARY
TWO DIGIT ACCOUNT LEVEL
1243 MWe LOW SULFUR COAL-FIRED PLANT
MIDDLETOWN, USA

COST BASIS
07/76

08/30/77

ACCT NO	ACCOUNT DESCRIPTION	FACTORY EQUIP. COSTS	SITE LABOR HOURS	SITE LABOR COST	SITE MATERIAL COST	TOTAL COSTS
20 .	LAND AND LAND RIGHTS				2,000,000	2,000,000
21 .	STRUCTURES + IMPROVEMENTS	3,155,469	1554655 MH	18,013,514	27,552,514	48,721,497
22 .	BOILER PLANT EQUIPMENT	87,151,285	2174808 MH	27,375,744	5,950,999	120,478,028
23 .	TURBINE PLANT EQUIPMENT	81,230,723	1853747 MH	23,706,125	5,291,549	110,228,397
24 .	ELECTRIC PLANT EQUIPMENT	7,480,100	1041778 MH	12,782,945	7,629,575	27,892,620
25 .	MISCELLANEOUS PLANT EQUIPT	5,722,267	259176 MH	3,323,701	811,186	9,857,154
26 .	MAIN COND HEAT REJECT SYS	11,547,105	261506 MH	3,230,373	1,072,055	15,849,533
2 .	TOTAL DIRECT COSTS	196,286,949	7145670 MH	88,432,402	50,307,878	335,027,229
91 .	CONSTRUCTION SERVICES	13,601,000	1180000 MH	12,313,000	16,872,000	42,786,000
92 .	HOME OFFICE ENGRG.&SERVICE	14,710,000				14,710,000
93 .	FIELD OFFICE ENGRG&SERVICE	9,402,000			900,000	10,302,000
9 .	TOTAL INDIRECT COSTS	37,713,000	1180000 MH	12,313,000	17,772,000	67,798,000
	TOTAL BASE COST	233,999,949	8325670 MH	100,745,402	68,079,878	402,825,229

TABLE 8-2

DIRECT CRAFT LABOR SUMMARY FOR 1243 MWe
LOW SULFUR COAL PLANT - MIDDLETOWN, USA
COST BASIS - 7/76

Craft Description	Site Labor Hours	% Hours	Site Labor Cost	% Cost
Asbestos Worker	111,030	1.6	1,445,610	1.6
Boiler Maker	219,652	3.1	3,035,590	3.4
Bricklayer	122,707	1.7	1,400,093	1.6
Carpenter	209,284	2.9	2,427,698	2.7
Dock Builder	873	0.0	11,978	0.0
Electrician	1,259,841	17.6	15,622,026	17.7
Iron Worker	646,888	9.1	8,571,302	9.7
Laborers	573,985	8.0	5,349,538	6.0
Millwrights	147,385	2.1	1,868,836	2.1
Operating Engineers	464,761	6.5	5,800,187	6.6
Painters	209,750	2.9	2,007,308	2.3
Pipefitters	1,794,953	25.1	24,052,372	27.2
Roofers	9,181	.1	123,760	.1
Teamsters	111,608	1.6	955,370	1.1
Undefined Crafts	1,263,772	17.7	15,760,734	17.8
TOTAL FOR PLANT	7,145,670	100.0	$ 88,432,402	100.0

9

SECTION 9
PLANT DESCRIPTION

SECTION 9

PLANT DESIGN DESCRIPTION

9.1 INTRODUCTION

Section 9 describes the Low Sulfur Coal Plant design and the construction support activities covered by the cost estimate.

The material presented in this section is organized to correspond to the uniform system of accounts (USAEC Report NUS-531) used for the detailed cost estimate. This format correlates the plant design description with the cost estimate in Section 10 and the equipment list in Section 12. The two digit accounts used in this regard are as follows:

A summary description is provided in Section 9 for each major account. This is followed by detailed descriptions of each system and structure at the three digit account level.

The descriptions associated with Accounts 21 through 26 address the power plant design. This corresponds to the "direct cost" portion of the cost estimate. The descriptions associated with the Accounts 91 through 93 define the construction support activities. This corresponds to the "indirect cost" portion of the cost estimate. The sum of the "direct cost" and the "indirect cost" is the "total base construction cost".

The scope of the indirect cost accounts varies with utility and project. Therefore, an understanding of the definition of these accounts, provided later in this section, will avoid confusion when utilizing the cost estimates herein.

9.2 PLANT DESIGN CRITERIA

9.2.1 General Study Criteria

The major criteria for the Low Sulfur Coal Plant study were discussed in Section 8. The key parameters are tabulated in Tables 9-1 and 9-2 in this section. The coal selection criteria is described in Section 9.2.2. Design codes for the major structures and equipment are addressed in Section 9.2.3 and in the Equipment List in Section 12. The design of the heat rejection system is based upon mechanical draft wet cooling towers.

9.2.2 Coal Selection Criteria

The design of a coal fired plant is influenced by the chemical

characteristics and calorific value of the coal. Therefore, a coal was selected which is the basis for the plant design.

The following criteria were used in selecting the design basis coal:

- o The coal is representative of a major western coal field.
- o The coal field size is large enough to reasonably expect that it will be mined for steam electric power plant fuel in the future as long as the fuel is legally burnable.
- o The sulfur content is sufficiently low so as not to require the use of sulfur dioxide removal equipment in meeting emission requirements as of January 1, 1976.
- o The coal field is currently providing fuel for steam electric power plants.

The description of the location and extent of the design basis coal seam selected for this study is presented in Table 9-3. The coal analysis for the coal from this location and seam is presented in Table 9-4.

TABLE 9-1

KEY PLANT PARAMETERS - STEAM SUPPLY SYSTEM

1243 MWe LOW SULFUR COAL PLANT

Steam Generator	Supercritical pressure, single reheat with a Pressurized Furnace
Steam Flow	
Maximum Continuous Rating 10^6 lb/hr	9.775
Normal Superheater Outlet, 10^6 lb/hr	9.141
Normal Reheater Outlet 10^6 lb/hr	7.486
Steam Pressure	
Superheater Outlet, psig	3,845
Reheater Outlet, psig	650
Steam Temperature	
Superheater Outlet, F	1,010
Reheater Outlet, F	1,000
Final Feedwater Temperature, F	547
Fuel Type	Western Sub-Bituminous Coal
Fuel Firing Rate, Ton/Hr	770
Fuel Analysis	See Table 9-4
Number of Pulverizers	7 Plus 1 Spare
Pulverizer Fuel Flow, Tons/Hr	110
Number of Forced Draft Fans	3
Total Forced Draft Fan Capacity, scfm	2,103,000
Number of Primary Air Fans	2
Total Primary Air Fan Capacity, scfm	526,000
Number of Precipitators	3
Precipitator Efficiency, in percent	99.65

TABLE 9-2

KEY PLANT PARAMETERS - STEAM AND POWER CONVERSION SYSTEM

GUARANTEED CONDITION-1243 MWe LOW SULFUR COAL PLANT

Turbine Configuration	Cross-Compound, 8 Flow
Steam Flow at HP Turbine Inlet, 10^6 lb/hr	9.141
Steam Pressure at HP Turbine Inlet, psia	3,515
Steam Temperature at HP Turbine Inlet, F	1,000
Turbine Back Pressure, in HgA (multi-pressure condenser)	1.7/2.5
Turbine Output, MWe	1,309
Auxiliary Power, MWe	66
Net Station Output, MWe	1,243
Number of Feedwater Heating Stages	8
Generator Rating, MVA	722
Net Station Steam Rate, lbs/kWhr	7.35
Net Station Heat Rate, Btu/kWhr	9,057
Thermal Efficiency, in percent	37.68

TABLE 9-3

LOCATION AND EXTENT OF DESIGN BASIS COAL SEAM

1243 MWe LOW SULFUR COAL PLANT

Coal Type: Western Low Sulfur Sub-Bituminous Coal

Location:

State: Wyoming

County: Campbell

Seam: Roland Smith

Extent:

Reserves: 1,000,000,000 Tons (Note 1)

Current Production: 9,000,000 Tons/Year (1976)

Projected Production: 20,000,000 Tons/Year (1978)

Major Coal Users: Steam Electric Power Plants

Note 1: Current known reserve for Roland Smith seam under lease. The seam is probably larger. Bureau of Mines IC 8693 estimates coal reserves for Campbell County in which this seam is located at 33,600,000,000 tons.

TABLE 9-4

DESIGN BASIS COAL ANALYSIS

1243 MWe LOW SULFUR COAL PLANT

Coal Type: Sub-Bituminous Coal	Western Low Sulfur
Moisture (% by Wt.):	31.8
Proximate Analysis (% by Wt. dry):	
Volatile Matter:	47.6
Fixed Carbon:	45.1
Ash:	7.3
Ultimate Analysis (% by Wt. dry):	
Carbon:	69.3
Hydrogen	5.2
Nitrogen	0.9
Sulfur	0.5
Oxygen	16.8
Ash Analysis (% by Wt. dry):	
SiO	28.8
Fe_2O_3	9.0
Al_2O_3	13.0
TiO_2	0.7
CaO	25.0
MgO	6.5
SO_3	18.0
K_2O	0.4
Na_2O	1.2
Calorific Value (Btu/lb.)	
As Received	8,164
Dry	11,970
Ash Fusion Temperature (^oF Red./ ^oF Ox.)	
Initial	2140/2160
H = W (Hgt. of coal pile equals wdt. of coal pile)	2180/2190
H = ½W	2200/2210
Fluid	2280/2370

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9.2.3 Structural Design Criteria

The structural design criteria used for the reference plant design are summarized as follows:

Structures are designed to withstand the effects of various combinations of all normal loadings to which they are subjected in accordance with ACI 318, Building Code Requirements for Reinforced Concrete, AISC Specification for the Design, Fabrication and Erection of Structural Steel for Buildings and applicable local building codes. The structures are designed for seismic effects in accordance with criteria established by the Uniform Building Code. The chimney is designed in accordance with ACI 307, Specification for the Design and Construction of Reinforced Concrete Chimneys. Coal silos are designed using 55 lbs/cu ft as the coal density for load calculations.

The loads listed below are considered in the buildings designs where applicable.

- o Dead Loads - Permanent gravity loads including concrete, structural steel, equipment, piping, cable trays and hydrostatic pressure. The ground water level is assumed at El + 10 ft - 0 in. Buoyancy from ground water is considered in building stability and base mat design.
- o Live Loads - Loads which vary with intensity and/or occurrence. During normal operation the live loads considered are a snow load of 20 psf and the lateral soil pressures. During construction live load from cranes, wet concrete and major equipment transport loads are also considered.
- o Wind Load - Wind loading is in accordance with ANSI A58.1 with a basic wind loading of 26 psf.

- o Flood Loads - The plant site lies ten ft above the 100 year maximum water level of the North River. Consequently no flooding of the site is considered.

- o Seismic - Structures are designed for seismic conditions in accordance with the requirements of the Uniform Building Code.

9.3 PLANT DESIGN DESCRIPTION

Following are the LSC plant design descriptions for Accounts 21 through 26.

ACCOUNT 21 STRUCTURES AND IMPROVEMENTS

The steam generator , the turbine generator and all other related equipment are housed in fully enclosed buildings. The superstructures have braced steel frames bearing on concrete footings supported on the bedrock underlying the site. Grating floors are used whenever possible to allow maximum air circulation within the building. The siding for the buildings is generally insulated metal panels with interior liner panels. Layouts of the plants are shown on the drawings in Section 11. Design concepts are discussed in greater detail in the following design descriptions for the major accounts.

ACCOUNT 211 Yardwork

The plant location is the hypothetical site of Middletown U.S.A. This is defined in Section 13, Site Description.

The datum plane for site and yard elevations is mean river level. Main plant finish grade is 18 ft above mean river level. Soil overburden is estimated to be eight feet thick. Lime stone rock with no underground cavities are located below the overburden and is satisfactory for supporting plant structures.

Site preparation consists of clearing, grubbing and stripping of top soil structures, roads, railroads, parking areas and the materials handling area and for the construction facilities. Rough grading quantities include

the general cut and fill for the main plant structures and fine grading with landscaping.

Earth excavation, rock excavation, backfill, concrete fill and dewatering for the main plant structures are included with the structure associated yardwork. This includes all excavation work for the steam generator building and turbine heater and control building areas. Excavation work for structures not included with the main excavation are included with the structural work for each of the individual buildings. The cut and fill work also includes hauling, dumping, stockpiling, placing and compacting. For those portions of the structure below rock, concrete fill is used under and adjacent to the structure. In cases where rock elevations vary, concrete fill is used to assure that building loads are carried to competent rock.

Excavated material is used on site for general fill as much as possible. Spoil areas and storage areas are utilized for excavated material not used for fill or for top soil. Erosion and sedimentation control of those areas is practiced in accordance with EPA requirements. Temporary settling basins are provided to collect all runoff during construction prior to discharge into the North River.

Transformer area, above ground oil storage tanks and other oil or chemical storage and handling areas are designed to contain spills and collect and route surface runoff to the holding pond prior to discharge to the North River. In addition, steam generator and turbine building floor drains and other plant dirty drains are routed by underground piping to the waste

process building, as required, or to the holding pond for treatment before discharge into the North River.

The yard drainage system consists of a system of interceptor ditches (paved and unpaved) and storm drains with catch basins to carry storm water from developed areas. Sedimentation basins are provided during construction as required. Water courses that are intercepted near the power plant, coal storage pile, are diverted by ditches into existing stream beds or storm drains. Culverts carry stream flow under the railroad, railroad car storage yard and roads. The yard surface water drainage is directed to the North River via the existing water courses as much as possible. Building roof drainage is directed to the yard drainage system.

Surface water runoff from portions of the coal handling, precipitator, ash handling, and oil storage areas, together with the plant dirty drains is routed by underground piping to a holding pond and to the waste treatment system for treatment in the contaminated yard and building drainage system.

A temporary sanitary sewage system is provided during construction. Piping and toilet facilities for permanent plant requirements are provided based on permanent plant personnel requirements. All sewage receives tertiary treatment prior to discharge into the North River.

Highway access is provided to the site by five miles of secondary roads connecting to a state highway. This road is in good condition and needs no additional improvements. An onsite asphalt road is provided around the main plant structures. The highway road is paved in accordance with

the standard thickness required for public highways. In addition, parking areas, concrete curbs and walks are provided.

Temporary construction roads with minimum thickness paving (AASHO HS20 Loading) and unpaved roads for material handling equipment are provided. Service roads are arranged to provide access to all truck sized doors in the power plant units, to all buildings and to auxiliary structures requiring servicing or maintenance by vehicles. Paved roads for washing and refueling locomotives and mobile equipment are provided.

Railroad access to the site is provided by constructing a double track railroad spur which intersects the B&M Railroad. The spur which is five miles long from the main line to the plant site, approaches the site from the east. Anticipated railroad traffic is up to 1300 cars per week in 100 car unit coal trains. During construction 400 to 500 cars of construction materials are delivered including the boiler components, transformers, and generator stator. These items are the heaviest loads anticipated and require special cars. A yard locomotive is provided to handle all onsite car movements.

In addition to the coal delivery loop track there are spur tracks into the turbine hall, the transformer yard, the warehouse, the fuel tank area, and the locomotive repair shop.

A temporary spur is installed to the construction yard storage area and to the boiler area for delivery and installation of the boiler headers, boiler panels and subassemblies.

A ladder track area, for storage of cars with bypass tracks and switches allows engine access to either end of trains being divided. This track accommodates odd lot trains of coal, and equipment. It is also used for trains of departing empty cars and/or waste material.

All road bed and trackage are designed in accordance with the latest railroad standards. Railroad structures are designed for Cooper E80 wheel loading.

In addition to the above items; fencing, a gate house, and roadway and yard lighting are provided with the yardwork.

ACCOUNT 212 Steam Generator Building

The steam generator building consists of the boiler house, auxiliary boiler room, air compressor room, machin shop, diesel generator room, and forced draft fan room. The building is 134 ft wide, 330 ft long and 300 ft high at the top of the boiler, and has an overall volume of approximately 12,700,000 cu ft. A description of each of the above areas of the building is given below.

Boiler House

The boiler house is a steel framed structure 184 ft wide and 280 ft long with two main roof heights of 180 ft for the coal silos and conveyors and 300 ft at the top of the boiler. The building volume, less the forced draft fan room, is approximately 12,000,000 cu ft. It has three main floors at elevations 18 ft, 43 ft, and 73 ft. The building is supported on reinforced concrete spread footings on rock. The reinforced concrete

ground floor is located at grade. The roof is cast in place concrete over metal deck, covered with a roofing membrane and supported on steel framing. The exterior walls are insulated metal siding and the interior walls are either concrete or metal partitions.

The building houses the steam generator, coal silos and pulverizers, coal conveyors, the forced draft fan room and an elevator.

Ventilation for the boiler house is provided by 24-66,600 cfm each power roof ventilators and heating is provided by 80 steam unit heaters located throughout the building.

Auxiliary Boiler Room

The auxiliary boiler room, located north west of the boiler house, is a one story steel frame structure 50 ft wide, 75 ft long and 40 ft high. The building volume is approximately 150,000 cu ft. The building substructure and superstructure are identical to that described for the boiler house. The auxiliary boiler room houses the two auxiliary boilers and their accessory equipment.

Ventilation is provided by wall exhaust fans and heating is provided by steam unit heaters.

Air Compressor Room

The air compressor room, located north of the boiler house, is a one story steel frame structure 50 ft wide, 50 ft long and 40 ft high. The building volume is 100,000 cu ft. The building substructure and superstructure are identical to that described for the boiler house. The air compressor

room houses the soot blowing air compressors, receiver and accessories the station air compressors, receivers, air dryers and accessories.

Ventilation is provided by wall exhaust fans and heating is provided by steam unit heaters.

Machine Shop

The machine shop, located north of the boiler house, is a one story steel framed structure 50 ft wide, 63 ft long and 40 ft high. The building volume is approximately 126,000 cu ft. The building substructure and superstructure are identical to that described for the boiler house.

The machine shop houses the machines and tools necessary to perform the required in-plant maintenance and repair of plant equipment. A monorail is installed for handling equipment.

Ventilation is provided by wall exhaust fans and heating is provided by steam unit heaters.

Diesel Generator Room

The diesel generator room, located north east of the boiler house, is a one story steel framed structure 50 ft wide, 27 ft long and 40 ft high. The building volume is approximately 54,000 cu ft. The building substructure and superstructure are identical to that described for the boiler house.

The diesel generator room houses the two auxiliary diesel generators, air intakes for the diesel generators, and auxiliary equipment. The exhaust

silencers are mounted on the roof. A monorail is installed for equipment maintenance and removal.

Ventilation is provided by wall exhaust fans and heating is provided by steam unit heaters.

Forced Draft Fan Room

The forced draft fan room, located on west side of the boiler house, is a one story steel framed structure 42 ft wide, 140 ft long and 42 ft high. The building volume is approximately 247,000 cu ft. The fan room is part of the boiler house and has a common substructure. The roof slab is cast in place concrete over acoustically treated metal deck and supported on steel framing. The exterior walls are acoustical masonry block. The walls and roof are designed to resist the differential pressure caused by the fans. Sound attenuators are installed at the air inlets in the walls, and personnel doors are pressure tight and arranged to provide an air lock. A lintel is installed in a wall to allow for equipment removal.

The fan room houses the forced draft and primary air fans, inlet silencers, combustion air steam coils and accessories. A monorail is installed for equipment maintenance and removal.

ACCOUNT 213 Turbine, Heater and Control Building

The building consists of the turbine hall, auxiliary (heater) bay, and control and switchgear building as described below.

Turbine Hall and Auxiliary Bay

The turbine hall and auxiliary bay are located east of the boiler house. The turbine hall is a three story (elevations 18 ft, 43 ft and 73 ft) steel framed structure 151 ft wide, 260 ft long and 125 ft high. The auxiliary bay is a four story (elevations 18 ft, 43 ft, 73 ft and 102 ft) steel framed structure 30 ft wide, 260 ft long and 125 ft high. The building volume is approximately 5,882,500 cu ft. The building is supported on reinforced concrete spread footings on rock. The reinforced concrete ground floor is located at grade. The mezzanine, operating and deaerator floors are reinforced slabs supported on metal deck on steel framing. The roof is concrete plank covered with a roofing membrane. The exterior walls are insulated metal siding, and the interior walls are either concrete block or metal partitions. The massive "high tuned" turbine pedestal is reinforced concrete and is supported on a thick concrete foundation mat bearing on rock. The turbine pedestal is isolated from the remaining building support loads. Structural quantities for the pedestal are shown in account 231 of the cost estimate.

The building houses the turbine-generator, its condensers and associated equipment, feedwater heaters, boiler feed pumps and condenser, boiler feed booster pumps, condensate pumps, condensate booster pumps, condensate polishing and demineralizing equipment, turbine lube oil equipment, deaerator, other auxiliary equipment and switchgear rooms.

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The turbine hall and auxiliary bay are cooled by 12 - 75,000 cfm each power roof ventilators and heated by 34 steam unit heaters located throughout the building.

At the south end of the turbine hall is located a rail car bay for transport of generator and turbine parts. An overhead traveling crane located at the top of the building serves this bay as well as the full operating floor area. All floors are connected by several stairways.

Control and Switchgear Building

The control and switchgear building, located north of the turbine hall, is a four story (elevations 18 ft, 34 ft, 50 ft, and 73 ft) steel framed structure 50 ft wide, 150 ft long and 69 ft high. The building volume is approximately 517,500 cu ft. The building substructure and superstructure are identical to that described for the turbine hall and auxiliary bay.

The control and switchgear building houses the 13.8 kV and 4.16 kV switchgear, battery rooms, d-c auxiliary rooms, relay and instrumentation and control cabinet room, coal sampling and water analysis laboratories, cable spreading room, communication room, and control room.

The control and switchgear building HVAC system provides filtered and conditioned air to the control room, water analysis room, communications room, cable spreading room and switchgear area. Supply air to these rooms is provided by a multizone air handling unit and a heating and ventilating unit. A centrifugal water chiller supplies chilled water for air

conditioning and cooling requirements. Local exhaust fans exhaust air as required from the toilet and battery rooms.

ACCOUNT 218B Administration and Service Building

The administration and service building, located south of the turbine hall, is a four story (elevations 18 ft, 43 ft, 58 ft, and 73 ft) steel framed structure 90 ft wide, 90 ft long and 75 ft high. The building volume is approximately 607,500 cu ft. The building is supported on reinforced concrete spread footings on rock. The reinforced concrete ground floor is located at grade. The other floors are reinforced concrete supported on metal deck on steel framing. The roof is concrete plank covered with a roofing membrane. The exterior walls are insulated metal siding and the interior walls are either concrete block or metal partitions. Most areas are provided with suspended acoustical ceilings.

The building houses the service shops, storage areas, locker rooms, showers, lunch room, equipment rooms, laboratories, general offices and conference rooms.

Filtered and conditioned air is provided to the offices, conference room, laboratories, shops, storage area, lunch rooms, equipment rooms and toilet and locker rooms. Supply air to the rooms is provided by a multizone air handling unit and a heating and ventilating unit. Return air fans exhaust air to the units or to atmosphere as required. Chilled water is supplied from a centrifugal water chiller. Local fans exhaust air as required from toilets, locker rooms and fume hoods.

218D Fire Pump House

The fire pump house, located along the riverbank west of the main plant structures, is an integral part of the makeup water intake structure.

The two fire pumps and one jockey pump are located on the north side of the makeup water intake structure and are supported from the reinforced concrete basin roof slab. The structural description, quantities and costs are shown in account 261.

218I Electrical Switchgear Buildings

The electrical switchgear buildings consist of three separate one story steel framed structures. The coal handling system and cooling tower buildings, located south of the main plant structures, are 30 ft wide, 50 ft long, and 16 ft high. The building volumes are approximately 24,000 cu ft each. The material handling switchgear building, located south west of the main plant structures, is 25 ft wide, 30 ft long and 16 ft high. The building volume is approximately 12,000 cu ft. The switchgear buildings are supported on reinforced concrete spread footings on rock. The superstructure is prefabricated and has insulated metal walls and roof.

The buildings are heated by electric unit heaters. Supply air is provided by ventilating units consisting of roughing filters and supply air fans. The buildings are pressurized to protect equipment from coal dust.

218L Stacker Reclaimer Transfer Tower

The stacker/reclaimer transfer tower is a steel framed structure measuring 60 ft by 60 ft by 80 ft high. The tower is located eastward of the rotary

car dumper. The building is supported on reinforced concrete spread footings on rock. The reinforced concrete ground floor is located at grade.

The building houses the head pulleys and drives for the dumper-to-transfer tower conveyor and the dead storage reclaim conveyor, the tail pulley for the transfer tower-to-crusher house conveyor, and the stacker reclaimer yard conveyor, a motorized flop gate and a 500 ton surge bin.

ACCOUNT 218M Coal Car Thaw Shed

The coal car thaw shed, located southwest of the main plant structures, is a one story steel framed structure 20 ft wide, 159 ft long and 24 ft high. The building volume is approximately 76,000 cu ft. The shed is located on the track approaching the rotary car dumper. The shed is supported on reinforced concrete spread footings on rock. The reinforced concrete ground floor is located at grade. The superstructure is metal siding and roof deck, and is furnished with the coal car thawing equipment shown in account 224.13. The shed has two heating bays and one soaking bay.

ACCOUNT 218N Rotary Car Dumper Building and Tunnel

The rotary car dumper building, located southwest of the main plant structures, is a one story steel framed structure 52 ft wide, 66 ft long and 26 ft high. The building volume is approximately 89,200 cu ft. The foundation is reinforced concrete founded on rock. The roof is either insulated or uninsulated metal roof deck supported on steel framing. The

exterior walls are either insulated or uninsulated metal siding and the interior walls are masonry block. The underground conveyor tunnels are reinforced concrete founded on rock.

The building houses the rotary car dumper, traveling hammermill lump breaker, receiving hoppers, vibrating feeders, transfer chutes, dust suppression system, control house, toilet facilities, and equipment rooms.

Heating is provided by electric unit heaters. Supply air to the electrical equipment rooms is provided by a ventilating unit consisting of a roughing filter and supply air fan. Excess air is exhausted through wall louvers. The rooms are pressurized to protect equipment from coal dust. A packaged air cooled air conditioning unit maintains the control room at ambient conditions. The substructure and tunnels are supplied with air through a ventilating fan.

ACCOUNT 2180 Dead Storage Reclaim Hoppers

The two dead storage reclaim hoppers located between the active and dead storage piles, are a steel and concrete underground structure. The hoppers are housed in a structure 25 ft wide, 33 ft long and 30 ft high founded on bedrock underlying the site. The top of the hopper is located 20 ft above ground level elevation (18 ft).

ACCOUNT 218P Coal Crusher House

The coal crusher house, located southwest of the rotary car dumper building, is a steel framed structure 48 ft wide, 48 ft long and 106 ft high. The building volume is approximately 244,000 cu ft. The building is supported on reinforced concrete spread footings on rock.

The reinforced concrete ground floor is located at grade. The three floors are reinforced concrete slabs supported on metal deck on steel framing. The roof is metal deck supported on metal framing. The exterior walls are metal siding, and the interior walls are masonry block.

The building houses the head pulleys for the reclaim conveyors, magnetic separators, surge bin, vibrating feeders, and two crushers.

Heating is provided for the coal crusher house by electric unit heaters. Supply air to electrical rooms is provided by a ventilating unit consisting of roughing filter and supply air fan. Excess air is exhausted through wall louvers. The rooms are pressurized to protect equipment from coal dust.

ACCOUNT 2180 Boiler House Transfer Tower

The boiler house transfer tower, located at the southwest corner of the boiler house, is a steel framed structure 30 ft wide, 40 ft long and 242 ft high. The tower volume is approximately 290,400 cu ft. The tower is supported on reinforced concrete spread footings on rock. The reinforced concrete ground floor, which is integral with the boiler house ground floor, is located at grade. The two floors are reinforced concrete slabs supported on metal deck on steel framing. The roof is free standing metal deck. The exterior walls, from elevations 18 ft 10 198 ft, are common with the boiler house on two sides and insulated metal siding on the other two sides. From elevations 198 ft to 260 ft, the exterior walls are either insulated or uninsulated siding.

The tower houses the head pulleys of the crusher house-to-boiler house conveyors, transfer chutes-to-tripper conveyors, and as-fired sampling system.

Heating is provided to the electrical equipment room by electric unit heaters. Supply air is provided by a ventilating unit consisting of a roughing filter and supply air fan. Excess air is exhausted through wall louvers. The room is pressurized to protect equipment from coal dust.

ACCOUNT 218R Dead Storage Transfer Tunnel

The dead storage transfer tunnel is an underground concrete and steel conveyor gallery. The tunnel uses the dead storage reclaim conveyors that transfer coal from the dead storage reclaim hoppers to the stacker/reclaimer transfer tower. The tunnel measures 10 ft wide by 10 ft deep by 1300 ft long, and is founded on the bedrock underlying the plant site.

Ventilation for the dead storage transfer tunnel is provided by a fan house located eastward of the dead storage reclaim hoppers.

ACCOUNT 218T Locomotive Repair Shop and Garage Facilities

The locomotive repair shop and garage, located north of the rotary car dumper, is a one story steel framed structure 65 ft wide, 65 ft long and 30 ft high. The building volume is approximately 126,800 cu ft. The reinforced concrete ground floor is located at grade. The roof is metal deck on steel framing. The exterior walls are insulated metal siding.

The building houses a locomotive repair area and four-bay garage facility for the onsite diesel operated heavy equipment and service vehicles.

Heating is provided by electric unit heaters. The area is ventilated by drawing outside air through wall louvers and exhausting through power roof ventilators.

ACCOUNT 218U Materials Handling and Service Building

The materials handling and service building, located north of the rotary car dumper, is a one story steel framed structure 50 ft wide, 60 ft long and 20 ft high. The building volume is approximately 60,000 cu ft. The building is supported on reinforced concrete spread footings on rock. The reinforced concrete ground floor is located at grade. The roof is insulated metal deck supported on steel framing. The exterior walls are insulated metal siding and the interior walls are masonry block.

The building houses the service shops, offices, storage areas, lunch room, toilet and shower rooms.

The HVAC system provides filtered and conditioned air to the offices, lunch rooms, electrical and mechanical rooms, toilet and shower rooms. Supply air to the rooms is provided by a multizone air handling unit and a heating and ventilating unit. The multizone air handling unit consists of a roughing filter, heating and cooling coils, and supply air fan.

ACCOUNT 218V Waste Water Treatment Building

The waste water treatment building, located west of the main plant structures, is a one story prefabricated steel structure 25 ft wide, 80 ft

long and 20 ft high. The building volume is approximately 40,000 cu ft. The building is supported on reinforced concrete spread footings on rock. The reinforced concrete ground floor is located at grade. The exterior walls and roof are insulated metal and interior walls are masonry block.

The building houses a control area, storage area, pumps, tanks and other waste water treatment equipment. Large items of the treatment equipment, such as the batch holding tank, are located adjacent to the building.

Heating is provided by electric unit heaters. The building is ventilated by drawing outside air through wall louvers and exhausting through power roof ventilators.

ACCOUNT 218W Miscellaneous Coal Handling Structures

The conveyor galleries include all overhead coal conveyor supporting structures and their associated foundations. The galleries are approximately 2,500 ft long and are supported on reinforced concrete spread footings on rock. The conveyor galleries consist of removable dust tight sheet metal enclosures supported from structural steel members. Grating walkways provided for access are illuminated.

The coal pile membrane barrier area is 4,000,000 ft^2. The impermeable membrane layer blankets all areas where coal is stored outdoors, and prevents contamination of ground water by coal pile rain water runoff. The top of the membrane is covered with suitable fill material to prevent damage by coal handling equipment. A drainage system, installed below

the membrane layer throughout the active and dead storage areas, routes intercepted surface drainage to drainage channels and prevents hydrostatic pressure on the underside of the membrane layer.

ACCOUNT 219 Stack Structure

The stack structure measures 600 ft high (618 ft elevation) with a 30 ft inside diameter and 40 ft outside diameter at the top, and 50 ft inside diameter and 60 ft outside diameter at the bottom.

The stack is a reinforced concrete structure with a separate free standing brick liner. An elevator and ladder in the stack structure provide for access to platforms for sampling ports, smoke density temperature probes, and for maintenance of aircraft warning lights. The foundation is a 100 ft. octagonal reinforced concrete mat bearing on rock.

ACCOUNT 22 BOILER PLANT EQUIPMENT

The steam generating system supplies steam to the turbine generator which converts heat energy to electrical energy. The steam generator includes the steam generator, soot blowers, pulverizers, coal feeders and piping, fuel firing equipment, primary air and forced draft fans, primary and secondary regenerative air preheaters and associated ductwork, complete structural steel, and associated instrumentation and controls.

ACCOUNT 221 Steam Generating System

The steam generator is a supercritical pressure unit with a single reheat designed for a maximum continuous rating of 9,775,000 lb/hr of steam at 3,845 psig and 1,010 F at the superheater outlet and 1,000 F at the reheater outlet using 547 F feedwater delivered to the economizer. The furnace is designed for firing low sulfur western sub-bituminous coal. Ignitors fired with No. 2 fuel oil are utilized during startup and low load operation.

The overall dimensions of the steam generator are approximately 120 ft wide by 140 ft long by 300 ft, above floor elevation. The single dry ash furnace is designed for pressurized draft operation. The furnace cross section is approximately 120 ft long by 57 ft deep. Multiple rows of burners are located in the front and rear walls. Steam temperature is maintained at reduced load by varying firing rate of burner rows. The burners are supplied with pulverized coal from a total of seven pulverizers each having a nominal rating of 105 tons/hr. (70 percent 200 mesh @ 50 Grindability). Design basis coal has better than nominal grindability which permits the pulverizer to achieve the design output of 110 tons/hr. An eighth pulverizer is provided as a spare.

The steam generator is equipped with an automatic sequential soot blowing system. The system is designed to remove soot and ash from the boiler surfaces to maintain effective heat transfer. The soot blowers use compressed air with electric motors for rotating and traversing the lances. Two 10,000 scfm centrifugal air compressors supply the required soot blowing air at a pressure of 300 psig.

A superheater bypass system is provided to control flow and pressure during the transition period of attaining critical pressure operation. This is accomplished by maintaining the pressure within the waterwalls and primary superheater sections above saturation pressure until supercritical operation is attained. The bypass provides the flexibility to control the rate of pressure and temperature increase and to coordinate the startup sequence of both the turbine and steam generator.

The steam generator is equipped with a vent and drain system which provides a means of venting air, steam and accumulated water from the boiler and piping systems during startup and shutdown. The system also is used for filling and draining the steam generator during chemical cleaning and hydrostatic testing. The system drains to the waste water treatment system and is designed to drain the steam generator during normal operation in two hours and during chemical cleaning in one hour.

Valves necessary for startup and shutdown or control of the unit are arranged for remote operation.

ACCOUNT 222 Draft System

A pressurized draft system provides combustion air to the furnace and forces the combustion gases thru the steam generator system. The draft system flow diagram for the unit is shown in Drawing 6515.002-LSC-5.

Three 33-1/3 percent capacity forced draft fans and two 50 percent capacity primary air fans are provided.

The forced draft fans operate the steam generator at its maximum continuous rating. One forced draft fan and one primary air fan is capable of sustaining operation at reduced load. The forced draft fans discharge through three secondary regenerative element type air heaters to the burner windboxes. The primary air fans discharge through two primary regenerative air heaters to the pulverizers inlets.

Steam coils are provided with sufficient surface to maintain a forced draft and primary air fan inlet temperature of 80 F. A control system is provided to maintain the average cold-end temperature of the regenerative air heater at 185 F (above the acid dewpoint) using the steam coils; or to maintain flue gas temperature to the precipitator at a minimum of 275 F. The inlet steam coils are protected against freezing.

Electrostatic precipitators, located at the outlets of the regenerative air heaters, are provided to reduce the particulate emissions of the flue gas to conform to applicable State and Federal Regulations (presently 0.1 lb per million Btu fired). Provisions are made to isolate each regenerative air heater, precipitator, and draft fan train. Each precipitator is

sufficiently sectionalized to assure continued operation at guaranteed efficiency during rapping operations while isolated sections are operative.

Instrumentation for the boiler air and gas system monitors significant air and gas pressures, differential pressures, flows and temperatures from the air inlet to the furnace, i.e., at the windbox, to the gas outlet.

The draft system in this account includes only the amount of duct work and its supporting steel and foundations that is required between the precipitators and stack.

ACCOUNT 223 Ash and Dust Handling System

The ash and dust handling system removes and transports flyash from the precipitators, economizer and gas duct hoppers to the storage silos. The system consists of two 100 percent capacity dry positive displacement pressurized systems designed to handle 35 tons of ash per hour each. The dry type system uses a mixture of flue gas and air as the transporting medium. An air lock valve is located on each economizer hopper, precipitator hopper and gas duct hopper. A pressure system conveys the flyash to the silos. The silos provide for 90 hours accumulation of flyash while operating at maximum continuous rating assuming 85 percent of the ash is flyash.

Each flyash hopper is furnished with a hopper heater to prevent flyash caking. System capacity allows for intermittent operation with automatic actuation of the cycle on a timed basis. Control equipment is provided for the air preheater hopper, the precipitator hoppers and the flyash

silos. All primary devices are located at or near the source, transmitting to receiver type indicators and controllers located in the control panel.

A prepackaged control panel is enclosed and located near the precipitator. It contains all alarms, controllers, indicators, lights and switches, required for automatic or manual operation. A local annunciator alarms various system malfunctions and transmits a common trouble alarm to the main control room. A hopper load level control automatically activates the removal and transport system, transferring the material to the disposal storage silos.

Bottom Ash and Pyrites Handling System

The bottom ash and pyrites handling system removes the bottom ash from the boiler and pyrites from the pulverizers and transports them to the dewatering bins for removal by truck. This system is designed to handle 10 tons per hour. The system flow diagram for the bottom ash handling system is shown in Drawing 6515.002-LSC-16.

The bottom ash is transported by a hydraulic system using water as a transport medium. The bottom ash hopper provides ten hours of bottom ash accumulation while operating at maximum continuous rating, assuming 25 percent of the ash content is bottom ash. A continuous water trough around the periphery of the ash hopper seals against the full furnace pressure. Bottom ash dewatering bins provide 90 hours of storage, 45 hours for each bin, at maximum continuous rating. Bottom ash is removed from the site by truck and hauled to the disposal site.

The pyrites are also transported by a hydraulic system using water as a transport medium. Pyrites rejected from the pulverizers are sequentially sluiced from the pyrites box to a holding bin located near the pulverizer area. The holding bin provides storage of 12 hours accumulation of pyrites resulting from the boiler operation at maximum continuous rating. The pyrites are sluiced from the holding bin to one of two pyrites dewatering bins. Each bin provides 45 hours of storage while operating at maximum continuous rating. Control equipment is provided for the furnace bottom ash hoppers, the economizer ash hoppers, the pulverizer reject hoppers and the dewatering bins.

ACCOUNT 224 Fuel Handling Systems

The function of the coal handling system is to receive, stack out, reclaim, crush and transport coal to the coal silos in the boiler house. The buildings and structures comprising this system are located in the yard of the power plant southwest of the boiler house and turbine hall. The flow diagram for the coal handling system is shown in Drawing 6515.002-LSC-15.

The coal handling system is sized for coal rate of 770 tons per hour. This is based on using the design basis coal for the operating condition with the turbine valves wide open, five percent overpressure (VWO, 5 percent OP).

A total of 1,109,000 tons of coal is stored at the plant site, in the form of either active (short-term) or dead (long-term) storage. The Roland Smith seam coal used by the plant has a high moisture content (31.8

percent). Calorific degradation, and in some instances spontaneous ignition, may occur due to "dry-out" of the coal on the surface of the storage pile. To prevent spontaneous ignition, the coal in dead storage is sealed with an asphalt membrane similar to highway paving, and the active storage coal is "turned-over" i.e., depleted and replenished, on a scheduled basis.

The dead storage coal pile capacity is 832,000 tons, and provides for a 45 day supply of coal. This pile provided coal to the boiler only if normal rail delivery of coal is interrupted for an estimated period of time. The normal supply of coal to the plant is from active storage.

Active storage is 277,000 tons, and provides for a 15 day supply of coal. To allow for turning coal over, space is allocated for two 15 day coal piles. A bucket-wheel stacker/reclaimer, running on rails between the two piles, reclaims coal from one pile and alternately stacks coal on the other. Therefore, two-fifteen day coal piles are required to provide a 15 day reclaimable coal supply.

The coal handling system consists of four major structures; a rotary car dumper, a stacker/reclaimer (S/R) transfer tower, a stacker reclaimer and a crusher house. Coal enters the boiler house at a transfer tower at the southwest corner of the boiler house. Equipment for the coal handling system is sized to unload and transfer coal to storage (stacking) at a rate of 3,000 tons/hr. This allows turnaround of a 100-car unit train (100 tons per car) in three-to-four hours. Thirteen unit train loads of coal are required to provide the maximum tonnage of coal (129,360 tons)

burned weekly (7-days) by the plant. Thus, up-to-three unit trains per day, unloaded during the first and second shifts, can be easily accommodated. A four hour unloading cycle does not incur increased transportation costs due to railroad demurrage penalties since it is assumed that the utility leases dedicated unit trains supplying coal to the site. The railroad crew uncouples a loaded unit train at the coal unloading loop, and picks up an empty unit train at the storage ladder siding. The unit train is moved through the coal yard and switchyard by an in plant locomotive.

Coal is transferred from either active or dead storage (reclaimed) at a rate of 1250 tons/hr. Coal can be transferred directly from the dumper to the crusher house and boiler house, bypassing the active storage pile. Full 100 percent redundancy (i.e. crushers, conveyors, etc.) is provided. Coal is transferred on a nearly continuous basis.

Coal is weighed and totalized at two locations in the coal handling system; 1) at the rotary dumper-to-S/R transfer tower conveyor, and 2) at the S/R transfer tower-to-crusher house conveyors. As-fired coal is sampled in the boiler house transfer tower, prior to delivery to the coal silos; as received coal is sampled in the S/R transfer tower prior to discharge to the stacker/reclaimer. Magnetic separators remove miscellaneous iron from the coal at the top of both the S/R transfer tower and crusher house.

All of the coal conveyors are equipped with wire-reinforced fabric/rubber belt material and have self aligning troughing (angled side) idlers. The conveyors, and the adjacent walkway, are enclosed above ground. A

solvent/water spray dust suppression system prevents excessive dusting at the discharge of each conveyor.

Coal is delivered to the plant by a 100 car unit train, equipped with rotary car couplers. A hydraulic car positioner centers an individual car in the rotary dumper that rotates a car 180 degrees. The contents of a car discharge onto a traveling hammermill lump breaker, and subsequently into two hoppers. A vibrating feeder at the bottom of each hopper feeds coal onto the dumper-to-S/R transfer tower conveyor belt.

In those cases when coal is sent to active storage, the S/R transfer tower feeds the yard conveyor. This conveyor is reversible and extends the length of the active coal pile (approximately 1,900 feet) between the two piles. The yard conveyor is sized to stack at 3,000 tons per hour, or reclaim at 1,250 tons per hour.

Normally, coal is stacked on one of the two active coal piles and reclaimed from the other active pile. Coal is discharged and stacked from the boom conveyor. The boom is able to swing (called slewing) to form a level, evenly dispersed coal pile. Reclaimed coal is discharged from the bucket wheel to the boom conveyor, and to the yard conveyor. The yard conveyor transfers reclaimed coal to the surge bin in the S/R transfer tower.

A bulldozer reclaims coal from the dead storage (45 day) pile. Coal is pushed into ground level hoppers. The reclaim hoppers discharge onto an underground conveyor that also terminates at the surge bin in the S/R transfer tower.

The surge bin feeds a fully redundant S/R transfer tower-to-crusher house conveyor which discharges coal into a crusher house surge bin. Vibrating feeders in the bottom of the surge bin feed one of two fully redundant coal crushers. The crushers reduce the coal to a one inch to one and one half inch size. The crushed coal is fed to one of two conveyors.

Crusher house-to-boiler house conveyor belts transport the coal to the boiler house transfer tower. Here the coal is divided between the two rows (near and far) of coal silos. Each row is serviced by a traveling tripper that can be stopped to discharge the conveyor belt flow to a specific silo. The eight silos are sized for eight hours (approximately 770 tons each) of coal storage.

Ignition and Plant Fuel Oil System

The fuel oil system supplies No. 2 fuel oil to the main boiler ignitors for startup and low-load operation. This fuel oil is also used for the auxiliary boiler and miscellaneous diesel driven equipment, the emergency diesel-driven generator, the locomotive, the diesel-driven fire pump and the coal moving equipment. The plant fuel oil systems are located in the plant yard, boiler room, auxiliary boiler room and at the circulating water intake.

An aboveground fuel oil storage tank which stores 150,000 gallons of No. 2 fuel oil provides for a 30 day supply of oil for the auxiliary boiler. A dike surrounding the tank will contain the oil in the event of a spill or tank failure. Separate pumps, which take suction directly from the fuel oil storage tank, supply the fuel oil to the main and auxiliary boilers.

Oil delivery for the aboveground tank is made by either rail or truck. An unloading pump is provided for vehicles not having unloading equipment.

All diesel engine driven equipment is capable of burning No. 2 fuel oil. The aboveground storage tank also supplies fuel to the diesel engine driven equipment located in the proximity of the tank.

Instrumentation for the fuel oil system monitors and controls unloading, storage and transfer of fuel oil to points of use. It also provides information both locally and to the main control room as required for controls, displays, alarms and logs.

ACCOUNT 227 Steam Generator Plant Instrumentation and Control

The steam generator plant instrumentation and control provides the necessary instruments for the monitoring of the plant status and equipment condition. They include the required controls and indications for the startup, shutdown and normal operation of the plant. Monitors are provided for SO_2, NO_x, particulates and oxygen to insure compliance with the federal emission standards and other applicable state and local regulations.

Boiler-Turbine-Generator Control Board

The boiler-turbine-generator (BTG) board contains the necessary controllers, indicators and recorders for the plant coordinated control system, the turbine supervisory control system and the primary cycle systems. The board may be arranged in either an "L" or straight line configuration. Pneumatic instruments are not allowed on the board. The board is a walk-in type tunnel board.

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Instrument items on the board are grouped according to their functions. Normally, controllers and control switches are placed on the bench portion of the board, indicators and recorders are placed on the vertical position. Control and instrumentation that require continuous operators attention are mounted in the front side and those requiring periodic attention are placed in the rear. Space is provided for inserts of the following items: Mechanical-hydraulic control insert, load frequency control equipment insert, burner control insert, computer CRT with keyboard.

Computer console, printers, and trend recorders are mounted separately from the BTG board. The coal handling and related systems are controlled from the vertical board.

Auxiliary Panels and Cabinets

These panels and cabinets provide monitoring and controls of miscellaneous operations such as soot blowing, coal handling, compressed air supply and service water supply.

Instrument Racks

The instrument racks take the form of an open rack. They are used to mount local instruments such as pressure transmitters, manifolds, pressure switches, and other pneumatic instruments that connect directly with the process pipes. The rack has a rigid structure, suitably braced, to withstand all stress incidental to shipping, installation and operation, without warping or twisting. Arrangement of instruments, conduits on racks, and electrical devices are placed out of the paths of condensation or water drains when testing or calibrating instruments. In addition,

the instruments are so mounted that replacement could be accomplished without interruption of service to adjacent devices. There is provision to collect the drains when the instrument is removed. Suitable engraved, plastic nameplates are provided for each instrument.

Plant Computer System

The primary function of the plant computer system is to assist the control room operator in conducting safe and efficient operation of the power plant and to provide information on plant performance history. Normal safe operation of the plant does not require the use of the computer.

The major functions of the computer are:

a. Monitoring of all analog, digital and calculated input points

b. Analog input processing which includes conversion of analog inputs to engineering units, reasonability tests, limit comparisons, error checking

c. Digital input processing which includes status checkup

d. Sequence of event input processing

e. Pulse input signal processing

f. Operation of audible and visual alarm displays

g. Performance calculations - These include plant thermal efficiency calculations, unit heat rate calculations, condenser performance calculations, heat exchangers performance calculations, turbine performance calculations, boiler efficiency calculation and related electrical calculations

h. Analog and digital trend recording

i. Generation of periodic logs, on demand logs, alarm summary and post mortem review reports

The hardware of the computer system includes the following major equipment:

a. All required analog and digital signal conditioning equipment

b. All required signal scanning and signal multiplexing equipment

c. All required analog to digital and digital to analog converters

d. Termination cabinets for all incoming and outgoing cables and wires

e. Data acquisition computer with sufficient operating speed, core storage and input/output handling capability to meet system requirements and insure complete satisfactory performance

f. Watchdog timer for the computer

g. Two CRT's and three printers

h. Six point trend recorder

i. Paper tape reader/punch

j. Card reader

k. Uninterruptible a-c power supply

Coordinated Control System

The coordinated control system operates the turbine-generator and the boiler as an integrated unit. This system coordinates the regulation of feedwater flow, fuel feed, air flow, main steam temperature control, reheat steam temperature control and the turbine servo or load reference motor. The system is designed to minimize interactions between the values to be controlled; namely, unit generation, steam pressure and steam temperature, by proper adjustment of fuel, feedwater, air, turbine control valve and the steam temperature regulating equipment. The system has the flexibility of operating in one of the three modes: coordinated mode, boiler follow mode and turbine follow mode.

Burner Control System

The burner control system is designed to prevent continued operation of the steam generator where a hazardous furnace condition could exist, and to assist the operator in starting and stopping of burners and fuel equipment.

The control system consists of four major subsystems: furnace purge system, burner mill control system, boiler fuel safety system and alarm system. The furnace purge system insures that the boiler is adequately purged under the conditions and in the proper sequence prior to igniting the first fire in the boiler. The burner mill control system allows remote operation of the ignitors and burners. The subsystem is designed to follow a predetermined set program in safely placing ignitors and burners in and out of service. The boiler fuel safety system is designed to shut off all fuel to the furnace in the event that predetermined potentially hazardous conditions should develop during operation. Examples of these conditions are loss of flame, loss of seal air, or loss of primary air. The alarm system alerts the operator the existence of certain equipment malfunctions such as mill trip, main flame and detector failure.

ACCOUNT 23 TURBINE PLANT EQUIPMENT

The turbine plant equipment includes the turbine-generator and all auxiliary equipment necessary to assure continuous operation of the main turbine - generator. All turbine plant equipment is designed to operate at the valve wide open, five percent overpressure point (VWO, 5 percent OP).

The turbine generator is a cross compound (two shaft) eight flow machine. Normally 55 percent of the inlet steam passes through the entire turbine machinery frame and exhausts into the condenser at a vacuum condition, where waste heat is rejected. The remaining 45 percent of the inlet flow is extracted at various stages from the turbine for heating the feedwater being pumped to the boiler. A portion of the extraction steam also powers two auxiliary steam turbines that drive the main boiler feedwater pumps.

Cold reheat pipes carry 82 percent of main steam inlet flow from the high pressure turbine exhaust to the reheater section of the boiler. Hot reheat piping supplies reheated steam to interceptor valves that control steam flow to the intermediate pressure turbine.

Condensate is pumped from the condenser hot-wells by three 50 percent capacity condensate pumps through 100 percent flow deep bed polishing demineralizers, and a steam packing exhauster. Three 33-1/3 percent capacity condensate booster pumps provide the necessary head from that point for the condensate to flow through the four stages of low pressure heaters to the deaerator. The two 50 percent capacity heater drain pumps take the first stage heater drains from the heater drain tank and return it to the cycle at the suction to the condensate polishing system. Then

two 50 percent capacity steam turbine driven main feedwater pumps supply water to the high pressure feedwater heaters (6th, 7th, 8th stages) to raise the feedwater temperature to 547 F before entering the boiler economizer.

ACCOUNT 231 Turbine Generator

The turbine-generator is designed to deliver 1243 MWe net output with throttle steam conditions of 3515 psia, 1000 F superheated steam, 600 psia and 1000 F reheat, zero percent make-up, 1.7/2.5 in-HgA back pressure, eight stages of feedwater heating, and turbine driven feedwater pumps. The maximum guaranteed steam heat balance diagram is shown in Drawing 6515.002-LSC-6.

The turbine is a cross-compound two parallel shaft machine with eight flow exhaust using 30 inch last stage blades designed for 3600 rpm. One shaft consists of one high pressure turbine and two low pressure turbines driving an electrical generator. The second shaft consists of one intermediate pressure turbine and two low pressure turbines driving a second electrical generator. Both shafts rotate at 3600 rpm, and drive identical generators. The maximum guarantee throttle flow is 9,140,816 lb of steam/hr.

The cold reheat steam exhausts from the high pressure machine at 652 psia, 565 F and passes through the reheater section of the boiler. Hot reheat steam returns and passes through four interceptor valves to the intermediate pressure turbine. Exhaust from the intermediate pressure turbine passes to each of the four low pressure turbines through crossover pipes.

Generator

Each of the two turbine-driven electric generators has a rating of 722 MVA with 0.90 PF, 26,000 V, 3 phase, 60 Hz output. Each has a totally enclosed hydrogen cooled (at 75 psig) rotor. The stator is a liquid conductor-cooled type with deionized water (at 100 F) as the liquid coolant.

The generator rotor is furnished with an internal cooling system including: hydrogen coolers, terminal bushings, instruments, grounding pads, seal housing insulation, foundation plates, shims, and special tools.

The generator stator is furnished with the following external equipment: deionized water circulating and cooling unit assembled on a skid and including storage tank, pumps, coolers, deionizer, flow meter, conductivity cells, gauges, piping, valves, filters, instruments, and regulating equipment, stator winding control cabinet assembled and combined with the hydrogen control cabinet including annunciator, generator automatic runback logic and all necessary control devices.

The generator hydrogen system includes: hydrogen coolers, one skid mounted seal oil unit, hydrogen manifold with one bottle pressure regulator with high and low pressure gauges, pressure switch for hydrogen supply pressure alarm, shutoff valves and bottle connectors, generator hydrogen pressure regulator, hydrogen storage bottles, control cabinet, temperature detectors, and special tools.

The excitation switchgear is an integrated unit of standard low voltage, indoor, and metal enclosed. The function of the excitation switchgear is to connect, rectify and control excitation to the a-c alternator exciter from the alternator stator, and to provide voltage regulation by adjustment of the generator field voltage (d-c regulator) or the generator terminal voltage (a-c regulator). The excitation switchgear houses the exciter field breaker, the thyristor regulator bridge and the a-c and d-c regulator logic.

Exciter

Each of the two generators is provided with static-type excitation, and it has a response ratio of 1.5.

Mechanical-Hydraulic Control

Rotational speed and load of the HP and IP turbine shafts are controlled by a mechanical-hydraulic control system. A mechanical governor varies the oil pressure of a low pressure hydraulic system that uses the bearing lubricating oil as the working fluid. This low pressure system actuates the appropriate servomotors, that control a second high pressure fluid system using a fire retardant hydraulic fluid. This high pressure fluid controls hydraulic cylinders that actuate the HP turbine stop and throttle valves or the IP turbine reheat interceptor and stop valves.

The control system directly monitors and controls the speed of both turbine shafts from 50 rpm; i.e., slightly above turning gear speed, to synchronous generator speed of 3600 rpm, and for all generator load conditions. All safety subsystems actuate the low pressure hydraulic system to shut down the unit.

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During unit startup, thermal sensors in the turbine casings provide input to an analog computer model that continuously calculates critical thermal stress. Thus, high stress conditions can over-ride all other automatic control functions and provide longer turbine warming periods during startups, if necessary.

Turbine Gland Steam Sealing System

The gland steam sealing system provides sealing for all turbine shafts at the turbine shell penetrations, under all conditions of turbine loading. The shaft packings seal against leakage of air into the condenser (vacuum packings) and prevent steam from blowing out into the turbine room (pressure packings).

The steam sealing system provides the above functions automatically at all loads and consists of the following equipment: oil operated dual feed steam regulator, steam packing exhauster with two blowers, auxiliary steam feed regulator, regulator bypass unloading valve, blowdown valve, three-way diverting valves and ventilator valve. The HP turbine inner glands are relieved to heater number five. The HP, IP and LP turbine outer glands are relieved to the steam packing exhauster. The steam packing exhauster is designed with stainless steel tubes for 400 psig pressure and 125 F cooling water.

Lubricating Oil System

A main shaft driven positive displacement gear pump supplies the oil required by the high pressure hydraulic control system and the low pressure

lubrication system during normal operation, and provides high pressure and low pressure oil for the hydrogen seal oil system of the generators. A motor suction oil pump supplies low pressure lubrication oil to the main shaft pump suction during startup and shutdown.

Turbine Oil Conditioning System

The lubricating continuous bypass oil conditioning system has a capacity of 2,020 gallons per hour of 150 SSU viscosity lubricating oil at 100 F. The clean oil storage capacity in the conditioner is 1500 gallons at turbine shutdown. The system consists of the following equipment: centrifugal type lubrication oil purifier with inlet and discharge pump, necessary instruments, breakover switch, feed/stop valve, electric controller and safety interlocks, 14.2 kW heater, centrifuge driven by an open drip-proof motor including piping and wiring.

Gas Systems

The carbon dioxide system consists of a four ton liquid carbon dioxide storage unit with refrigeration system, vaporizer, relief valves and two pressure reducing valves. Carbon dioxide is used for purging hydrogen from the generator housing during shutdown, and for purging air from the housing before being filled with hydrogen during startup.

Hydrogen gas is used to cool the rotor of the generator and is circulated within the generator housing under pressure. Shell and tube type coolers at the ends of the generator are supplied with cooling water to dissipate the rotor heat and wind losses.

The hydrogen is supplied from a series of bottled containers which are individually connected to a manifold. The manifold is equipped with a relief valve and two pressure regulators with isolation valves.

ACOUNT 233 Condensing System

Condensing Equipment

The two surface condensers are multi-pressure, single pass design with divided fabricated steel water boxes and shell. The condensers are designed to handle the total heat rejection from the main turbine. Each condenser has a condensing surface of 407,000 sq ft; 29,602-3/4 inch diameter 18 BWG 90-10 CuNi tubes, 70 ft long. Cooling water flow in each condenser is 221,750 gpm resulting in a tube velocity of 6.5 ft/sec and a total temperature rise at full load of 26 F.

Each condenser shell is floor mounted and connected to the turbine exhaust flange by means of a stainless steel expansion joint to accommodate thermal expansion.

The carbon steel shell is equipped with fabricated steel water boxes that are bolted to the condenser shells and designed for removal without disturbing the tube sheets.

Four motor driven two stage vacuum pumps are supplied for removing non-condensible gases from the two condenser shells. During startup, all four pumps are operating, hogging the condensers to minimize the time to reach the intermediate pressure at which operation begins. To provide system reliability, four 50 percent capacity pumps are selected, with two

normally operating to maintain condenser vacuum. When condenser pressure falls to 26 in-Hg vacuum, the spare ejector or vacuum pumps start automatically.

The total hotwell capacity of the two shells is 62,000 gallons at normal water level. The hotwell is designed to deaerate the condensate to maintain a maximum of five ppm of dissolved O_2 during normal steady state operation.

The condensate pumps are vertical type, suitable for the NPSH requirements of the condenser hotwell service. The pumps develop sufficient head to ensure adequate suction pressure at the condensate booster pumps after overcoming the pressure drop in the condensate piping, steam packing exhauster, and the condensate polishing demineralizers. Three half-size motor driven pumps are supplied. The third pump is redundant and is on standby or isolated for maintenance.

The steam packing exhauster consists of a shell and tube type condenser and air removal equipment in the form of two full size motor driven blowers.

One complete condensate polishing system is provided that is capable of treating 100 percent of the condensate flow. The system consists of seven individual high flow rate, deep bed type demineralizers operating in parallel.

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The condensate passes through six demineralizers with the seventh demineralizer serving as a standby. Each demineralizer is rated for a flow rate of 2,500 gpm (48 gpm per sq ft of flow area). The bed depth is three ft with two ft free board. The shells are designed for 200 psig, 130 F, and are lined with rubber with stainless steel internals. The total resin volume consists of 100 cu ft of cation resin and 50 cu ft of anion resin per shell. When the resin is expended, it is regenerated externally. A resin separation tank, cation regeneration tank, anion regeneration tank and resin storage tank are principal parts of the regeneration system. A hot water caustic dilution tank and a control panel complete with instrumentation for automatic regeneration is also provided with this system.

ACCOUNT 234 Feedheating System

Feedwater Heaters

Eight stages of feedwater heaters are utilized to heat the feedwater returning to the boiler. The heaters are placed in series and operate under increased pressure of various stages of extraction steam from the high pressure, intermediate pressure, and the low pressure turbines. All heaters have a horizontal U-tube arrangement, using stainless steel tubes. Each heater has an integral drain-cooler section with the exception of the first and fifth stage heaters.

There are four low pressure (LP) stages of feedwater heating, one deaerating stage, and three high pressure (HP) stages of feedwater heating. The LP heating system consists of eight feedwater heaters arranged in two parallel

trains of four each. A single bypass is provided to allow removing a complete train of heaters from service while still maintaining full load on the unit. The bypass is sized to pass 40 percent of the guarantee turbine throttle flow while the remaining heaters pass 60 percent. The LP heaters employ a cascade drain arrangement to heater number one, where they collect in a drain tank and are pumped foward to the inlet of the condensate polishing system.

The fifth stage heater is a horizontal tray type deaerator with storage tank. The storage tank is sized for five minutes storage at VWO, 5 percent OP.

The high pressure (HP) feedwater heating system consists of nine feedwater heaters arranged in three parallel trains of three each. Each train is designed to pass one third of the VWO, 5 percent OP flow. The HP heater drains cascade to the fifth stage deaerator drain tank.

Boiler Feedwater Pumps

Two 50 percent capacity motor driven boiler feedwater booster pumps are provided to supply the minimum net positive suction head (NPSH) at the suction of the boiler feedwater pumps. Each pump is designed for a flow rate of 13,500 gpm at 150 ft total dynamic head (TDH).

The two 50 percent capacity turbine driven boiler feedwater pumps are designed for a flow rate of 13,500 gpm each and develop a TDH of 11,500 ft when operating at a speed of 5,800 rpm. Calculated brake horsepower is 43,660. Each feed pump is driven by a dual admission, multi-stage, condensing steam turbine exhausting to a separate steam condenser which

then drains to the main steam condenser. The dual admission inlet consists of a high and a low pressure valve, one supplied with main steam, the other supplied with steam from the high pressure turbine exhaust to the low pressure valve. For startup purposes, auxiliary boiler steam is also supplied to the low pressure valve admission inlet.

ACCOUNT 235 Other Turbine Plant Equipment

Main Vapor Piping Systems

The main vapor piping systems consist of the main steam and hot and cold reheat systems. The main steam system conveys high pressure superheated steam from the steam generator to the high pressure turbine, related auxiliary equipment, and the station auxiliary steam system.

The hot and cold reheat system conveys exhaust steam from the HP turbine to the steam generator reheater and returns it to the intermediate pressure turbine.

The main steam and hot and cold reheat system flow diagram is shown in Drawing No. 6515.002-LSC-7.

Turbine Building Closed Cooling Water System

A closed cooling water system is provided with three 50 percent capacity (6,000 gpm each) motor driven water pumps, air tank and heat exchangers, which dissipates heat to the main cooling towers. The heat exchangers are two 50 percent capacity shell and tube type, designed for a flow rate of 6,000 gpm on both the shell and tube sides. The tubes are 90-10 CuNi material, and supply 95 F water to the system based on a supply water

temperature of 85 F from the plant service water system. The system supplies cooling water to the turbine plant and miscellaneous plant equipment.

Demineralized Water Makeup System

The demineralized water makeup system consists of two independent trains, each having the following equipment: an activated charcoal prefilter, cation demineralizer, an anion demineralizer, and a mixed bed demineralizer. A common vacuum degasifier serves both trains with water from the cation demineralizers directed to the vacuum degasifier before being admitted to the anion demineralizer. Each demineralizer regenerates in place without sluicing the resins. The makeup demineralizing system supplies the plant makeup requirements, and the effluent is discharged into the two 500,000 gallon condensate storage tanks.

Chemical Treatment System

The chemical treatment system is used to maintain the water chemistry of the feedwater and consists of two hydrazine feed pumps, two ammonia feed pumps, one hydrazine storage tank and one ammonia storage tank. The hydrazine chemically removes the dissolved oxygen from the feedwater and the ammonia controls the pH.

Neutralization System

The neutralization system consists of two pumps, one blower and one tank. The neutralization tank is used to chemically neutralize the spent regenerant from the demineralization system and condensate polishing system to acceptable levels prior to discharge.

ACCOUNT 236 Turbine Plant Instrumentation and Control

Main Control Board

The main control board for the turbine plant is an integral part of the boiler-turbine-generator control (BTG) board described in the Account 227. The requirements of the BTG board also apply to the turbine plant main control board.

Turbine Supervisory Panel

The turbine supervisory panel contains recorders to be mounted on the BTG board or the turbine and unit miscellaneous panel. These are the shaft vibration recorder, the eccentricity, speed and position recorder, and the multipoint expansion and temperature recorder. An indicator is provided for turbine shaft vibration phase angle.

MHC Control Cabinet

The mechanical hydraulic control (MHC) cabinet contains the control and indicating equipment required for the startup, normal operation and testing of the turbine. This cabinet is normally mounted as a subpanel on the boiler-turbine-generator board. Typical control functions available are:

a. Selection of starting rates: slow, medium or fast

b. Setting of turbine speed at startup

c. Setting of load limit, and loading rate limit

d. Chest/shell warming

e. Turbine trip

f. Selection of operating mode: standby, manual or remote

g. Selection of load: increase or decrease

Typical indicating functions available are:

a. Turbine speed

b. Percentage of warming rate

c. Throttle steam pressure, first stage pressure, intermediate pressure

d. Generator output, MW

e. Acceleration, rpm/minute

f. Valve positions for main stop valves, control valves and intermediate valves.

Typical testing functions available are:

a. Thrust bearing wear detector test

b. Backup overspeed trip test

c. Electrical trip test

d. Mechanical overspeed and piston trip test

e. Testing of main stop valves, control valves and intermediate valves

Turbine Accessory Panels

Turbine accessory panels contain the instrumentation and control devices for various turbine auxiliary systems. These panels may be field mounted or control room mounted. Typical auxiliary systems are hydrogen and cooling water, turning gear motor control, and excitation control. Control panels for these systems are located in the field. There are turbine panels located in the control room, such as the turbine control panels

and turbine supervisory instrument cabinet. These control room panels contain the circuitry for the turbine control devices, turbine supervisory instruments, and turbine stress measurement, and are mounted on the main control board or other vertical panels.

Turbine Plant Heating, Ventilation and Air Conditioning Panels

These panels provide monitoring and control of the HVAC systems for buildings which house the turbine plant systems. Typical HVAC systems controlled from these panels are turbine building air handling system, intake structure ventilation system, and administration building ventilation system.

Turbine and Unit Miscellaneous Panel

The turbine plant miscellaneous panel is a vertical, walk-through control board with access doors at both ends. The panel provides the monitors and controls for auxiliary turbine systems such as turbine lube oil system and miscellaneous turbine monitoring recorders. The panel also provides the controls of the valving for the extraction steam lines, drain lines, and feedwater heater isolation. Instrumentation and controls that require constant operator attention are located in the BTG board.

Computer

The computer system described in the steam generator plant instrumentation and control section also monitors the turbine plant systems. One computer system is used for both the boiler and the turbine systems.

Turbine Plant Instrument Tubing and Fittings

The scope of supply of instrument tubing begins at the root valve and

extends to the instrument shutoff valve. Materials and certification of instrument lines which are part of the pressure boundary are in accordance with the Instrument Society of America Standards.

ACCOUNT 24 ELECTRIC PLANT EQUIPMENT

The electric plant equipment conveys the electric power generated in the plant to the low voltage bushings of the generator step-up (GSU) transformers, controls and meters the electric energy, and protects the components through which the power flows. It is the source of power for the plant auxiliaries and the plant control, protection and surveillance systems during normal operation and emergency conditions.

Continuous ratings of equipment and interrupting ratings of protective and disconnecting devices are based on equipment load tabulations, fault studies and voltage regulation studies. Equipment continuous current ratings are based on the maximum continuous load plus the largest spare auxiliary, and the effects of diversity. Short time intermittent loads are not included.

The electric plant design features are as follows:

a. The plant auxiliary distribution system design is based on a source voltage variation of ±5 percent.

b. The main generator, the three single phase generator step-up (GSU) transformers and the four three phase unit auxiliary transformers (UAT) are interconnected with isolated phase bus. (Note: The GSU transformers, the connections to the switchyard and the switchyard equipment and materials are not included in the equipment list or base cost estimate for this study. However, provisions have been made in the plant design for location of the GSU transformers and routing of the connection to the switchyard. The GSU transformers and switchyard are shown on the drawings for clarity and completeness).

c. Four unit auxiliary transformers (UAT), are connected to the generator main leads. Two are three winding transformers rated at 25.5 kV to 13.8 - 13.8 kV, one is a three winding transformer rated at 25.5 kV to 4.16 - 4.16 kV, and one is a two winding transformer rated at 25.5 kV to 4.16 kV.

d. Two reserve auxiliary transformers (RAT), are connected to an offsite transmission system. One is a three winding transformer rated at 230 kV to 13.8 - 13.8 kV and the other is a three winding transformer rated at 230 kV to 4.16 - 4.16 kV.

e. The medium voltage a-c distribution system is nominally 13.8 kV and 4.16 kV. Two or more separate and independent buses are provided for each voltage level; four buses for the 13.8 kV system and two buses for the 4.16 kV system. In addition, one 4.16 kV bus is provided for the coal handling system.

f. The low voltage a-c distribution systems are a nominal 480 volts. Twenty-three buses are provided for the plant process systems, ten buses for the precipitators and five buses for the coal handling system.

g. Two separate and independent 120 volt nominal, uninterruptible power supplies fed from the 480 volt buses are provided. One supplies power to instrumentation and control and the other to the plant computer.

h. The auxiliary d-c distribution and supply system is nominally 125/250 volts, with a center-tapped battery system. One center-tapped station battery and distribution system is provided.

i. One 125 volt battery charger is provided for each of the two 125 volt sections of the 125/250 volt center-tapped battery.

j. Two redundant, 100 percent, 400 kW diesel generator units are provided as the power supply for the emergency buses, and are automatically connected to their respective buses when the unit and reserve auxiliary power supplies are not available.

Motor starting voltage and frequency and allowable operational variations, at which the required starting and operating torques are developed, are as follows:

a. Continuous Operation of a-c Motors

1) Voltage: ± 10 percent of rated

2) Frequency: ± 5 percent of rated

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b. Starting and Short Time (Approx. 30 seconds) Operation of a-c Motors (Voltage): 80 percent of rated

c. d-c Motors (Voltage): 210 to 280 volts

All emergency loads are furnished with a-c or d-c power from one of the following: the a-c emergency buses, the uninterruptible instrumentation and control a-c power supplies or the d-c buses.

The unit power supply for the plant electric auxiliaries is from the main generator through the unit auxiliary transformers. The reserve power supply is from the 230 kV offsite power supply via the reserve auxiliary transformers. The emergency power supply is from one of the two diesel generator units to the corresponding emergency a-c bus.

The availability design bases for the electric power system are tabulated in Table 9-5 of this section.

Table 9-6 in this section presents allowable ranges of temperature for electric equipment. Design ambient conditions for spaces housing electric equipment are based on these ranges and limits plus a minimum of five percent for margin.

ACCOUNT 241 Switchgear

The medium voltage metal-clad switchgear comprises four 13.8 kV buses and three 4.16 kV buses. Each bus is supplied by an independent winding of a UAT or by a shared winding of an RAT. Motors rated 2,500 hp and above are rated 13.2 kV and motors rated 250 hp to 2,250 hp are rated 4.0 kV. Transfer schemes are provided for automatically and manually transferring

each bus between the reserve power supply and the unit power supply. Overcurrent protection is provided for all circuits. Differential protection, overload protection and zero sequence overcurrent ground protection is provided for all medium voltage motor circuits.

480 volt motor control centers are provided for power distribution to motors 100 hp and below, lighting loads and miscellaneous loads such as motor-operated valves, resistance heaters, heat tracing and motor space heaters.

ACCOUNT 242 Station Service Equipment

Four unit auxiliary transformers (UAT) and two reserve auxiliary transformers (RAT) are provided to furnish power to the plant auxiliary power system. Each UAT winding is sized with sufficient margin to carry the plant auxiliary load of its connected bus under the heaviest load conditions. Each RAT winding is sized to cover either the startup load of its two connected buses or the plant auxiliary load of either one of its connected buses at the heaviest load conditions. Transformer impedances are based on limiting fault current availability to switchgear capability considering voltage regulation. Each transformer is protected with differential protection schemes and sudden internal overpressure devices.

Unit substations are provided to transform the medium distribution voltages to the low distribution voltage for low voltage loads. Motors rated 125 hp through 200 hp are connected to the unit substations. Unit substation transformer impedances are based on matching switchgear capability to fault current availability considering voltage regulation. Overcurrent

protection is provided for all circuits. Overload protection is provided for motor circuits. The unit substations for the cooling towers are fed from a loop ieeder. The distribution buses for the precipitators are also fed from a loop feeder.

The battery systems comprise the plant batteries and battery chargers. The plant 125/250 volt d-c bus is supplied from a 125/250 volt center tapped battery and two 125 volt battery chargers, one for each 125 volt section of the 125/250 volt battery. During normal operation, d-c power is supplied from the battery chargers. During emergency operation, d-c power is supplied from the batteries. During startup and shutdown, d-c power is supplied from whichever source is available.

Two redundant diesel generator units are provided to furnish emergency a-c power to the emergency buses.

Each diesel generator unit is provided with automatic starting systems that are initiated when loss of offsite power occurs. Minimum voltage that can be experienced at the diesel generator terminals during motor starting is 85 percent.

Two dual input solid state inverters are provided to serve as uninterruptible power sources for miscellaneous a-c and plant instrumentation loads. The inverters are supplied with power from the a-c buses through regulating transformers or directly from the station battery.

ACCOUNT 243 Switchboards

Two a-c power distribution panels are provided to distribute a-c power from the inverters to the 120/240 volt uninterruptible loads. They are configured as one panel per inverter.

One d-c power distribution switchgear lineup is provided to distribute d-c power from the battery and its associated chargers.

Twenty feet of control benchboard is provided in the main control board lineup for control and data acquisition of the main generator and the auxiliary electric power system.

One electric system relay panel lineup is provided for protection and metering of the main generators, the generator step-up transformers and the unit and reserve auxiliary transformers. The main generator is protected by high speed differential, ground current, loss-of-field, negative sequence overcurrent, and voltage restrained overcurrent relays. The main generator, the generator step-up (GSU) transformers and the unit auxiliary transformers are protected by power directional and overall differential relays. The reserve auxiliary transformers are protected by power directional and differential relays.

ACCOUNT 244 Protective Equipment

The station grounding system provides the means for maintaining an effective ground at equipment and metal structures, protecting equipment and structures from galvanic corrosion and protecting personnel from dangerous potentials. Lightning protection schemes are provided for the stack and for the boiler structure.

ACCOUNT 245 Electrical Structures and Wiring Containers

This equipment provides mechanical protection for wire and cable routed between various equipment and buildings. The bulk of the raceways consist of cable trays of various types. Raceways are routed in accordance with the same criteria as for cable routing. Fire stops are placed in cable trays wherever they penetrate floors or firewalls, and in other areas where their installation reduces the hazard of fire propagation.

ACCOUNT 246 Power and Control Wiring

Isolated phase bus is provided to interconnect generator terminals, GSU transformer low voltage terminals and UAT high voltage terminals. This is force-cooled with redundant active components in the cooling unit.

The plant wire and cable consists of three conductor and triplexed, single conductor power cable, multi-conductor control cable, coaxial, triaxial, shielded twisted pair and multi-shielded twisted pair and shielded quad instrument wire. Materials for insulation systems (ethylene-propylene rubber insulation with chloro-sulfonated polyethylene based jacket) are selected to provide optimum system performance in the areas of physical stability, tensile strength, flexibility, aging characteristics, resistance to abrasion, ozone (where required), water absorption, heat distortion, solvent extraction, self-extinguishing and non-propagating fire characteristics and resistance to corona effects where required. Wire and cable is separated by voltage and energy level to reduce heating and fault problems.

Wire and cable routing is governed by the following:

a. Requirements for the power supply, control network and/or instrumentation signals.

b. Requirements for loading.

c. Requirements for physical separation of different voltage and energy level circuits.

d. Avoidance of high hazard areas (e.g., areas subject to high ambient temperatures and fires).

e. Simplicity of layout.

f. Ease of installation.

g. Ease of access.

TABLE 9-5

AVAILABILITY RELATED DESIGN BASES FOR THE ELECTRIC POWER SYSTEM

1. Availability Oriented Design:

   a. Considers interactive effects of plant operating requirements and natural phenomena to the extent that power required by the plant auxiliaries is available to fulfill the plant operating requirements.

   b. Includes provisions to minimize fire or fire damage and to detect, confine and promptly extinguish any fire which might occur.

   c. Includes provisions to allow periodic maintenance of systems and equipment.

2. Power sources, and power supplies, have sufficient backup and distribution systems have sufficient independence so that reduction of plant output will be prevented or minimized for loss of any source or bus.

TABLE 9-6

DESIGN AMBIENT CONDITIONS FOR ELECTRIC EQUIPMENT

Type of Equipment	Limit	Ambient Temperature Limit (Degrees F) Equipment	Equipment Space
Battery	Max	90	N/A
Battery	Min	77	80
Cable	Max	104	100
Cable	Min	N/A	N/A
All Other**	Max	104	100
All Other**	Min	40*	50*

* Or above dewpoint temperature, whichever is higher

** Sensitive relays and other electrical devices are placed in controlled environment spaces such as the control room, computer room, or battery room, as applicable.

ACCOUNT 25 MISCELLANEOUS PLANT EQUIPMENT

Miscellaneous plant equipment includes systems for maintenance or provisions for plant equipment support requirements. Included are cranes and hoists, air, water and steam services, auxiliary boiler and associated equipment, and the plant fuel oil system.

ACCOUNT 251 Transportation and Lifting Equipment

Cranes and Hoists

A turbine-generator overhead traveling bridge crane located in the turbine hall has a main hoist capacity of 100 ton, and an auxiliary hoist of 30 ton capacity with a bridge span of 144 ft.

There are ten hoists provided, one of 10 ton capacity and nine of five ton capacity, which are capable of hoisting 30 ft in height.

ACCOUNT 252 Air, Water and Steam Service System

Compressed Air System

The plant compressed air system supplies service and instrument air for the entire plant. The compressed air system consists of three 50 percent (350 cfm each) reciprocating compressors, complete with intake filters, aftercoolers, air receivers and two 100 percent air dryers. Each compressor has an inlet silencer and filter.

Compressed air is supplied to the air receivers at a maximum of 150 psig and a minimum of 100 psig.

Each compressor maintains air receiver tank pressure within desired operating range. A local control switch is provided to manually start and stop each compressor. To provide for an additional source of service air, an interconnection is made with the soot blower air compressor system.

Service Water System

The service water system supplies cooling water from the main condenser heat rejection (MCHR) system to the turbine building closed cooling water system. The system has three 50 percent capacity (9,000 gpm each), vertical wet pit service water pumps which are located in the circulating water pumphouse. Makeup water to the MCHR system is discharged near the suction of these pumps to lower the average temperature of the service water.

Fire Protection System

The fire protection system is designed to minimize the probability and effect of the occurrence of a fire. The system has three vertical wet pit fire pumps (1500 gpm each), two motor driven and one diesel driven; and one 50 gpm vertical wet pit jockey pump. The pumps are located in the fire pump house adjacent to and common with the makeup water pump house.

The jockey pump normally operates to maintain system pressure. One of the motor driven pumps is used in the event that the jockey pump cannot maintain system pressure. The second motor driven pump is started if the system pressure continues to drop. If system pressure is still falling the diesel driven pump is started. A booster pump is provided in the boiler house to supply water to the top elevations.

Potable Water System

Potable water is required for drinking, sanitary, and washing purposes at the plant. This water is supplied by the local municipal water supply system.

Auxiliary Boiler System

This system consists of two auxiliary oil fired boilers located in the auxiliary boiler room. The function of the auxiliary boiler system is to provide auxiliary steam during shutdown periods and during startup. The system flow diagram for the auxiliary steam is shown on Dwg. 6515.002-LSC-14.

Two 100 percent capacity auxiliary boilers are provided. These boilers are shop assembled, pressurized type, complete with forced draft fans, including ducting between fans, windboxes and breaching to the stack. These "packaged" boilers are equipped with automatic control of feedwater and combustion, including all protective devices.

Each auxiliary boiler is sized to provide the quantity of steam required for a cold start of the main unit, under the worst expected conditions. The estimated flow is 150,000 lb/hr each. The auxiliary boilers are designed to produce steam at 165 psig and 600 F.

The auxiliary boilers are manually started. They are capable of being normally started either locally or from the control room. Each phase of the startup procedure is separately initiated. The auxiliary boiler is

controlled to shut down when the steam-flow falls below the minimum flow capability of the boiler during plant startup.

Fuel oil atomization utilizes steam from the auxiliary steam system. Compressed air and/or mechanical atomizing burners are provided for startup when steam is not available. Each boiler discharges exhaust gases through separate flues. Forced draft flow control is provided by inlet dampers. Boiler blowdown in accomplished manually without heat recovery equipment.

ACCOUNT 253 Communications System

Local Communications System

The communication system consists of an intercommunication and paging system, a telephone system, and a sound-powered telephone system. These systems are designed to provide communications between various parts of the plant for all conditions of operation.

ACCOUNT 254 Furnishings and Fixtures

Instrument Shop Apparatus

Instrument shop apparatus are provided for testing, calibration, repairing, and routine maintenance of the plant instrumentation and control devices.

A typical list of instrument shop apparatus is provided below:

a. Dead weight tester

b. Pneumatic calibrator equipment

c. Decade resistance box

d. Digital volt meter

e. Variable voltage and current sources

f. [illegible]ometer

g. Oscilloscope

h. Electronic counter

i. Stop watch

j. Resistance and impedance bridges

k. Megger

l. Pressure gauges

m. Meters: d-c (MA, Amp, Volts), a-c (Amp, Volts)

Meteorological Monitoring System

The meteorological monitoring system provides all equipment essential for the monitoring and recording of the atmospheric parameters of the plant prior to, during construction, and over the life of the plant. The equipment for the system consists of a meteorological tower and various meteorological monitoring instruments.

Water Quality Monitoring System

The water quality monitoring system monitors the rates and concentrations of contaminants in the plant effluent discharge. Typical variables measured are chlorine, suspended solids, pH, oil and grease. Sampling techniques are established to yield representative batches or flows of the effluent discharge. Analytical data are recorded in proper form for immediate, as well as future interpretation and use.

Thermal Effluent Monitoring System

This system monitors the temperature of the effluent discharged from the plant. The system provides basic data to evaluate the thermal effect of the plant effluent.

Air Quality Monitoring

Air quality monitoring is performed by the stack gas monitoring system which provides for the measurement and recording of pollutants related with the stack gas. Measurements are made of particulate load, and of sulfur dioxide and nitrogen oxide concentrations. Concentration measurements are corrected for diluting air by measuring oxygen concentration in the stack gas.

Emission standards for particulates, sulfur dioxide and nitrogen oxide are in accordance with CFR 40, Protection of Environment, Part 60, Subpart D, and other applicable local and state regulations.

The detecting instruments are of the in-situ type, i.e., with sensing devices located in the stack. Withdrawal and conditioning of stack gas samples are not required. Sulfur dioxide and nitrogen oxide is reported in terms of concentration, i.e., $\mu g/m^3$ or ppm.

Particulate emission is reported in mass flow units, i.e., lbs/hr by combining measurements of particulate concentration and the mass flow rate of stack gas. Emission rate is integrated and logged daily. Sampling ports are provided for comformance testing.

ACCOUNT 255 Waste Water Treatment Equipment

The wastewater treatment equipment is designed to treat all plant wastewater. This includes water runoff from coal piles, demineralizers, regenerant effluents metal cleaning wastes, and floor drain discharges.

Two two-million gallon holding tanks are provided for retention and treatment of metal cleaning wastes and coal pile runoff. Lime is fed to the tanks to raise the wastewater pH. Iron is effectively precipitated at pHs greater than 8.0. After allowing for the sludge to settle, sludge is withdrawn from the tanks and dewatered by two vacuum filters. Supernatant from the holding tanks is pumped to a 5,000 gallon pH adjustment tank. The wastewater subsequently passes through one of two two-million gallon earthen settling basins before discharge.

Spent regenerants from the demineralzers are treated in a 40,000 gallon neutralization tank. Acid and caustic feed systems are provided for neutralization. The treated wastewater is passed through the earthen settling basins prior to discharge.

Floor drains are collected in several sumps located in the plant, and pumped to a central API separator for oil and grease and suspended solids removal. Effluent from the separator is passed through the earthen settling basins prior to discharge.

ACCOUNT 26 MAIN CONDENSER HEAT REJECTION SYSTEM

The main heat rejection system is a circulating water system consisting of structures and mechanical equipment which serve the main condensers and service water system to reject the plant heat through two mechanical draft wet cooling towers. Makeup water extracted from the North River initially passes through traveling screens. The raw water is then clarified, and chemicals are injected for pH and for fouling control. Fouling within the towers is controlled by continuous blowdown to the river in order to maintain the concentration at less than ten times that of the makeup water.

ACCOUNT 261 Structures

Makeup Water Intake and Discharge Structures

The makeup water intake and discharge structures are located along the riverbank west of the main plant structures. The intake basin is 18 ft wide by 32 ft long by 32 ft deep and is below plant grade. The volume of the basin is approximately 18,400 cu ft. The north wall of the structure has a 5 ft wide by 9 ft long and 32 ft high extension which houses the fire pumps. The structure is reinforced concrete with foundation mat bearing on rock. There are two intake chambers and two makeup water pumps supported from the reinforced concrete basin roof slab. The intakes are protected by bar racks, trash rakes, stop logs, traveling screens and a trash pit. Fish escapes are also provided. A channel is excavated in the river bottom from the ship channel to the intake structure to ensure an adequate supply of water during low tide conditions. Interior walls are reinforced and masonry concrete. A battery and switchgear room are

located at grade adjacent to the basin and supported on spread footings. The floor, roof, exterior walls and interior walls are reinforced concrete. The blowdown discharge is provided by concrete pipes running between the circulating water pumps discharge and the river.

Circulating Water Pump House

The circulating water pump house is a reinforced concrete structure located between the turbine building and the cooling towers and supported on a three ft thick reinforced concrete foundation. The superstructure has common walls with the turbine building and administration building. The circulating water pump basin foundation is supported on rock 28 ft below grade sloping upwards to the cooling tower water basins four ft below grade. The circulating water basin is approximately 60 ft wide, 70 ft long and 27 ft high to the operating floor. Attached to the west end of the four-bay circulating water pump basin is a service water pump basin founded 12 ft below grade. The basin is 12 ft wide, 17 ft long and 16 ft high to the operating floor. The foundation also slopes upwards to the cooling tower water basins. The approximate volume of the two basins is 120,000 cu ft.

The exterior walls, base mat, operating floor slab and interior columns supporting the operating floor are reinforced concrete. Portions of the operating floor are grating. The intake areas are protected by panel screens and stop logs. A 40 ft wide, 70 ft long and 13 ft high equipment room is located on the reinforced concrete portion of the operating slab. The room houses the circulating water pumps and electrical equipment.

The equipment room is masonry construction with a built-up roof on metal deck.

Makeup Water Pretreatment Building

The makeup water pretreatment building, located west of the main plant structures, is a two story steel framed structure 60 ft wide, 115 ft long and 30 ft high. The building volume is approximately 207,000 cu ft. It is supported on reinforced concrete spread footings on rock. The reinforced concrete ground floor is located six ft below grade. The intermediate floor is reinforced concrete supported on metal deck on steel framing. The roof is concrete channel plank covered with a roofing membrane. The exterior walls are insulated metal siding and the interior walls are concrete block.

The building houses the sand filters, carbon filters, chemical feeds, sludge dewatering equipment and all other equipment and accessories required for a complete water pretreatment system.

The building has a heating and ventilation system which consists of four 25,000 cfm roof ventilators for cooling and four electric unit heaters for heating.

ACCOUNT 262 Mechanical Equipment

Circulating Water Pumps

There are four 25 percent capacity circulating water pumps, of the mixed flow vertical type. Each pump is designed for a flow rate of 111,000 gpm with a total dynamic head of 105 ft. Circulating water pump motors are

3,000 hp each, operating at a synchronous speed of 400 rpm. The pumps are located within a pump house well where the water flows from the individual cooling tower basins by gravity. The pumps discharge the water to the main condensers, where heat is absorbed. The water is then returned to the distribution system of the towers. Water flow from each individual cooling tower is controlled simply by an overflow from the tower basin.

Cooling Towers

There are two main mechanical draft wet cooling towers, each sized for one half of the requirements. Each tower is designed to cool 230,000 gpm of water from 118 F to 92 F when operating at a wet bulb temperature of 74 F. Each tower employs a reinforced concrete-filled structure combined with components for water distribution, fill splash service, support system, drift eliminators, louvers and fan deck. The fan deck provides a stable base for the 13 fan cylinders and mechanical equipment. Each fan is 33 ft in diameter and operates in an 18 ft high, glass reinforced polyester, velocity recovery fan stack. The hot water distribution system includes a circular flume distribution basin and metering orifice which uniformly distributes the hot water over the fill. The distribution basin is divided into thirds by means of concrete dividers. This design allows one third of the tower to be removed from service with the full flow distributed over the remainder of the tower.

Main Cooling Tower Make-up and Blowdown Systems

Two 100 percent mixed flow vertical type pumps are provided for the makeup system. Each pump is rated at 13,000 gpm developing a total dynamic head

of 35 ft and is driven by a 150 hp motor. The pumps are located at the intake structure adjacent to the river. Two six ft wide by 31 ft high traveling screens are provided, each suitable for 50 percent of the flow requirements with an approach velocity of 1/2 ft per second. Serving the traveling screens are two 100 percent capacity screen wash pumps with a flow rate of 110 gpm and a total dynamic head of 100 ft to wash the screens when they require cleaning. Two screen speeds are provided, a high and low speed, for removal of materials. Vertical trash racks with automatic rake are provided ahead of the traveling screens to remove debris.

Makeup Water Pretreatment Plant

The source of makeup water is from the North River. The purpose of this system is to precondition the raw river water which is used principally as makeup to the circulating water system. However, a small portion of the clarified water is used as makeup to the demineralizer.

The primary objective is to remove debris and suspended solids characteristically present in river water. The amount of solids and debris contained in the raw influent is subject to wide fluctuations due to seasonal changes and natural river environment.

Initially, the influent water is clarified within a rectangular vessel. Various chemicals are used to achieve optimum settling and removal of solid particulates. The clarified effluent is then used directly as makeup to the circulating water system.

Chlorination at approximately 8,000 lb a day is included in the clarification step to oxidize naturally occurring organic matter. Chlorination is also applied directly to the recirculating cooling water on an intermittent basis to minimize biological fouling within the condenser and throughout the piping system. Sulfuric acid is also used for pH control to minimize formation of scale on the heat exchanger surfaces.

Accordingly, any serious operation and/or maintenance problems resulting from plugging, clogging, or development of bacteriological growths throughout the plant piping and cooling systems are practically eliminated. The water used as makeup to the demineralizer is first filtered and dechlorinated. In addition, the clarified water is used for the initial filling of the fire protection system and for general use throughout the power plant.

2.4 CONSTRUCTION SUPPORT ACTIVITIES

The description associated with accounts 91 through 93 addresses the construction support activities. This portion of the cost estimate (Volume III, Section 10) is called the "indirect cost".

ACCOUNT 91 CONSTRUCTION SERVICES

The services, functions, expenses, taxes and other indirect costs are contained in the listed code of accounts.

ACCOUNT 911 Temporary Construction Facilities

The costs for temporary construction and facilities are costs of all temporary structures, janitorial services and maintenance of temporary facilities, guards and security, roads, parking lots, laydown areas, and temporary electrical and piping, temporary heat, air, steam and water systems, general cleanup, etc.

ACCOUNT 912 Construction Tools and Equipment

The costs for construction tools and equipment are the cost of rental and/or purchase of construction equipment, small tools, consumables (fuel and lubricants) and maintenance of construction equipment.

ACCOUNT 913 Payroll Insurance and Taxes

These include insurance and taxes related to craft labor such as Social Security taxes and state unemployment taxes at 9.3 percent of the cost of total craft labor. Workmen's Compensation Insurance and Public Liability and Property Damage Insurance are included at 4.9 percent of the cost of total craft labor.

ACCOUNT 914 Permits Insurance and Local Taxes

This account includes builders all-risk insurance, local fees and permits, state and local taxes and liability insurance.

Builders all-risk insurance is an allowance based upon in-house experience for the cost of their item during the project construction phase.

ACCOUNT 92 HOME OFFICE ENGINEERING AND SERVICES

ACCOUNT 921 Home Office Services

These services are associated with home office engineering and design, procurement and expediting activities, estimating and cost control, engineering planning and scheduling, home office reproduction services as well as expenses associated with performance of the above functions (i.e., telephone, postage, computer use, travel, etc.). These costs include salaries of personnel, direct payroll-related costs (DPC), overhead loading, expenses and fee for these services consistent with contractual terms.

ACCOUNT 922 Home Office Quality Assurance

This includes the services of home office quality assurance engineers and staff personnel engaged in work on the project. Services include reviews, audits, and vendor surveillance as required for design and construction of the facility. Costs included are salaries, DPC, overhead loading and expenses (i.e., travel) of these individuals. Manhours required for these services and their costs are based upon UE&C experience in this area.

714 156

ACCOUNT 923 Home Office - Construction Management

These services include those of the construction manager and his assistants. Services of construction planning and scheduling, construction methods, labor relations, safety and security personnel are utilized as required. Costs include salaries, DPC, overhead loading, and expenses.

ACCOUNT 93 FIELD OFFICE ENGINEERING AND SERVICE

ACCOUNT 931 Field Office Expenses

These expenses include costs associated with purchase and/or rental of furniture and equipment (including reproduction), communication charges, postage, stationery, other office supplies, first aid and medical expenses.

ACCOUNT 932 Field Job Supervision

This management function includes the resident construction superintendent and his assistants, craft labor supervisors, field accounting, payroll and administrative personnel, field construction schedulers, field purchasing personnel, warehousemen, survey parties, stenographers and clerical personnel. Costs include salaries, DPC, overhead loading, relocation costs of key personnel, and fee. The estimates assume that size of supervisory forces is a function of total direct employed craft labor. The supervision requirement was calculated to be the number of manhours equal to about 10 percent of 85 percent of total craft labor.

ACCOUNT 933 Field - Quality Assurance

These services include those of personnel located at the job site engaged in inspection, required documentation of equipment and inspection of construction activities. Costs included are salaries, DPC, and overhead loading.

ACCOUNT 934 Test and Startup Engineering

These services are associated with preparation of startup and plant operation manuals and test procedures, direction and supervision of all testing of equipment and systems as the plant nears completion and direction of startup of the facility. Costs include salaries, DPC, overhead loading, and miscellaneous related expenses. Costs of any craft labor required for startup and testing activities are included in the appropriate Direct Cost line items.

Indirect accounts 913, 921, 922, 923, 932, 933 and 934 are included under factory costs in the cost estimate to differentiate them from site related craft labor and material costs.

SECTION 10

COST ESTIMATE

10

SECTION 10

COST ESTIMATE

10.1 INTRODUCTION

This section contains the details of the total base construction cost estimate for the low sulfur coal (LSC) plant described in Section 9. The criteria and plant description used to govern the development of the cost estimate are specified in Sections 8 and 9. The cost estimate reflects the reference plant design at the "Middletown" hypothetical site described in Section 13 entitled, "Site Description".

The estimated total base construction cost for the 1243 MWe LSC is $406,943,271 or $327 kW based on July 1, 1976 prices. The cost estimate presented in this section is summarized at the two and three digit level of accounting detail in Tables 10-2 and 10-3 respectively. The cost estimate presented here is a total base construction cost that does not include contingency, interest during construction or escalation.

The total base construction cost is organized in accordance with the expanded AEC Code of Accounts (USAEC Report NUS-531). Therefore, it corresponds in structure to the Plant Description (Section 9) and the Equipment List (Section 12). This is done for the reader's convenience in relating the material presented in the different sections of the report.

The total base construction cost consists of "direct" and "indirect" costs. The "direct cost" (Accounts 20 through 26) encompasses the cost of the power plant structures and systems. The "indirect cost" (Accounts

91 through 93) consists of the costs of the construction support activities.

10.2 COST ESTIMATE EXCLUSIONS

The list of items excluded from the cost estimate is shown in Table 10-1. Generally, these items are sensitive to the particular policies and preferences of the individual utility and to the specific plant and site being considered.

TABLE 10-1

1243 MWe LSC COST ESTIMATE EXCLUSIONS

1. Main Transformer, Switchyard and Transmission Facility Costs
2. Owner's Costs, Including Consultants, Site Selection, etc.
3. Waste Disposal Costs
4. Fees and Permits - Federal, State, Local
5. State and Local Taxes
6. Spare Parts
7. Interest During Construction
8. Initial Coal Supply
9. Escalation
10. Contingency

TABLE 10-2
COST ESTIMATE SUMMARY
TWO DIGIT ACCOUNT LEVEL
1243 MWe LOW SULFUR COAL-FIRED PLANT
MIDDLETOWN, USA

COST BASIS
07/76

08/30/77

ACCT NO	ACCOUNT DESCRIPTION	FACTORY EQUIP. COSTS	SITE LABOR HOURS	SITE LABOR COST	SITE MATERIAL COST	TOTAL COSTS
20 .	LAND AND LAND RIGHTS				2,000,000	2,000,000
21 .	STRUCTURES + IMPROVEMENTS	3,155,469	1554655 MH	18,013,514	27,552,514	48,721,497
22 .	BOILER PLANT EQUIPMENT	87,151,285	2174808 MH	27,375,744	5,950,999	120,478,028
23 .	TURBINE PLANT EQUIPMENT	81,230,723	1853747 MH	23,706,125	5,291,549	110,228,397
24 .	ELECTRIC PLANT EQUIPMENT	7,480,100	1041778 MH	12,782,945	7,629,575	27,892,620
25 .	MISCELLANEOUS PLANT EQUIPT	5,722,267	259176 MH	3,323,701	811,186	9,857,154
26 .	MAIN COND HEAT REJECT SYS	11,547,105	261506 MH	3,230,373	1,072,055	15,849,533
2 .	TOTAL DIRECT COSTS	196,286,949	7145670 MH	88,432,402	50,307,878	335,027,229
91 .	CONSTRUCTION SERVICES	13,601,000	1180000 MH	12,313,000	16,872,000	42,786,000
92 .	HOME OFFICE ENGRG.&SERVICE	14,710,000				14,710,000
93 .	FIELD OFFICE ENGRG&SERVICE	9,402,000			900,000	10,302,000
9 .	TOTAL INDIRECT COSTS	37,713,000	1180000 MH	12,313,000	17,772,000	67,798,000
	TOTAL BASE COST	233,999,949	8325670	100,745,402	68,079,878	402,825,229

TABLE 10-3
COST ESTIMATE SUMMARY
THREE DIGIT ACCOUNT LEVEL
1243 MWe LOW SULFUR COAL-FIRED PLANT
MIDDLETOWN, USA

COST BASIS
07/76

08/30/77

ACCT NO	ACCOUNT DESCRIPTION	FACTORY EQUIP. COSTS	SITE LABOR HOURS	SITE LABOR COST	SITE MATERIAL COST	TOTAL COSTS
20.	LAND AND LAND RIGHTS				2,000,000	2,000,000
211.	YARDWORK	115,500	235045 MH	2,413,385	2,842,394	5,371,279
212.	STEAM GENERATOR BUILDING	529,607	552764 MH	6,770,555	14,990,442	22,290,604
213.	TURBINE,HEATER,CONTROL BLD	342,469	275629 MH	3,333,970	5,612,031	9,288,470
218B.	ADMINISTRATION+SERVICE BLG	214,656	58634 MH	716,425	824,794	1,755,875
218D.	IRE PUMPHOUSE					
218I.	ELECTRICAL SWITCHGR BLDGS	22,763	6860 MH	84,000	45,400	152,163
218L.	STACK/RECLAIM TRANSFR TOWR	5,400	8815 MH	102,334	85,948	193,732
218M.	COAL CAR THAW SHED		2023 MH	23,330	12,435	35,765
218N.	ROTARY CAR DUMP BLDG+TUNNL	3,485	37186 MH	431,915	374,245	809,645
218O.	DEAD STORAGE RECLM HOPPERS		18061 MH	207,830	191,370	399,200
218P.	COAL CRUSHER HOUSE	84,640	16813 MH	209,036	217,190	513,866
218Q.	BOILER HOUSE TRANSFR TOWER	2,680	5844 MH	74,678	131,972	209,330
218R.	DEAD STORAGE TRANSFER TUNL		49753 MH	568,086	409,175	977,261
218T.	LOCOMOTIVE REPAIR GARAGE	11,570	4715 MH	58,298	64,460	134,328
218U.	MATERIAL HANDL+SERVICE BLD	17,735	10570 MH	129,195	135,343	282,273
218V.	WASTE WATER TREATMENT BLDG	4,964	11160 MH	130,568	93,565	229,097
218W.	MISC COAL HANDLING STRUCT	800,000	193322 MH	1,985,093	1,332,925	4,118,018
219.	STACK STRUCTURE	1,000,000	67461 MH	774,766	188,825	1,963,591
21.	STRUCTURES + IMPROVEMENTS	3,155,469	1554655 MH	18,013,514	27,552,514	48,721,497

TABLE 10-3
COST ESTIMATE SUMMARY
THREE DIGIT ACCOUNT LEVEL
1243 MWe LOW SULFUR COAL-FIRED PLANT
MIDDLETOWN, USA

COST BASIS
07/76

08/30/77

ACCT NO	ACCOUNT DESCRIPTION	FACTORY EQUIP. COSTS	SITE LABOR HOURS	SITE LABOR COST	SITE MATERIAL COST	TOTAL COSTS
220A.	FOSSIL STEAM SUPPLY SYSTEM	56,675,000	1158000 MH	14,347,620	1,434,767	72,457,382
221.	STEAM GENERATING SYSTEM	1,253,585	37651 MH	488,922	58,724	1,801,231
222.	DRAFT SYSTEM	13,867,860	438522 MH	5,733,928	1,741,137	21,342,925
223.	ASH + DUST HANDLING SYSTEM	3,576,225	105785 MH	1,362,082	186,929	5,125,236
224.	FUEL HANDLING SYSTEMS	9,748,615	220446 MH	2,889,032	949,896	13,587,543
227.	INSTRUMENTATION + CONTROL	1,860,000	76044 MH	929,533	67,895	2,857,428
228.	BOILER PLANT MISC ITEMS	170,000	138360 MH	1,624,627	1,511,656	3,306,283
22 .	BOILER PLANT EQUIPMENT	87,151,285	2174808 MH	27,375,744	5,950,999	120,478,028
231.	TURBINE GENERATOR	45,288,261	339531 MH	4,179,574	1,580,551	51,048,386
233.	CONDENSING SYSTEMS	9,040,725	174929 MH	2,305,125	236,731	11,582,581
234.	FEED HEATING SYSTEM	14,310,145	313874 MH	4,071,810	407,590	18,789,545
235.	OTHER TURBINE PLANT EQUIP.	12,035,592	920579 MH	11,930,504	1,213,283	25,179,379
236.	INSTRUMENTATION + CONTROL	556,000	5383 MH	65,798	3,290	625,088
237.	TURBINE PLANT MISC ITEMS		99451 MH	1,153,314	1,850,104	3,003,418
23 .	TURBINE PLANT EQUIPMENT	81,230,723	1853747 MH	23,706,125	5,291,549	110,228,397

TABLE 10-3
COST ESTIMATE SUMMARY
THREE DIGIT ACCOUNT LEVEL
1243 MWe LOW SULFUR COAL-FIRED PLANT
MIDDLETOWN, USA

COST BASIS
07/76

08/30/77

ACCT NO	ACCOUNT DESCRIPTION	FACTORY EQUIP. COSTS	SITE LABOR HOURS	SITE LABOR COST	SITE MATERIAL COST	TOTAL COSTS
241.	SWITCHGEAR	3,302,800	57380 MH	709,825	71,859	4,084,484
242.	STATION SERVICE EQUIPMENT	3,174,200	54635 MH	669,257	125,385	3,968,842
243.	SWITCHBOARDS	518,000	10530 MH	130,167	61,419	709,586
244.	PROTECTIVE EQUIPMENT		77400 MH	955,055	630,000	1,585,055
245.	ELECT.STRUC +WIRING CONTNR		464862 MH	5,683,627	2,189,225	7,872,852
246.	POWER & CONTROL WIRING	485,100	376971 MH	4,635,014	4,551,687	9,671,801
24 .	ELECTRIC PLANT EQUIPMENT	7,480,100	1041778 MH	12,782,945	7,629,575	27,892,620
251.	TRANSPORTATION & LIFT EQPT	1,223,000	8125 MH	104,497	90,419	1,417,916
252.	AIR,WATER+STEAM SERVICE SY	3,162,672	182780 MH	2,365,717	294,839	5,823,228
253.	COMMUNICATIONS EQUIPMENT	100,000	25000 MH	307,386	154,656	562,042
254.	FURNISHINGS + FIXTURES	653,700	6720 MH	78,761	16,094	748,555
255.	WASTE WATER TREATMENT EQPT	582,895	36551 MH	467,340	255,178	1,305,413
25 .	MISCELLANEOUS PLANT EQUIPT	5,722,267	259176 MH	3,325,701	811,186	9,857,154
261.	STRUCTURES	89,971	63552 MH	740,739	674,982	1,505,692
262.	MECHANICAL EQUIPMENT	11,457,134	197954 MH	2,489,634	397,073	14,343,841
26 .	MAIN COND HEAT REJECT SYS	11,547,105	261506 MH	3,230,373	1,072,055	15,849,533
2 .	TOTAL DIRECT COSTS	196,286,949	7145670 MH	80,432,402	50,307,878	335,027,229

TABLE 10-3
COST ESTIMATE SUMMARY
THREE DIGIT ACCOUNT LEVEL
1243 MWe LOW SULFUR COAL-FIRED PLANT
MIDDLETOWN, USA

COST BASIS
07/76

08/30/77

ACCT NO	ACCOUNT DESCRIPTION	FACTORY EQUIP. COSTS	SITE LABOR HOURS	SITE LABOR COST	SITE MATERIAL COST	TOTAL COSTS
911.	TEMPORARY CONSTRUCTION FAC		1020000 MH	10,327,000	4,997,000	15,324,000
912.	CONSTRUCTION TOOLS & EQUIP		160000 MH	1,986,000	11,300,000	13,286,000
913.	PAYROLL INSURANCE & TAXES	13,601,000				13,601,000
914.	PERMITS,INS. & LOCAL TAXES				575,000	575,000
915.	TRANSPORTATION					
91 .	CONSTRUCTION SERVICES	13,601,000	1180000 MH	12,313,000	16,872,000	42,786,000
921.	HOME OFFICE SERVICES	13,710,000				13,710,000
922.	HOME OFFICE Q/A					
923.	HOME OFFICE CONSTRCTN MGMT	1,000,000				1,000,000
92 .	HOME OFFICE ENGRG.&SERVICE	14,710,000				14,710,000
931.	FIELD OFFICE EXPENSES				900,000	900,000
932.	FIELD JOB SUPERVISION	8,901,000				8,901,000
933.	FIELD QA/QC	186,000				186,000
934.	PLANT STARTUP & TEST	315,000				315,000
93 .	FIELD OFFICE ENGRG&SERVICE	9,402,000			900,000	10,302,000
9 .	TOTAL INDIRECT COSTS	37,713,000	1180000 MH	12,313,000	17,772,000	67,798,000
	TOTAL BASE COST	233,299,949	8325670 MH	100,745,402	68,078,878	402,825,229

SECTION 11

DRAWINGS

11

SECTION 11

DRAWING LIST

1243 MWe LOW SULFUR COAL-FIRED PLANT

This section contains the drawings for the 1243 MWe Low Sulfur Coal Plant described in Section 9. The drawings include Plot Plan, General Arrangement Drawings, Flow Diagrams, Block Diagrams and One Line Diagrams.

Drawing Number	Title
6515.002 - LSC-1	Symbol Legend for Flow and Block Diagrams
6515.002 - LSC-2	Plot Plan
6515.002 - LSC-3	General Arrangement - Plan "A-A" at El. 18'-0"
6515.002 - LSC-4	General Arrangement - Plans at 43'-0" and 73-0" Elevations
6515.002 - LSC-5	Flow Diagram - Forced Draft System
6515.002 - LSC-6	Steam Heat Balance Diagram (Max. Guaranteed)
6515.002 - LSC-7	Flow Diagram - Main Steam Hot Reheat and Cold Reheat System
6515.002 - LSC-8	Flow Diagram - HP and IP Extraction Steam System
6515.002 - LSC-9	Flow Diagram - LP Extraction Steam System
6515.002 - LSC-10	Flow Diagram - Condensate and Feedwater System
6515.002 - LSC-11	Flow Diagram - Heater Drains and Vents System
6515.002 - LSC-12	One Line Diagram - Unit Electrical Distribution
6515.002 - LSC-13	One Line Diagram - d-c Distribution System
6515.002 - LSC-14	Flow Diagram - Auxiliary Steam System
6515.002 - LSC-15	Flow Diagram - Coal Handling System
6515.002 - LSC-16	Flow Diagram - Bottom Ash Handling System
6515.002 - LSC-17	Block Diagram - Plant Fire Protection System
6515.002 - LSC-18	Block Diagram - Waste Water Treatment System

VALVE BODIES

OPEN	CLOSED	
		SLIDING GATE
		GATE
		GLOBE
		BUTTERFLY
		THREE WAY
		ANGLE
		SAFETY OR RELIEF
		SWING CHECK
		STOP CHECK
		SAUNDERS (WEIR)
		POWER ASSISTED NON RETURN
		POWER ASSISTED PRESSURE RELIEF

VALVE ACTUATOR

	HANDWHEEL - MANUAL
	GEAR - MANUAL
	ELECTRIC MOTOR
	SOLENOID (SPRING OPPOSED)
	PISTON OR CYLINDER
	ELECTRO - HYDRAULIC
	DIAPHRAGM (SPRING OPPOSED)

PIPING SYMBOLS

	EXPANSION JOINT
	ORIFICE
	REDUCER

INSTRUMENT S

714 170

LINE DESIGNATIONS

LINE CONTINUES TO

LINE CONTINUES FROM

PRIMARY PROCESS FLOW

SECONDARY PROCESS FLOW

EQUIPMENT SYMBOLS

F FILTER

S STRAINER

HEAT EXCHANGER TUBE END

HEAT EXCHANGER SHELL SIDE

TANK

FEEDWATER W/HEATER VENTS & DRAINS

DRAIN COOLER

HORIZONTAL PUMP

OR

VERTICAL PUMP

POSITIVE DISPLACEMENT PUMP

FAN OR BLOWER

YMBOL

LOW NOZZLE

NO.	DATE	DESCRIPTION	CHKR	SUP. ENG.
		FIRST ISSUE		

ENGINEER

STATE REG. NO.

SYMBOL LEGEND
FOR
FLOW & BLOCK DIAGRAMS
1243 MWe FOSSIL PLANT
MIDDLETOWN HYPOTHETICAL SITE

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6515.002-LSC-1

714 170

PLANT NOMENCLATURE

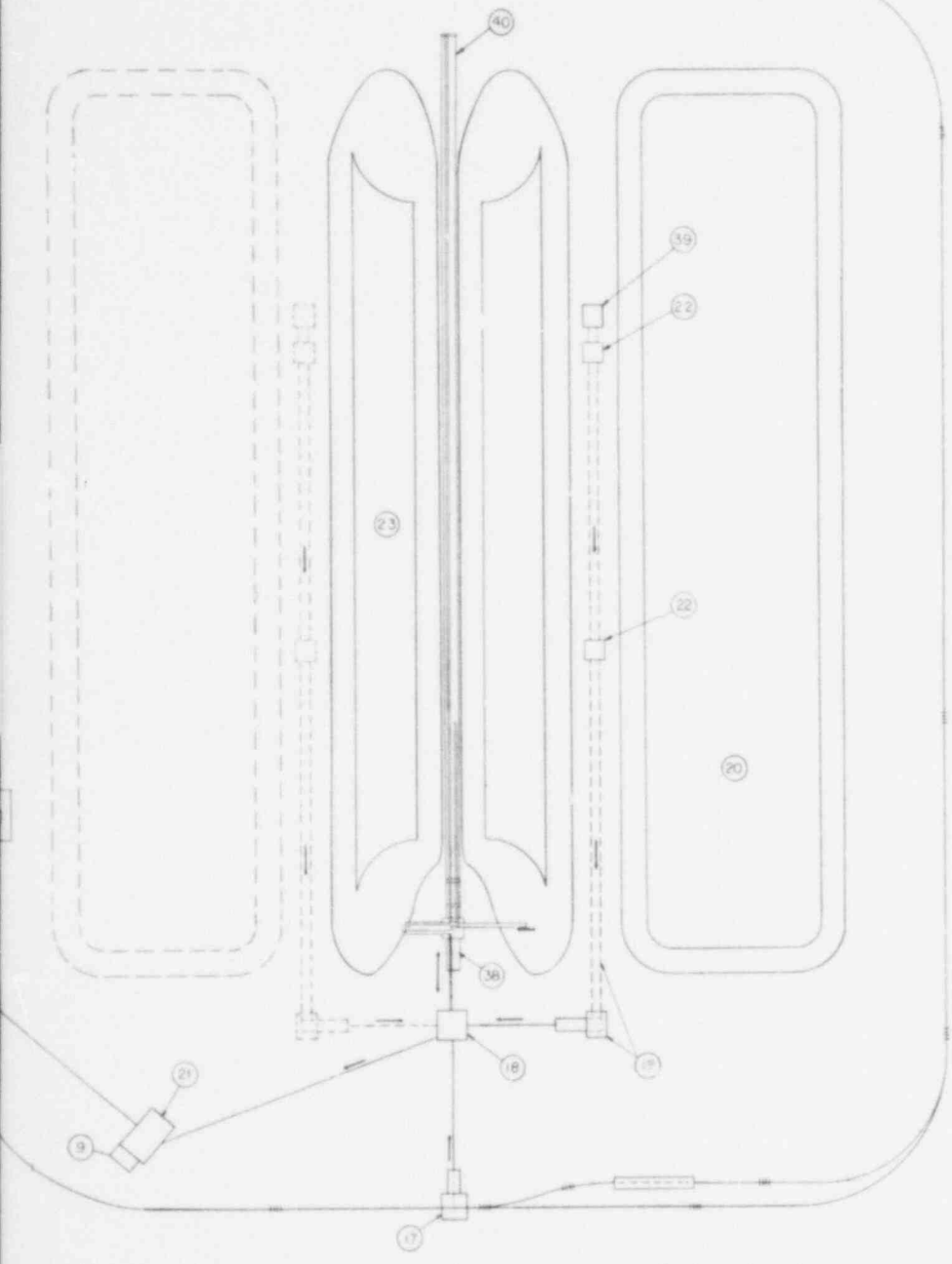
1 - BOILER HOUSE
2 - TURBINE HALL
3 - SERVICE AREA
4 - STACK
5 - ADMINISTRATION BUILDING
6 - CIRCULATING WATER PUMP HOUSE
7 - CONDENSATE STORAGE TANKS
8 - COOLING TOWER SWITCHGEAR BUILDING
9 - COAL HANDLING SYSTEM SWITCHGEAR BUILDING
10 - FUEL OIL TANK
11 - BATCH WASTE SUMP
12 - RECIRCULATING TANK
13 - SETTLING TANK
14 - DEWATERING BINS
15 - MAIN COOLING TOWERS
16 - CAR THAW SHED
17 - ROTARY CAR DUMPER
18 - STACKER/RECLAIMER TRANSFER TOWER
19 - RECLAIM TRANSFER TUNNEL
20 - COAL PILE (45 DAY-DEAD STORAGE)
21 - CRUSHER HOUSE
22 - RECLAIM HOPPERS
23 - COAL PILE (15 DAY-ACTIVE STORAGE)
24 - COAL PILE SETTLING BASIN
25 - WASTE WATER SETTLING BASIN
26 - BATCH HOLDING TANKS
27 - WASTE WATER TREATMENT BUILDING
28 - LOCOMOTIVE REPAIR SHOP
29 - MAKE-UP WATER INTAKE STRUCTURE/FIRE PUMP HSE
30 - TRANSFORMER YARD
31 - MATERIAL HANDLING & SERVICE/SWITCHGEAR BUILDING
32 - CONTROL & SWITCHGEAR AREA
33 - SECONDARY AIR PREHEATERS
34 - PRECIPITATORS
35 - WAREHOUSE
36 - MAKE-UP WATER PRETREATMENT BUILDING
37 - SWITCHYARD
38 - BUCKET WHEEL STACKER/RECLAIMER
39 - VENTILATION FAN HOUSE
40 - STACKER/RECLAIMER YARD CONVEYOR
41 - AUXILIARY BAY
42 - FLY ASH SILOS

N

NORTH RIVER

FLOW →

714 171



100 50 0 100 200

SCALE - FEET

PLOT PLAN
1243 MWe FOSSIL PLANT
MIDDLETOWN HYPOTHETICAL SITE
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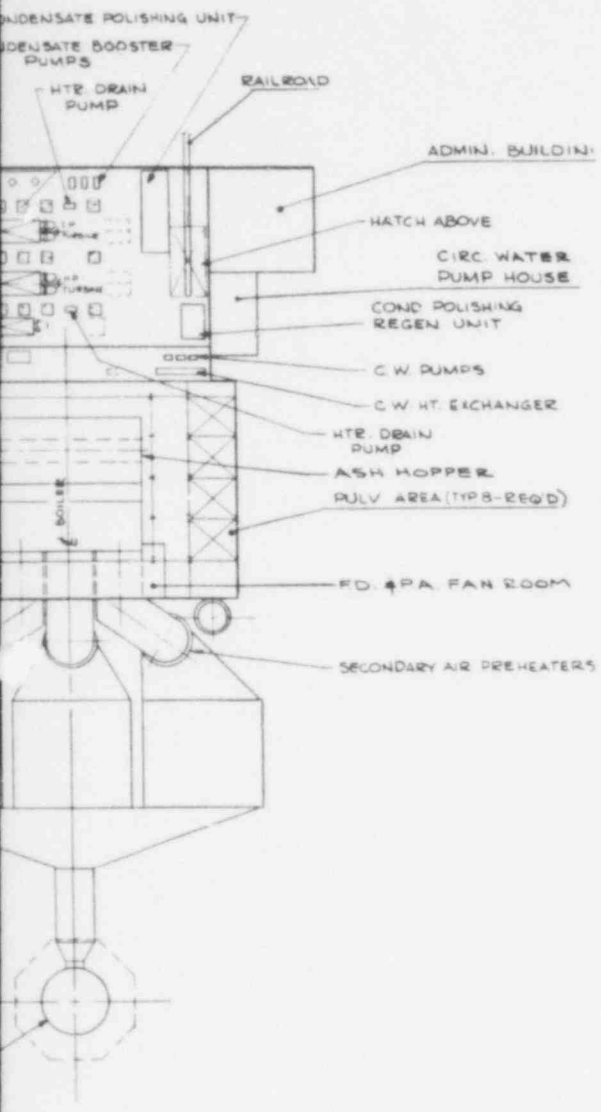
e515002-LSC-2

714 172


N
GROUND FLOOR
CONDENSATE PUMPS
TURBINE LUBE OIL COND. SKID
MAIN TURBINE
CONDENSER
B. F. P. T. CONDENSER
SWITCHGEAR AREA
VACUUM PUMPS
B.F.P. BOOSTER PUMPS
DIESEL GENERATOR RM
MACHINE SHOP
AIR COMPRESSOR RM
AUX BOILER RM
PRIMARY AIR PREHEATERS
PRECIPITATOR (3 REQD)
STACK



NOTE:
FOR PLANE OF SECTION 'A-A'
SEE DWG. GSIS 002-LSC-4

0 60' 120'
SCALE FEET

NO.	DATE	DESCRIPTION	ENGR.	SUP. ENG.
		FIRST ISSUE		

ENGINEER
STATE REG. NO.

GENERAL ARRANGEMENT
PLAN 'A-A' (EL. 18'-0" & 180')
1243 MWe FOSSIL PLANT
MIDDLETOWN HYPOTHETICAL SITE

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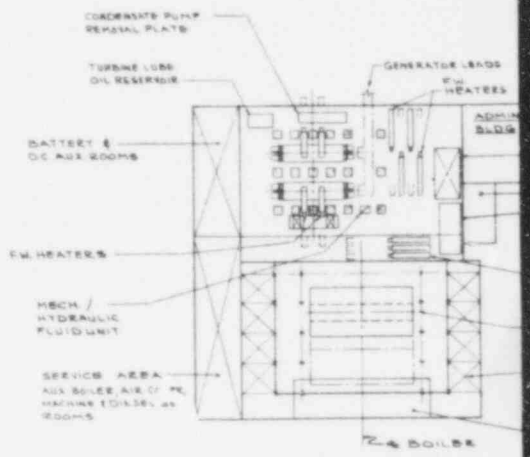
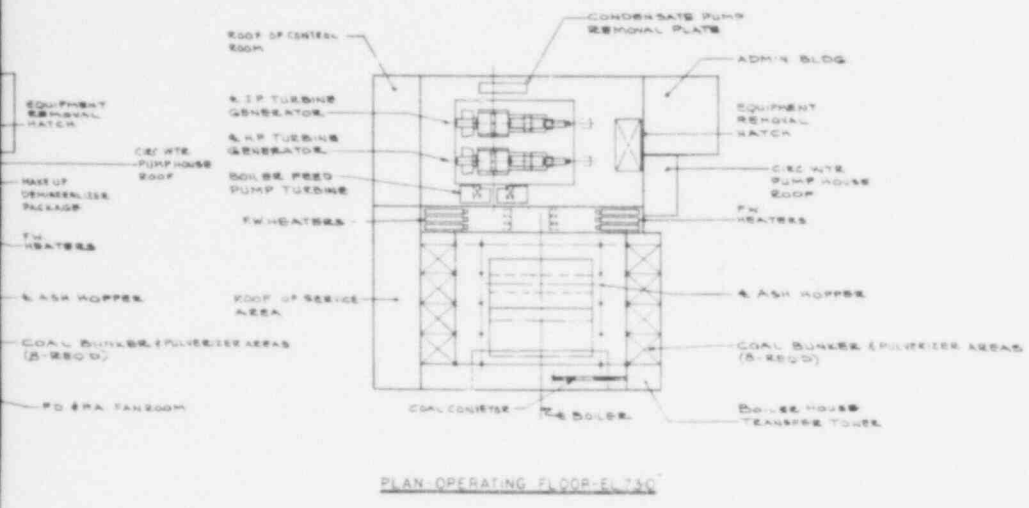
6515002-LSC-3

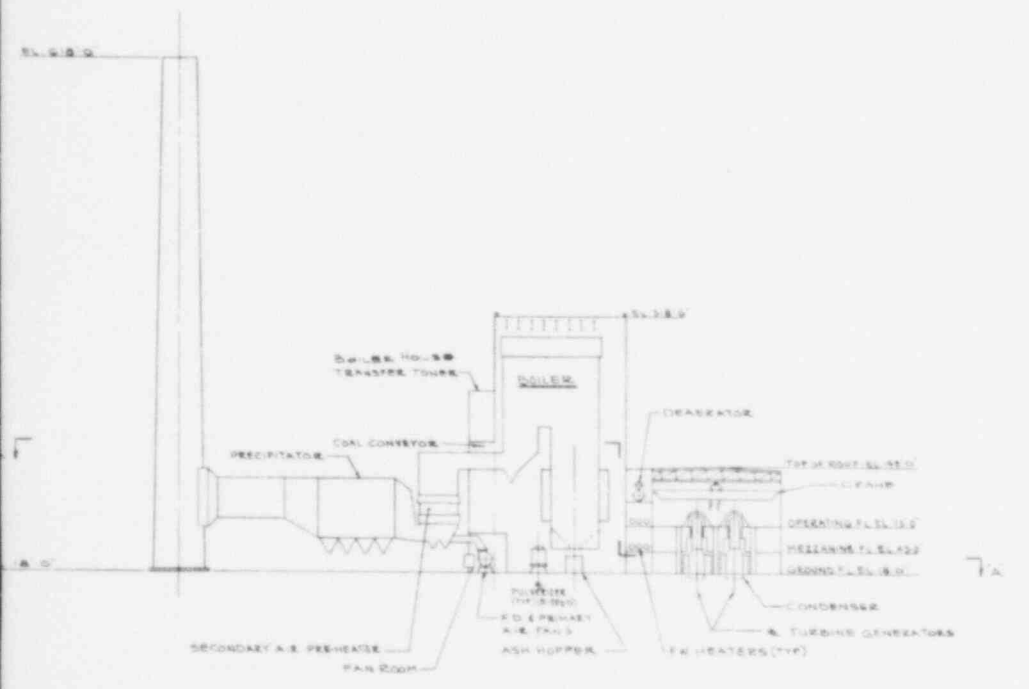
714 174



PLAN - MEZZANINE FLOOR - EL 430'



PLAN-OPERATING FLOOR-EL 730'



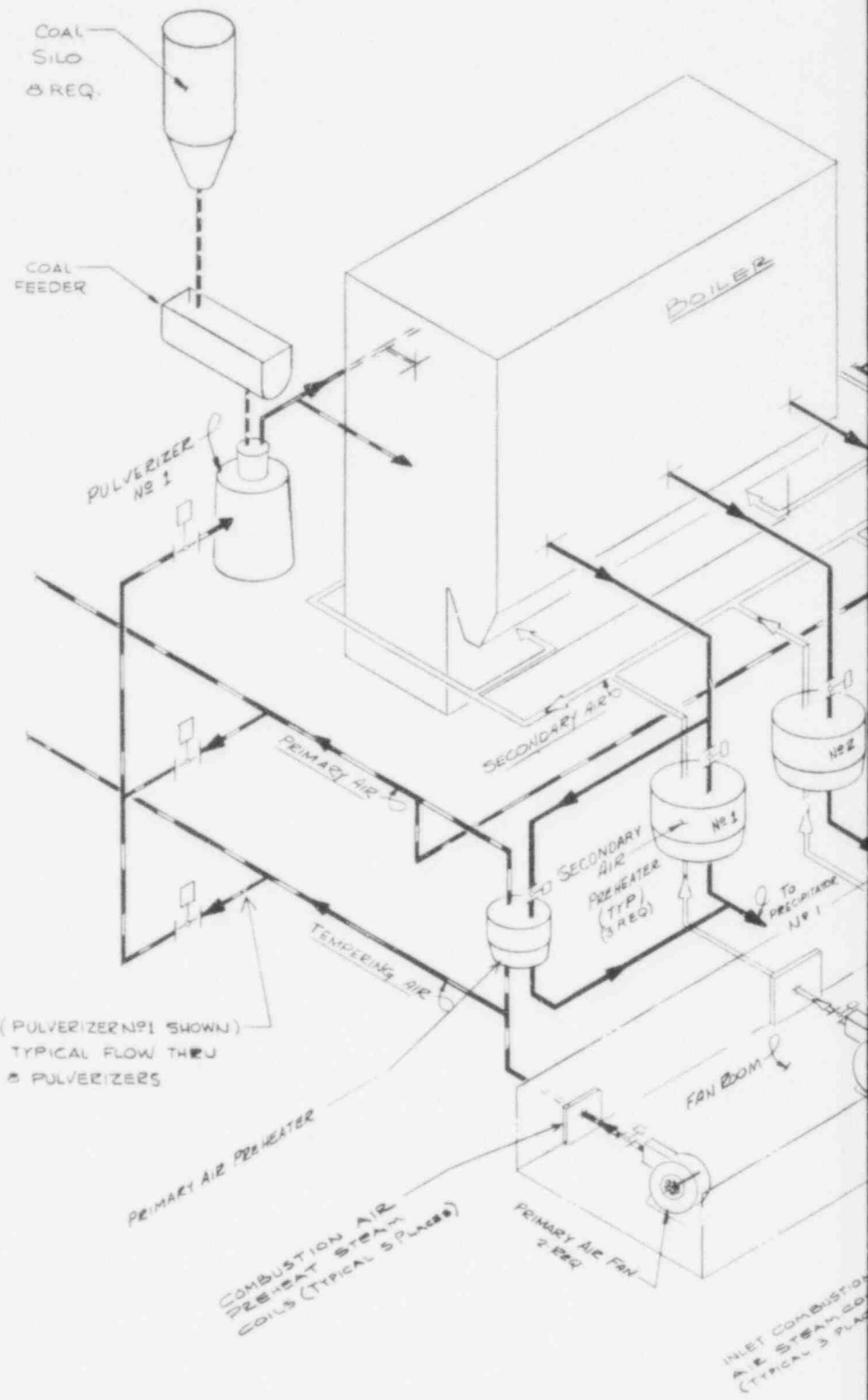
ELEVATION

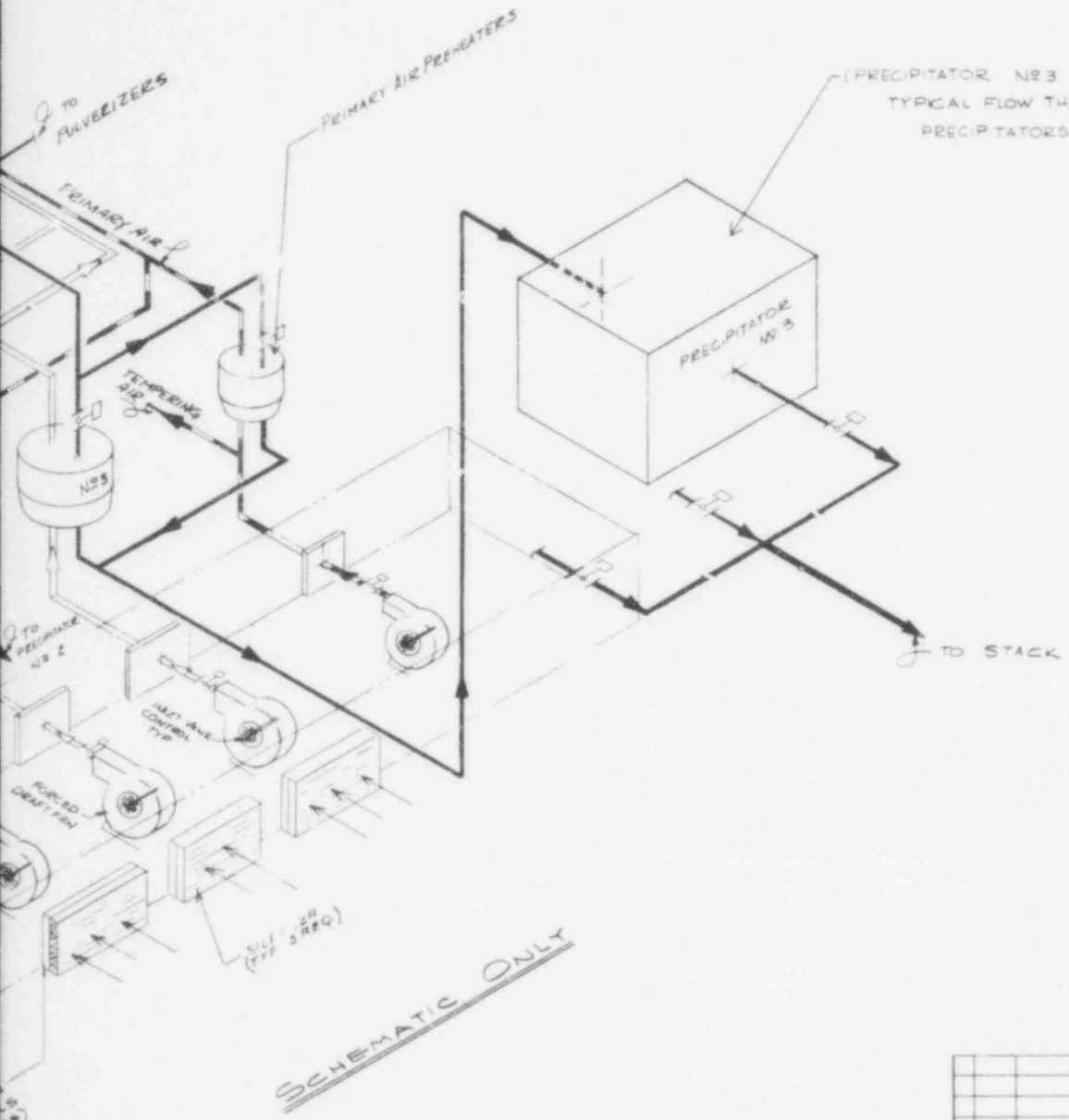
NOTE:
FOR PLAN A-A SEE DWG 6515102 LSC-5

SCALE - FEET

GENERAL ARRANGEMENT PLANS (EL 450' & 730') AND ELEVATION
1243 MWe FOSSIL PLANT
MIDDLETOWN HYPOTHETICAL SITE
united engineers
6515002-LSC-4

714 176


COAL SILO 8 REQ.
COAL FEEDER
PULVERIZER NO 1
BOILER
SECONDARY AIR
PRIMARY AIR
NO 2
NO 1
SECONDARY AIR PREHEATER (TYP) (3 REQ)
TO PRECIPITATOR NO 1
TEMPERING AIR
(PULVERIZER NO 1 SHOWN) TYPICAL FLOW THRU 8 PULVERIZERS
FAN ROOM
PRIMARY AIR PREHEATER
COMBUSTION AIR PRE-HEAT STEAM COILS (TYPICAL 5 PLACES)
PRIMARY AIR FAN 2 REQ



NOTE

FOR SYMBOL LEGEND SEE DWG 6515.002-LSC-1

NO	DATE	DESCRIPTION	ENGR	SUP. ENG.
		FIRST ISSUE		

ENGINEER

STATE REG. NO.

FLOW DIAGRAM
FORCED DRAFT SYSTEM
1243 MWe FOSSIL PLANT
MIDDLETOWN HYPOTHETICAL SITE

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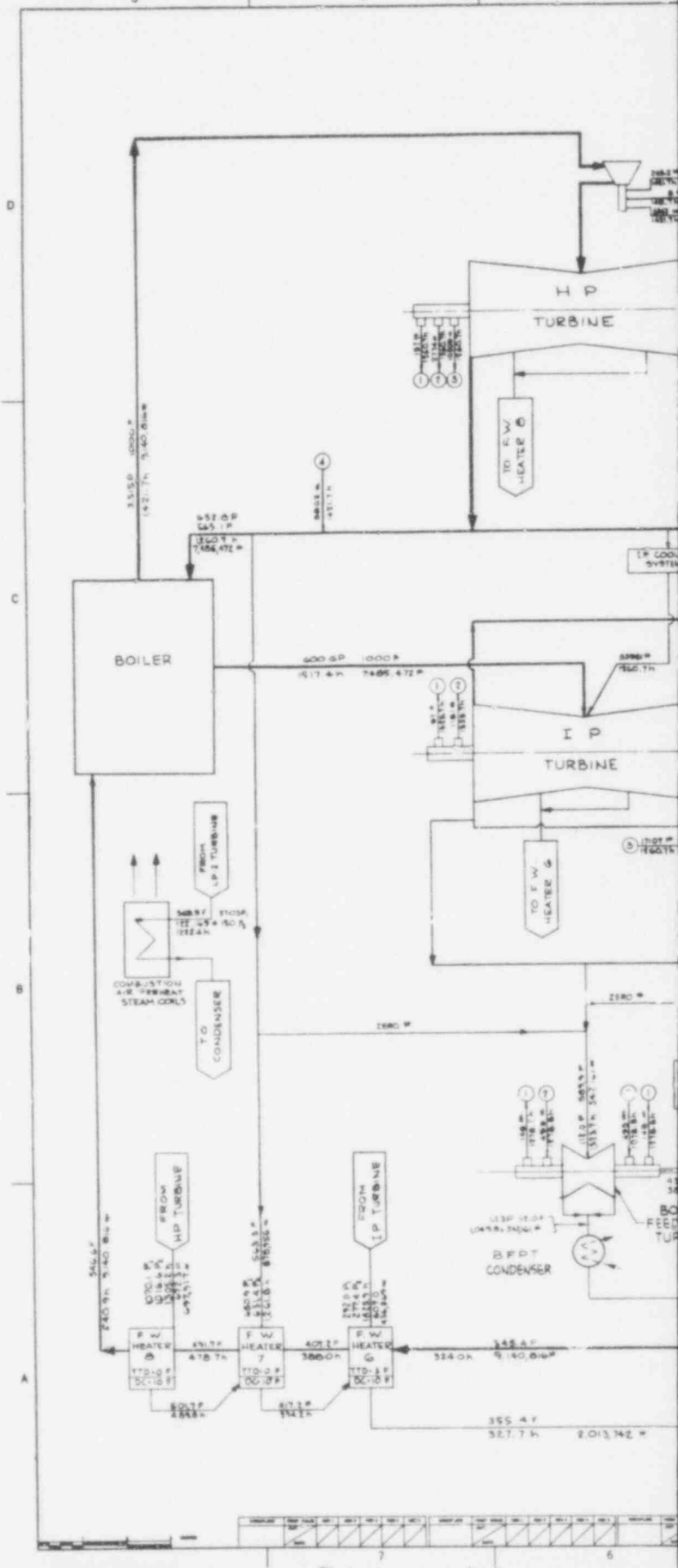
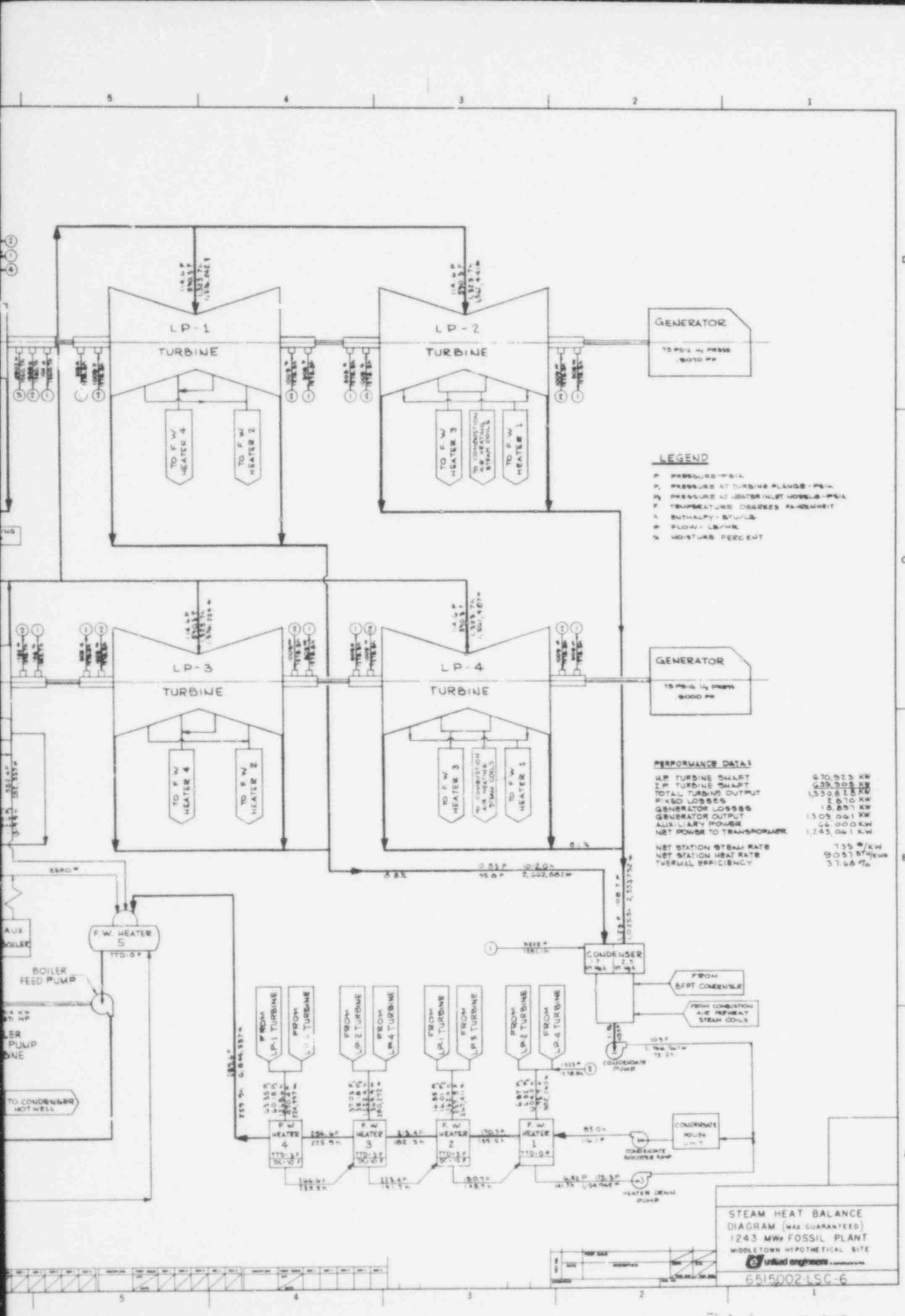
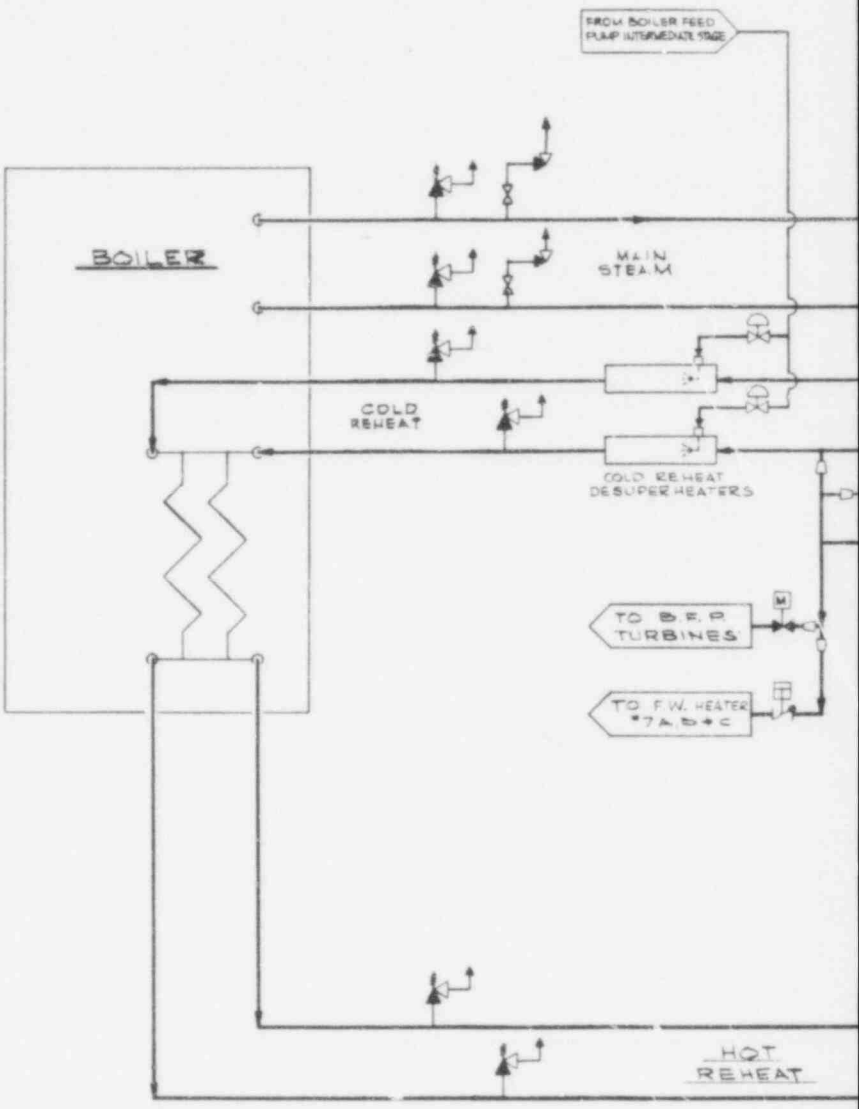
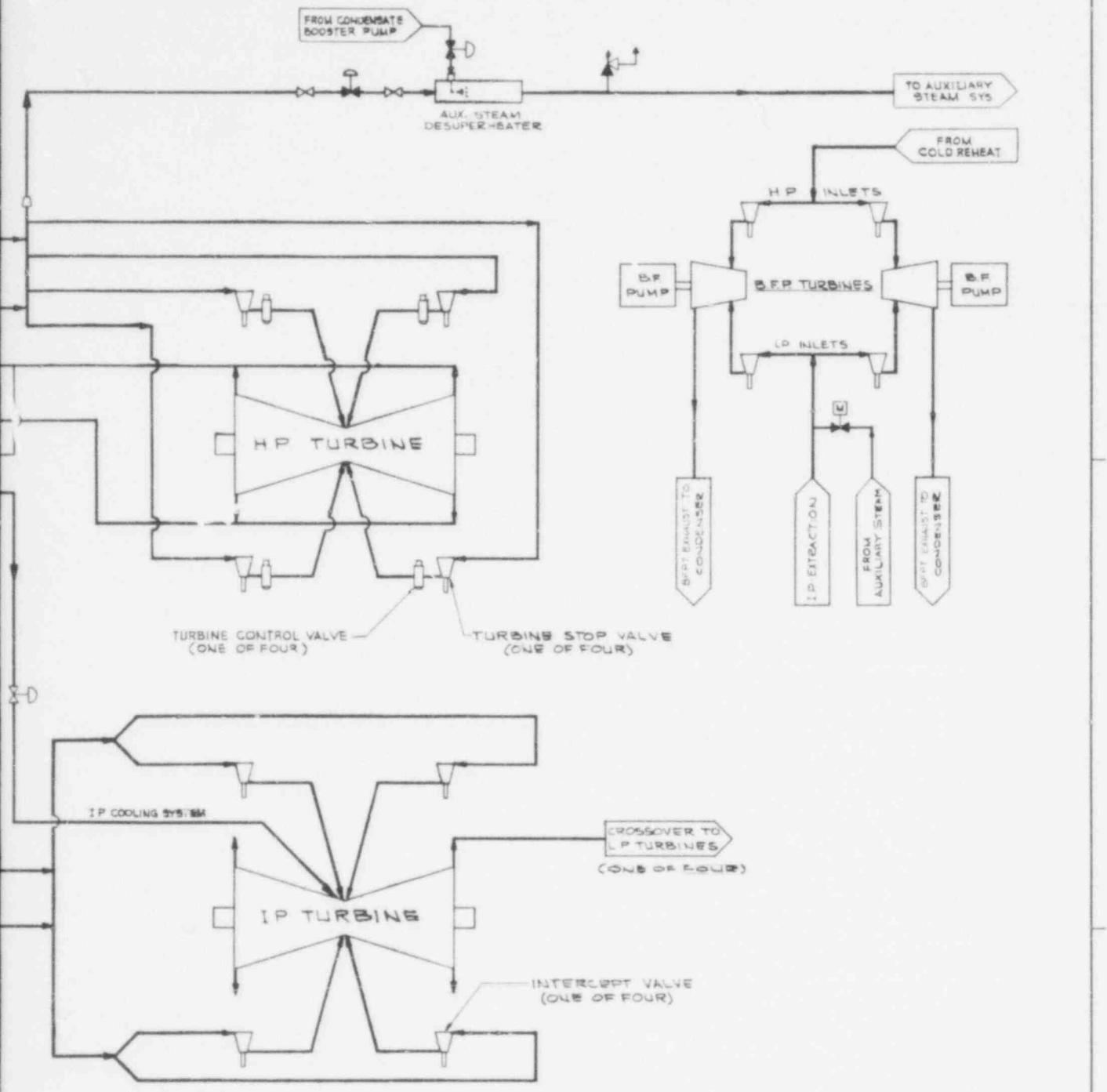
6515.002-LSC-5


H P
TURBINE
I P
TURBINE
BOILER
TO F.W. HEATER 8
TO F.W. HEATER 6
FROM LP 2 TURBINE
COMBUSTION AIR PREHEAT STEAM COILS
TO CONDENSER
FROM HP TURBINE
FROM IP TURBINE
BFPT CONDENSER
F.W. HEATER 8
F.W. HEATER 7
F.W. HEATER 6
8
7
6
D
C
B
A


LP-1 TURBINE
LP-2 TURBINE
LP-3 TURBINE
LP-4 TURBINE
GENERATOR
GENERATOR
TO F.W. HEATER 4
TO F.W. HEATER 2
TO F.W. HEATER 3
TO COMBUSTION AIR HEATING STEAM COILS
TO F.W. HEATER 1
LEGEND
P PRESSURE-PSIA
P1 PRESSURE AT TURBINE FLANGE-PSIA
Ph PRESSURE AT HEATER INLET NOZZLE-PSIA
T TEMPERATURE DEGREES FAHRENHEIT
h ENTHALPY-BTU/LB
W FLOW-LB/HR
% MOISTURE PERCENT
PERFORMANCE DATA
H.P. TURBINE SHAFT 670,923 KW
I.P. TURBINE SHAFT 639,505 KW
TOTAL TURBINE OUTPUT 1,330,818 KW
PIK&D LOSSES 2,870 KW
GENERATOR LOSSES 18,857 KW
GENERATOR OUTPUT 1,309,091 KW
AUXILIARY POWER 66,000 KW
NET POWER TO TRANSFORMER 1,243,091 KW
NET STATION STEAM RATE 7.35 #/KW
NET STATION HEAT RATE 9051 BTU/KWH
THERMAL EFFICIENCY 37.68 %
F.W. HEATER 5
BOILER FEED PUMP
AUX BOILER
TO CONDENSER HOTWELL
CONDENSER
FROM BFPT CONDENSER
FROM COMBUSTION AIR PREHEAT STEAM COILS
CONDENSATE PUMP
F.W. HEATER 4
F.W. HEATER 3
F.W. HEATER 2
F.W. HEATER 1
CONDENSATE BOOSTER PUMP
CONDENSATE POLISH UNIT
HEATER DRAIN PUMP
STEAM HEAT BALANCE DIAGRAM (MAX GUARANTEED) 1243 MWe FOSSIL PLANT
MIDDLETOWN HYPOTHETICAL SITE
stilad engineers
6615002-LSC-6

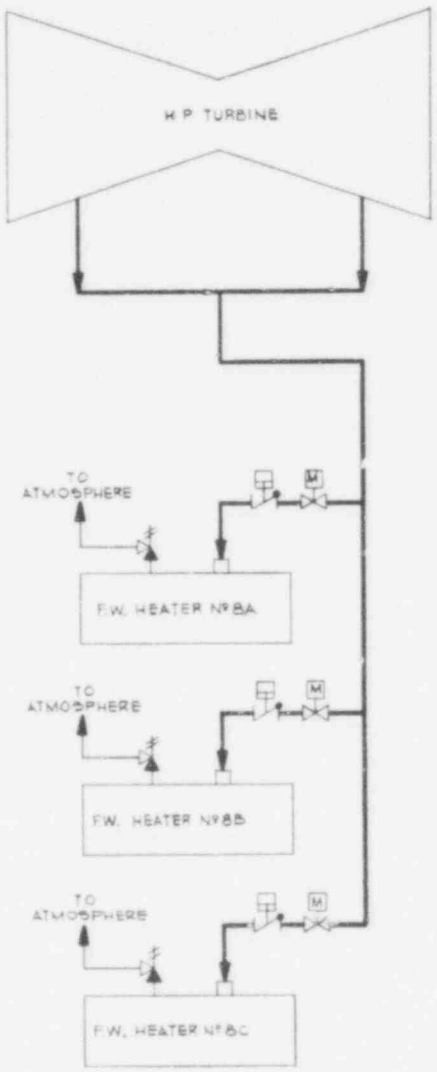

FROM BOILER FEED PUMP INTERMEDIATE STAGE
BOILER
MAIN STEAM
COLD REHEAT
COLD REHEAT DESUPERHEATERS
TO B.F.P. TURBINES
TO F.W. HEATER #7 A, B & C
HOT REHEAT



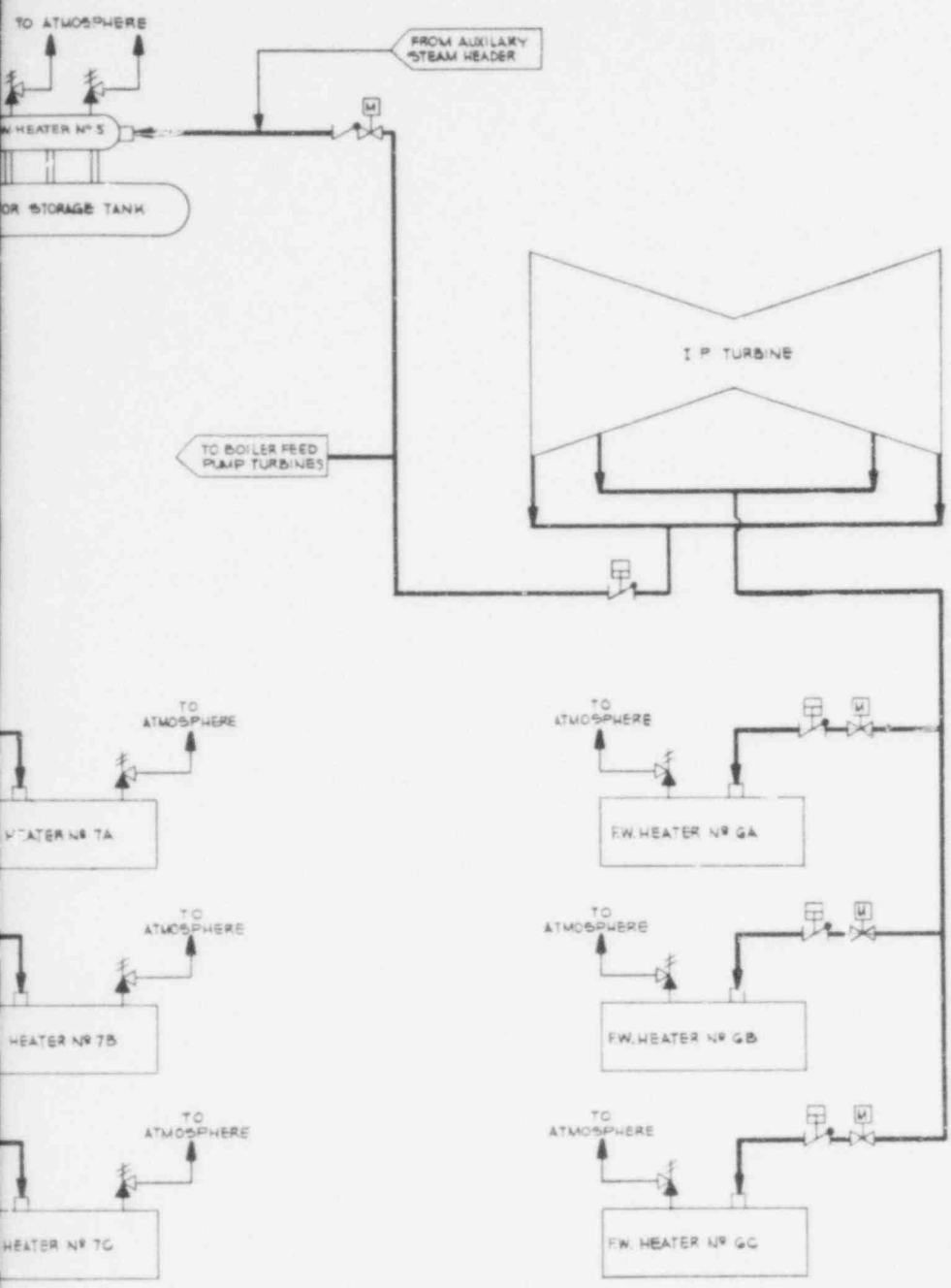
NOTE:
FOR SYMBOL LEGEND SEE DWG 6515002-LSC-1

NO.	DATE	DESCRIPTION	ENGR.	SUP. ENG.
		FIRST ISSUE		

FLOW DIAGRAM
MAIN STEAM HOT REHEAT & COLD REHEAT SYSTEM
1243 MWe FOSSIL PLANT
MIDDLETOWN HYPOTHETICAL SITE
united engineers & constructors inc.
6515.002-LSC-7


H P TURBINE
TO ATMOSPHERE
F.W. HEATER N°8A
TO ATMOSPHERE
F.W. HEATER N°8B
TO ATMOSPHERE
F.W. HEATER N°8C

FROM COLD REHEAT



NOTE:
FOR SYMBOL LEGEND SEE DWG. 6515.002-LSC-1

REV.	DATE	DESCRIPTION	ENGR	SUP. ENG.
		FIRST ISSUE		

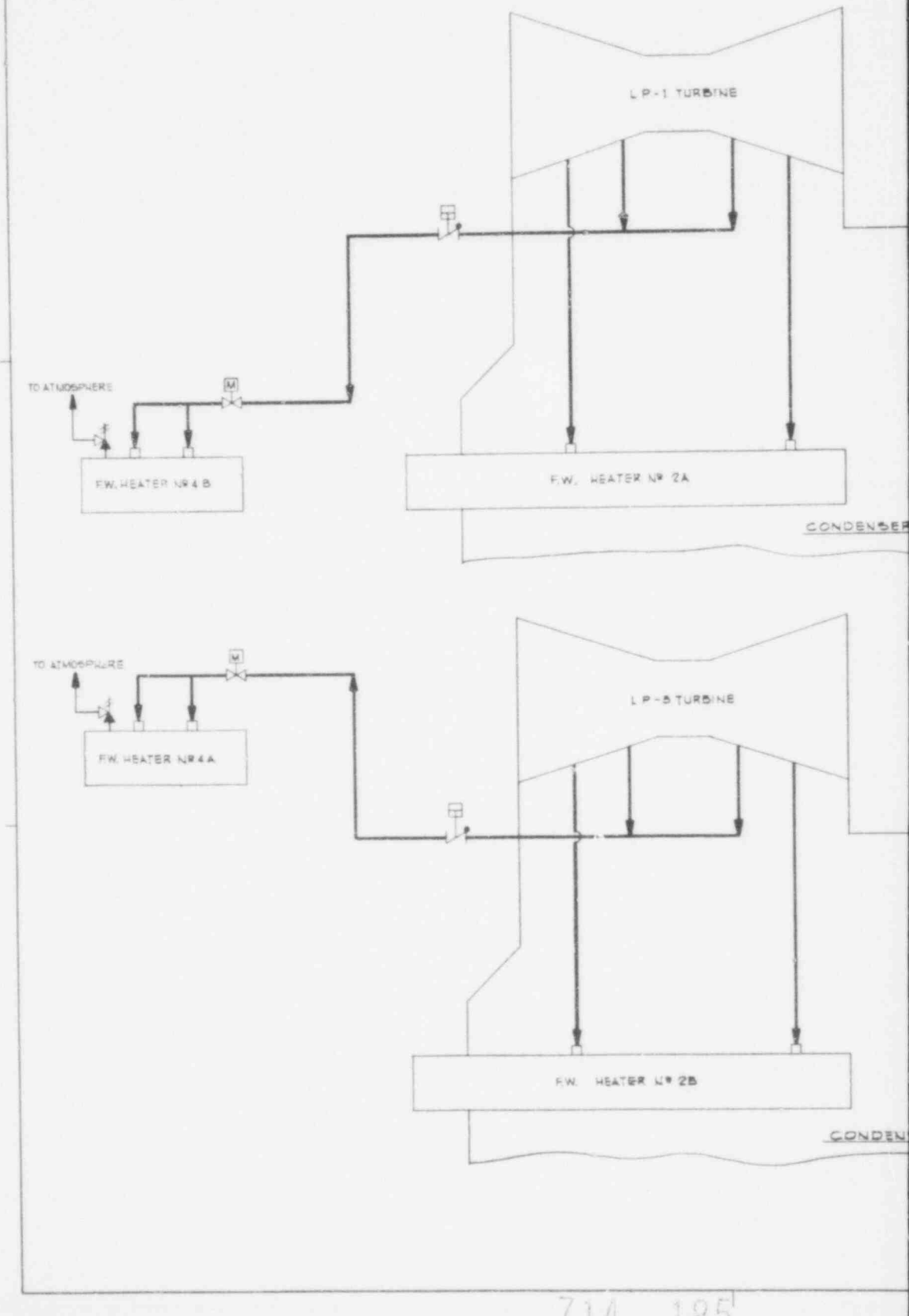
ENGINEER

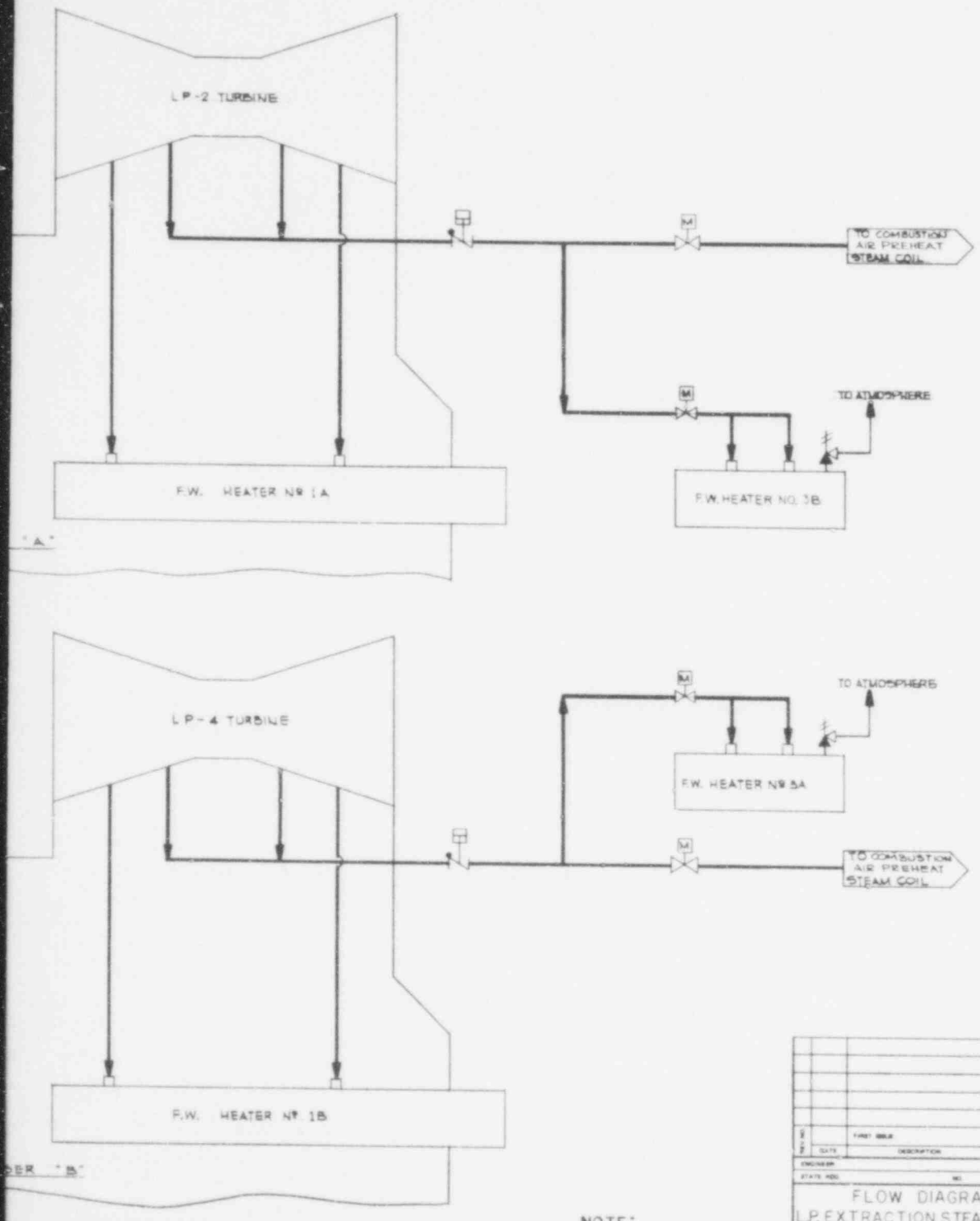
STATE REG. NO.

FLOW DIAGRAM
H.P. & L.P. EXTRACTION STEAM SYS.
1243 MWe FOSSIL PLANT
MIDDLETOWN HYPOTHETICAL SITE

united engineers & constructors inc.

6515.002-LSC-8


L P - 1 TURBINE
TO ATMOSPHERE
M
F.W. HEATER Nº 4 B
F.W. HEATER Nº 2A
CONDENSER
TO ATMOSPHERE
M
F.W. HEATER Nº 4 A
L P - 5 TURBINE
F.W. HEATER Nº 2B
CONDEN



NOTE:
FOR SYMBOL LEGEND SEE DWG. 6515.002-LSC-1

NO.	DATE	DESCRIPTION	ENGR.	SUP. ENG.
		FIRST ISSUE		

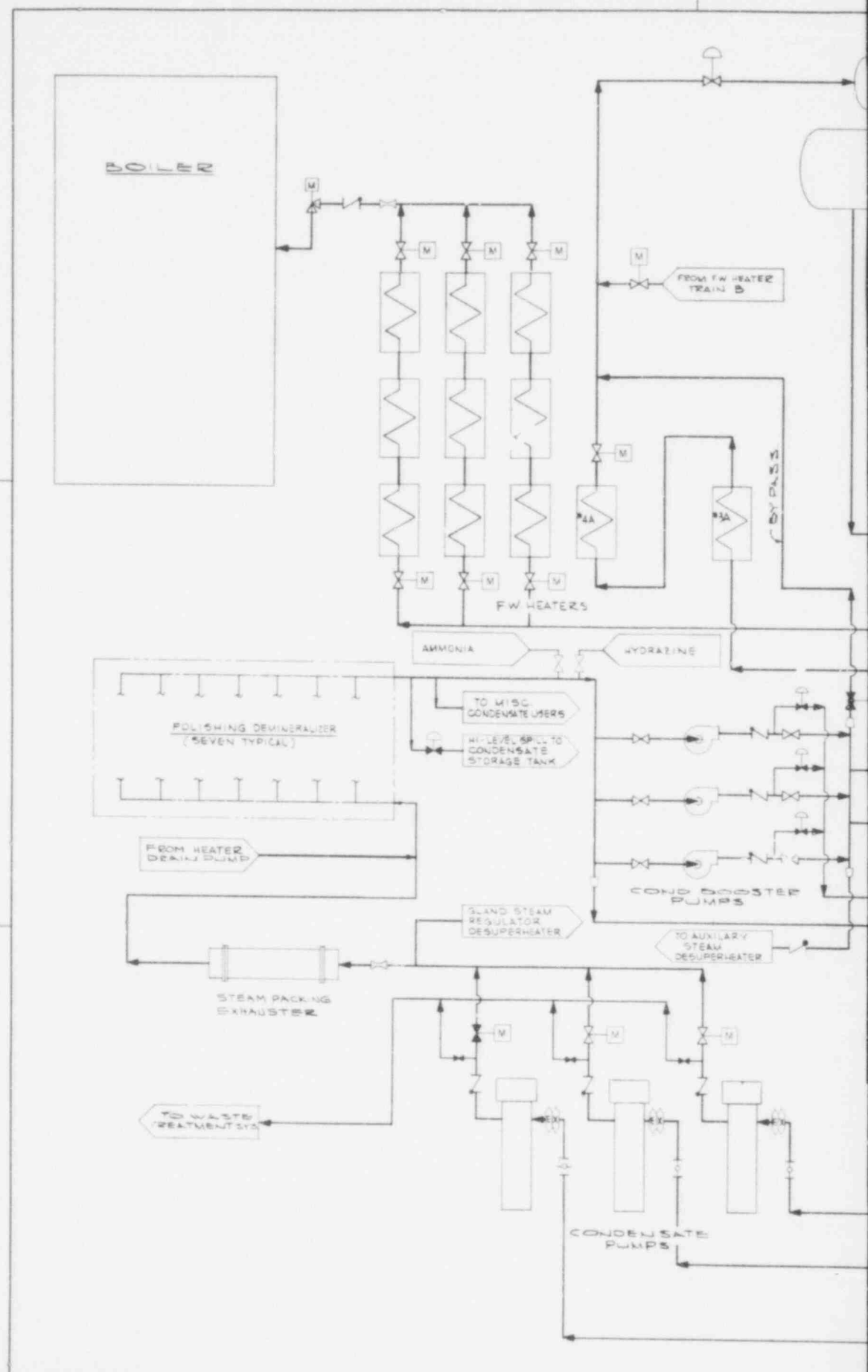
ENGINEER

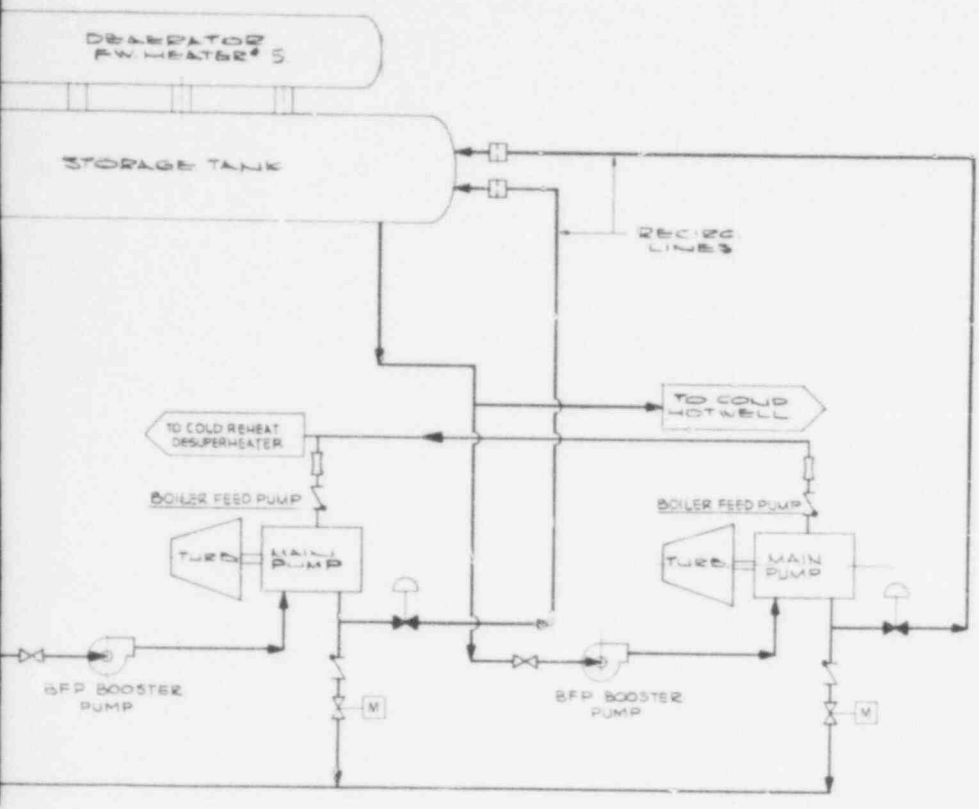
STATE REG. NO.

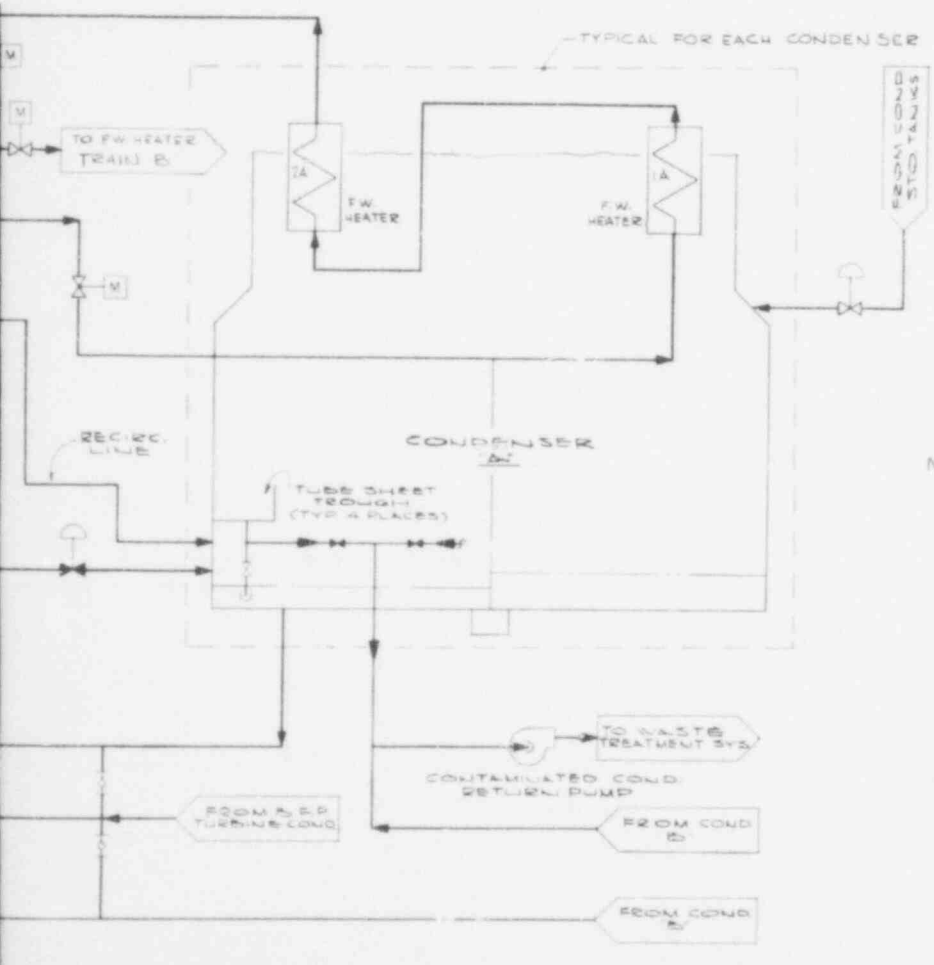
FLOW DIAGRAM
L.P. EXTRACTION STEAM SYSTEM
1243 MWe FOSSIL PLANT
MIDDLETOWN HYPOTHETICAL SITE

united engineers & constructors inc.

6515.002-LSC-9


BOILER
FROM F.W. HEATER TRAIN B
#4A
#3A
BY PASS
F.W. HEATERS
AMMONIA
HYDRAZINE
TO MISC. CONDENSATE USERS
HI-LEVEL SPILL TO CONDENSATE STORAGE TANK
POLISHING DEMINERALIZER (SEVEN TYPICAL)
FROM HEATER DRAIN PUMP
COND BOOSTER PUMPS
GLAND STEAM REGULATOR DESUPERHEATER
TO AUXILARY STEAM DESUPERHEATER
STEAM PACKING EXHAUSTER
TO WASTE TREATMENT SYS
CONDENSATE PUMPS





NOTE

FOR SYMBOL LEGEND SEE DWG 6515002-LSC-1

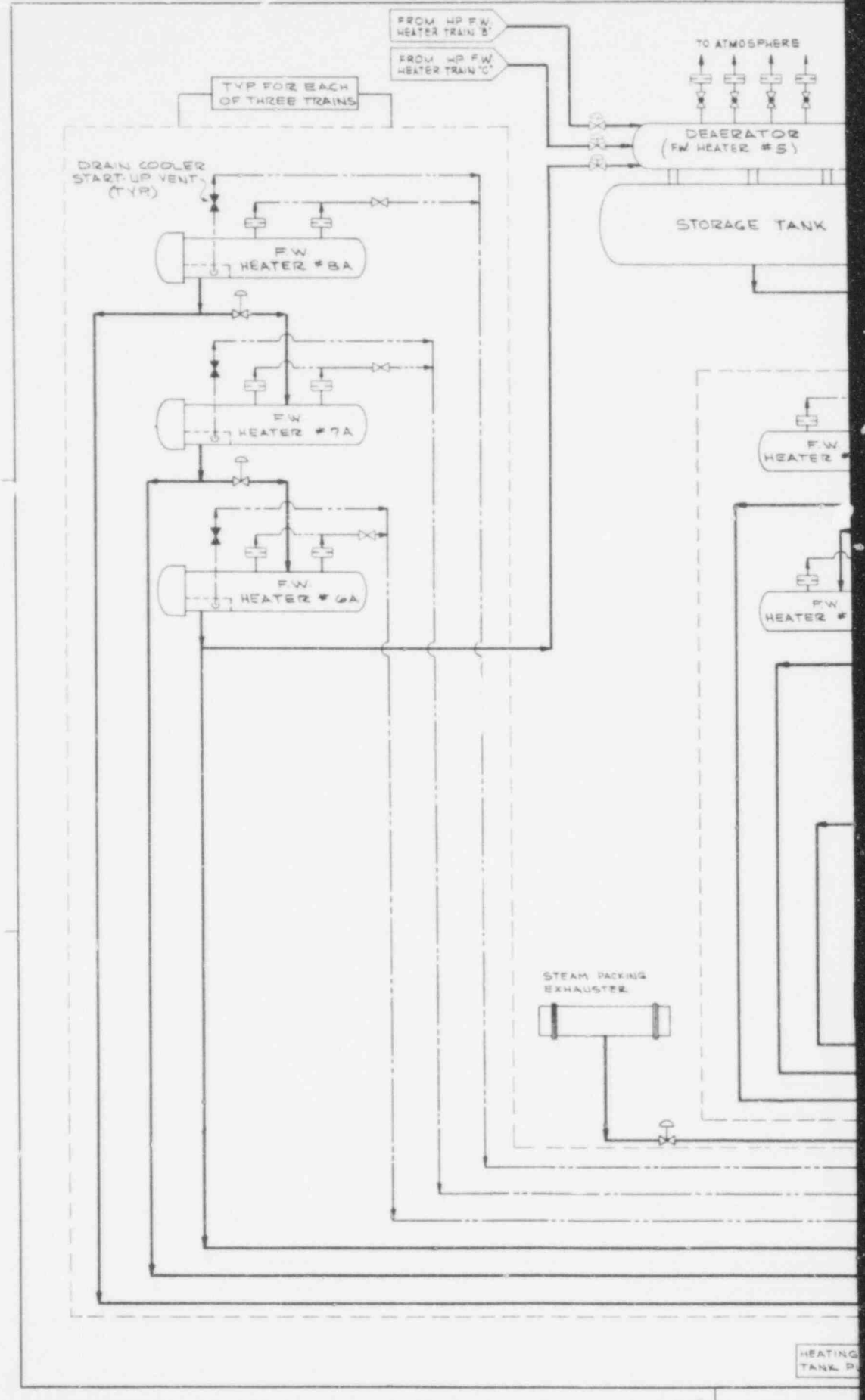
REVISIONS				
	FIRST ISSUE			
	DATE	DESCRIPTION	ENGR.	SUP. ENG.
ENGINEER				
STATE REG.		NO.		

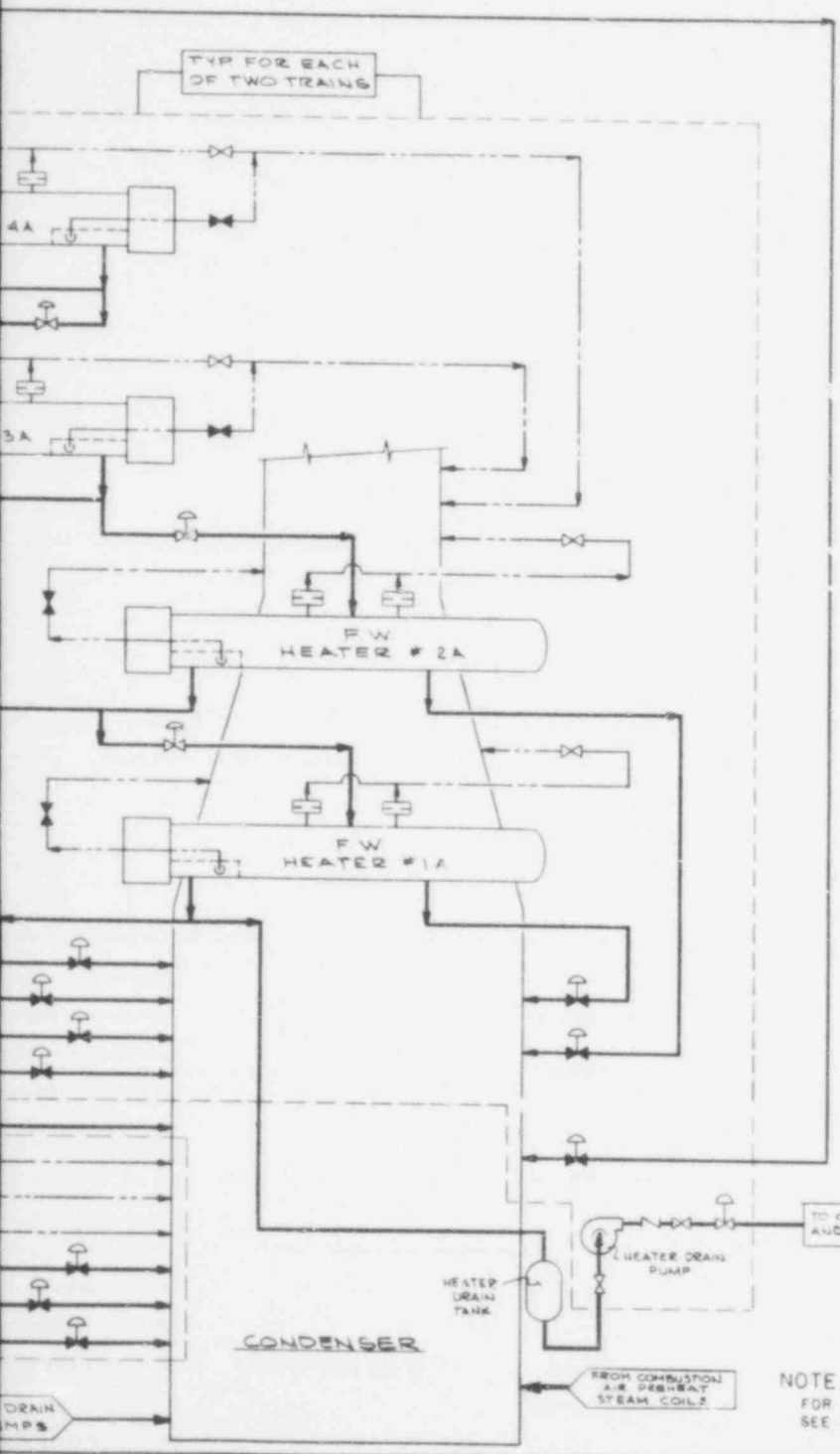
FLOW DIAGRAM
CONDENSATE & FEEDWATER SYSTEM
1243 MWe FOSSIL PLANT
MIDDLETOWN HYPOTHETICAL SITE

united engineers & constructors inc.

6515002-LSC-10

7 14 80


FROM HP F.W. HEATER TRAIN 'B'
FROM HP F.W. HEATER TRAIN 'C'
TYP FOR EACH OF THREE TRAINS
TO ATMOSPHERE
DEAERATOR (FW HEATER #5)
STORAGE TANK
DRAIN COOLER START-UP VENT (TYP)
F.W. HEATER #8A
F.W. HEATER #7A
F.W. HEATER #6A
F.W. HEATER #
F.W. HEATER #
STEAM PACKING EXHAUSTER
HEATING
TANK P



LEGEND

HEATER DRAINS

HEATER VENTS

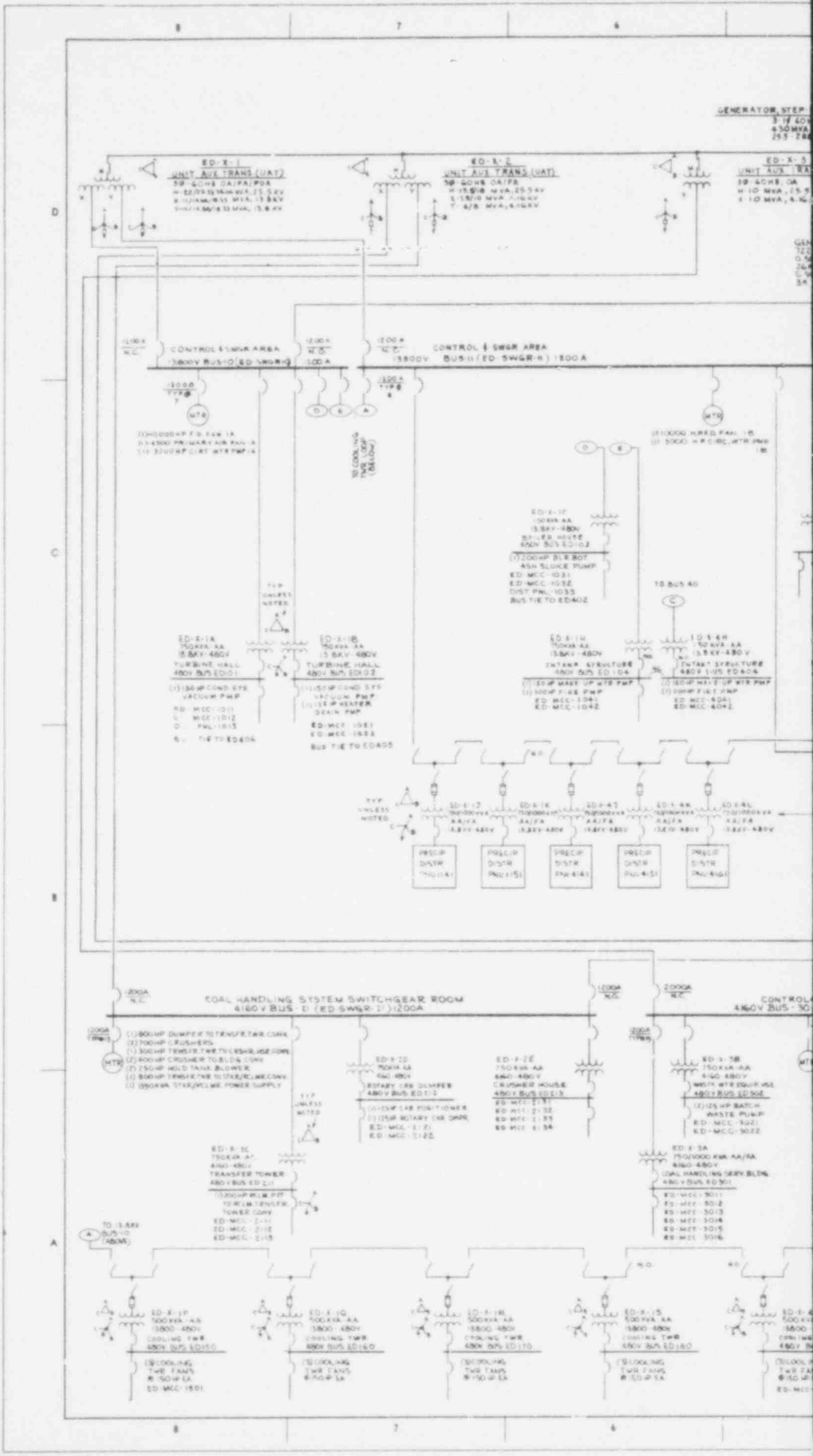
NOTE:
FOR SYMBOL LEGEND SEE DWG 6515.002-LSC-1

REV NO	DATE	DESCRIPTION	ENGR.	SUP. ENG.
		FIRST ISSUE		
ENGINEER				
STATE REG.		NO.		

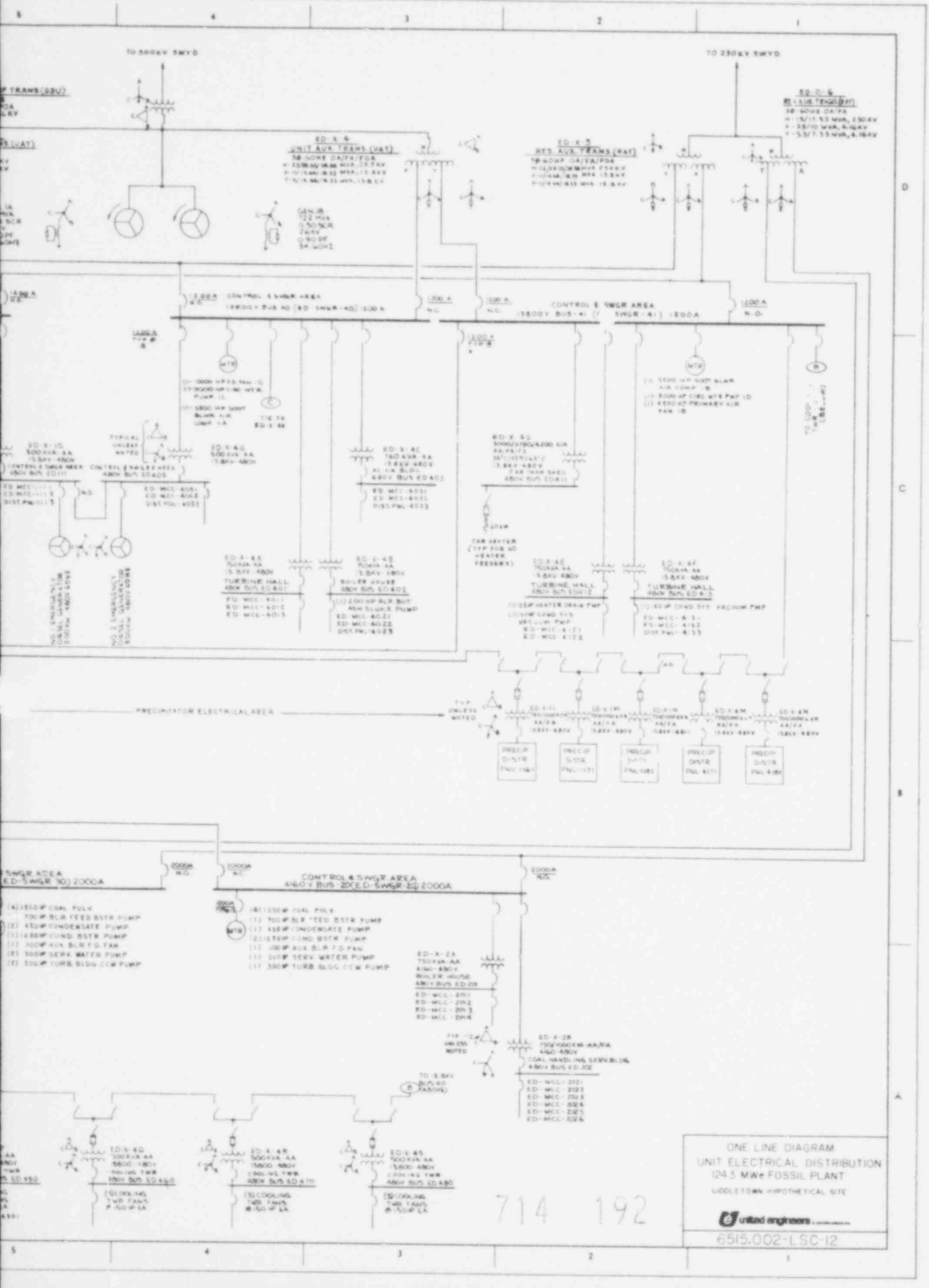
FLOW DIAGRAM
HEATER DRAINS & VENTS SYS.
1243 MWe FOSSIL PLANT
MIDDLETOWN HYPOTHETICAL SITE

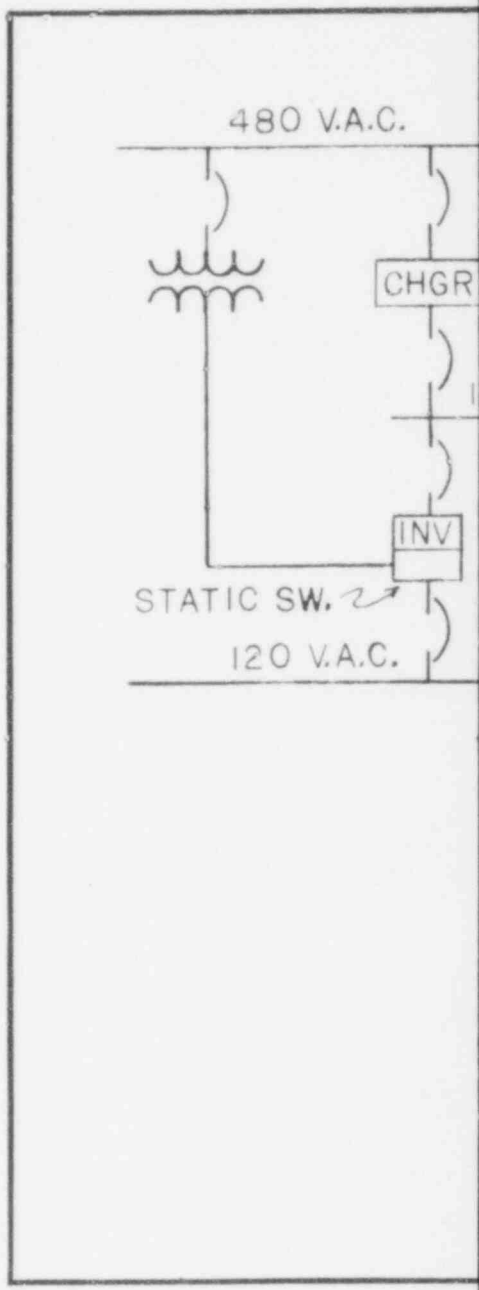
united engineers

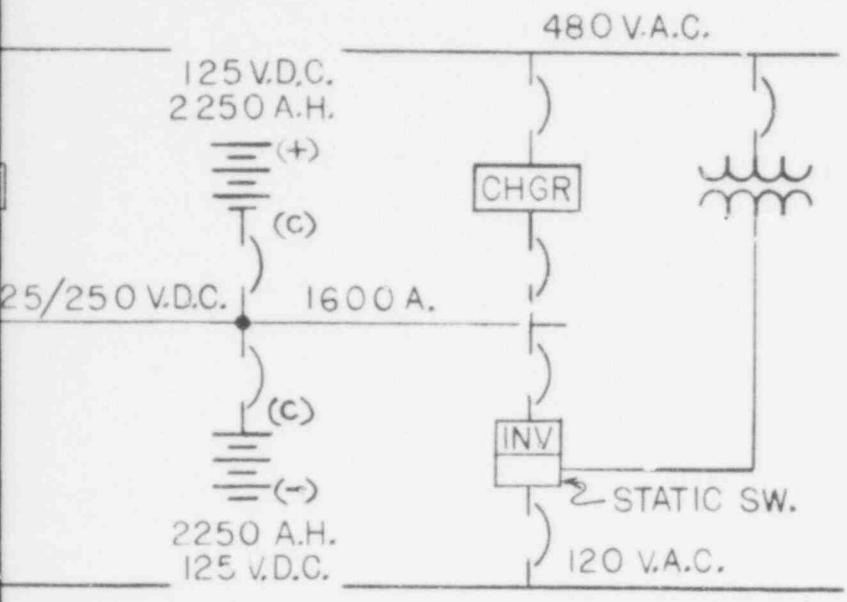
6515.002-LSC-11


ED-X-1
UNIT AUX TRANS (UAT)
ED-X-2
UNIT AUX TRANS (UAT)
CONTROL & SWGR AREA
13800V BUS-11 (ED-SWGR-11) 1200 A
COAL HANDLING SYSTEM SWITCHGEAR ROOM
4160V BUS-21 (ED-SWGR-21) 1200A
TURBINE HALL
480V BUS ED101
480V BUS ED102
TYP UNLESS NOTED
PRECIP DISTR
TO BUS 40
BUS TIE TO ED402
BUS TIE TO ED405
COOLING TWR
480V BUS ED150
480V BUS ED160
480V BUS ED170
480V BUS ED180
TRANSFER TOWER
ROTARY CAR DUMPER
CRUSHER HOUSE
COAL HANDLING SERV BLDG
480V BUS ED301
WASTE PUMP
MTR

714 191


TO 500KV SWYD
TO 230KV SWYD
ED-X-4
UNIT AUX. TRANS (UAT)
ED-X-5
RES. AUX. TRANS (RAT)
ED-X-6
GEN 1B
722 MVA
0.50 SCR
26KV
0.90 PF
3Ø 60HZ
CONTROL & SWGR AREA
13800V BUS 40 (ED-SWGR-40) 1200 A
CONTROL & SWGR AREA
13800V BUS 41 (ED-SWGR-41) 1200A
PRECIPITATOR ELECTRICAL AREA
PRECIP DISTR PNL
CONTROL & SWGR AREA
4160V BUS 20 (ED-SWGR-20) 2000A
NO. 1 EMERGENCY DIESEL GENERATOR
NO. 2 EMERGENCY DIESEL GENERATOR
TURBINE HALL
BOILER HOUSE
COAL HANDLING SERV. BLDG
COOLING TWR
ONE LINE DIAGRAM
UNIT ELECTRICAL DISTRIBUTION
1243 MWe FOSSIL PLANT
MIDDLETOWN HYPOTHETICAL SITE
united engineers
6515.002-LSC-12
714 192


480 V.A.C.
CHGR
INV
STATIC SW.
120 V.A.C.



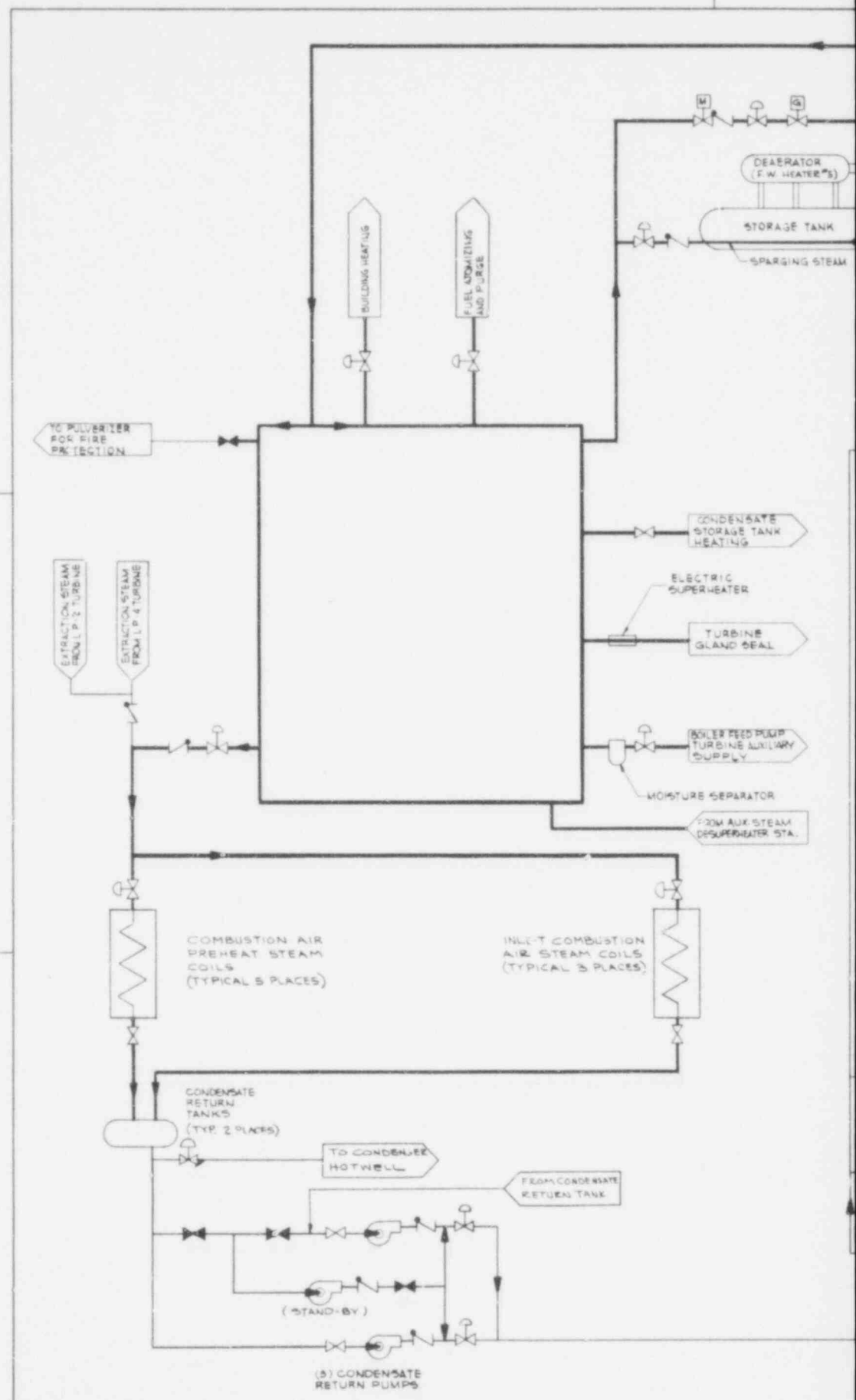
ENGINEER	DATE
STATE REG.	No.

ONE LINE DIAGRAM
D.C. DISTRIBUTION SYS.
1243 MWe FOSSIL PLANT

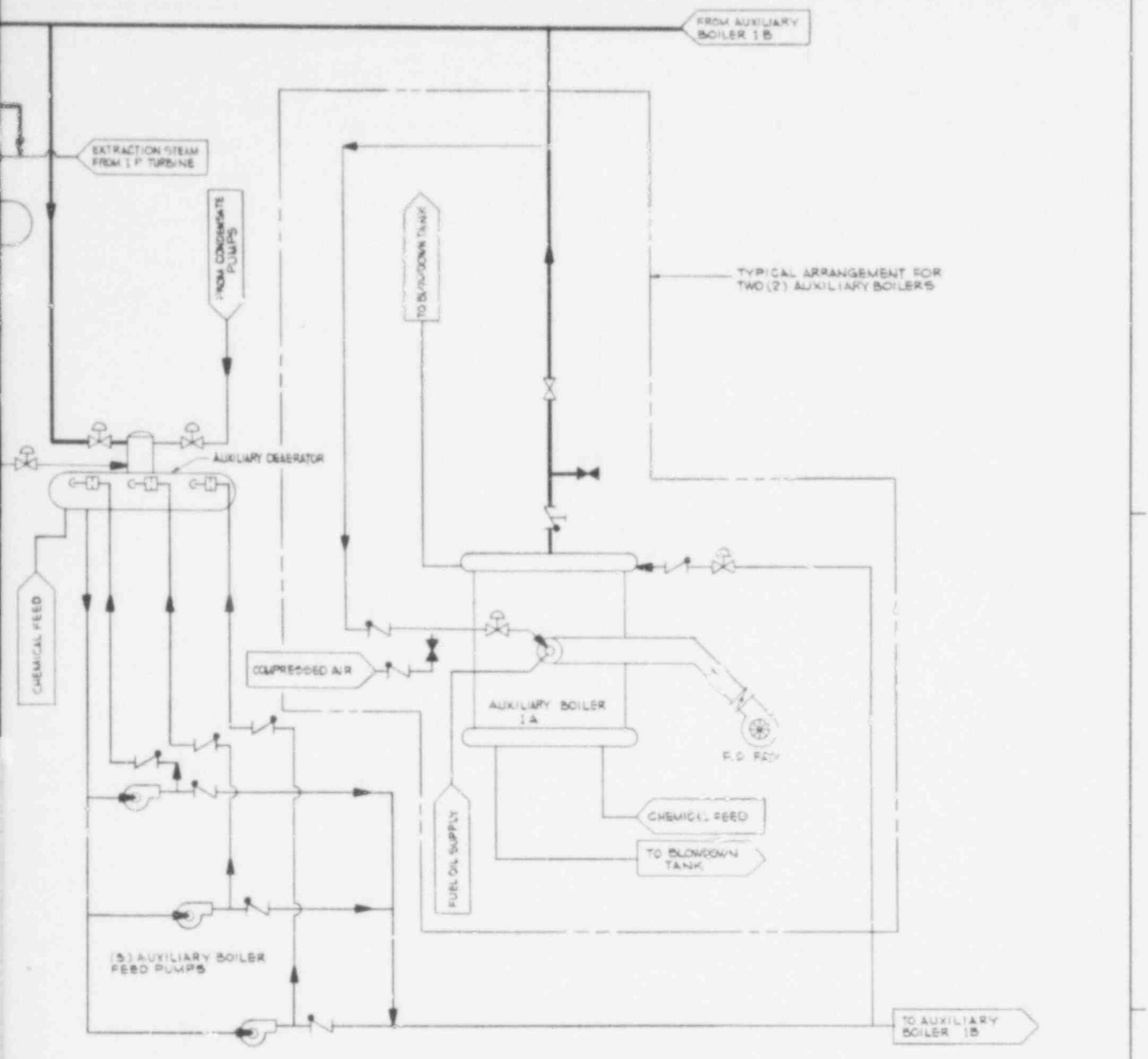
MIDDLETOWN HYPOTHETICAL SITE

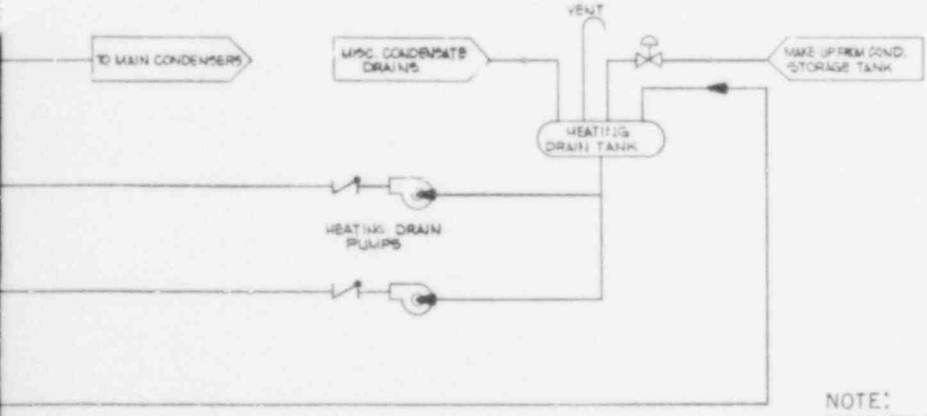
united engineers & constructors inc

6515.002-LSC-13


M
G
DEAERATOR (F.W. HEATER #5)
STORAGE TANK
SPARGING STEAM
BUILDING HEATING
FUEL ATOMIZING AND PURGE
TO PULVERIZER FOR FIRE PROTECTION
CONDENSATE STORAGE TANK HEATING
ELECTRIC SUPERHEATER
TURBINE GLAND SEAL
EXTRACTION STEAM FROM L.P. 2 TURBINE
EXTRACTION STEAM FROM L.P. 4 TURBINE
BOILER FEED PUMP TURBINE AUXILIARY SUPPLY
MOISTURE SEPARATOR
F-20M AUX. STEAM DESUPERHEATER STA.
COMBUSTION AIR PREHEAT STEAM COILS (TYPICAL 5 PLACES)
INLET COMBUSTION AIR STEAM COILS (TYPICAL 3 PLACES)
CONDENSATE RETURN TANKS (TYP. 2 PLACES)
TO CONDENSER HOTWELL
FROM CONDENSATE RETURN TANK
(STAND-BY)
(3) CONDENSATE RETURN PUMPS

714 195





NOTE:
FOR SYMBOL LEGEND SEE DWG. 6515.002-LSC-1

NO.	DATE	DESCRIPTION	CHKD.	SUP. ENG.
		FIRST ISSUE		

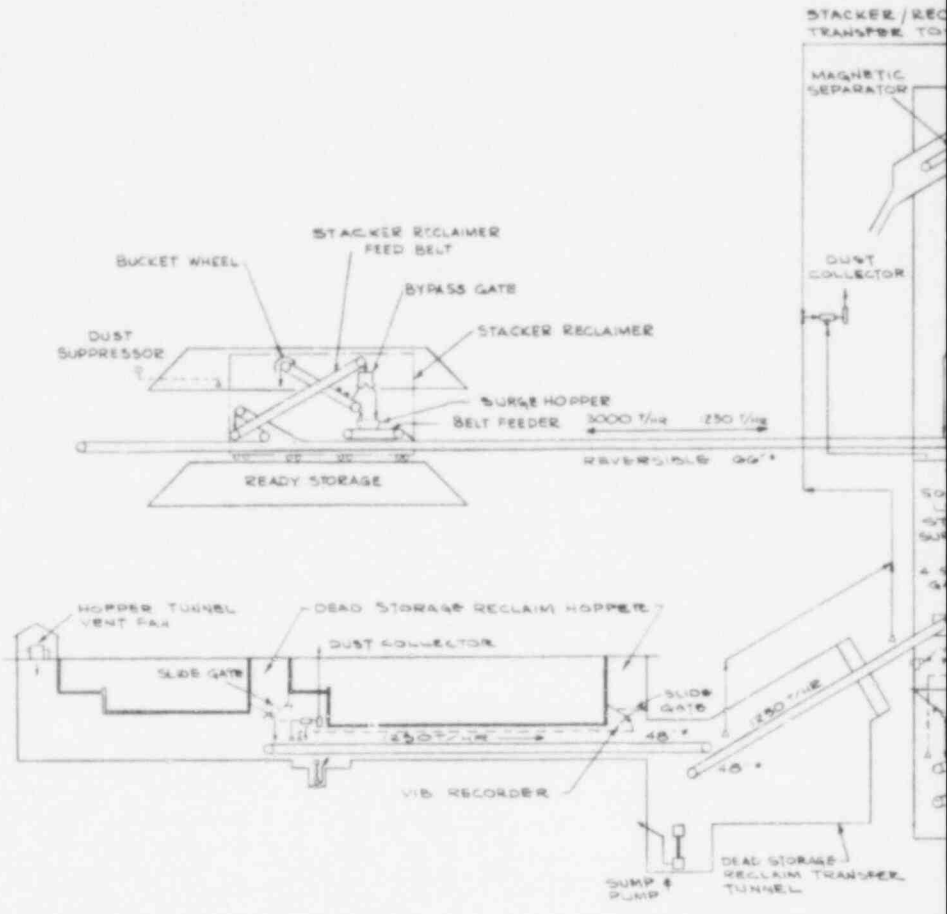
ENGINEER

STATE REG. NO.

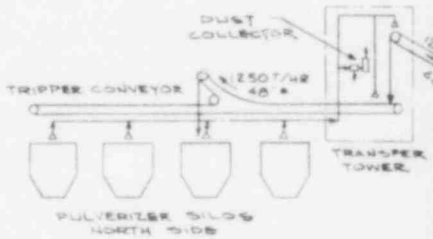
FLOW DIAGRAM
AUXILIARY STEAM SYSTEM
1243 MWe FOSSIL PLANT
MIDDLETOWN HYPOTHETICAL SITE

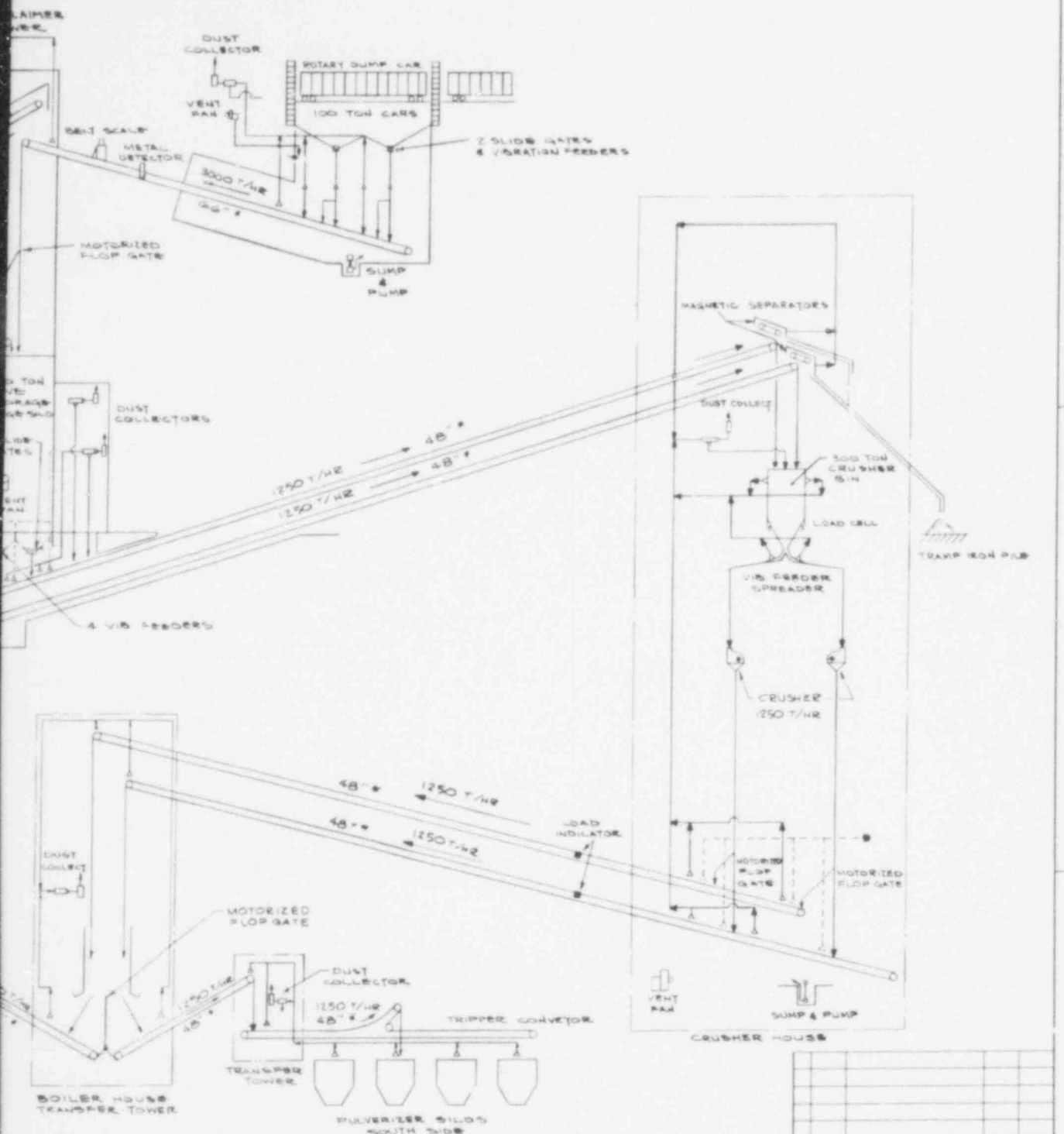
united engineers

6515.002-LSC-14


STACKER / REC
TRANSFER TO
MAGNETIC SEPARATOR
DUST COLLECTOR
STACKER RECLAIMER FEED BELT
BUCKET WHEEL
BYPASS GATE
DUST SUPPRESSOR
STACKER RECLAIMER
SURGE HOPPER
BELT FEEDER
3000 T/HR
230 T/HR
REVERSIBLE
READY STORAGE
HOPPER TUNNEL VENT FAN
DEAD STORAGE RECLAIM HOPPER
DUST COLLECTOR
SLIDE GATE
SLIDE GATE
230 T/HR
48 "
48 "
VIB RECORDER
SUMP & PUMP
DEAD STORAGE RECLAIM TRANSFER TUNNEL

* BELT WIDTH


DUST COLLECTOR
TRIPPER CONVEYOR
230 T/HR
48 "
TRANSFER TOWER
PULVERIZER SILOS NORTH SIDE

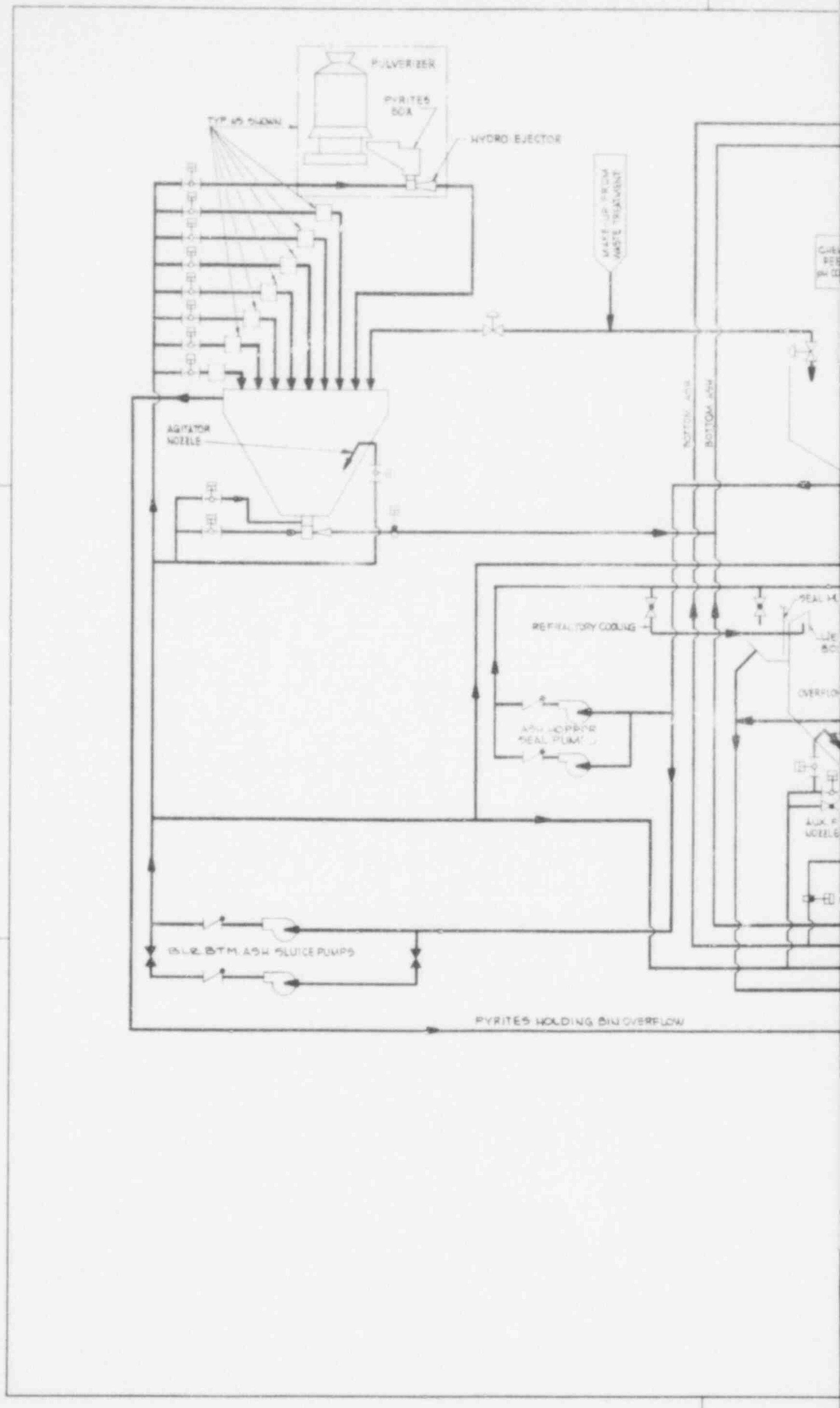


NO.	DATE	DESCRIPTION	CHKD	SUP. ENG.

FLOW DIAGRAM
COAL HANDLING SYSTEM
1243 MWe FOSSIL PLANT
MIDDLETOWN HYPOTHETICAL SITE

united engineers

6515.002-LSC-15


PULVERIZER
PYRITES BOX
TYP AS SHOWN
HYDRO EJECTOR
MAKE-UP FROM WASTE TREATMENT
AGITATOR NOZZLE
BOTTOM ASH
BOTTOM ASH
REFRACTORY COOLING
SEAL
ASH HOPPER SEAL PUMPS
BLR BTM ASH SLUICE PUMPS
PYRITES HOLDING BIN OVERFLOW

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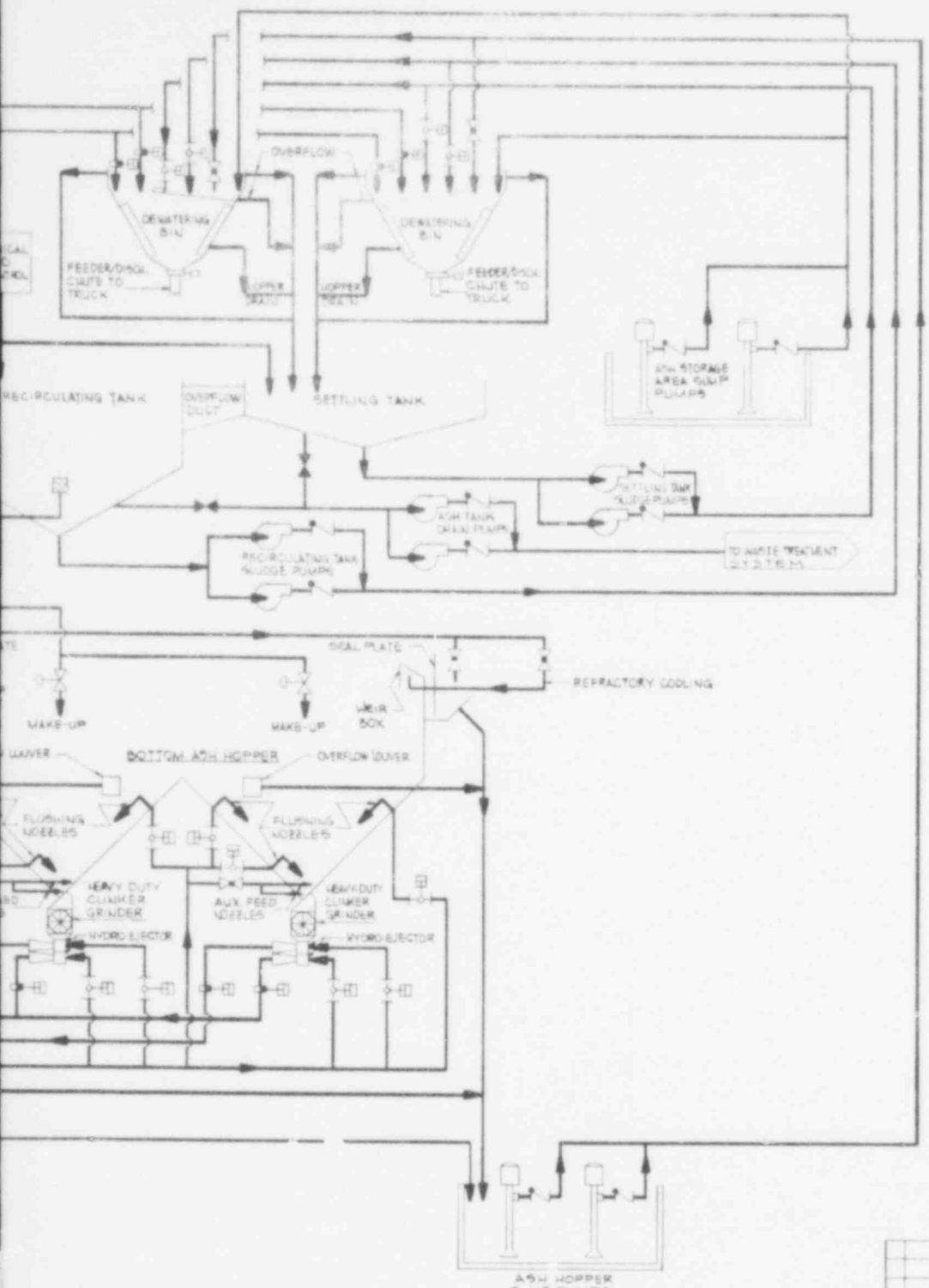


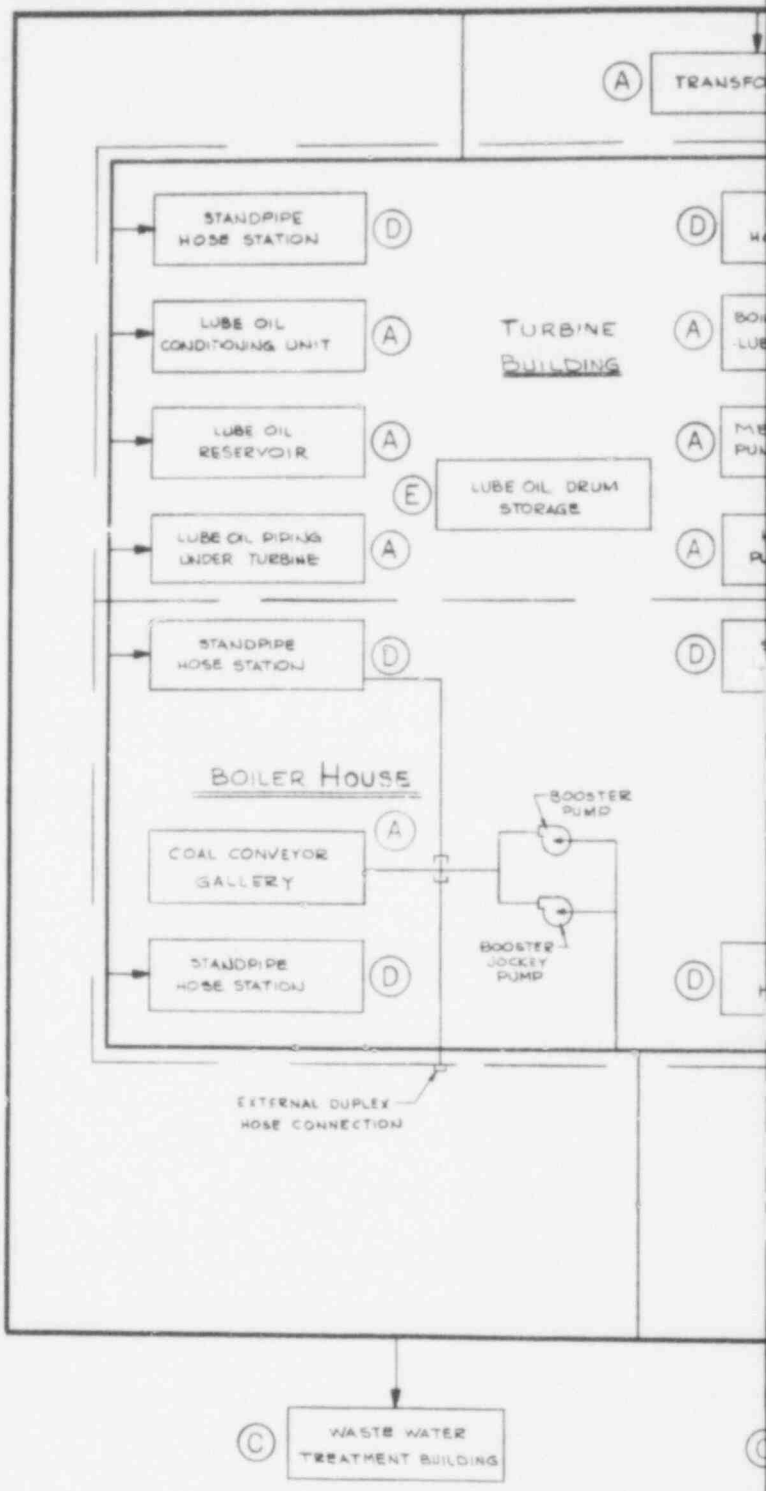
NOTE:
FOR SYMBOL LEGEND SEE DWG. 6515.002-LSC-1

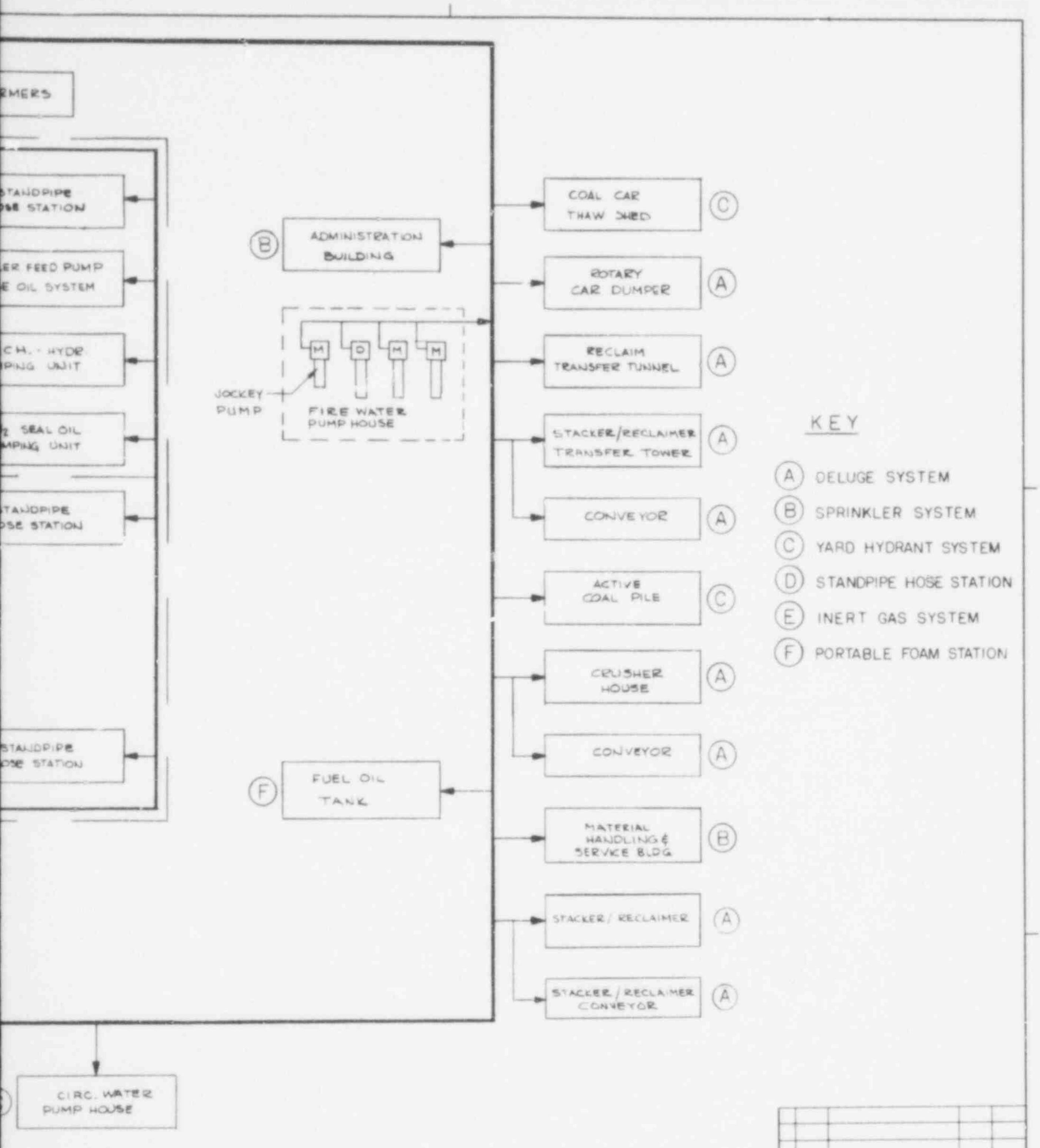
NO.	DATE	DESCRIPTION	ENGR.	SUP. ENG.

FLOW DIAGRAM
BOTTOM ASH HANDLING SYS.
1243 MWe FOSSIL PLANT
MIDDLETOWN HYPOTHETICAL SITE

united engineers

6515.002-LSC-16


A
TRANSFO
STANDPIPE HOSE STATION
D
LUBE OIL CONDITIONING UNIT
A
TURBINE BUILDING
LUBE OIL RESERVOIR
LUBE OIL DRUM STORAGE
E
LUBE OIL PIPING UNDER TURBINE
BOILER HOUSE
COAL CONVEYOR GALLERY
BOOSTER PUMP
BOOSTER JOCKEY PUMP
EXTERNAL DUPLEX HOSE CONNECTION
C
WASTE WATER TREATMENT BUILDING



NOTE:
FOR SYMBOL LEGEND SEE DWG. 6515002-LSC-1

FIRST ISSUE

BLOCK DIAGRAM
PLANT FIRE
PROTECTION SYSTEM
1243 MWe FOSSIL PLANT

MIDDLETOWN HYPOTHETICAL SITE

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6515.002-LSC-17

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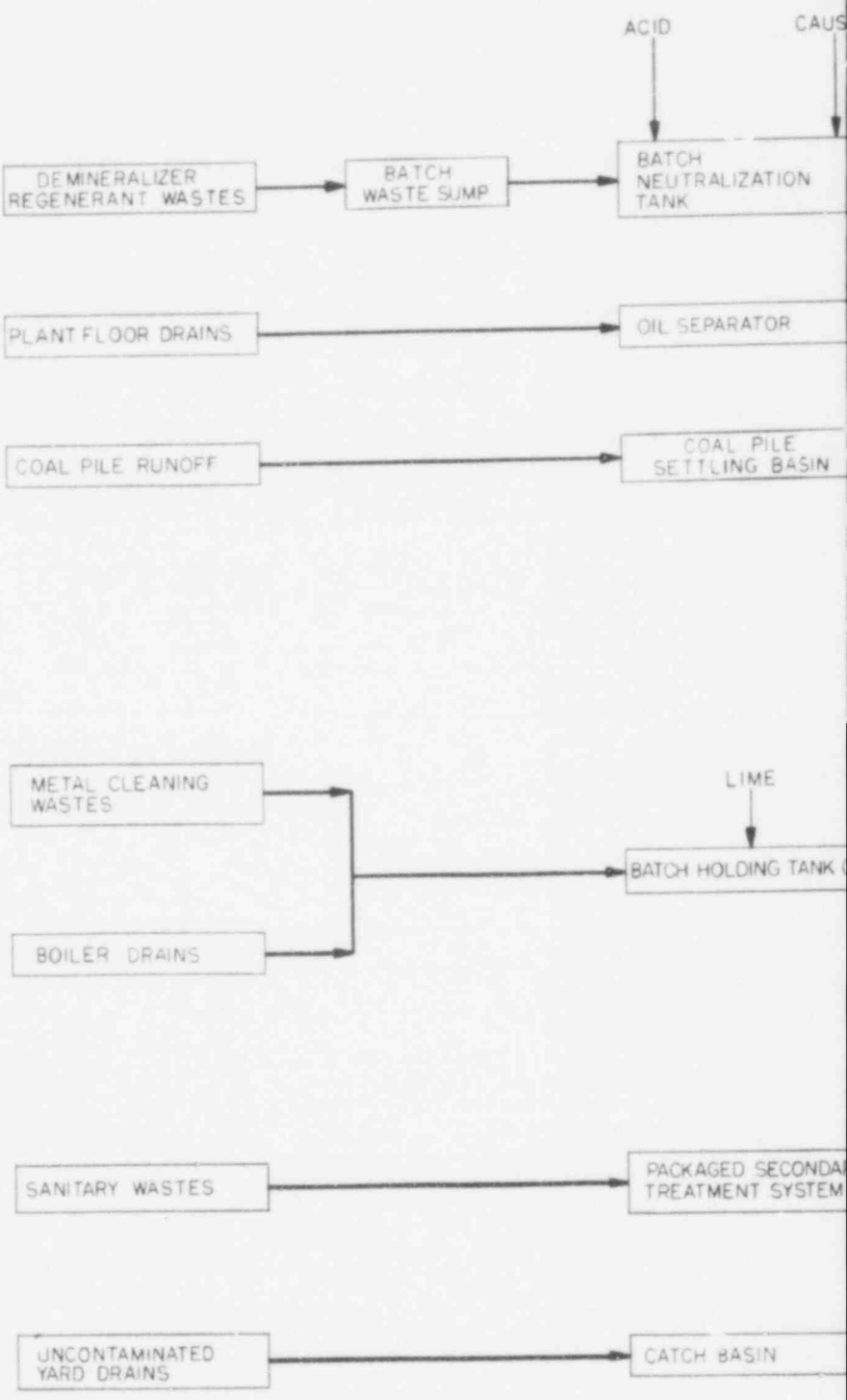
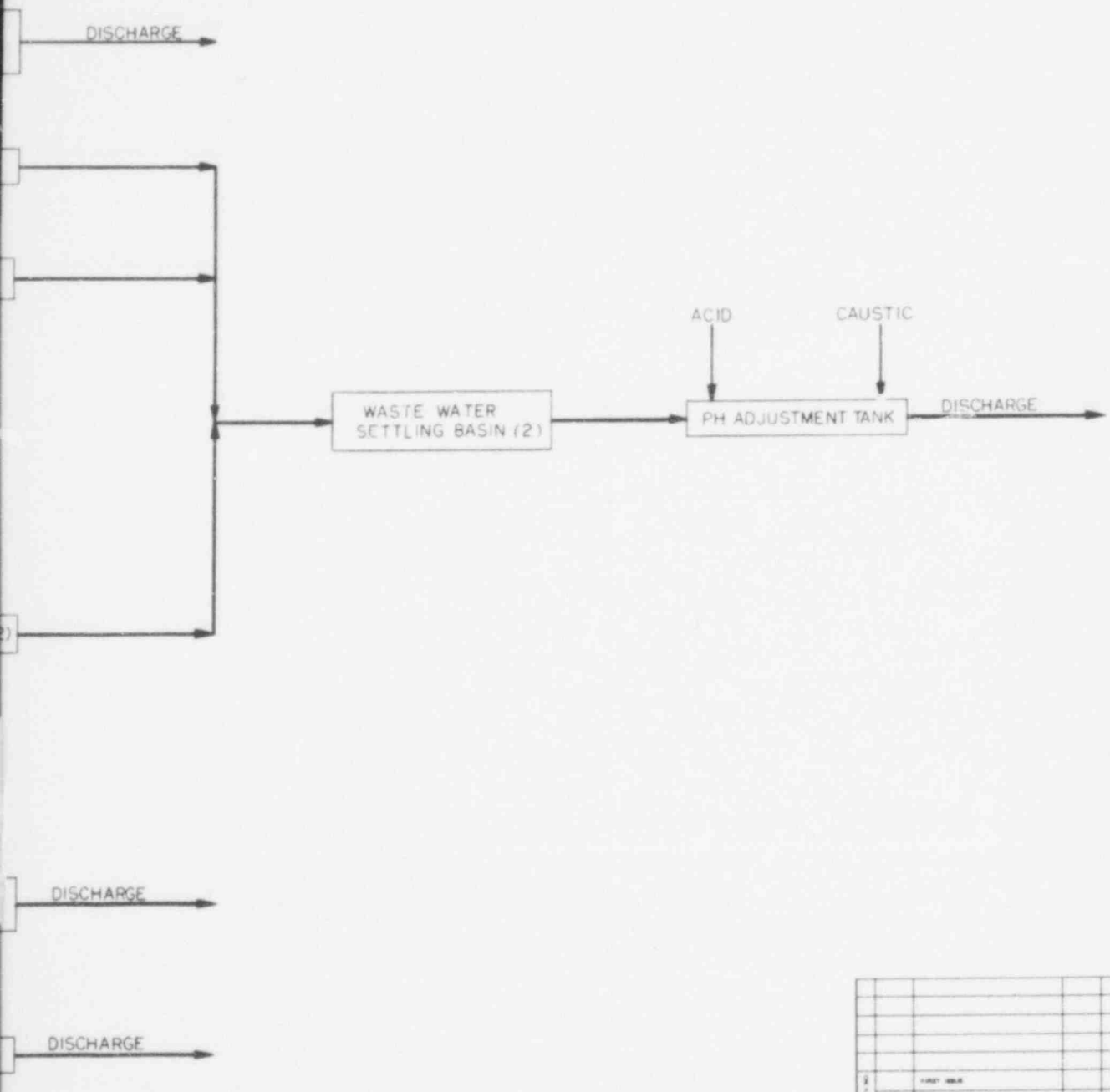

ACID
CAUS
DEMINERALIZER REGENERANT WASTES
BATCH WASTE SUMP
BATCH NEUTRALIZATION TANK
PLANT FLOOR DRAINS
OIL SEPARATOR
COAL PILE RUNOFF
COAL PILE SETTLING BASIN
METAL CLEANING WASTES
LIME
BATCH HOLDING TANK
BOILER DRAINS
SANITARY WASTES
PACKAGED SECONDA TREATMENT SYSTEM
UNCONTAMINATED YARD DRAINS
CATCH BASIN

TIC



NO.	DATE	DESCRIPTION	ENGR.	SUP. ENG.
		FIRST ISSUE		

ENGINEER

STATE REG. NO.

BLOCK DIAGRAM
WASTE WATER
TREATMENT SYSTEM
1243 MWe FOSSIL PLANT
MIDDLETOWN HYPOTHETICAL SITE

united engineers & constructors inc.

6515.002-LSC-18

SECTION 12

EQUIPMENT LIST

12

SECTION 12

EQUIPMENT LIST

12.1 INTRODUCTION

This section lists the account descriptions of the 1243 MWe LSC Coal-Fired plant design developed for this study.

As a convenience, the account descriptions are listed in accordance with an expanded AEC code-of-accounts (USAEC Report NUS-531), which permits correlation and cross-referencing with the cost estimate in Section 10, Volume III of this report.

In order to maintain consistency for the various systems in the equipment list, nine standard sub-account headings are used to group similar items, as follows:

1. Rotating Machinery
2. Heat Transfer Equipment
3. Tanks and Pressure Vessels
4. Purification and Filtration Equipment
5. Piping or Piping and Ductwork
6. Valves or Valves and Dampers
7. Piping - Miscellaneous Items
8. Instrumentation and Control
9. Foundation/Skids

EQUIPMENT LIST - REPORT 1

MODEL 630 - 1243 MWE/3300 MWT COAL - 2.5/1.7 IN HG AV - MIDDLETOWN,USA - LOW SULFUR - COST BASIS 07/76

ACCOUNT NUMBER	ITEM	DESCRIPTION
20 .	LAND AND LAND RIGHTS	
21 .	STRUCTURES + IMPROVEMENTS	
211.	YARDWORK	
211.1	GENERAL YARDWORK	
211.11	GENERAL CUT + FILL	
211.111	CUT + FILL BEYOND OPEN CUT	
211.112	CLEARING + GRUBBING	
211.113	FINE GRADING	
211.114	LANDSCAPING	
211.12	ROADS, WALKS+PARKING AREA	
211.121	SUBGRADE PREPARATION	
211.122	ON-SITE ROADS+PARKING AREA	
211.1221	ROADS - ASPHALT	
211.1222	PARKING AREAS - ASPHALT	
211.1223	CURBS - CONCRETE	
211.123	WALKS - CONCRETE	
211.14	FENCING + GATES	
211.141	PERMANENT FENCE	
211.142	GATE HOUSE	
211.15	SANITARY SEWER FACILITY	
211.151	SEWAGE TREATMENT FACILITY	
211.152	SANITARY PIPING	
211.1521	2 IN + SMALLER	

MODEL 630 - 1243 MWE/3300 MWT COAL - 2.5/1.7 IN HG AV - MIDDLETOWN,USA - LOW SULFUR - COST BASIS 07/76

ACCOUNT NUMBER	ITEM	DESCRIPTION
211.1522	2.5 IN + LARGER	
211.15221	CI BELL + SPIGOT/NNS	
211.153	OIL SEPERATORS	
211.16	YARD DRAINAGE STORM SEWERS	
211.161	DRAINS	
211.162	PIPING	
211.1621	2 IN + SMALLER	
211.1622	2.5 IN + LARGER	
211.16221	GALVANIZED/NNS	
211.17	ROADWAY + YARD LIGHTING	
211.19	SETTLING BASINS	
211.191	EARTH EXCAVATION	
211.192	ROCK EXCAVATION	
211.193	BACKFILL	
211.194	PUMPING	
211.195	FORMWORK	
211.196	REINFORCING STEEL	
211.197	CONCRETE	
211.198	SHEET PILING	
211.199	RIP-RAP(12 IN. THICK)	
211.4	RAILROADS	
211.41	CUT + FILL	
211.42	GRADING	

EQUIPMENT LIST - REPORT 1 08/15/77

MODEL 630 - 1243 MWE/3300 MWT COAL - 2.5/1.7 IN HG AV - MIDDLETOWN,USA - LOW SULFUR - COST BASIS 07/76

ACCOUNT NUMBER	ITEM	DESCRIPTION
211.43	TRACK(BALLAST,TIES,RAIL)	
211.45	SWITCHES + BUMPERS	
211.451	TURNOUTS(NO. 8)	
211.452	BUMPERS	
211.46	RIP RAP(24 IN. THICK)	
211.7	STRUCTURE ASSOCIATED YDWK.	
211.71	CUT + FILL	
211.711	OFF. CUT	
211.7111	DEWATERING	
211.7112	EARTH EXCAVATION	
211.7113	ROCK EXCAVATION	
211.712	FILL + BKFILL(PLACE/COMP)	
211.7122	EARTH FILL	
211.7123	SAND FILL	
211.7124	CONCRETE FILL	
212.	STEAM GENERATOR BUILDING	
212.1	BUILDING STRUCTURE	
212.11	EXCAVATION WORK	
212.111	EARTH EXCAVATION	
212.112	ROCK EXCAVATION	
212.113	CONCRETE FILL	
212.114	FILL + BACKFILL	
212.115	DEWATERING	

MODEL 630 - 1243 MWE/3300 MWT COAL - 2.5/1.7 IN HG AV - MIDDLETOWN,USA - LOW SULFUR - COST BASIS 07/76

ACCOUNT NUMBER	ITEM	DESCRIPTION
212.13	SUBSTRUCTURE CONCRETE	
212.131	FORMWORK	
212.132	REINFORCING STEEL	
212.133	CONCRETE	
212.134	EMBEDDED STEEL	
212.135	FLOOR FINISH	
212.139	WELDED WIRE FABRIC	
212.14	SUPERSTRUCTURE	
212.141	CONCRETE WORK	
212.1411	FORMWORK	
212.1412	REINFORCING STEEL	
212.1413	CONCRETE	
212.1415	FLOOR FINISH	
212.1416	CONSTRUCTION JOINTS	
212.142	STRUCTURAL + MISC. STEEL	
212.1421	STRUCTURAL STEEL	
212.1422	MISC. FRAMES,ETC.	
212.1423	FLOOR GRATING(GALVANIZED)	
212.1424	STAIR TREADS	
212.1425	HANDRAIL	
212.143	EXTERIOR WALLS	
212.1432	MASONRY WALLS	
212.1433	METAL INSULATED SIDING	

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MODEL 630 - 1245 MWE/3300 MWT COAL - 2.5/1.7 IN HG AV - MIDDLETOWN,USA - LOW SULFUR - COST BASIS 07/76

ACCOUNT NUMBER	ITEM	DESCRIPTION
212.144	ROOFING + FLASHING	
212.1441	METAL ROOF DECK	
212.1443	CONCRETE FILL	
212.1444	WELDED WIRE FABRIC	
212.1445	B.U. ROOFING, NO INSULATIN	
212.146	INTERIOR WALLS + PARTITION	
212.1462	MASONRY WALLS	
212.1463	METAL PARTITIONS	
212.147	DOORS + WINDOWS	
212.1471	ROLLING STEEL DOORS	
212.1472	PERSONNEL DOORS	
212.1473	SASH + GLAZING	
212.148	SPECIAL FINISHES	
212.1481	VINYL TILE FLOORS	
212.1482	COMPUTER FLOORS(RAISED)	
212.1483	CERAMIC TILE FLOOR + WALLS	
212.1484	ACOUSTICAL CEILING	
212.149	PAINTING	
212.1492	STEELWORK	
212.1493	HANDRAILS	
212.1494	DOORS + WALLS	
212.2	BUILDING SERVICES	
212.21	PLUMBING + DRAINS	

7114 211

EQUIPMENT LIST - REPORT 1 08/15/77

MODEL 630 - 1243 MWE/3500 MWT COAL - 2.5/1.7 IN HG AV - MIDDLETOWN,USA - LOW SULFUR - COST BASIS 07/76

ACCOUNT NUMBER	ITEM	DESCRIPTION
212.211	ROOF DRAINS + PIPING	
212.2111	DRAINS	
212.2115	PIPING	
212.212	FLOOR DRAINS + PIPING	
212.2121	DRAINS	
212.2125	PIPING	
212.213	OIL SEPERATOR	
212.22	HEATING,VENT + AIR COND	
212.221	BOILER ROOM	
212.2211	ROTATING MACHINERY	
212.22111	BOILER RM ROOF VENT+MOTOR	
212.221111	BOILER RM ROOF VENTILATOR	
212.221112	BOILER RM ROOF VENT MOTOR	
212.2212	HEAT TRANSFER EQUIPMENT	
212.22121	BOILER ROOM UNIT HEATERS	
212.2214	PURIFICATION + FILT EQUIP	
212.22141	BOILER RM VAC CLEAN SYS+MT	
212.221411	BOILER RM VAC CLEAN SYS EQ	
212.221412	BOILER RM VAC CL S MOTOR	
212.22142	BUNKER VENTILATION	
212.221421	CYCLONE DUST COLLECTOR	
212.2215	EXHAUST DUCTWORK-BUNKER	
212.2216	VALVES + DAMPERS	

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EQUIPMENT LIST - REPORT 1

MODEL 630 - 1243 NWE/3300 MWT COAL - 2.5/1.7 IN HG AV - MIDDLETOWN,USA - LOW SULFUR - COST BASIS 07/76

ACCOUNT NUMBER	ITEM	DESCRIPTION
212.22169	SPECIAL VALVES + DAMPERS	
212.221691	BOILER ROOM WALL LOUVERS	
212.222	LUBE OIL DRUM STORAGE	
212.2221	ROTATING MACHINERY	
212.22211	LUBE OIL DM ST EXHST FN+MT	
212.222111	LUBE OIL DM ST EXHAUST FAN	
212.222112	LUBE OIL DM ST EXHST MOTOR	
212.2222	HEAT TRANSFER EQUIPMENT	
212.22221	LUBE OIL DM ST HEATER+MTR	
212.222211	LUBE OIL DM ST UNIT HEATER	
212.222212	LUBE OIL DM ST HEATR MOTOR	
212.2226	VALVES + DAMPERS	
212.22269	SPECIAL VALVES + DAMPERS	
212.222691	LUBE OIL DM ST WALL LOUVER	
212.223	ELEVATOR MACHINE ROOM	
212.2233	HEAT TRANSFER EQUIPMENT	
212.22321	ELEV MACH RM BASEBOARD HTR	
212.2236	VALVES + DAMPERS	
212.22369	SPECIAL VALVES + DAMPERS	
212.223691	ELEV MACH RM WALL LOUVERS	
212.2239	FOUNDATIONS/SKIDS	
212.22391	ELEV MACH RM AIR UNIT+MTR	
212.223911	ELEV MACH RM AIR UNIT	

711.4
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EQUIPMENT LIST - REPORT 1 08/15/77

MODEL 61J - 1243 MWE/5300 MWT COAL - 2.5/1.7 IN HG AV - MIDDLETOWN,USA - LOW SULFUR - COST BASIS 07/76

ACCOUNT NUMBER	ITEM	DESCRIPTION
212.223912	ELEV MACH RM AIR UNT MOTOR	
212.224	AUXILIARY BOILER ROOM	
212.2241	ROTATING MACHINERY	
212.22411	AUX BOILER RM EXHST FN+MTR	
212.224111	AUX BOILER RM EXHAUST FAN	
212.224112	AUX BOILER RM EXHST MOTOR	
212.2242	HEAT TRANSFER EQUIPMENT	
212.22421	AUX BOILER RM HEATER+MOTOR	
212.224211	AUX BOILER RM UNIT HEATERS	
212.224212	AUX BOILER RM HEATER MOTOR	
212.2246	VALVES + DAMPERS	
212.22469	SPECIAL VALVES + DAMPERS	
212.224691	AUX BOILER RM WALL LOUVER	
212.225	MACHINE SHOP	
212.2251	ROTATING MACHINERY	
212.22511	MACHINE SHOP EXHST FAN+MTR	
212.225111	MACHINE SHOP EXHAUST FAN	
212.225112	MACHINE SHOP EXHAUST MOTOR	
212.2252	HEAT TRANSFER EQUIPMENT	
212.22521	MACH SHOP UNIT HEATERS+MTR	
212.225211	MACHINE SHOP UNIT HEATERS	
212.225212	MACH SHOP UNIT HEATER MTR	
212.2256	VALVES + DAMPERS	

EQUIPMENT LIST - REPORT 1 08/15/77

MODEL 630 - 1243 MWE/3300 MWT COAL - 2.5/1.7 IN HG AV - MIDDLETOWN,USA - LOW SULFUR - COST BASIS 07/76

ACCOUNT NUMBER	ITEM	DESCRIPTION
212.22569	SPECIAL VALVES + DAMPERS	
212.225691	MACHINE SHOP WALL LOUVERS	
212.226	AIR COMPRESSOR ROOM	
212.2261	ROTATING MACHINERY	
212.22611	AIR COMP RM EXHST FAN+MTR	
212.226111	AIR COMP RM EXHAUST FAN	
212.226112	AIR COMP RM EXHAUST MOTOR	
212.2262	HEAT TRANSFER EQUIPMENT	
212.22621	AIR COMP RM UNIT HEATR+MTR	
212.226211	AIR COMP RM UNIT HEATERS	
212.226212	AIR COMP RM UNIT HEATR MTR	
212.2266	VALVES + DAMPERS	
212.22669	SPECIAL VALVES + DAMPERS	
212.226691	AIR COMP RM WALL LOUVERS	
212.227	COAL TRIPPER GALLERY	
212.2271	ROTATING MACHINERY	
212.22711	COAL TRIP GAL ROOF VENT+MT	
212.227111	COAL TRIP GAL ROOF VENT	
212.227112	COAL TRIP GAL ROOF VENT MT	
212.228	INSTRUMENTATION + CONTROL	
212.24	LIGHTING + SERVICE POWER	
212.25	ELEVATOR	
212.251	ELEVATOR EQUIPMENT	

EQUIPMENT LIST - REPORT 1 08/15/77

MODEL 630 - 1243 MWE/3300 MWT COAL - 2.5/1.7 IN HG AV - MIDDLETOWN,USA - LOW SULFUR - COST BASIS 07/76

ACCOUNT NUMBER	ITEM	DESCRIPTION
212.26	FIRE PROTECTION SYSTEM	
212.261	ROTATING MACHINERY	
212.2611	FIRE PROTECTION PUMP+MOTOR	
212.26111	FIRE PROTECTION PUMP	
212.26112	FIRE PROTECTION PUMP MOTOR	
212.262	HOSE + SPRAY EQUIPMENT	
212.2621	HOSE REELS	
212.2622	SPRAY HEADS	
212.265	PIPING	
212.2652	2.5 IN + LARGER	
212.26521	CS/NNS	
213.	TURBINE,HEATER,CONTROL BLD	
213.1	BUILDING STRUCTURE	
213.11	EXCAVATION WORK	
213.111	EARTH EXCAVATION	
213.112	ROCK EXCAVATION	
213.113	CONCRETE FILL	
213.114	FILL + BACKFILL	
213.115	DEWATERING	
213.13	SUBSTRUCTURE CONCRETE	
213.131	FORMWORK	
213.132	REINFORCING STEEL	
213.133	CONCRETE	

EQUIPMENT LIST - REPORT 1

MODEL 639 - 1243 MWE/3300 MWT COAL - 2.5/1.7 IN HG AV - MIDDLETOWN,USA - LOW SULFUR - COST BASIS 07/76

ACCOUNT NUMBER	ITEM	DESCRIPTION
213.134	EMBEDDED STEEL	
213.135	FLOOR FINISH	
213.136	WATERPROOFING	
213.137	CONSTRUCTION JOINTS	
213.138	RUBBING CONCRETE SURFACE	
213.139	WIRE FABRIC	
213.14	SUPERSTRUCTURE	
213.141	CONCRETE WORK	
213.1411	FORMWORK	
213.14111	FORMWORK - WOOD	
213.14112	FORMWORK - METAL	
213.1412	REINFORCING STEEL	
213.1413	CONCRETE	
213.1414	EMBEDDED STEEL	
213.1415	FLOOR FINISH	
213.1416	WATERPROOFING	
213.1417	RUBBING CONCRETE SURFACES	
213.1418	CONSTRUCTION JOINTS	
213.142	STRUCTURAL + MISC STEEL	
213.1421	STRUCTURAL STEEL	
213.1422	FLOOR + PLATFORM SUPPORTS	
213.1423	MISC FRAMES, ETC	
213.1424	CHECKERED PLATE	

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EQUIPMENT LIST - REPORT 1

MODEL 630 - 1243 MWE/3300 MWT COAL - 2.5/1.7 IN HG AV - MIDDLETOWN,USA - LOW SULFUR - COST BASIS 07/76

ACCOUNT NUMBER	ITEM	DESCRIPTION
213.1425	FLOOR GRATING(GALV)	
213.1426	STAIR TREADS	
213.1427	HANDRAIL	
213.143	EXTERIOR WALLS	
213.1431	CONCRETE WALLS	
213.1432	MASONRY WALLS	
213.1433	METAL INSULATED SIDING	
213.144	ROOF DECK	
213.1441	METAL ROOF DECK	
213.1442	CONCRETE PLANK	
213.1443	CONCRETE FILL	
213.1444	REINFORCING STEEL	
213.145	ROOFING + FLASHING	
213.1451	B.U. ROOF INSULATION+FLASH	
213.1452	ELASTOMERIC ROOFING	
213.146	INTERIOR WALLS+PARTITIONS	
213.1461	MASONRY WALLS	
213.1462	CONCRETE BLOCK WALLS	
213.1463	METAL PARTITIONS	
213.147	DOORS + WINDOWS	
213.1471	ROLLING STEEL DOORS	
213.1472	PERSONNEL DOORS	
213.1473	SASH + GLAZING	

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EQUIPMENT LIST - REPORT 1

MODEL 653 - 1243 MWE/3300 MWT COAL - 2.5/1.7 IN HG AV - MIDDLETOWN,USA - LOW SULFUR - COST BASIS 07/76

ACCOUNT NUMBER	ITEM	DESCRIPTION
213.146	SPECIAL FINISHES	
213.1461	VINYL TILE FLOORS	
213.1464	ACOUSTICAL CEILING	
213.149	PAINTING	
213.1491	CONCRETE	
213.1492	STEELWORK	
213.1493	DOORS + WALLS	
213.1494	HANDRAIL	
213.2	BUILDING SERVICES	
213.21	PLUMBING + DRAINS	
213.211	ROOF DRAINS + PIPING	
213.2111	DRAINS	
213.2115	PIPING	
213.21151	2 IN + SMALLER	
213.21152	2.5 IN + LARGER	
213.211521	GALV STEEL/NNS	
213.212	FLOOR DRAINS + PIPING	
213.2121	DRAINS	
213.2125	PIPING	
213.21251	2 IN + SMALLER	
213.21252	2.5 IN + LARGER	
213.212521	CI/NNS	
213.212522	CS/NNS	

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MODEL 650 - 1243 MWE/3300 MWT COAL - 2.5/1.7 IN HG AV - MIDDLETOWN,USA - LOW SULFUR - COST BASIS 07/76

ACCOUNT NUMBER	ITEM	DESCRIPTION
213.212523	PVC/NNS	
213.215	PUMPS	
213.2151	DRAIN PUMP + MOTOR	
213.21511	DRAIN PUMP	
213.21512	DRAIN PUMP MOTOR	
213.214	SANITARY DRAINS + PIPING	
213.2141	SANITARY FIXTURES	
213.2145	PIPING	
213.21451	2 IN + SMALLER	
213.214511	CI/NNS	
213.214512	COPPER/NNS	
213.21452	2.5 IN + LARGER	
213.214521	CI/NNS	
213.22	HEATING,VENT + AIR COND	
213.221	GENERAL BUILDING	
213.2211	ROTATING MACHINERY	
213.22111	ROOF VENTILATOR + MOTOR	
213.221111	ROOF VENTILATOR	
213.221112	ROOF VENTILATOR MOTOR	
213.2212	HEAT TRANSFER EQUIPMENT	
213.22121	STEAM HEATER UNIT + MOTOR	
213.221211	STEAM UNIT HEATER	
213.221212	STEAM UNIT MOTOR	

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EQUIPMENT LIST - REPORT 1

MODEL 630 - 1243 MWE/3300 MWT COAL - 2.5/1.7 IN HG AV - MIDDLETOWN,USA - LOW SULFUR - COST BASIS 07/76

ACCOUNT NUMBER	ITEM	DESCRIPTION
213.2215	PIPING	
213.22151	2 IN + SMALLER	
213.221511	CS/NNS	
213.22152	2.5 IN + LARGER	
213.221521	CS/NNS	
213.2216	VALVES + DAMPERS	
213.22161	GATE	
213.22162	CHECK	
213.22169	SPECIAL VALVES + DAMPERS	
213.221691	INTAKE LOUVERS	
213.2217	PIPING - MISC ITEMS	
213.22171	HANGERS + SUPPORTS	
213.22172	INSULATION	
213.222	HEATER BAY	
213.2221	ROTATING MACHINERY	
213.22211	ROOF VENTILATOR + MOTOR	
213.222111	ROOF VENTILATOR	
213.222112	ROOF VENTILATOR MOTOR	
213.223	LUBE OIL ROOM	
213.2231	ROTATING MACHINERY	
213.22311	LUBE OIL RM EXHST FAN+MTR	
213.223111	LUBE OIL RM EXHST FAN	
213.223112	LUBE OIL RM EXHST FAN MTR	

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EQUIPMENT LIST - REPORT 1

MODEL 630 - 1243 MWE/3300 MWT COAL - 2.5/1.7 IN HG AV - MIDDLETOWN,USA - LOW SULFUR - COST BASIS 07/76

ACCOUNT NUMBER	ITEM	DESCRIPTION
213.2236	VALVES	
213.22369	SPECIAL VALVES + DAMPERS	
213.223691	DAMPERS	
213.225	CONTROL ROOM	
213.2251	ROTATING MACHINERY	
213.22511	CHILLER WATER PUMP + MOTOR	
213.225111	CHILLER WATER PUMP	
213.225112	CHILLER WATER PUMP MOTOR	
213.22512	CONTROL RM EXHST FAN+MOTOR	
213.225121	CONTROL RM EXHST FAN	
213.225122	CONTROL RM EXHST FAN MOTOR	
213.2252	HEAT TRANSFER EQUIPMENT	
213.22521	CHILLER + MOTOR	
213.225211	CHILLER	
213.225212	CHILLER MOTOR	
213.22522	MULTIZONE AIR UNIT+MOTOR	
213.225221	MULTIZONE AIR HANDLING UNT	
213.225222	MULTIZONE AIR UNIT MOTOR	
213.22523	HEATING+VENT AIR UNIT+MTR	
213.225231	HEATING+VENT AIR UNIT	
[illegible]	HEATING+VENT AIR UNIT MTR	
213.2255	PIPING + DUCTWORK	
213.22551	[illegible] NETWORK	

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EQUIPMENT LIST - REPORT 1 08/15/77

MODEL 630 - 1243 MWE/3300 MWT COAL - 2.5/1.7 IN HG AV - MIDDLETOWN,USA - LOW SULFUR - COST BASIS C7/76

ACCOUNT NUMBER	ITEM	DESCRIPTION
213.226	WATER SAMPLING ROOM	
213.2261	ROTATING MACHINERY	
213.22611	WATR SAMP RM EXHST FAN+MTR	
213.226111	WATER SAMP RM EXHST FAN	
213.226112	WATR SAMP RM EXHST FAN MTR	
213.227	COAL SAMPLING ROOM	
213.2271	ROTATING MACHINERY	
213.22711	COAL SAMP RM EXHST FAN+MTR	
213.227111	COAL SAMP RM EXHST FAN	
213.227112	COAL SAMP RM EXHST FAN MTR	
13.228	BATTERY ROOM	
13.2281	ROTATING MACHINERY	
213.22811	BATTERY ROOM EXHST FAN+MTR	
213.228111	BATTERY ROOM EXHST FAN	
213.228112	BATTERY ROOM EXHST FAN MTR	
213.229	INSTRUMENTATION + CONTROL	
213.23	FIRE PROTECTION SYSTEM	
213.232	HOSE + SPRAY EQUIPMENT	
213.2321	HOSE REELS	
213.2322	SPRAY HEADS	
213.235	PIPING	
213.2352	2.5 IN + LARG	
213.23521	CS/NNS	

EQUIPMENT LIST - REPORT 1

MODEL 630 - 1243 MWE/3300 MWT COAL - 2.5/1.7 IN HG AV - MIDDLETOWN,USA - LOW SULFUR - COST BASIS 07/76

ACCOUNT NUMBER	ITEM	DESCRIPTION
213.236	VALVES	
213.2369	SPECIAL VALVES	
213.23691	DELUGE VALVES	
213.24	LIGHTING + SERVICE POWER	
2168.	ADMINISTRATION+SERVICE BLG	
2168.1	BUILDING STRUCTURE	
2168.11	EXCAVATION WORK	
2168.111	EARTH EXCAVATION	
2168.112	ROCK EXCAVATION	
2168.113	CONCRETE FILL	
2168.114	FILL + BACKFILL	
2168.115	DEWATERING	
2168.13	SUBSTRUCTURE CONCRETE	
2168.131	FORMWORK	
2168.132	REINFORCING STEEL	
2168.133	CONCRETE	
2168.134	EMBEDDED STEEL	
2168.135	FLOOR FINISH	
2168.136	WATERPROOFING	
2168.137	CONSTRUCTION JOINTS	
2168.138	RUBBING CONCRETE SURFACES	
2168.139	WELDED WIRE FABRIC	
2168.14	SUPERSTRUCTURE	

EQUIPMENT LIST - REPORT 1

MODEL 630 - 1243 MWE/3300 MWT COAL - 2.5/1.7 IN HG AV - MIDDLETOWN,USA - LOW SULFUR - COST BASIS 07/76

ACCOUNT NUMBER	ITEM	DESCRIPTION
2188.141	CONCRETE WORK	
2188.1411	FORMWORK	
2188.14111	FORMWORK-WOOD	
2188.14112	FORMWORK-METAL	
2188.1412	REINFORCING STEEL	
2188.1413	CONCRETE	
2188.1414	EMBEDDED STEEL	
2188.1415	FLOOR FINISH	
2188.1416	WATERPROOFING	
2188.1417	RUBBING CONCRETE SURFACES	
2188.1418	CONSTRUCTION JOINTS	
2188.142	STRUCTURAL + MISC. STEEL	
2188.1421	STRUCTURAL STEEL	
2188.1423	MISC. FRAMES,ETC.	
2188.1425	FLOOR GRATING(GALV.)	
2188.1426	STAIR TREADS	
2188.1427	HANDRAIL	
2188.143	EXTERIOR WALLS	
2188.1431	CONCRETE WALLS	
2188.1432	MASONRY WALLS	
2188.1433	METAL INSULATED SIDING	
2188.1434	WINDOW WALL	
2188.144	ROOF DECK	

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MODEL 630 - 1243 MWE/3300 MWT COAL - 2.5/1.7 IN HG AV - MIDDLETOWN,USA - LOW SULFUR - COST BASIS 07/76

ACCOUNT NUMBER	ITEM	DESCRIPTION
2188.1442	PRECAST CONCRETE PANELS	
2188.145	ROOFING + FLASHING	
2188.1451	B.U. ROOF INSUL + FLASHING	
2188.146	INTERIOR WALLS+PARTITIONS	
2188.1462	MASONRY WALLS	
2188.1463	METAL PARTITIONS	
2188.147	DOORS + WINDOWS	
2188.1471	ROLLING STEEL DOORS	
2188.1472	PERSONNEL DOORS	
2188.1473	SASH + GLAZING	
2188.148	WALLS,FLOOR+CEILING FINISH	
2188.1481	VINYL FLOOR TILE	
2188.1482	CERAMIC TILE FLOOR	
2188.1483	CARPET	
2188.1484	CERAMIC TILE WALL FINISH	
2188.1485	SUSPENDED CEILING	
2188.149	PAINTING	
2188.1491	CONCRETE	
2188.1492	STEELWORK	
2188.1495	HANDRAIL	
2188.1497	DOORS + WALLS	
2188.2	BUILDING SERVICES	
2188.21	PLUMBING + DRAINS	

MODEL 630 - 1243 MWE/3300 MWT COAL - 2.5/1.7 IN HG AV - MIDDLETOWN,USA - LOW SULFUR - COST BASIS 07/76

ACCOUNT NUMBER	ITEM	DESCRIPTION
2188.211	ROOF DRAINS + PIPING	
2188.2111	DRAINS	
2188.2115	PIPING	
2188.21152	2.5 IN+LARGER(GALV/NNS)	
2188.212	FLOOR DRAINS + PIPING	
2188.2121	DRAINS	
2188.2125	PIPING	
2188.21251	2.5 IN+LARGER(CS/NNS)	
2188.21252	2.5 IN+LARGER(CI/NNS)	
2188.213	PLUMBING FIXTURES+PIPING	
2188.2131	FIXTURES	
2188.2132	DOMESTIC WATER HEATERS	
2188.2135	PIPING	
2188.21351	2 IN + SMALLER(CS/NNS)	
2188.21352	2 IN + SMALLER(COPPER/NNS)	
2188.21353	2.5 IN+LARGER(CS/NNS)	
2188.22	HEATING,VENT + AIR COND	
2188.221	AIR CONDITIONING SYSTEMS	
2188.2214	FOUNDATIONS/SKIDS	
2188.22191	MULTIZONE AIR UNIT + MOTOR	
2188.222	EXHAUST AIR SYSTEMS	
2188.2223	ROTATING MACHINERY	
2188.22231	TOILET RM EXHAUST FAN+MTR	

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MODEL 630 - 1243 MWE/3300 MWT COAL - 2.5/1.7 IN HG AV - MIDDLETOWN,USA - LOW SULFUR - COST BASIS 07/76

ACCOUNT NUMBER	ITEM	DESCRIPTION
2188.22232	FUME HOOD EXHAUST FAN+MTR	
2188.22233	RETURN AIR FANS + MOTORS	
2188.223	REFRIG CHILLED WATER SYS	
2188.2231	ROTATING MACHINERY	
2188.22311	CHILLER + MOTOR	
2188.22322	CHILLED WATER PUMP + MOTOR	
2188.224	BUILDING HEATING SYSTEMS	
2188.2241	HEAT TRANSFER EQUIPMENT	
2188.22411	HEAT+VENT AIR UNIT + MOTOR	
2188.22412	ELECTRIC BASEBOARD HEATERS	
2188.225	PIPING	
2188.2251	2 IN+SMALLER	
2188.22511	CS/NNS	
2188.2252	2.5 IN+LARGER	
2188.22521	CS/NNS	
2188.226	VALVES	
2188.2261	GATE	
2188.2262	CHECK	
2188.2263	GLOBE	
2188.2265	SAFETY/RELIEF	
2188.2268	PLUG	
2188.2267	SPECIAL VALVES	
2188.227	PIPING-MISC. ITEMS	

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EQUIPMENT LIST - REPORT 1

MODEL 630 - 1243 MWE/3300 MWT COAL - 2.5/1.7 IN HG AV - MIDDLETOWN,USA - LOW SULFUR - COST BASIS 07/76

ACCOUNT NUMBER	ITEM	DESCRIPTION
2138.2271	HANGERS	
2138.228	DUCTWORK	
2138.229	INSTRUMENTATION+CONTROL	
2138.23	FIRE PROTECTION	
2138.231	FIRE HOSE CABINETS	
2138.232	SPRINKLERS	
2138.24	LIGHTING+SERVICE POWER	
2138.25	ELEVATOR	
2138.251	ELEVATOR EQUIPMENT	
2130.	FIRE PUMPHOUSE	
2131.	ELECTRICAL SWITCHGR BLDGS	
2181.1	BUILDING STRUCTURE	
2131.11	EXCAVATION WORK	
2181.111	EXCAVATION-EARTH	
2181.114	BACKFILL-EARTH	
2131.13	SUBSTRUCTURE CONCRETE	
2181.131	FORMWORK	
2181.132	REINFORCING STEEL	
2131.133	CONCRETE	
2181.134	EMBEDDED STEEL	
2181.135	FLOOR FINISH	
2181.139	WIRE FABRIC	
2181.14	SUPERSTRUCTURE	

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MODEL 630 - 1243 MWE/3300 MWT COAL - 2.5/1.7 IN HG AV - MIDDLETOWN,USA - LOW SUL UR - COST BASIS 07/76

ACCOUNT NUMBER	ITEM	DESCRIPTION
216I.142	STRUCTURAL + MISC. STEEL	
218I.1421	PREFAB BUILDING	
218I.147	DOORS + WINDOWS	
218I.1472	PERSONNEL DOORS	
218I.1473	SASH + GLAZING	
216I.2	BUILDING SERVICES	
216I.21	PLUMBING + DRAINS	
218I.22	HEATING,VENT + AIR COND	
218I.24	LIGHTING + SERVICE POWER	
218L	STACK/RECLAIM TRANSFR TOWR	
218L.1	BUILDING STRUCTURE	
218L.11	EXCAVATION WORK	
218L.111	EXCAVATION-EARTH	
218L.114	BACKFILL-EARTH	
218L.13	SUBSTRUCTURE CONCRETE	
218L.131	FORMWORK	
218L.132	REINFORCING STEEL	
216L.133	CONCRETE	
218L.134	EMBEDDED STEEL	
218L.135	FLOOR FINISH	
218L.14	SUPERSTRUCTURE	
218L.142	STRUCTURAL + MISC STEEL	
218L.1421	STRUCTURAL STEEL	

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MODEL 630 - 1243 MWE/3300 MWT COAL - 2.5/1.7 IN HG AV - MIDDLETOWN,USA - LOW SULFUR - COST BASIS 07/76

ACCOUNT NUMBER	ITEM	DESCRIPTION
218L.1422	MISC. STEEL	
218L.1423	FLOOR GRATING	
218L.1424	STAIR TREADS	
218L.143	EXTERIOR WALLS	
218L.1432	METAL UNINSULATED WALLS	
218L.144	ROOF DECK	
218L.1441	METAL UNINSULATED ROOF	
218L.147	DOORS + WINDOWS	
218L.1472	PERSONNEL DOORS	
218L.149	PAINTING	
218L.1491	STEELWORK	
218L.1493	HANDRAIL	
218L.2	BUILDING SERVICES	
218L.22	HEATING,VENT + AIR COND	
218L.24	LIGHTING + SERVICE POWER	
218M.	COAL CAR THAW SHED	
218M.1	BUILDING STRUCTURE	
218M.11	EXCAVATION WORK	
218M.111	EXCAVATION-EARTH	
218M.114	BACKFILL-EARTH	
218M.13	SUBSTRUCTURE CONCRETE	
218M.131	FORMWORK	
218M.132	REINFORCING STEEL	

MODEL 630 - 1243 MWE/3300 MWT COAL - 2.5/1.7 IN HG AV - MIDDLETOWN,USA - LOW SULFUR - COST BASIS 07/76

ACCOUNT NUMBER	ITEM	DESCRIPTION
218M.133	CONCRETE	
218M.134	EMBEDDED STEEL	
218M.14	SUPERSTRUCTURE	
218M.24	LIGHTING + SERVICE POWER	
218N.	ROTARY CAR DUMP BLDG+TUNNL	
218N.1	BUILDING STRUCTURE	
218N.11	EXCAVATION WORK	
218N.111	EXCAVATION-EARTH	
218N.112	EXCAVATION-ROCK	
218N.114	BACKFILL-EARTH	
218N.115	DEWATERING	
218N.13	SUBSTRUCTURE CONCRETE	
218N.131	FORMWORK	
218N.132	REINFORCING STEEL	
218N.133	CONCRETE	
218N.134	EMBEDDED STEEL	
218N.135	FLOOR FINISH	
218N.139	WIRE FABRIC	
218N.14	SUPERSTRUCTURE	
218N.141	CONCRETE WORK	
218N.142	STRUCTURAL + MISC STEEL	
218N.1421	STRUCTURAL STEEL	
218N.1423	MISC STEEL	

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MODEL 630 - 1243 MWE/3300 MWT COAL - 2.5/1.7 IN HG AV - MIDDLETOWN,USA - LOW SULFUR - COST BASIS 07/76

ACCOUNT NUMBER	ITEM	DESCRIPTION
218N.1425	FLOOR GRATING	
218N.1426	STAIR TREADS	
218N.143	EXTERIOR WALLS	
218N.1433	METAL INSULATED SIDING	
218N.1434	METAL UNINSULATED SIDING	
218N.144	ROOF DECK	
218N.1441	METAL ROOF DECK -INSULATED	
218N.1442	METAL ROOF DECK-UNINSUL	
218N.145	INTERIOR WALLS	
218N.1462	MASONRY	
218N.147	DOORS + WINDOWS	
218N.1472	PERSONNEL DOORS	
218N.1474	WINDOWS -INSULATED GLASS	
218N.2	BUILDING SERVICES	
218N.21	DRAINS + PIPING	
218N.211	ROOF DRAINS + PIPING	
218N.212	FLOOR DRAINS + PIPING	
218N.213	PLUMBING FIXTURES+PIPING	
218N.2131	FIXTURES	
218N.2132	DOMESTIC WATER HEATERS	
218N.215	PIPING	
218N.22	HEAT,VENT+AIR CONDITIONING	
218N.23	FIRE PROTECTION	

MODEL 630 - 1243 MWE/3500 MWT COAL - 2.5/1.7 IN HG AV - MIDDLETOWN,USA - LOW SULFUR - COST BASIS 07/76

ACCOUNT NUMBER	ITEM	DESCRIPTION
2134.24	LIGHTING + SERVICE POWER	
2160.	DEAD STORAGE RECLM HOPPERS	
2160.1	BUILDING STRUCTURE	
2160.11	EXCAVATION WORK	
2160.111	EXCAVATION-EARTH	
2160.114	BACKFILL-EARTH	
2160.13	SUBSTRUCTURE CONCRETE	
2160.131	FORMWORK	
2160.132	REINFORCING STEEL	
2160.133	CONCRETE	
2160.134	EMBEDDED STEEL	
2160.135	FLOOR FINISH	
213P.	COAL CRUSHER HOUSE	
213P.1	BUILDING STRUCTURE	
213P.11	EXCAVATION WORK	
213P.111	EXCAVATION-EARTH	
213P.114	BACKFILL-EARTH	
213P.13	SUBSTRUCTURE CONCRETE	
213P.131	FORMWORK	
213P.132	REINFORCING STEEL	
213P.133	CONCRETE	
213P.134	EMBEDDED STEEL	
213P.135	FLOOR FINISH	

EQUIPMENT LIST - REPORT 1

MODEL 833 - 1243 MWE/3300 MWT COAL - 2.5/1.7 IN HG AV - MIDDLETOWN,USA - LOW SULFUR - COST BASIS 07/76

ACCOUNT NUMBER	ITEM	DESCRIPTION
21GP.139	WIRE FABRIC	
21GP.14	SUPERSTRUCTURE	
21GP.141	CONCRETE WORK	
21GP.1411	FORMWORK	
21GP.14111	METAL FORMWORK	
21GP.1413	CONCRETE	
21GP.142	STRUCTURAL + MISC STEEL	
21GP.1421	STRUCTURAL STEEL	
21GP.143	EXTERIOR WALLS	
21GP.1434	METAL UNINSULATED SIDING	
21GP.144	ROOF DECK	
21GP.1442	METAL ROOF DECK-UNINSUL	
21GP.147	INTERIOR WALLS	
21GP.1472	MASONRY	
21GP.147	DOORS + WINDOWS	
21GP.1472	PERSONNEL DOORS	
21GP.2	BUILDING SERVICES	
21GP.21	DRAINS + PIPING	
21GP.211	ROOF DRAINS + PIPING	
21GP.212	FLOOR DRAINS + PIPING	
21GP.22	HEATING,VENT + AIR COND	
21GP.24	LIGHTING + WIRING	
21GP.25	ELEVATOR	

MODEL 630 - 1243 MWE/3300 MWT COAL - 2.5/1.7 IN HG AV - MIDDLETOWN,USA - LOW SULFUR - COST BASIS 07/76

ACCOUNT NUMBER	ITEM	DESCRIPTION
218P.251	ELEVATOR EQUIPMENT	
218Q.	BOILER HOUSE TRANSFR TOWER	
218Q.1	BUILDING STRUCTURE	
218Q.11	EXCAVATION WORK	
218Q.111	EXCAVATION-EARTH	
218Q.114	BACKFILL-EARTH	
218Q.13	SUBSTRUCTURE CONCRETE	
218Q.131	FORMWORK	
218Q.132	REINFORCING STEEL	
218Q.133	CONCRETE	
218Q.134	EMBEDDED STEEL	
218Q.14	SUPERSTRUCTURE	
218Q.141	CONCRETE WORK	
218Q.1411	FORMWORK	
218Q.14111	METAL FORMWORK	
218Q.1413	CONCRETE	
218Q.142	STRUCTURAL + MISC STEEL	
218Q.1421	STRUCTURAL STEEL	
218Q.143	EXTERIOR WALLS	
218Q.1435	METAL INSULATED SIDING	
218Q.1434	METAL UNINSULATED SIDING	
218Q.144		
218Q.1441	METAL ROOF DECK	

MODEL 630 - 1243 MWE/3300 MWT COAL - 2.5/1.7 IN HG AV - MIDDLETOWN,USA - LOW SULFUR - COST BASIS 07/76

ACCOUNT NUMBER	ITEM	DESCRIPTION
218Q.147	DOORS + WINDOWS	
218Q.1472	PERSONNEL DOORS	
218Q.2	BUILDING SERVICES	
218Q.22	HEATING,VENT + AIR COND	
218Q.24	LIGHTING + SERVICE POWER	
218R.	DEAD STORAGE TRANSFER TUNL	
218R.1	BUILDING STRUCTURE	
218R.11	EXCAVATION WORK	
218R.111	EXCAVATION-EARTH	
218R.114	BACKFILL-EARTH	
218R.13	SUBSTRUCTURE CONCRETE	
218R.131	FORKWORK	
218R.132	REINFORCING STEEL	
218R.133	CONCRETE	
218R.134	EMBEDDED STEEL	
218R.135	FLOOR FINISH	
218R.2	BUILDING SERVICES	
218R.24	LIGHTING + SERVICE POWER	
218T.	LOCOMOTIVE REPAIR GARAGE	
218T.1	BUILDING STRUCTURE	
218T.11	EXCAVATION WORK	
218T.111	EXCAVATION-EARTH	
218T.114	BACKFILL-EARTH	

MODEL 630 - 1243 MWE/3300 MWT COAL - 2.5/1.7 IN HG AV - MIDDLETOWN,USA - LOW SULFUR - COST BASIS 07/76

ACCOUNT NUMBER	ITEM	DESCRIPTION
218T.13	SUBSTRUCTURE CONCRETE	
218T.131	FORMWORK	
218T.132	REINFORCING STEEL	
218T.133	CONCRETE	
218T.134	EMBEDDED STEEL	
218T.135	FLOOR FINISH	
218T.139	WIRE FABRIC	
218T.14	SUPERSTRUCTURE	
218T.141	CONCRETE WORK	
218T.142	STRUCTURAL + MISC STEEL	
218T.1421	STRUCTURAL STEEL	
218T.143	EXTERIOR WALLS	
218T.1433	METAL INSULATED SIDING	
218T.144	ROOF DECK	
218T.1441	METAL ROOF DECK	
218T.147	DOORS + WINDOWS	
218T.1471	ROLLING STEEL DOORS	
218T.1472	PERSONNEL DOORS	
218T.2	BUILDING SERVICES	
218T.22	HEATING,VENT + AIR COND	
218T.24	LIGHTING + SERVICE POWER	
218U.	MATERIAL HANDL+SERVICE BLD	
218U.1	BUILDING STRUCTURE	

EQUIPMENT LIST - REPORT 1

MODEL 630 - 1243 MWE/3300 MWT COAL - 2.5/1.7 IN HG AV - MIDDLETOWN,USA - LOW SULFUR - COST BASIS 07/76

ACCOUNT NUMBER	ITEM	DESCRIPTION
2180.11	EXCAVATION WORK	
2180.111	EXCAVATION-EARTH	
2180.114	BACKFILL-EARTH	
2180.13	SUBSTRUCTURE CONCRETE	
2180.131	FORMWORK	
2180.132	REINFORCING STEEL	
2180.133	CONCRETE	
2180.134	EMBEDDED STEEL	
2180.135	FLOOR FINISH	
2180.139	WIRE FABRIC	
2180.14	SUPERSTRUCTURE	
2180.141	CONCRETE WORK	
2180.142	STRUCTURAL + MISC STEEL	
2180.143	EXTERIOR WALLS	
2180.1433	METAL INSULATED SIDING	
2180.1434	METAL UNINSULATED SIDING	
2180.144	ROOF DECK	
2180.1441	METAL ROOF DECK	
2180.145	ROOFING + FLASHING	
2180.1451	B.U. ROOF,INSUL + FLASHING	
2180.146	INTERIOR WALLS	
2180.1462	MASONRY	
2180.1463	TOILET PARTITIONS	

MODEL 630 - 1243 MWE/3300 MWT COAL - 2.5/1.7 IN HG AV - MIDDLETOWN,USA - LOW SULFUR - COST BASIS 07/76

ACCOUNT NUMBER	ITEM	DESCRIPTION
213U.147	DOORS + WINDOWS	
213U.1471	ROLLING STEEL DOORS	
213U.1472	PERSONNEL DOORS	
213U.1473	SASH + GLAZING	
213U.148	WALLS,FLOOR+CEIL FINISH	
213U.1481	VINYL FLOOR TILE	
213U.1482	CERAMIC FLOOR TILE	
213U.1485	SUSPENDED CEILING	
213U.1486	CEMENT PLASTER CEILING	
213U.2	BUILDING SERVICES	
213U.21	DRAINS + PIPING	
213U.211	ROOF DRAINS + PIPING	
213U.212	FLOOR DRAINS + PIPING	
213U.22	HEATING,VENT + AIR COND	
213U.23	FIRE PROTECTION	
213U.24	LIGHTING + SERVICE POWER	
213V.	WASTE WATER TREATMENT BLDG	
213V.1	WASTE WATER EQUIPMENT BLDG	
213V.11	BUILDING STRUCTURE	
213V.111	EXCAVATION WORK	
213V.1111	EXCAVATION-EARTH	
213V.1114	BACKFILL-EARTH	
213V.113	SUBSTRUCTURE CONCRETE	

EQUIPMENT LIST - REPORT 1

MODEL 63C - 1243 MWE/3300 MWT COAL - 2.5/1.7 IN HG AV - MIDDLETOWN,USA - LOW SULFUR - COST BASIS 07/76

ACCOUNT NUMBER	ITEM	DESCRIPTION
218V.1131	FORMWORK	
218V.1132	REINFORCING STEEL	
218V.1133	CONCRETE	
218V.1134	EMBEDDED STEEL	
218V.1135	FLOOR FINISH	
218V.1139	WIRE FABRIC	
218V.114	SUPERSTRUCTURE	
218V.1141	CONCRETE WORK	
218V.1142	STRUCTURAL + MISC STEEL	
218V.1143	EXTERIOR WALLS	
218V.11433	METAL INSULATED SIDING	
218V.1145	ROOFING + FLASHING	
218V.11455	METAL ROOF DECK	
218V.1147	DOORS + WINDOWS	
218V.11471	ROLLING STEEL DOORS	
218V.11472	PERSONNEL DOORS	
218V.1149	PAINTING	
218V.11495	DOORS	
218V.12	BUILDING SERVICES	
218V.121	PLUMBING + DRAINS	
218V.1212	FLOOR DRAINS + PIPING	
218V.122	HEATING,VENT + AIR COND	
218V.1221	ROTATING MACHINERY	

EQUIPMENT LIST - REPORT 1 08/15/77

MODEL 630 - 1243 MWE/3300 MWT COAL - 2.5/1.7 IN HG AV - MIDDLETOWN,USA - LOW SULFUR - COST BASIS 07/76

ACCOUNT NUMBER	ITEM	DESCRIPTION
213V.12211	POWER ROOF VENTILATOR+MTR	
213V.1222	HEAT TRANSFER EQUIPMENT	
216V.12221	ELECTRIC UNIT HEATERS+MTR	
213V.1225	VALVES + DAMPERS	
21ov.12259	WALL LOUVERS	
218V.123	FIRE PROTECTION EQUIPMENT	
218v.1231	PORTABLE FIRE EXTINGUISH	
213V.124	LIGHTING + SERVICE POWER	
213V.2	WASTE WATER SETTLING BASIN	
213V.21	EXCAVATION WORK	
213v.211	EXCAVATION-EARTH	
218V.214	BACKFILL-EARTH	
216v.23	SUBSTRUCTURE CONCRETE	
216v.231	FORMWORK	
213V.232	REINFORCING STEEL	
218V.233	CONCRETE	
218V.3	API OIL SEPARATOR	
213V.31	BUILDING STRUCTURE	
213V.311	EXCAVATION WORK	
218V.3111	EXCAVATION-EARTH	
218V.311-	BACKFILL-EARTH	
218V.313	SUBSTRUCTURE CONCRETE	
218V.3131	FORMWORK	

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MODEL 630 - 1243 MWE/3300 MWT COAL - 2.5/1.7 IN HG AV - MIDDLETOWN,USA - LOW SULFUR - COST BASIS 07/76

ACCOUNT NUMBER	ITEM	DESCRIPTION
218V.3132	REINFORCING STEEL	
218V.3133	CONCRETE	
218V.314	SUPERSTRUCTURE	
218V.3141	CONCRETE WORK	
218V.3142	STRUCTURAL + MISC STEEL	
218V.31421	CARBON STEEL PLUME	
218W.	MISC COAL HANDLING STRUCT	
218W.1	CONVEYOR GALLERIES	
218W.11	BUILDING STRUCTURE	
218W.111	EXCAVATION WORK	
218W.1111	EXCAVATION-EARTH	
218W.1114	BACKFILL-EARTH	
218W.113	SUBSTRUCTURE CONCRETE	
218W.1131	FORMWORK	
218W.1132	REINFORCING STEEL	
218W.1133	CONCRETE	
218W.1134	EMBEDDED STEEL	
218W.114	SUPERSTRUCTURE	
218W.1141	CONCRETE WORK	
218W.1142	STRUCTURAL + MISC STEEL	
218W.11421	STRUCTURAL STEEL	
218W.11423	MISC. FRAMES, ETC.	
218W.11425	METAL WALKWAYS	

EQUIPMENT LIST - REPORT 1 08/15/77

MODEL 630 - 1243 MWE/3300 MWT COAL - 2.5/1.7 IN HG AV - MIDDLETOWN,USA - LOW SULFUR - COST BASIS 07/76

ACCOUNT NUMBER	ITEM	DESCRIPTION
218W.1143	EXTERIOR WALLS	
218W.11433	METAL INSULATED SIDING	
218W.1144	ROOF DECK	
218W.11441	METAL ROOF DECK-INSULATED	
218W.2	STACKER/RECLAIMER	
218W.21	BUILDING STRUCTURE	
218W.211	EXCAVATION WORK	
218W.2111	EXCAVATION-EARTH	
218W.2113	BACKFILL-BALLAST	
218W.2114	BACKFILL-EARTH	
218W.2115	BACKFILL-BALLAST	
218W.213	SUBSTRUCTURE CONCRETE	
218W.2131	FORMWORK	
218W.2132	REINFORCING STEEL	
218W.2133	CONCRETE	
218W.2134	EMBEDDED STEEL	
218W.214	SUPERSTRUCTURE	
218W.2141	TRACK(BALLAST,TIES,RAIL)	
218W.3	COAL PILE MEMBRANE BARRIER	
218W.31	EARTHWORK	
218W.32	MEMBRANE BARRIER	
218W.5	BUILDING SERVICES	
218W.54	LIGHTING + SERVICE POWER	

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EQUIPMENT LIST - REPORT 1

MODEL 630 - 1243 MWE/3300 MWT COAL - 2.5/1.7 IN HG AV - MIDDLETOWN,USA - LOW SULFUR - COST BASIS 07/76

ACCOUNT NUMBER	ITEM	DESCRIPTION
219.	STACK STRUCTURE	
219.1	STRUCTURE	
219.11	EXCAVATION WORK	
219.111	EXCAVATION-EARTH	
219.112	EXCAVATION-ROCK	
219.114	BACKFILL-EARTH	
219.115	DEWATERING	
219.13	SUBSTRUCTURE CONCRETE	
219.131	FORMWORK	
219.132	REINFORCING STEEL	
219.133	CONCRETE	
219.14	SUPERSTRUCTURE	
219.141	CONCRETE WORK	
219.1412	REINFORCING STEEL	
219.1413	CONCRETE	
219.1414	BRICK LINER	
219.142	STRUCTURAL + MISC STEEL	
219.1421	STRUCTURAL STEEL	
219.2	CHIMNEY SERVICES	
219.24	AIRCRAFT WARNING LIGHTS	
219.25	ELEVATOR	
219.26	LIGHTNING PROTECTION	
22 .	BOILER PLANT EQUIPMENT	

EQUIPMENT LIST - REPORT 1 08/15/77

MODEL 63D - 1243 MWE/3300 MWT COAL - 2.5/1.7 IN HG AV - MIDDLETOWN,USA - LOW SULFUR - COST BASIS 07/76

ACCOUNT NUMBER	ITEM	DESCRIPTION
220A.	FOSSIL STEAM SUPPLY SYSTEM	
220A.1	QUOTED FSSS PRICE	
220A.2	DISTRIBUTED FSSS COST	
220A.21	STEAM GENERATING EQUIPMENT	
220A.211	SUPERCRITICAL PRESS BOILER	
220A.212	ASSOCIATED BOILER SYSTEMS	
220A.213	MISC BOILER SYSTEMS	
220A.214	SOOTBLOWERS	
220A.22	DRAFT EQUIPMENT	
220A.221	FORCED DRAFT FAN + MOTOR	
220A.222	PRIMARY AIR FAN + MOTOR	
220A.224	REGENERATIVE AIR HTR+MOTOR	
220A.25	FUEL HANDLING EQUIPMENT	
220A.251	COAL FEEDER + MOTOR	
220A.252	COAL PULVERIZER + MOTOR	
221.	STEAM GENERATING SYSTEM	
221.1	STEAM GENERATING EQUIPMENT	
221.11	SUPERCRITICAL PRESS BOILER	
221.12	ASSOCIATED BOILER SYSTEMS	
221.13	MISC BOILER SYSTEMS	
221.2	STEAM GENERATING ACCESSORY	
221.21	BOILER BYPASS SYSTEM	
221.215	PIPING	

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MODEL 630 - 1243 MWE/3300 MWT COAL - 2.5/1.7 IN HG AV - MIDDLETOWN,USA - LOW SULFUR - COST BASIS 07/76

ACCOUNT NUMBER	ITEM	DESCRIPTION
221.2152	2.5 IN + LARGER	
221.21521	CS/NNS	
221.216	VALVES	
221.2161	GATE	
221.2162	CHECK	
221.217	PIPING-MISC ITEMS	
221.2171	HANGERS + SUPPORTS	
221.2172	INSULATION	
221.22	BOILER VENTS AND DRAINS	
221.225	PIPING	
221.2251	2 IN + SMALLER	
221.22511	CS/NNS	
221.2252	2.5 IN + LARGER	
221.22521	CS/NNS	
221.226	VALVES	
221.2265	RELIEF	
221.227	PIPING-MISC ITEMS	
221.2271	HANGERS + SUPPORTS	
221.3	SOOTBLOWING SYSTEM	
221.31	ROTATING MACHINERY	
221.311	SOOTBLOWERS	
221.312	S.B. COMPRESSOR + MOTOR	
221.3121	S.B. COMPRESSOR	

EQUIPMENT LIST - REPORT 1 08/15/77

MODEL 630 - 1243 MWE/3300 MWT COAL - 2.5/1.7 IN HG AV - MIDDLETOWN,USA - LOW SULFUR - COST BASIS 07/76

ACCOUNT NUMBER	ITEM	DESCRIPTION
221.3122	S.B. COMPRESSOR MOTOR	
221.33	TANKS AND PRESSURE VESSELS	
221.331	S.B. AIR RECEIVER	
221.35	PIPING	
221.351	2 IN + SMALLER	
221.3511	CS/NNS	
221.352	2.5 IN + LARGER	
221.3521	CS/NNS	
221.36	VALVES	
221.361	GATE	
221.362	CHECK	
221.363	GLOBE	
221.365	RELIEF	
221.37	PIPING-MISC ITEMS	
221.371	HANGERS + SUPPORTS	
221.39	FOUNDATIONS/SKIDS	
221.397	COMPRESSORS + AIR RECEIVER	
221.3971	EXCAVATION WORK	
221.3973	SUPERSTRUCTURE CONCRETE	
221.39731	FORMWORK	
221.39732	REINFORCING STEEL	
221.39733	CONCRETE	
221.39734	EMBEDDED STEEL	

MODEL 030 - 1243 MWE/3300 MWT COAL - 2.5/1.7 IN HG AV - MIDDLETOWN,USA - LOW SULFUR - COST BASIS 07/76

ACCOUNT NUMBER	ITEM	DESCRIPTION
222.	DRAFT SYSTEM	
222.1	ROTATING MACHINERY	
222.11	FORCED DRAFT FAN + MOTOR	
222.111	FORCED DRAFT FAN	
222.112	FORCED DRAFT FAN MOTOR	
222.12	PRIMARY AIR FAN + MOTOR	
222.121	PRIMARY AIR FAN	
222.122	PRIMARY AIR FAN MOTOR	
222.14	AIR HEATER DRAIN PUMP+MTR	
222.141	AIR HEATER DRAIN PUMP	
222.142	AIR HEATER DRAIN PUMP MTR	
222.2	HEAT TRANSFER EQUIPMENT	
222.21	REGENERATIVE AIR HEATERS	
222.211	SECONDARY AIR HEATER+MOTOR	
222.2111	SECONDARY AIR HEATER	
222.2112	SECONDARY AIR HEATER MOTOR	
222.212	PRIMARY AIR HEATER + MOTOR	
222.2121	PRIMARY AIR HEATER	
222.2122	PRIMARY AIR HEATER MOTOR	
222.22	INLET COMBUST AIR STM COIL	
222.23	COMBST AIR PREHT STM COILS	
222.3	TANKS AND PRESSURE VESSELS	
222.31	AIR HEATER DRAIN TANK	

EQUIPMENT LIST - REPORT 1

MODEL 630 - 1243 MWE/3300 MWT COAL - 2.5/1.7 IN HG AV - MIDDLETOWN,USA - LOW SULFUR - COST BASIS 07/76

ACCOUNT NUMBER	ITEM	DESCRIPTION
222.4	PURIFICATION+FILTRATION EQ	
222.41	ELECTROSTATIC PRECIPITATOR	
222.5	PIPING + DUCTWORK	
222.51	AIR PREHEAT STEAM PIPING	
222.511	2 IN + SMALLER	
222.5111	CS/NNS	
222.512	2.5 IN + LARGER	
222.5121	CS/NNS	
222.52	DUCTWORK	
222.521	AIR DUCTS	
222.5211	FD FAN TO AIR HEATER DUCTS	
222.5212	PRIMARY AIR DUCTWORK	
222.522	GAS DUCTS	
222.5221	AIR HEATER TO STACK DUCT	
222.5222	DUCT INSULATION	
222.6	VALVES	
222.61	GATE	
222.62	CHECK	
222.63	GLOBE	
222.7	PIPING-MISC ITEMS	
222.72	INSULATION	
222.73	SPECIALTIES	
222.731	AIR INLET SILENCERS	

EQUIPMENT LIST - REPORT 1

MODEL 630 - 1243 MWE/3300 MWT COAL - 2.5/1.7 IN HG AV - MIDDLETOWN,USA - LOW SULFUR - COST BASIS 07/76

ACCOUNT NUMBER	ITEM	DESCRIPTION
222.8	INSTRUMENTATION + CONTROLS	
222.9	FOUNDATIONS/SKIDS	
222.91	PRECIPITATOR+DUCT FOUND	
222.911	EXCAVATION WORK	
222.9111	EXCAVATION-EARTH	
222.9114	BACKFILL-EARTH	
222.913	SUBSTRUCTURE CONCRETE	
222.9131	FORMWORK	
222.9132	REINFORCING STEEL	
222.9133	CONCRETE	
222.914	SUPERSTRUCTURE	
222.9142	STRUCTURAL + MISC STEEL	
222.91421	STRUCTURAL STEEL	
222.91423	MISCELLANEOUS STEEL	
222.91425	FLOOR GRATING (GALVANIZED)	
222.91426	STAIR TREADS	
222.91427	HANDRAIL	
222.9149	PAINTING	
222.91492	STRUCTURAL STEEL	
222.91494	HANDRAIL	
222.92	PRIMARY AIR+FD FAN FOUND	
222.921	EXCAVATION WORK	
222.9211	EXCAVATION-EARTH	

MODEL 630 - 1243 MWE/3300 MWT COAL - 2.5/1.7 IN HG AV - MIDDLETOWN,USA - LOW SULFUR - COST BASIS 07/76

ACCOUNT NUMBER	ITEM	DESCRIPTION
222.9214	BACKFILL-EARTH	
222.923	SUBSTRUCTURE CONCRETE	
222.9231	FORMWORK	
222.9232	REINFORCING STEEL	
222.9233	CONCRETE	
222.924	SUPERSTRUCTURE	
222.93	AIR HEATER FOUNDATIONS	
222.931	EXCAVATION WORK	
222.9311	EXCAVATION-EARTH	
222.9314	BACKFILL-EARTH	
222.933	SUBSTRUCTURE CONCRETE	
222.9331	FORMWORK	
222.9332	REINFORCING STEEL	
222.9333	CONCRETE	
222.9334	EMBEDDED STEEL	
222.934	SUPERSTRUCTURE	
222.9342	STRUCTURAL + MISC STEEL	
222.93421	STRUCTURAL STEEL	
222.93423	MISCELLANEOUS STEEL	
222.93425	FLOOR GRATING/CHECKER PLT	
222.93426	STAIR TREADS	
222.93427	HANDRAIL	
222.9349	PAINTING	

MODEL 630 - 1243 MWE/3300 MWT COAL - 2.5/1.7 IN HG AV - MIDDLETOWN,USA - LOW SULFUR - COST BASIS 07/76

ACCOUNT NUMBER	ITEM	DESCRIPTION
222.93492	STRUCTURAL STEEL	
222.93494	HANDRAIL	
223.	ASH + DUST HANDLING SYSTEM	
223.1	ASH + DUST HANDLING EQUIP	
223.11	FLY ASH EQUIPMENT	
223.11914	BACKFILL-EARTH	
223.12	BOTTOM ASH + PYRITES EQUIP	
223.19	FOUNDATIONS/SKIDS	
223.191	DEWATERING BIN FOUNDATIONS	
223.1911	EXCAVATION WORK	
223.19111	EXCAVATION-EARTH	
223.19114	BACKFILL-EARTH	
223.1913	SUBSTRUCTURE CONCRETE	
223.19131	FORMWORK	
223.19132	REINFORCING STEEL	
223.19133	CONCRETE	
223.19134	EMBEDDED STEEL	
223.1914		
223.192	FLY ASH SILO FOUNDATIONS	
223.1921	EXCAVATION WORK	
223.19211	EXCAVATION-EARTH	
223.19214	BACKFI ARTH	
223.1923	SUBSI RE CONCRETE	

EQUIPMENT LIST - REPORT 1

MODEL 630 - 9245 MWE/3300 MWT COAL - 2.5/1.7 IN HG AV - MIDDLETOWN,USA - LOW SULFUR - COST BASIS 07/76

ACCOUNT NUMBER	ITEM	DESCRIPTION
223.19231	FORMWORK	
223.19232	REINFORCING STEEL	
223.19233	CONCRETE	
223.19234	EMBEDDED STEEL	
223.193	PYRITES HOLDING BIN FOUND	
223.1931	EXCAVATION WORK	
223.1933	SUBSTRUCTURE CONCRETE	
223.19331	FORMWORK	
223.19332	REINFORCING STEEL	
223.19333	CONCRETE	
223.19334	EMBEDDED STEEL	
223.194	SETTLING TANK FOUNDATION	
223.1941	EXCAVATION WORK	
223.19411	EXCAVATION-EARTH	
223.19414	BACKFILL-EARTH	
223.1943	SUBSTRUCTURE CONCRETE	
223.19431	FORMWORK	
223.19432	REINFORCING STEEL	
223.19433	CONCRETE	
223.19434	EMBEDDED STEEL	
223.195	RECIRCULATING TANK FOUND	
223.1951	EXCAVATION WORK	
223.19511	EXCAVATION-EARTH	

EQUIPMENT LIST - REPORT 1

MODEL 630 - 1243 MWE/3300 MWT COAL - 2.5/1.7 IN HG AV - MIDDLETOWN,USA - LOW SULFUR - COST BASIS 07/76

ACCOUNT NUMBER	ITEM	DESCRIPTION
223.19514	BACKFILL-EARTH	
223.1953	SUBSTRUCTURE CONCRETE	
223.19531	FORMWORK	
223.19532	REINFORCING STEEL	
223.19533	CONCRETE	
223.19534	EMBEDDED STEEL	
223.2	MISC ASH+DUST HANDLING EQ	
223.21	ROTATING MACHINERY	
223.211	ASH HOPPER SEAL PUMP+MOTOR	
223.2111	ASH HOPPER SEAL PUMP	
223.2112	ASH HOPPER SEAL PUMP MOTOR	
223.25	PIPING	
223.251	RECIRCULATION+SEAL WATER	
223.2511	2 IN + SMALLER	
223.25111	CS/NNS	
223.2512	2.5 IN + LARGER	
223.25121	CS/NNS	
223.26	VALVES	
223.261	GATE	
223.262	CHECK	
223.263	GLOBE	
224.	FUEL HANDLING SYSTEMS	
224.1	COAL UNLOADING EQUIPMENT	

MODEL 630 - 1245 MWE/3300 MWT COAL - 2.5/1.7 IN HG AV - MIDDLETOWN,USA - LOW SULFUR - COST BASIS 07/76

ACCOUNT NUMBER	ITEM	DESCRIPTION
224.11	RAILROAD CAR POSITIONER	
224.12	ROTARY CAR DUMPER	
224.13	COAL CAR THAWING EQUIPMENT	
224.2	CONVEYING EQUIPMENT	
224.21	BELT CONVEYORS	
224.3	CRUSHER EQUIPMENT	
224.31	COAL CRUSHER + MOTOR	
224.311	COAL CRUSHER	
224.312	COAL CRUSHER MOTOR	
224.4	PULVERIZING SYSTEMS	
224.41	COAL FEEDER + MOTOR	
224.411	COAL FEEDER	
224.412	COAL FEEDER MOTOR	
224.42	PULVERIZER + MOTOR	
224.421	PULVERIZER	
224.422	PULVERIZER MOTOR	
224.45	PIPING + DUCTWORK	
224.49	FOUNDATIONS/SKIDS	
224.491	PULVERIZER FOUNDATIONS	
224.4911	FORMWORK	
224.4912	REINFORCING STEEL	
224.4913	CONCRETE	
224.4914	EMBEDDED STEEL	

EQUIPMENT LIST - REPORT 1

MODEL 630 - 1243 MWE/3300 MWT COAL - 2.5/1.7 IN HG AV - MIDDLETOWN,USA - LOW SULFUR - COST BASIS 07/76

ACCOUNT NUMBER	ITEM	DESCRIPTION
224.5	STORAGE EQUIPMENT	
224.51	BUCKET WHEEL STACKER/RECLM	
224.52	COAL SILO	
224.521	COAL SILO A283,3/8IN PLATE	
224.522	COAL SILO A304,3/8IN PLATE	
224.523	COAL SILO A 36 STIFFENERS	
224.6	OTHER COAL HANDLING EQUIP	
224.61	SLIDEGATE + MOTOR	
224.611	SLIDEGATE	
224.612	SLIDEGATE MOTOR	
224.62	WEIGHT SCALES	
224.63	MISC VIBRATING FEEDERS+MTR	
224.631	MISC VIBRATING FEEDERS	
224.632	MISC VIBRATING FEEDER MTR	
224.64	COAL SAMPLING SYSTEMS	
224.65	DUST SUPPRESSION SYSTEMS	
224.66	FIRE PROTECTION SYSTEM	
224.67	SUMP DRAIN SYSTEM	
224.671	ROTATING MACHINERY	
224.6711	SUMP PUMPS + MOTORS	
224.67111	SUMP PUMPS	
224.67112	SUMP PUMP MOTORS	
224.675	PIPING	

MODEL 630 - 1243 MWE/3300 MWT COAL - 2.5/1.7 IN HG AV - MIDDLETOWN,USA - LOW SULFUR - COST BASIS 07/76

ACCOUNT NUMBER	ITEM	DESCRIPTION
224.7	IGNITION OIL SYSTEM	
224.71	ROTATING MACHINERY	
224.711	IGNITION OIL PUMP + MOTOR	
224.7111	IGNITION OIL PUMP	
224.7112	IGNITION OIL PUMP MOTOR	
224.75	PIPING	
224.751	2 IN + SMALLER	
224.7511	CS/NNS	
224.752	2.5 IN + LARGER	
224.7521	CS/NNS	
224.76	VALVES	
224.762	CHECK	
224.768	PLUG	
224.8	INSTRUMENTATION + CONTROL	
225.393411		
225.393412		
226.393413		
226.393415		
227.	INSTRUMENTATION + CONTROL	
227.1	BENCHBOARD, PANELS + RACKS	
227.11	BOILER - TG CONTROL PANEL	
227.17	AUXILIARY PANELS+CABINETS	
227.18	INSTRUMENT RACKS	

MODEL 630 - 1243 MWE/3300 MWT COAL - 2.5/1.7 IN HG AV - MIDDLETOWN,USA - LOW SULFUR - COST BASIS 07/76

ACCOUNT NUMBER	ITEM	DESCRIPTION
227.2	PLANT COMPUTER SYSTEM	
227.3	STACK GAS MONITORING SYS	
227.4	PLANT CONTROL SYSTEM	
227.41	COORDINATED CONTROL SYSTEM	
227.42	BURNER CONTROL SYSTEM	
227.5	INSTRUMENT TUBING+FITTINGS	
228.	BOILER PLANT MISC ITEMS	
228.1	MISC SUSPENSE ITEMS	
228.11	FINAL ALIGNMENT + CHECKING	
228.12	FIELD PAINTING	
228.13	QUALIFICATION OF WELDERS	
228.3	BOILER PLANT INSULATION	
228.31	PIPE INSULATION	
228.32	EQUIPMENT INSULATION	
228.4	SAMPLING EQUIPMENT	
23 .	TURBINE PLANT EQUIPMENT	
231.	TURBINE GENERATOR	
231.1	TURBINE GENERATOR +ACCSSRY	
231.11	TURBINE FACTORY COST	
231.12	OTHER TURBINE COSTS	
231.13	EXCITER & VOLTAGE REGULTR.	
231.2	FOUNDATIONS	
231.21	T-G PEDESTAL	

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MODEL 63J - 1243 MWE/3300 MWT COAL - 2.5/1.7 IN HG AV - MIDDLETOWN,USA - LOW SULFUR - COST BASIS 07/76

ACCOUNT NUMBER	ITEM	DESCRIPTION
231.211	EXCAVATION WORK	
231.2111	EXCAVATION - EARTH	
231.2112	EXCAVATION - ROCK	
231.2114	BACKFILL - EARTH	
231.2115	DEWATERING	
231.213	SUBSTRUCTURE CONCRETE	
231.2131	FORKWORK	
231.2132	REINFORCING STEEL	
231.2133	CONCRETE	
231.2134	EMBEDDED STEEL	
231.2137	RUBBING CONCRETE SURFACE	
231.2138	EXPANSION JOINT	
231.214	SUPERSTRUCTURE	
231.2141	CONCRETE WORK	
231.21411	FORMWORK	
231.21412	REINFORCING STEEL	
231.21413	CONCRETE	
231.21414	EMBEDD STEEL	
231.21417	RUBBING CONCRETE SURFACES	
231.21418	EXPANSION JOINT	
231.2142	STRUCTURAL + MISC STEEL	
231.21421	STRUCTURAL STEEL	
231.21425	GRATING	

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MODEL 630 - 1243 MWE/3300 MWT COAL - 2.5/1.7 IN HG AV - MIDDLETOWN,USA - LOW SULFUR - COST BASIS 07/76

ACCOUNT NUMBER	ITEM	DESCRIPTION
231.4	LUBRICATING OIL SYSTEM	
231.43	TANKS + PRESSURE VESSELS	
231.431	LUBE OIL STORAGE TANK	
231.45	PIPING	
231.451	2IN. + SMALLER	
231.4511	CS/NNS	
231.452	2.5IN + LARGER	
231.4521	CS/NNS	
231.46	VALVES	
231.461	GATE	
231.47	PIPING-MISC. ITEMS	
231.471	HANGERS + SUPPORTS	
231.472	INSULATION	
231.473	SPECIALTIES	
231.48	INSTRUMENTATION + CONTROL	
231.49	SKIDS / FOUNDATIONS	
231.491	LUBE OIL CONDTNG EQPT SKID	
231.492	FIRE PROTECTION EQPT.	
231.5	GAS SYSTEMS	
231.51	HYDROGEN STORAGE SYSTEM	
231.513	TANKS + PRESSURE VESSELS	
231.5131	HYDROGEN STORAGE BOTTLES	
231.515	PIPING	

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MODEL 630 - 1243 MWE/3300 MWT COAL - 2.5/1.7 IN HG AV - MIDDLETOWN,USA - LOW SULFUR - COST BASIS 07/76

ACCOUNT NUMBER	ITEM	DESCRIPTION
231.5151	2 IN + SMALLER	
231.5152	2.5 IN + LARGER	
231.51521	CS/NNS	
231.516	VALVES	
231.5163	GLOBE	
231.517	PIPING-MISC ITEMS	
231.5171	HANGERS + SUPPORTS	
231.5172	INSULATION	
231.5173	SPECIALTIES	
231.52	CARBON DIOXIDE STORAGE SYS	
231.523	TANKS + PRESSURE VESSELS	
231.5231	CARBON DIOXIDE TANKS	
231.525	PIPING	
231.5251	2 IN + SMALLER	
231.5252	2.5 IN + LARGER	
231.52521	CS/NNS	
231.526	VALVES	
231.5263	GLOBES	
231.527	PIPING-MISC ITEMS	
231.5271	HANGER + SUPPORT	
233.	CONDENSING SYSTEMS	
233.1	CONDENSER EQUIPMENT	
233.12	HEAT TRANSFER EQUIPMENT	

EQUIPMENT LIST - REPORT 1

MODEL 630 - 1243 MWE/3300 MWT COAL - 2.5/1.7 IN HG AV - MIDDLETOWN,USA - LOW SULFUR - COST BASIS 07/76

ACCOUNT NUMBER	ITEM	DESCRIPTION
233.121	CONDENSERS	
233.2	CONDENSATE SYSTEM	
233.21	ROTATING MACHINERY	
233.211	CONDENSATE PUMP + MOTOR	
233.2111	COND PUMP	
233.2112	COND PUMP MOTOR	
233.212	CONDENSATE BOOSTER PUMP+MT	
233.2121	CONDENSATE BOOSTER PUMP	
233.2122	BOOSTER PUMP MOTOR	
233.213	TRANSFER PUMP + MOTOR	
233.2131	TRANS PUMP	
233.2132	TRANS PUMP MOTOR	
233.221	COND. STORAGE TK HEATER	
233.23	TANKS & PRESSURE VESSELS	
233.231	CONDENSATE STORAGE TANK	
233.25	PIPING	
233.251	2 IN. + SMALLER	
233.2511	CS/NNS	
233.252	2.5 IN. + LARGER	
233.2521	CS/NNS	
233.26	VALVES	
233.261	GATE VALVES	
233.262	CHECK VALVES	

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MODEL 630 - 1243 MWE/3300 MWT COAL - 2.5/1.7 IN HG AV - MIDDLETOWN,USA - LOW SULFUR - COST BASIS 07/76

ACCOUNT NUMBER	ITEM	DESCRIPTION
233.263	GLOBE VALVES	
233.266	BUTTERFLY	
233.267	BALL VALVES	
233.27	PIPING-MISC. ITEMS	
233.271	HANGERS + SUPPORTS	
233.272	INSULATION	
233.273	SPECIALTIES	
233.28	INSTRUMENTATION + CONTROL	
233.29	FOUNDATIONS	
233.291	CONDENSATE TANK FDTN	
233.2911	FORMWORK	
233.2912	REINFORCING STEEL	
233.2913	CONCRETE	
233.292	CONDENSATE PUMP FDTN	
233.2921	FORMWORK	
233.2922	REINF. STEEL	
233.2923	CONCRETE	
233.2924	EMBEDDED IRON	
233.2925	STRUCTURAL STEEL	
233.2926	MISC. STEEL	
233.293	BOOSTER PUMP FDTN	
233.2931	FORMWORK	
233.2932	REINF. STEEL	

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MODEL 630 - 1243 MWE/3300 MWT COAL - 2.5/1.7 IN HG AV - MIDDLETOWN,USA - LOW SULFUR - COST BASIS 07/76

ACCOUNT NUMBER	ITEM	DESCRIPTION
233.2933	CONCRETE	
233.2934	EMBEDDED IRON	
233.2935	STRUCTURAL STEEL	
233.2936	MISC. STEEL	
233.3	GAS REMOVAL SYSTEM	
233.31	CONDENSER GAS REMOVAL SYS.	
233.311	ROTATING MACHINERY	
233.3111	MECH VACUUM PUMP & MOTOR	
233.31111	MECH VAC PUMP	
233.31112	MECH VAC PUMP MOTOR	
233.315	PIPING	
233.3151	2 IN. + SMALLER	
233.31511	CS/NNS	
233.3152	2.5 IN. + LARGER	
233.31521	CS/NNS	
233.316	VALVES	
233.3161	GATE	
233.3163	GLOBE	
233.317	PIPING-MISC. ITEMS	
233.3171	HANGERS + SUPPORTS	
233.3172	INSULATION	
233.3173	SPECIALTIES	
233.318	INSTRUMENTATION + CONTROL	

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MODEL 630 - 1243 MWE/3300 MWT COAL - 2.5/1.7 IN HG AV - MIDDLETOWN,USA - LOW SULFUR - COST BASIS 07/76

ACCOUNT NUMBER	ITEM	DESCRIPTION
233.319	FOUNDATIONS/SKIDS	
233.3191	VACUUM PUMP FDTN.	
233.31911	FORMWORK	
233.31912	REINFORCING STEEL	
233.31913	CONCRETE	
233.31914	EMBEDDED STEEL	
233.4163		
233.5	CONDENSATE POLISHING	
233.51	ROTATING MACHINERY	
233.511	ACID REGEN PUMP + MOTOR	
233.5111	ACID REGEN PUMP	
233.5112	ACID REGEN PUMP MOTOR	
233.512	CAUSTIC REGEN PUMP + MOTOR	
233.5121	CAUSTIC REGEN PUMP	
233.5122	CAUSTIC REGEN PUMP MOTOR	
233.513	AMMONIA REGEN PUMP + MOTOR	
233.5131	AMMONIA REGEN PUMP	
233.5132	AMMONIA REGEN PUMP MOTOR	
233.514	SLUICE WATER REGEN P+M	
233.5141	SLUICE WATER REGEN PUMP	
233.5142	SLUICE WATER REGEN P MOTOR	
233.515	RECYCLE PUMP + MOTOR	
233.5151	RECYCLE PUMP	

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MODEL 630 - 1243 MWE/3300 MWT COAL - 2.5/1.7 IN HG AV - MIDDLETOWN,USA - LOW SULFUR - COST BASIS 07/76

ACCOUNT NUMBER	ITEM	DESCRIPTION
233.5152	RECYCLE PUMP MOTOR	
233.516	AIR BLOWER + MOTOR	
233.5161	AIR BLOWER	
233.5162	AIR BLOWER MOTOR	
233.53	TANKS + PRESSURE VESSELS	
233.531	RESIN SEPRTR+CATION REGN TK	
233.532	ANION REGEN TANK	
233.533	RESIN STORAGE TANK	
233.534	HOT WATER HEATING TANK	
233.535	BULK ACID STORAGE TANK	
233.536	BULK CAUSTIC STORAGE TANK	
233.537	BULK AMMONIA STORAGE TANK	
233.54	PURIFICATION EQUIPMENT	
233.541	MIXED BED DEMINERALIZERS	
233.58	INSTRUMENTATION + CONTROL	
234.	FEED HEATING SYSTEM	
234.1	FEEDWATER HEATERS	
234.12	HEAT TRANSFER EQUIPMENT	
234.121	NO.1 LP HEATERS	
234.122	NO.2 LP HEATERS	
234.123	NO.3 LP HEATERS	
234.124	NO 4 LP HEATER	
234.125	NO 5 LP HEATER/DEAERATOR	

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MODEL 630 - 1243 KWE/3300 MWT COAL - 2.5/1.7 IN HG AV - MIDDLETOWN,USA - LOW SULFUR - COST BASIS 07/76

ACCOUNT NUMBER	ITEM	DESCRIPTION
234.1251	DEAERATOR	
234.1252	DEAERATOR STORAGE TANK	
234.126	NO 6 HP HEATER	
234.127	NO 7 HP HEATER	
234.128	NO 8 HP HEATER	
234.2	FEEDWATER SYSTEM	
234.21	ROTATING MACHINERY	
234.211	MAIN BOILER FEED PUMP-MBFP	
234.212	MBFP TURBINE DRIVES	
234.216	MAIN BF BOOSTER PUMP + MTR	
234.2161	MAIN BF BOOSTER PUMP	
234.2162	MAIN BF BOOSTER PUMP MTR.	
234.22	HEAT TRANSFER EQUIPMENT	
234.221	MAIN BOILER FP CONDENSER	
234.25	PIPING	
234.251	2 IN + SMALLER	
234.2511	CS/PC	
234.2512	CS/BC	
234.252	2.5IN + LARGER	
234.2521	CS/PC	
234.25211	CS/PC	
234.25212	CS/PC	
234.2522	CS/BC	

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MODEL 630 - 1243 MWE/3300 MWT COAL - 2.5/1.7 IN HG AV - MIDDLETOWN,USA - LOW SULFUR - COST BASIS 07/76

ACCOUNT NUMBER	ITEM	DESCRIPTION
234.26	VALVES	
234.261	GATE	
234.262	CHECK	
234.263	GLOBE	
234.27	PIPING-MISC. ITEMS	
234.271	HANGERS & SUPPORTS	
234.272	INSULATION	
234.273	SPECIALTIES	
234.28	INSTRUMENTATION + CONTR L	
234.29	SKIDS/FOUNDATIONS	
234.291	MBFP	
234.2911	FORMWORK	
234.2912	REINFORCING STEEL	
234.2913	CONCRETE	
234.2914	EMBEDDED STEEL	
234.3	EXTRACTION STEAM SYSTEM	
234.35	PIPING	
234.351	2 IN + SMALLER	
234.3511	CS/NNS	
234.352	2.5IN + LARGER	
234.3521	CS/NNS	
234.36	VALVES	
234.361	GATE	

EQUIPMENT LIST - REPORT 1

MODEL 630 - 1243 MWE/3300 MWT COAL - 2.5/1.7 IN HG AV - MIDDLETOWN,USA - LOW SULFUR - COST BASIS 07/76

ACCOUNT NUMBER	ITEM	DESCRIPTION
234.362	CHECK	
234.363	GLOBE	
234.37	PIPING-MISCELLANEOUS	
234.371	HANGER + SUPPORTS	
234.372	INSULATION	
234.373	SPECIALTIES	
234.38	INSTRUMENTATION + CONTROL	
234.4	F&H VENT + DRAIN SYSTEM	
234.41	ROTATING MACHINERY	
234.411	HEATER DRAIN PUMP + MOTOR	
234.4111	HEATER DRAIN PUMP	
234.4112	HEATER DRAIN PUMP MOTOR	
234.43	TANKS + PRESSURE VESSELS	
234.431	HEATER DRAIN TANK	
234.45	PIPING	
234.451	2 IN + SMALLER	
234.4511	CS/PC	
234.452	2.5IN + LARGER	
234.4521	CS/PC	
234.4522	CR-MO/PC	
234.46	VALVES	
234.461	GATE	
234.462	CHECK	

MODEL 630 - 1243 MWE/3300 MWT COAL - 2.5/1.7 IN HG A. - MIDDLETOWN,USA - LOW SULFUR - COST BASIS 07/76

ACCOUNT NUMBER	ITEM	DESCRIPTION
234.463	GLOBE	
234.47	PIPING-MISC. ITEMS	
234.471	HANGERS & SUPPORTS	
234.472	INSULATION	
234.473	SPECIALTIES	
234.48	INSTRUMENTATION + CONTROL	
235.	OTHER TURBINE PLANT EQUIP.	
235.1	MAIN VAPOR PIPING SYSTEM	
235.11	MAIN STEAM SYSTEM	
235.115	PIPING	
235.1151	2 IN + SMALLER	
235.11511	CR-MO/NNS	
235.11512	CR-MO/PC	
235.1152	2.5 IN + LARGER	
235.11521	CR-MO/BC	
235.115211	CR-MO/BC	
235.115212	CR-MO/BC	
235.11522	CR-MO/NNS	
235.116	VALVES	
235.1161	GATE	
235.1162	CHECK	
235.1163	GLOBE	
235.1165	RELIEF	

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MODEL 630 - 1243 MwE/3300 MwT COAL - 2.5/1.7 IN HG AV - MIDDLETOWN,USA - LOW SULFUR - COST BASIS 07/76

ACCOUNT NUMBER	ITEM	DESCRIPTION
235.117	PIPING-MISC ITEMS	
235.1171	HANGERS + SUPPORTS	
235.1172	INSULATION	
235.1173	SPECIALTIES	
235.11732	STEAM TRAPS + STRAINERS	
235.116	INSTRUMENTATION+CONTROL	
235.12	HOT REHEAT SYSTEM	
235.125	PIPING	
235.1251	2 IN + SMALLER	
235.12511	CR-MO/PC	
235.1252	2.5IN + LARGER	
235.12521	CR-MO/PC	
235.125211	CR-MO/PC	
235.125212	CR-MO/PC	
235.126	VALVES	
235.1261	GATE	
235.1263	GLOBE	
235.1265	SAFETY/RELIEF	
235.127	PIPING-MISC. ITEMS	
235.1271	HANGERS + SUPPORTS	
235.1272	INSULATION	
235.1273	SPECIALTIES	
235.12732	TRAPS + STRAINERS	

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MODEL 630 - 1243 MWE/3300 MWT COAL - 2.5/1.7 IN HG AV - MIDDLETOWN,USA - LOW SULFUR - COST BASIS 07/76

ACCOUNT NUMBER	ITEM	DESCRIPTION
235.128	INSTRUMENTATION + CONTROL	
235.13	COLD REHEAT SYSTEM	
235.135	PIPING	
235.1351	2 IN + SMALLER	
235.13511	CS/PC	
235.1352	2.5 IN + LARGER	
235.13521	CS/PC	
235.136	VALVES	
235.1361	GATE	
235.1362	CHECK	
235.1363	GLOBE	
235.1365	RELIEF	
235.137	PIPING-MISC. ITEMS	
235.1371	HANGERS + SUPPORTS	
235.1372	INSULATION	
235.1373	SPECIALTIES	
235.13732	TRAPS + STRAINERS	
235.138	INSTRUMENTATION + CONTROL	
235.15	ATTEMPERATING SYSTEM	
235.155	PIPING	
235.1551	2 IN + SMALLER	
235.15511	CS/PC	
235.1552	2.5 IN + LARGER	

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MODEL 630 - 1243 MWE/3300 MWT COAL - 2.5/1.7 IN HG AV - MIDDLETOWN,USA - LOW SULFUR - COST BASIS 07/76

ACCOUNT NUMBER	ITEM	DESCRIPTION
235.15521	CS/PC	
235.156	VALVES	
235.1561	GATE	
235.1562	CHECK	
235.157	PIPING-MISC ITEMS	
235.1571	HANGERS + SUPPORTS	
235.1572	INSULATION	
235.1573	SPECIALTIES	
235.15732	STEAM TRAPS + STRAINERS	
235.158	INSTRUMENTATION + CONTROL	
235.173	SPECIALTIES	
235.2	TURBINE AUXILIARIES	
235.21	MAIN STM/RHT VENTS & DRAIN	
235.215	PIPING	
235.2151	2 IN + SMALLER	
235.21511	CS/PC	
235.21512	CR-MO/PC	
235.2152	2.5 IN + LARGER	
235.21521	CS/PC	
235.21522	CR-MO/PC	
235.216	VALVES	
235.2163	GLOBE	
235.217	PIPING-MISC. ITEMS	

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MODEL 630 - 1243 MWE/3300 MWT COAL - 2.5/1.7 IN HG AV - MIDDLETOWN,USA - LOW SULFUR - COST BASIS 07/76

ACCOUNT NUMBER	ITEM	DESCRIPTION
235.2171	HANGERS + SUPPORTS	
235.2172	INSULATION	
235.2173	SPECIALTIES	
235.218	INSTRUMENTATION + CONTROL	
235.3	TB CLOSED CLG WATER SYS	
235.31	ROTATING MACHINERY	
235.311	TB CLOSED CLG WTR PUMP	
235.3111	TB CCW PUMP	
235.3112	TB CCW PUMP MOTOR	
235.32	HEAT TRANSFER EQUIPMENT	
235.321	HEAT EXCHANGERS	
235.33	TANKS + PRESSURE VESSELS	
235.331	HEAD TANK	
235.35	PIPING	
235.351	2 IN. + SMALLER	
235.3511	CS/NNS	
235.352	2.5 IN + LARGER	
235.3521	CS/NNS	
235.36	VALVES	
235.361	GATE	
235.362	CHECK	
235.363	GLOBE	
235.365	RELIEF	

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MODEL 630 - 1243 MWE/3300 MWT COAL - 2.5/1.7 IN HG AV - MIDDLETOWN,USA - LOW SULFUR - COST BASIS 07/76

ACCOUNT NUMBER	ITEM	DESCRIPTION
235.366	BUTTERFLY	
235.368	PLUG	
235.37	PIPING-MISC. ITEMS	
235.371	HANGERS + SUPPORTS	
235.372	INSULATION	
235.373	SPECIALTIES	
235.38	INSTRUMENTATION + CONTROL	
235.4	DEMIN.WATER MAKE-UP SYSTEM	
235.45	PIPING	
235.451	2 IN + SMALLER	
235.4511	CS/NNS	
235.452	2.5 IN + LARGER	
235.4521	CS/NNS	
235.46	VALVES	
235.47	PIPING-MISC ITEMS	
235.48	INSTRUMENTATION + CONTROL	
235.49	SKIDS / FOUNDATIONS	
235.491	DEMINERALIZER PACKAGE	
235.49.1	ROTATING MACHINERY	
235.49111	ACID REGENERANT P+M	
235.491111	ACID REGENERANT PUMP	
235.491112	ACID REGENERANT PUMP MOTOR	
235.49112	CAUSTIC REGENERANT P+M	

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EQUIPMENT LIST - REPORT 1

MODEL 630 - 1243 MWE/3300 MWT COAL - 2.5/1.7 IN HG AV - MIDDLETOWN,USA - LOW SULFUR - COST BASIS 07/76

ACCOUNT NUMBER	ITEM	DESCRIPTION
235.491121	CAUSTIC REGEN PUMP	
235.491122	CAUSTIC REGEN PUMP MOTOR	
235.49113	DEGASIFIER EVACUATING P+M	
235.491131	DEGASIFIER EVAC PUMP	
235.491132	DEGASIFIER EVAC PUMP MOTOR	
235.49114	DEGASIFIER BOOSTER P+M	
235.491141	DEGASIFIER BOOSTER PUMP	
235.491142	DEGASIFIER BOOSTER P MOTOR	
235.49121	DILUTE CAUSTIC WATER HTR.	
235.4913	TANKS + PRESSURE VESSELS	
235.49131	VACUUM DEGASIFIER	
235.49132	ACID REGENERANT DAY TANK	
235.49133	CAUSTIC REGENERANT DAY TK	
235.49134	HT WTR CAUSTIC DILUTION TK	
235.4914	PURIFICATION+FILTRATION EQ	
235.49141	FILTERS	
235.49142	CATION ION EXCHANGE BEDS	
235.49143	ANION ION EXCHANGE BEDS	
235.49144	MIXED-BED ION EXCHANGE BED	
235.5	CHEMICAL TREATMENT SYSTEM	
235.51	ROTATING MACHINERY	
235.511	AMMONIA FEED PUMP + MOTOR	
235.5111	AMMONIA FEED PUMP	

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MODEL 630 - 1243 MWE/3300 MWT COAL - 2.5/1.7 N HG AV - MIDDLETOWN,USA - LOW SULFUR - COST BASIS 07/76

ACCOUNT NUMBER	ITEM	DESCRIPTION
235.5112	AMMONIA FEED PUMP MOTOR	
235.512	HYDRAZINE FEED PUMP+MOTOR	
235.5121	HYDRAZINE FEED PUMP	
235.5122	HYDRAZINE FEED PUMP MOTOR	
235.53	TANKS + PRESSURE VESSELS	
235.531	AMMONIA STORAGE TANK	
235.532	HYDRAZINE STORAGE TANK	
235.55	PIPING	
235.551	2 IN + SMALLER	
235.5511	SS/NBS	
235.552	2.5 IN + LARGER	
235.56	VALVES	
235.563	GLOBE	
235.57	PIPE-MISC. ITEMS	
235.571	HANGERS + SUPPORTS	
235.572	INSULATION	
235.573	SPECIALTIES	
235.58	INSTRUMENTATION + CONTROL	
235.6	NEUTRALIZATION SYSTEM	
235.61	ROTATING MACHINERY	
235.611	OVERBOARD/RECIR PUMP+MOTOR	
235.6111	OVERBOARD/RECIR PUMP	
235.6112	OVERBOARD/RECIR PUMP MOTOR	

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EQUIPMENT LIST - REPORT 1

MODEL 63C - 1243 MWE/3300 MWT COAL - 2.5/1.7 IN HG AV - MIDDLETOWN,USA - LOW SULFUR - COST BASIS 07/76

ACCOUNT NUMBER	ITEM	DESCRIPTION
235.612	BLOWER + MOTOR	
235.6121	BLOWER	
235.6122	BLOWER MOTOR	
235.63	TANKS AND PRESSURE VESSELS	
235.631	NEUTRALIZATION TANK	
235.65	PIPING	
235.651	2IN & SMALLER	
235.6511	CS/NNS	
235.652	2.5 IN & LARGER	
235.6521	CS/NNS	
235.66	VALVES	
235.67	PIPING - MISC ITEMS	
235.671	HANGERS + SUPPORTS	
235.672	INSULATION	
235.673	SPECIALTIES	
235.68	INSTRUMENTATION + CONTROL	
236.	INSTRUMENTATION + CONTROL	
236.1	PROCESS IC EQUIPMENT	
236.11	BENCHBOARD, PANELS + RACKS	
236.111	TURBINE PLT MAIN CONTRL BD	
236.112	TURBINE PANELS	
236.1121	TURBINE SUPERVISORY PANELS	
236.1122	MHC CONTROL CABINET	

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MODEL 630 - 1243 MWE/3300 MWT COAL - 2.5/1.7 IN HG AV - MIDDLETOWN,USA - LOW SULFUR - COST BASIS 07/76

ACCOUNT NUMBER	ITEM	DESCRIPTION
23b.1123	TURBINE ACCESSORY PANELS	
23b.113	TURBINE PLANT HVAC PANELS	
23b.115	INSTRUMENT RACK-TURB PLANT	
23b.11b	TURBINE + UNIT MISC PANEL	
23b.2	PROCESS COMPUTER	
23b.3	TURB PLT I+C TUBING	
237.	TURBINE PLANT MISC ITEMS	
237.1	MISC SUSPENSE ITEMS	
237.11	PIPE	
237.12	FIELD PAINTING	
237.13	QUALIFICATION OF WELDERS	
237.3	TURBINE PLANT INSULATION	
237.31	PIPE INSULATION	
237.32	EQUIPMENT INSULATION	
24 .	ELECTRIC PLANT EQUIPMENT	
241.	SWITCHGEAR	
241.1	GEN EQPT SWITCHGEAR	
241.11	GEN LOAD BREAK SWITCH	
241.12	GEN NEUTRAL GROUNDING EQPT	
241.13	GEN CURRENT+POTENTIAL XFMR	
241.131	GEN.CURRENT TRANSFORMERS	
241.132	GEN.POTENTIAL TRANSFORMERS	
241.14	GEN SURGE PROTECTION EQPT	

EQUIPMENT LIST - REPORT 1

MODEL 633 - 1243 MWE/3300 MWT COAL - 2.5/1.7 IN HG AV - MIDDLETOWN,USA - LOW SULFUR - COST BASIS 07/76

ACCOUNT NUMBER	ITEM	DESCRIPTION
241.15	GEN EXCITATION SWITCHGEAR	
241.2	STATION SERVICE SWITCHGEAR	
241.21	MEDIUM VOLTAGE METAL CLAD	
241.211	13.8 KV	
241.212	6.9 KV	
241.213	4.16 KV	
241.2131	350 MVA	
241.2132	250 MVA	
241.22	STATION MOTOR CONTROL CNTR	
241.221	GENERAL PLANT	
242.	STATION SERVICE EQUIPMENT	
242.1	STATION SERV&STARTUP XFMR	
242.11	UNIT AUXILIARY TRANSFORMER	
242.111	13.8 KV TRANSFORMERS	
242.112	4.16 KV TRANSFORMER -3w-	
242.113	4.16 KV TRANSFORMER -2w-	
242.12	RESERVE AUXILIARY XFMR	
242.121	13.8 KV TRANSFORMER	
242.122	4.16 KV TRANSFORMER	
242.13	FOUNDATIONS FOR XFMRS	
242.131	EXCAVATION WORK	
242.1311	EARTH EXCAVATION	
242.1312	ROCK EXCAVATION	

MODEL 630 - 1243 MWE/3300 MWT COAL - 2.5/1.7 IN HG AV - MIDDLETOWN,USA - LOW SULFUR - COST BASIS 07/76

ACCOUNT NUMBER	ITEM	DESCRIPTION
242.1313	CONCRETE FILL	
242.1314	FILL + BACKFILL	
242.1315	DEWATERING	
242.132	SUBSTRUCTURE CONCRETE	
242.1321	FORMWORK	
242.1322	REINFORCING STEEL	
242.1323	CONCRETE	
242.1324	EMBEDDED STEEL	
242.1325	FLOOR FINISH	
242.1326	WATERPROOFING	
242.1327	CONSTRUCTION JOINTS	
242.1328	RUBBING CONCRETE SURFACES	
242.133	CRUSHED STONE FILL	
242.2	UNIT SUBSTATIONS	
242.21	LOAD CENTER SWITCHGEAR	
242.211	GENERAL PLANT SWITCHGEAR	
242.2111	COOLING TOWER	
242.2112	BALANCE OF PLANT-NO CT	
242.212	PRECIPITATOR SWITCHGEAR	
242.22	LOAD CENTER TRANSFORMERS	
242.221	GENERAL PLANT LD CTR XFMRS	
242.2211	COOLING TOWER	
242.2212	BALANCE OF PLT 13800-480V	

EQUIPMENT LIST - REPORT 1

MODEL 630 - 1243 MWE/3300 MWT COAL - 2.5/1.7 IN HG AV - MIDDLETOWN,USA - LOW SULFUR - COST BASIS 07/76

ACCOUNT NUMBER	ITEM	DESCRIPTION
242.221*	BALANCE OF PLT 4160-480V	
242.222	PRECIPITATOR LO CTR XFMRS	
242.23	MISCELLANEOUS XFMRS	
242.3	AUXILIARY POWER SOURCES	
242.31	BATTERY SYSTEMS	
242.311	STATION BATTERIES	
242.3111	BATTERIES	
242.312	BATTERY CHARGERS	
242.3121	CHARGERS	
242.32	EMERGENCY DIESEL GEN SYS	
242.321	DIESEL GENERATOR UNITS	
242.322	DIESEL GEN SUBSYSTEMS	
242.34	INVERTERS	
242.341	GENERAL PLANT INVERTERS	
243.	SWITCHBOARDS	
243.1	CONTROL PANELS	
243.11	GEN+AUX POWER SYS CTRL PNL	
243.12	CONSOLES	
243.13	VERTICAL PANELS	
243.14	GEN PROTECTIVE RELAY PANEL	
243.2	AUX.POWER & SIGNAL BOARDS	
243.21	POWER DISTRIBUTION PANELS	
243.211	AC PANELS	

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MODEL 630 - 1243 MWE/3300 MWT COAL - 2.5/1.7 LN HG AV - MIDDLETOWN,USA - LOW SULFUR - COST BASIS 07/76

ACCOUNT NUMBER	ITEM	DESCRIPTION
243.22	BATTERY CNTRL+DC DIST PNL	
243.221	DC PANELS	
243.223	MISC.PUSHBUTTONS,PNLS+FUSE	
243.224	BATTERY FUSES	
244.	PROTECTIVE EQUIP ENT	
244.1	GENRL STATION GROUND SYS	
244.11	EQUIPMENT GROUNDING SYSTEM	
244.12	YARD + STRUCTURE GROUNDING	
244.2	FIRE DETECTION+SUPPRESSION	
244.3	LIGHTNING PROTECTION	
244.4	CATHODIC PROTECTION	
244.5	HEAT TRACING + FREEZE PROT	
245.	ELECT.STRUC +WIRING CONTNR	
245.1	UNDERGROUND DUCT RUNS	
245.11	DUCT BANKS	
245.111	PVC DUCT	
245.112	STEEL CONDUIT	
245.113	STRUCTURAL WORK	
245.1131	EXCAVATION WORK	
245.1132	SUBSTRUCTURE CONCRETE	
245.11321	FORMWORK	
245.11322	REINFORCING STEEL	
245.11323	CONCRETE	

EQUIPMENT LIST - REPORT 1

MODEL 630 - 1243 MWE/3300 MWT COAL - 2.5/1.7 IN HG AV - MIDDLETOWN,USA - LOW SULFUR - COST BASIS 07/76

ACCOUNT NUMBER	ITEM	DESCRIPTION
245.2	CABLE TRAY	
245.3	CONDUIT	
245.	POWER & CONTROL WIRING	
246.1	GENERATOR CIRCUITS WIRING	
245.11	MAIN GENERATOR BUS DUCT	
245.12	DG UNIT BUS DUCT	
246.2	STATION SERVICE PWR WIRING	
245.21	HIGH VOLTAGE BUS+CABLE	
245.211	BUS DUCT	
246.2111	15 KV BUS DUCT	
245.2112	8 KV BUS DUCT	
245.2113	5 KV BUS DUCT	
245. 12	CABLE	
246.2121	15 KV CABLE	
246.2122	8 KV CABLE	
246.2123	5 KV CABLE	
246.22	LOW VOLTAGE BUS+CABLE	
245.221	BUS DUCT	
246.222	CABLE	
246.2221	LOW VOLTAGE POWER CABLE	
245.3	CONTROL CABLE	
245.4	INSTRUMENT WIRE	
25 .	MISCELLANEOUS PLANT EQUIPT	

EQUIPMENT LIST - REPORT 1

MODEL 630 - 1243 MWE/3300 MWT COAL - 2.5/1.7 IN HG AV - MIDDLETOWN,USA - LOW SULFUR - COST BASIS 07/76

ACCOUNT NUMBER	ITEM	DESCRIPTION
251.	TRANSPORTATION & LIFT EQPT	
251.1	CRANES & HOISTS	
251.11	TURBINE BUILDING CRANE	
251.111	TG OVERHEAD TRAVELING CRAN	
251.112	HEATER BAY CRANE	
251.14	INTAKE STRUCTURE CRANE	
251.15	CIRC WATER PUMPHOUSE CRANE	
251.16	MISC.CRANES,HOISTS+MONORLS	
251.161	10 TON CRANE	
251.162	5 TON CRANES	
251.17	DIESEL BUILDING CRANES	
251.2	RAILWAY EQUIPMENT	
251.21	DIESEL LOCOMOTIVE	
251.3	ROADWAY EQUIPMENT	
251.34	BULLDOZERS	
252.	AIR,WATER+STEAM SERVICE SY	
252.1	AIR SYSTEMS	
252.11	COMPRESSED AIR SYSTEM	
252.111	ROTATING MACHINERY	
252.1111	AIR COMPRESSORS + MOTORS	
252.11111	AIR COMPRESSORS	
252.11112	AIR COMPRESSOR MOTOR	
252.113	TANKS AND PRESSURE VESSELS	

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MODEL 630 - 1243 MWE/3300 MWT COAL - 2.5/1.7 IN HG AV - MIDDLETOWN,USA - LOW SULFUR - COST BASIS 07/76

ACCOUNT NUMBER	ITEM	DESCRIPTION
252.1131	AIR RECEIVERS	
252.1132	AIR DRYERS	
252.115	PIPING	
252.1151	2IN + SMALLER	
252.11511	CS/ANS	
252.1152	2.5IN + LARGER	
252.11521	CS/ANS	
252.116	VALVES	
252.1161	GATE	
252.1162	CHECK	
252.1163	GLOBE	
252.1165	RELIEF	
252.117	PIPING - MISC ITEMS	
252.1171	HANGERS + SUPPORTS	
252.1172	INSULATION	
252.11 3	SPECIALTIES	
252.118	INSTRUMENTATION+CONTROL	
252.2	WATER SYSTEMS	
252.21	SERVICE WATER SYSTEM	
252.211	ROTATING MACHINERY	
252.2111	SERVICE WATER PUMP & MOTOR	
252.21111	SERVICE WATER PUMP	
252.21112	SERVICE WATER PUMP MOTOR	

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MODEL 630 - 1243 MWE/3300 MWT COAL - 2.5/1.7 IN HG AV - MIDDLETOWN,USA - LOW SULFUR - COST BASIS 07/76

ACCOUNT NUMBER	ITEM	DESCRIPTION
252.215	PIPING	
252.2151	2IN & SMALLER	
252.21511	CS/NNS	
252.2152	2.5IN & LARGER	
252.21521	CS/NNS	
252.216	VALVES	
252.2161	GATE	
252.2162	CHECK	
252.2163	GLOBE	
252.2166	BUTTERFLY	
252.217	PIPING-MISC ITEMS	
252.2171	HANGERS AND SUPPORTS	
252.2172	INSULATION	
252.2173	SPECIALTIES	
252.2174	PIPE TRENCHING	
252.218	INSTRUMENTATION & CONTROL	
252.22	YARD FIRE PROTECTION	
252.221	ROTATING MACHINERY	
252.2211	DIESEL ENGINE FIRE PUMPS	
252.2212	MOTOR DRIVEN FIRE PUMPS	
252.22121	FIRE PUMP	
252.22122	FIRE PUMP MOTOR	
252.2213	JOCKEY PUMP + MOTOR	

MODEL 633 - 1243 MWE/3300 MWT COAL - 2.5/1.7 IN HG AV - MIDDLETOWN,USA - LOW SULFUR - COST BASIS 07/76

ACCOUNT NUMBER	ITEM	DESCRIPTION
252.22131	JOCKEY PUMP	
252.22132	JOCKEY PUMP MOTOR	
252.225	PIPING	
252.2252	2.5IN + LARGER	
252.22521	CS/NNS	
252.22522	CS/NNS	
252.226	VALVES	
252.2261	STANDARD VALVES	
252.2262	E-RATED VALVES	
252.22621	GATE	
252.22622	CHECK	
252.22625	RELIEF	
252.22629	SPECIAL VALVES	
252.226291	POST INDICATOR GATE	
252.226292	DELUGE	
252.227	PIPING - MISC ITEMS	
252.2271	HANGERS + SUPPORTS	
252.2272	INSULATION	
252.2273	SPECIALTIES	
252.22731	HOSE HOUSES	
252.22732	FIRE HYDRANTS	
252.228	INSTRUMENTATION+CONTROL	
252.24	POTABLE WATER SYSTEM	

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MODEL 630 - 1243 MWE/3300 MWT COAL - 2.5/1.7 IN HG AV - MIDDLETOWN,USA - LOW SULFUR - COST BASIS 07/76

ACCOUNT NUMBER	ITEM	DESCRIPTION
252.245	PIPING	
252.2451	2IN + SMALLER	
252.24511	GALV/NNS	
252.24512	CU/NNS	
252.2452	2.5IN + LARGER	
252.24521	GALV/NNS	
252.246	VALVES	
252.2461	GATE	
252.2462	CHECK	
252.2463	GLOBE	
252.2465	SAFETY/RELIEF	
252.2469	SPECIAL VALVES	
252.24691	SAFETY SHOWER	
252.24692	EYE WASH	
252.24693	HOSE BIBBS	
252.247	PIPING-MISC ITEMS	
252.2471	HANGERS + SUPPORTS	
252.2472	INSULATION	
252.2473	SPECIALTIES	
252.248	INSTRUMENTATION + CONTROL	
252.3	AUXILIARY STEAM SYSTEM	
252.31	AUXILIARY BOILER SYSTEM	
252.312	HEAT TRANSFER EQUIPMENT	

EQUIPMENT LIST - REPORT 1

MODEL 630 - 1243 MWE/3300 MWT COAL - 2.5/1.7 IN HG AV - MIDDLETOWN,USA - LOW SULFUR - COST BASIS 07/76

ACCOUNT NUMBER	ITEM	DESCRIPTION
252.3121	AUXILIARY BOILERS	
252.315	PIPING	
252.3151	2IN + SMALLER	
252.31511	CS/NNS	
252.3152	2.5IN + LARGER	
252.31521	CS/NNS	
252.316	VALVES	
252.3161	GATE	
252.3162	CHECK	
252.3163	GLOBE	
252.317	PIPING - MISC ITEMS	
252.3171	HANGERS + SUPPORTS	
252.3172	INSULATION	
252.3173	SPECIALTIES	
252.32	AUX BOILER FEEDWATER SYS	
252.321	ROTATING MACHINERY	
252.3211	AUX FW PUMPS + MOTORS	
252.32111	AUX FW PUMPS	
252.32112	AUX FW MOTORS	
252.325	PIPING	
252.3251	2 IN + SMALLER	
252.32511	CS/NNS	
252.3252	2.5 IN + LARGER	

EQUIPMENT LIST - REPORT 1 08/15/77

MODEL 630 - 1243 MWE/3300 MWT COAL - 2.5/1.7 IN HG AV - MIDDLETOWN,USA - LOW SULFUR - COST BASIS 07/76

ACCOUNT NUMBER	ITEM	DESCRIPTION
252.32521	CS/NNS	
252.326	VALVES	
252.3261	GATE	
252.3262	CHECK	
252.3263	GLOBE	
252.327	PIPING - MISC. ITEMS	
252.3271	HANGERS + SUPPORTS	
252.3272	INSULATION	
252.3273	SPECIALTIES	
252.33	AUX FUEL OIL SYSTEM	
252.331	ROTATING MACHINERY	
252.3311	FUEL OIL PUMPS + MOTORS	
252.33111	FUEL OIL PUMP	
252.33112	FUEL OIL PUMP MOTOR	
252.335	PIPING	
252.3351	2IN + SMALLER	
252.33511	CS/NNS	
252.3352	2.5IN + LARGER	
252.33521	CS/NNS	
252.336	VALVES	
252.3362	CHECK	
252.3368	PLUG	
252.337	PIPING - MISC ITEMS	

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MODEL 630 - 1243 MWE/3300 MWT COAL - 2.5/1.7 IN HG AV - MIDDLETOWN,USA - LOW SULFUR - COST BASIS 07/76

ACCOUNT NUMBER	ITEM	DESCRIPTION
252.3371	HANGERS + SUPPORTS	
252.3372	INSULATION	
252.3373	SPECIALTIES	
252.34	AUX DEAR + MAKEUP SYSTEM	
252.341	ROTATING MACHINERY	
252.3411	CONDENSATE RETURN PUMP+MT	
252.34111	CONDENSATE RETURN PUMPS	
252.34112	CONDENSATE RETURN PUMP MT	
252.343	TANKS AND PRESSURE VESSELS	
252.3431	DEAERATOR	
252.345	PIPING	
252.3451	2 IN + SMALLER	
252.34511	CS/NNS	
252.3452	2.5 IN + LARGER	
252.34521	CS/NNS	
252.346	VALVES	
252.3461	GATE	
252.3462	CHECK	
252.3463	GLOBE	
252.347	PIPING - MISC. ITEMS	
252.3471	HANGERS + SUPPORTS	
252.3472	INSULATION	
252.3473	SPECIALTIES	

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MODEL 630 - 1243 MWE/3300 MWT COAL - 2.5/1.7 IN HG AV - MIDDLETOWN,USA - LOW SULFUR - COST BASIS 07/76

ACCOUNT NUMBER	ITEM	DESCRIPTION
252.35	AUX CHEM FEED SYSTEM	
252.351	ROTATING MACHINERY	
252.3511	CHEM FEED PUMPS + MOTORS	
252.35111	CHEM FEED PUMP	
252.35112	CHEM FEED PUMP MOTOR	
252.353	TANKS AND PRESSURE VESSELS	
252.3531	CHEM FEED TANKS	
252.355	PIPING	
252.3551	2 IN + SMALLER	
252.35511	SS/NNS	
252.3552	2.5 IN + LARGER	
252.356	VALVES	
252.3561	GATE	
252.3562	CHECK	
252.3563	GLOBE	
252.3569	SPECIAL VALVES	
252.35691	NEEDLE	
252.357	PIPING - MISC ITEMS	
252.3571	HANGERS + SUPPORTS	
252.3572	INSULATION	
252.3573	SPECIALTIES	
252.36	AUX.STEAM+CONDENSATE RETN.	
252.361	ROTATING MACHINERY	

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EQUIPMENT LIST - REPORT 1

MODEL 630 - 1243 MWE/3300 MWT COAL - 2.5/1.7 IN HG AV - MIDDLETOWN,USA - LOW SULFUR - COST BASIS 07/76

ACCOUNT NUMBER	ITEM	DESCRIPTION
252.3611	HEATING DRAIN TANK PUMP+MT	
252.36111	HEATING DRAIN TANK PUMP	
252.36112	HEATING DRAIN TANK PUMP MT	
252.363	TANKS AND PRESSURE VESSELS	
252.3631	HEATING DRAIN TANK	
252.365	PIPING	
252.3651	2 IN + SMALLER	
252.36511	CS/NNS	
252.3652	2.5 IN + LARGER	
252.36521	CS/NNS	
252.366	VALVES	
252.3661	GATE	
252.3662	CHECK	
252.3663	GLOBE	
252.367	PIPING - MISC.ITEMS	
252.3671	HANGERS + SUPPORTS	
252.3672	INSULATION	
252.3673	SPECIALTIES	
252.37	AUX BOILER STACKS + DUCT	
252.38	AUX BOILER BLOWDOWN	
252.383	TANKS AND PRESSURE VESSELS	
252.3831	AUX BOILER BLOWDOWN TANK	
252.385	PIPING	

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MODEL 630 - 1243 MWE/3300 MWT COAL - 2.5/1.7 IN HG AV - MIDDLETOWN,USA - LOW SULFUR - COST BASIS 07/76

ACCOUNT NUMBER	ITEM	DESCRIPTION
252.3851	2 IN + SMALLER	
252.38511	CS/NNS	
252.3852	2.5 IN + LARGER	
252.386	VALVES	
252.3861	GATE	
252.3862	CHECK	
252.3869	SPECIAL VALVES	
252.38691	BLOWDOWN	
252.387	PIPING - MISC ITEMS	
252.3871	HANGERS + SUPPORTS	
252.3872	INSULATION	
252.3873	SPECIALTIES	
252.39	AUX STEAM SYS COMPLETE I+C	
252.4	PLANT FUEL OIL SYSTEM	
252.41	ROTATING MACHINERY	
252.411	FUEL OIL UNLOAD PUMP+MOTOR	
252.4111	FUEL OIL UNLOADING PUMP	
252.4112	FUEL OIL UNLOAD PUMP MOTOR	
252.43	TANKS AND PRESSURE VESSELS	
252.431	PLANT FUEL OIL STORAGE TK	
252.45	PIPING	
252.451	2 IN + SMALLER	
252.4511	CS/NNS	

EQUIPMENT LIST - REPORT 1

MODEL 630 - 1243 MWE/3300 MWT COAL - 2.5/1.7 IN HG AV - MIDDLETOWN,USA - LOW SULFUR - COST BASIS 07/76

ACCOUNT NUMBER	ITEM	DESCRIPTION
252.452	2.5 IN + LARGER	
252.4521	CS/NNS	
252.46	VALVES	
252.460	PLUG	
252.47	PIPING-MISC ITEMS	
252.471	HANGERS + SUPPORTS	
252.472	INSULATION	
252.473	SPECIALTIES	
252.49	FOUNDATIONS/SKIDS	
252.491	PLANT FUEL OIL STG TK FNDT	
252.4911	EXCAVATION WORK	
252.49111	EARTH EXCAVATION	
252.49112	BACKFILL	
252.4912	CONCRETE WORK	
252.49121	FORMWORK	
252.49122	REINFORCING STEEL	
252.49123	CONCRETE	
252.4913	COMPACTED SAND BED	
252.4914	DIKE	
253.	COMMUNICATIONS EQUIPMENT	
253.1	LOCAL COMMUNICATIONS SYS	
253.11	GEN.PURPOSE TELEPHONE SYS	
253.12	SOUND POW TELEPHONE SYS	

EQUIPMENT LIST - REPORT 1 08/15/77

MODEL 630 - 1243 MWE/3300 MWT COAL - 2.5/1.7 IN HG AV - MIDDLETOWN,USA - LOW SULFUR - COST BASIS 07/76

ACCOUNT NUMBER	ITEM	DESCRIPTION
253.15	PA + INTERCOM SYS.	
253.2	SIGNAL SYSTEMS	
253.21	FIRE DETECTION SYSTEM	
253.211		
253.212		
254.	FURNISHINGS + FIXTURES	
254.1	SAFETY EQUIPMENT	
254.11	PORTABLE FIRE EXTINGUISHRS	
254.2	CHEMICAL LAB + INSTR SHOP	
254.223	INSTRUMENT SHOP APPARATUS	
254.23	SPEC LAB FURNITURE+FIXTURE	
254.3	OFFICE EQUIP+FURNISHINGS	
254.31	OFFICE FURNITURE	
254.4	CHANGE ROOM EQUIPMENT	
254.41	LOCKERS+BENCHES	
254.5	ENVIRONMENT MONIT EQUIP	
254.52	METEOROLOGICAL MONIT.EQUIP	
254.53	WATER QUALITY MONITORING	
254.54	THERMAL EFFLUENT MONITOR	
254.56	AIR QUALITY MONITORING	
254.6	DINING FACILITIES	
254.61	CAFETERIA EQUIPMENT	
255.	WASTE WATER TREATMENT EQPT	

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MODEL 630 - 1243 MWE/3300 MWT COAL - 2.5/1.7 IN HG AV - MIDDLETOWN,USA - LOW SULFUR - COST BASIS 07/76

ACCOUNT NUMBER	ITEM	DESCRIPTION
255.1	ROTATING MACHINERY	
255.11	GROUP I -	
255.111	BATCH WASTE TRANS PUMP+MTR	
255.1111	BATCH WASTE TRANSFER PUMP	
255.1112	BATCH WASTE TRANS PUMP MTR	
255.112	SLUDGE FEED PUMP + MOTOR	
255.1121	SLUDGE FEED PUMP	
255.1122	SLUDGE FEED PUMP MOTOR	
255.113	FILTRATE SUMP PUMP + MOTOR	
255.1131	FILTRATE SUMP PUMP	
255.1132	FILTRATE SUMP PUMP MOTOR	
255.114	LIME SLURRY PUMP + MOTOR	
255.1141	LIME SLURRY PUMP	
255.1142	LIME SLURRY PUMP MOTOR	
255.115	REGENERATION WASTE PMP+MTR	
255.1151	REGENERATION WASTE PUMP	
255.1152	REGENERATION WASTE PMP MTR	
255.116	HOLDING TANK BLOWER +MOTOR	
255.1161	HOLDING TANK BLOWER	
255.1162	HOLDING TANK BLOWER MOTOR	
255.117	ROT DRUM VAC FILT PUMP+MTR	
255.1171	ROTARY DRUM VACUUM PUMP	
255.1172	ROTARY DRUM MOTOR	

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MODEL 630 - 1243 MWE/3300 MWT COAL - 2.5/1.7 IN HG AV - MIDDLETOWN,USA - LOW SULFUR - COST BASIS 07/76

ACCOUNT NUMBER	ITEM	DESCRIPTION
255.1173	VACUUM PUMP MOTOR	
255.12	GROUP II	
255.121	SULFURIC ACID FEED PMP+MTR	
255.1211	SULFURIC ACID FEED PUMP	
255.1212	SULFURIC ACID FEED PMP MTR	
255.122	CAUSTIC FEED PUMP + MOTOR	
255.1221	CAUSTIC FEED PUMP	
255.1222	CAUSTIC FEED PUMP MOTOR	
255.123	LIME SLRY TNK AGITATOR+MTR	
255.1231	LIME SLRY TANK AGITATOR	
255.1232	LIME SLRY TNK AGITATOR MTR	
255.124	REGENER TANK AGITATOR+MTR	
255.1241	REGENERATION TANK AGITATOR	
255.1242	REGENER TANK AGITATOR MTR	
255.125	PH ADJUST TNK AGITATOR+MTR	
255.1251	PH ADJUST TANK AGITATOR	
255.1252	PH ADJUST TNK AGITATOR MTR	
255.126	SLUDGE CONVEYOR + MOTOR	
255.1261	SLUDGE CONVEYOR	
255.1262	SLUDGE CONVEYOR MOTOR	
255.5	TANKS AND PRESSURE VESSELS	
255.51	BATCH HOLDING TANK	
255.52	LIME SLURRY HOLDING TANK	

MODEL 630 - 1243 MWE/3300 MWT COAL - 2.5/1.7 IN HG AV - MIDDLETOWN,USA - LOW SULFUR - COST BASIS 07/76

ACCOUNT NUMBER	ITEM	DESCRIPTION
255.33	API SEPARATOR TANK	
255.34	CAUSTIC STORAGE TANK	
255.35	SULFURIC ACID STORAGE TANK	
255.36	REGENERANT HOLDING TANK	
255.37	PH ADJUSTMENT TANK	
255.5	PIPING	
255.51	2 IN + SMALLER	
255.511	CS/NNS	
255.52	2.5 IN + LARGER	
255.521	CS/NNS	
255.6	VALVES	
255.61	GATE	
255.7	PIPING-MISC ITEMS	
255.71	HANGERS AND SUPPORTS	
255.8	WASTE WATER I+C	
255.91	BATCH WASTE HOLD TNK FOUND	
255.911	EXCAVATION WORK	
255.9111	EXCAVATION-EARTH	
255.913	SUBSTRUCTURE CONCRETE	
255.9131	FORMWORK	
255.9132	REINFORCING STEEL	
255.9133	CONCRETE	
255.92	LIME SLURRY HOLD TNK FOUND	

EQUIPMENT LIST - REPORT 1

MODEL 630 - 1243 MWE/3300 MWT COAL - 2.5/1.7 IN HG AV - MIDDLETOWN,USA - LOW SULFUR - COST BASIS 07/76

ACCOUNT NUMBER	ITEM	DESCRIPTION
255.921	EXCAVATION WORK	
255.923	SUBSTRUCTURE CONCRETE	
255.9231	FORMWORK	
255.9232	REINFORCING STEEL	
255.9233	CONCRETE	
255.93	PH ADJUSTMENT TANK FOUND	
255.931	EXCAVATION WORK	
255.933	SUBSTRUCTURE CONCRETE	
255.9331	FORMWORK	
255.9332	REINFORCING STEEL	
255.9333	CONCRETE	
255.94	DEWATERING MACHINE FOUND	
255.941	EXCAVATION WORK	
255.9411	EXCAVATION-EARTH	
255.9414	BACKFILL-EARTH	
255.943	SUBSTRUCTURE CONCRETE	
255.9431	FORMWORK	
255.9432	REINFORCING STEEL	
255.9433	CONCRETE	
255.95	CAUSTIC + ACID TANKS FOUND	
255.951	EXCAVATION WORK	
255.9511	EXCAVATION-EARTH	
255.9514	BACKFILL-EARTH	

EQUIPMENT LIST - REPORT 1

MODEL 630 - 1243 MWE/3300 MWT COAL - 2.5/1.7 IN HG AV - MIDDLETOWN,USA - LOW SULFUR - COST BASIS 07/76

ACCOUNT NUMBER	ITEM	DESCRIPTION
255.953	SUBSTRUCTURE CONCRETE	
255.9531	FORMWORK	
255.9532	REINFORCING STEEL	
255.9533	CONCRETE	
255.96	MISC PUMP FOUNDATIONS	
255.961	EXCAVATION WORK	
255.9611	EXCAVATION-EARTH	
255.9614	BACKFILL-EARTH	
255.963	SUBSTRUCTURE CONCRETE	
255.9631	FORMWORK	
255.9632	REINFORCING STEEL	
255.9633	CONCRETE	
255.9634	EMBEDDED STEEL	
255.97	BATCH WASTE TNK BLDG FOUND	
255.971	EXCAVATION WORK	
255.9711	EXCAVATION-EARTH	
255.9714	BACKFILL-EARTH	
255.973	SUBSTRUCTURE CONCRETE	
255.9731	FORMWORK	
255.9732	REINFORCING STEEL	
255.9733	CONCRETE	
255.98	REGENERAT WASTE TANK FOUND	
255.981	EXCAVATION WORK	

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MODEL 630 - 1243 MWE/3300 MWT COAL - 2.5/1.7 IN HG AV - MIDDLETOWN,USA - LOW SULFUR - COST BASIS 07/76

ACCOUNT NUMBER	ITEM	DESCRIPTION
255.9811	EXCAVATION-EARTH	
255.9814	BACKFILL-EARTH	
255.983	SUBSTRUCTURE CONCRETE	
255.9831	FORMWORK	
255.9832	REINFORCING STEEL	
255.9833	CONCRETE	
255.99	BATCH WST TRANS PUMP FOUND	
255.991	EXCAVATION WORK	
255.9911	EXCAVATION-EARTH	
255.9914	BACKFILL-EARTH	
255.993	SUBSTRUCTURE CONCRETE	
255.9931	FORMWORK	
255.9932	REINFORCING STEEL	
255.9933	CONCRETE	
26 .	MAIN COND HEAT REJECT SYS	
261.	STRUCTURES	
261.1	MAKEUP WTR INT + DISCH STR	
261.11	INTAKE STRUCTURE	
261.111	EXCAVATION WORK	
261.1111	EARTH EXCAVATION	
261.1112	ROCK EXCAVATION	
261.1113	SHEETING (TEMP COFFERDAM)	
261.1114	STRCT STL (TEMP COFFERDAM)	

EQUIPMENT LIST - REPORT 1

MODEL 630 - 1243 MWE/3300 MWT COAL - 2.5/1.7 IN HG AV - MIDDLETOWN,USA - LOW SULFUR - COST BASIS 07/76

ACCOUNT NUMBER	ITEM	DESCRIPTION
261.1115	PUMPING	
261.112	BEARING PILES (STEEL)	
261.113	SUBSTRUCTURE CONCRETE	
261.1131	FORMWORK	
261.1132	REINFORCING STEEL	
261.1133	CONCRETE	
261.1134	EMBEDDED STEEL	
261.1135	CONCRETE FINISH	
261.1136	WATERPROOFING	
261.1137	CONSTRUCTION JOINTS	
261.1138	RUBBING CONCRETE SURFACES	
261.114	SUPERSTRUCTURE	
261.1141	CONCRETE WORK	
261.1142	STRUCTURAL + MISC. STEEL	
261.11421	STRUCTURAL STEEL	
261.11422	GRATING (GALV)	
261.11423	HANDRAIL	
261.1143	EXTERIOR WALLS	
261.11431	CONCRETE	
261.11432	MASONRY	
261.1144	ROOF DECK	
261.11441	METAL ROOF DECK	
261.1145	ROOFING + FLASHING	

EQUIPMENT LIST - REPORT 1 08/15/77

MODEL 630 - 1243 MWE/3300 MWT COAL - 2.5/1.7 IN HG AV - MIDDLETOWN,USA - LOW SULFUR - COST BASIS 07/76

ACCOUNT NUMBER	ITEM	DESCRIPTION
261.11451	B.U. ROOFG, INSULTN, + FLA	
261.1146	INTERIOR WALLS	
261.11461	CONCRETE WALLS	
261.11462	MASONRY WALLS	
261.11463	PARTITIONS	
261.1147	DOORS + WINDOWS	
261.11471	ROLLING STEEL DOORS	
261.11472	PERSONNEL DOORS	
261.11473	SASH + GLAZING	
261.1149	PAINTING	
261.11491	CONCRETE	
261.11492	STEELWORK	
261.11493	METAL DECK	
261.11494	HANDRAIL	
261.117	BULKHEAD	
261.1171	STEEL SHEETING	
261.1172	STRUCTURAL STEEL	
261.1173	GRAVEL FILL	
261.1174	DREDGING	
261.1175	RIP-RAP (12 IN. THICK)	
261.1176	CHAIN LINK FENCE(7FT HIGH)	
261.118	PROTECTIVE DOLPHINS	
261.1181	WOOD PILES	

EQUIPMENT LIST - REPORT 1

MODEL 630 - 1243 MWE/3300 MWT COAL - 2.5/1.7 IN HG AV - MIDDLETOWN,USA - LOW SULFUR - COST BASIS 07/76

ACCOUNT NUMBER	ITEM	DESCRIPTION
261.119	BUILDING SERVICES	
261.1191	FLOOR DRAINS + PIPING	
261.1192	HEATING + VENTILATING	
261.11921	AXIAL WALL FANS	
261.11922	ELECTRIC UNIT HEATERS	
261.11928	INSTRUMENTATION + CONTROL	
261.12	DISCHARGE STRUCTURE	
261.121	EXCAVATION WORK	
261.1211	EARTH EXCAVATION	
261.1212	BACKFILL	
261.1213	DREDGING	
261.122	BEARING PILES (STEEL)	
261.127	RIP-RAP (12 IN. THICK)	
261.126	MARKER PILES (WOOD)	
261.2	CIRC WATER PUMP HOUSE	
261.21	BUILDING STRUCTURE	
261.211	EXCAVATION WORK	
261.2111	EARTH EXCAVATION	
261.2112	ROCK EXCAVATION	
261.2113	CONCRETE FILL	
261.2114	BACKFILL	
261.2115	PUMPING	
261.213	SUBSTRUCTURE CONCRETE	

MODEL 630 - 1243 MWE/3300 MWT COAL - 2.5/1.7 IN HG AV - MIDDLETOWN,USA - LOW SULFUR - COST BASIS 07/76

ACCOUNT NUMBER	ITEM	DESCRIPTION
261.2131	FORMWORK	
261.2132	REINFORCING STEEL	
261.2133	CONCRETE	
261.2134	EMBEDDED STEEL	
261.2135	FLOOR FINISH	
261.2136	WATERPROOFING	
261.2137	CONSTRUCTION JOINTS	
261.2138	RUBBING CONCRETE SURFACES	
261.2139	WIRE FABRIC	
261.214	SUPERSTRUCTURE	
261.2141	CONCRETE WORK	
261.21411	FORMWORK	
261.214111	FORMWORK-WOOD	
261.214112	FORMWORK-METAL	
261.21412	REINF. STEEL	
261.21413	CONCRETE	
261.21414	EMBEDDED STEEL	
261.21415	FLOOR FINISH	
261.21416	WATERPROOFING	
261.21417	RUBBING CONCRETE SURFACES	
261.21418	CONSTRUCTION JOINTS	
261.2142	STRUCT + MISC. STEEL	
261.21421	STRUCT. STEEL	

EQUIPMENT LIST - REPORT 1

MODEL 630 - 1243 MWE/3300 MWT COAL - 2.5/1.7 IN HG AV - MIDDLETOWN,US - LOW SULFUR - COST BASIS 07/76

ACCOUNT NUMBER	ITEM	DESCRIPTION
261.21423	MISC. FRAMES, ETC.	
261.21425	FLOOR GRATING (GALV.)	
261.21426	STAIR TREADS	
261.21427	HANDRAILS	
261.2143	EXTERIOR WALLS	
261.21431	CONCRETE WALLS	
261.21432	METAL SIDING(INSULATED)	
261.2144	ROOF DECK	
261.21441	METAL ROOF DECK	
261.2145	ROOFING + FLASHING	
261.21451	B.U. ROOFING, FLASHING+INS	
261.2146	INTERIOR WALLS + PARTIT.	
261.21461	CONCRETE WALLS	
261.21462	MASONRY WALLS	
261.21463	PARTITIONS	
261.2147	DOORS + WINDOWS	
261.21471	ROLLING STEEL DOORS	
261.21472	PERSONNEL DOORS	
261.21473	SASH + GLAZING	
261.2149	PAINTING	
261.21491	CONCRETE	
261.21492	STEELWORK	
261.21493	METAL DECK	

MODEL 630 - 1243 MWE/3300 MWT COAL - 2.5/1.7 IN HG AV - MIDDLETOWN,USA - LOW SULFUR - COST BASIS 07/76

ACCOUNT NUMBER	ITEM	DESCRIPTION
261.21494	HANDRAIL	
261.22	BUILDING SERVICE	
261.221	PLUMBING + DRAINS	
261.2211	ROOF DRAINS & PIPING	
261.22111	DRAINS	
261.22115	PIPING (ALL 2.5 IN + LGR)	
261.221151	GALV STEEL/NNS	
261.2212	FLOOR DRAINS & PIPING	
261.22121	DRAINS	
261.22125	PIPING (ALL 2.5 IN + LGR)	
261.221251	CI/NNS	
261.221252	PVC/NNS	
261.222	HEATING, VENT, + AIR COND	
261.2221	ROTATING MACHINERY	
261.22211	PROPELLER FAN + MOTOR	
261.222111	PROPELLER FAN	
261.222112	PROPELLER FAN MOTOR	
261.2222	HEAT TRANSFER EQUIPMENT	
261.22221	ELECTRIC UNIT HEATERS+MTR	
261.222211	ELECTRIC UNIT HEATERS	
261.222212	ELECTRIC UNIT HTR MOTORS	
261.2226	VALVES + DAMPERS	
261.22269	SPECIAL VALVES + DAMPERS	

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MODEL 630 - 1243 MWE/3300 MWT COAL - 2.5/1.7 IN HG AV - MIDDLETOWN,USA - LOW SULFUR - COST BASIS 07/76

ACCOUNT NUMBER	ITEM	DESCRIPTION
261.222691	INTAKE LOUVERS	
261.224	LIGHTING & SERVICE POWER	
261.226	INSTRUMENTATION + CONTROL	
261.3	MAKEUP WTR PRETREATMNT BLG	
261.31	BUILDING STRUCTURE	
261.311	EXCAVATION WORK	
261.3111	EARTH EXCAVATION	
261.3112	ROCK EXCAVATION	
261.3113	CONCRETE FILL	
261.3114	FILL + BACKFILL	
261.3115	DEWATERING	
261.313	SUBSTRUCTURE CONCRETE	
261.3131	FORMWORK	
261.3132	REINFORCING STEEL	
261.3133	CONCRETE	
261.3134	EMBEDDED STEEL	
261.3135	FLOOR FINISH	
261.3136	WATERPROOFING	
261.3137	CONSTRUCTION JOINTS	
261.3138	RUBBING CONCRETE SURFACES	
261.314	SUPERSTRUCTURE	
261.3141	CONCRETE WORK	
261.31411	FORMWORK	

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EQUIPMENT LIST - REPORT 1

MODEL 630 - 1243 MWE/3300 MWT COAL - 2.5/1.7 IN Hg AV - MIDDLETOWN,USA - LOW SULFUR - COST BASIS 07/76

ACCOUNT NUMBER	ITEM	DESCRIPTION
261.314111	FORMWORK-WOOD	
261.314112	FORMWORK-METAL	
261.31412	REINFORCING STEEL	
261.31413	CONCRETE	
261.31414	EMBEDDED STEEL	
261.31415	FLOOR FINISH	
261.31416	WATERPROOFING	
261.31417	RUBBING CONCRETE SURFACES	
261.31418	CONSTRUCTION JOINTS	
261.3142	STRUCTURAL + MISC STEEL	
261.31421	STRUCTURAL STEEL	
261.31423	MISCELLANEOUS FRAMES,ETC.	
261.31425	FLOOR GRATING (GALV.)	
261.31426	STAIN TREADS	
261.31427	HANDRAIL	
261.3143	EXTERIOR WALLS	
261.31431	CONCRETE WALLS	
261.31432	MASONRY WALLS	
261.31433	METAL INSULATED SIDING	
261.31434	WINDOW WALL	
261.3144	ROOF DECK	
261.31441	METAL ROOF DECK	
261.31442	PRECAST CONCRETE PANELS	

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EQUIPMENT LIST - REPORT 1

MODEL 630 - 1243 MWE/3300 MWT COAL - 2.5/1.7 IN HG AV - MIDDLETOWN,USA - LOW SULFUR - COST BASIS 07/76

ACCOUNT NUMBER	ITEM	DESCRIPTION
261.31443	CONCRETE FILL	
261.31444	REINFORCING STEEL	
261.3145	ROOFING + FLASHING	
261.31451	B.U. ROOFING,INSUL.+FLASH.	
261.31452	B.U. ROOF+FLASH(NO INSUL)	
261.3146	INTERIOR WALLS + PARTITION	
261.31461	CONCRETE WALLS	
261.31462	CONCRETE BLOCK	
261.31463	METAL PARTITIONS	
261.31464	PLASTER BD PARTIT.ONS	
261.3147	DOORS + WINDOWS	
261.31471	ROOLING STEEL DOORS	
261.31472	PERSONNEL DOORS	
261.31473	SASH + GLAZING	
261.3148	WALLS,FLOORS+CEILG FINISHS	
261.3149	PAINTING	
261.31491	CONCRETE	
261.31492	STEELWORK	
261.31493	METAL DECK	
261.31494	SPECIAL METALLIC PAINT	
261.31495	HANDRAIL	
261.31496	EPOXY	
261.32	BUILDING SERVICES	

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EQUIPMENT LIST - REPORT 1 08/15/77

MODEL 630 - 1243 MWE/3500 MWT COAL - 2.5/1.7 IN HG AV - MIDDLETOWN,USA - LOW SULFUR - COST BASIS 07/76

ACCOUNT NUMBER	ITEM	DESCRIPTION
261.321	PLUMBING + DRAINS	
261.3211	ROOF DRAINS + PIPING	
261.32111	DRAINS	
261.32115	PIPING (ALL 2.5 IN+LARGER)	
261.321151	GALV STEEL/NNS	
261.3212	FLOOR DRAINS + PIPING	
261.32121	DRAINS	
261.32125	PIPING (ALL 2.5 IN+LARGER)	
261.321251	CS/NNS	
261.321252	CI/NNS	
261.322	HEATING, VENT, + AIR COND	
261.3221	ROTATING MACHINERY	
261.32211	ROOF VENTILATORS + MOTORS	
261.322111	ROOF VENTILATORS	
261.322112	ROOF VENTILATORS MOTORS	
261.3222	HEAT TRANSFER EQUIPMENT	
261.32221	ELECTRIC UNIT HEATER+MOTOR	
261.322211	ELECTRIC UNIT HEATER	
261.322212	ELECTRIC UNIT HEATER+MOTOR	
261.3226	VALVES + DAMPERS	
261.32269	SPECIAL VALVES	
261.322691	INTAKE LOUVERS	
261.3228	INSTRUMENTATION CONTROL	

EQUIPMENT LIST - REPORT 1

MODEL 630 - 1243 MWE/3300 MWT COAL - 2.5/1.7 IN HG AV - MIDDLETOWN,USA - LOW SULFUR - COST BASIS 07/76

ACCOUNT NUMBER	ITEM	DESCRIPTION
261.324	LIGHTING + SERVICE POWER	
261.4	CHLORINATION BUILDING	
261.41	BUILDING STRUCTURE	
261.411	EXCAVATION WORK	
261.4111	EARTH EXCAVATION	
261.4114	BACKFILL	
261.413	SUBSTRUCTURE CONCRETE	
261.4131	FORMWORK	
261.4132	REINF.STEEL	
261.4133	CONCRETE	
261.4134	EMBEDDED STEEL	
261.4135	FLOOR FINISH	
261.4136	WATERPROOFING	
261.4137	CONSTRUCTION JOINTS	
261.4138	RUBBING CONCRETE SURFACES	
261.4139	WIRE FABRIC	
261.414	SUPERSTRUCTURE	
261.4141	CONCRETE WORK	
261.4142	STRUCT. + MISC. STEEL	
261.41421	STRUCT. STEEL	
261.41423	MISC. FRAMES, ETC.	
261.4143	EXTERIOR WALLS	
261.41432	MASONRY	

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EQUIPMENT LIST - REPORT 1 08/15/77

MODEL 630 - 1243 MWE/3300 MWT COAL - 2.5/1.7 IN HG AV - MIDDLETOWN,USA - LOW SULFUR - COST BASIS 07/76

ACCOUNT NUMBER	ITEM	DESCRIPTION
261.4144	ROOF DECK	
261.41441	METAL ROOF DECK	
261.4145	ROOFING + FLASHING	
261.41451	B.U.ROOFING,FLASHING+INSUL	
261.4147	DOORS + WINDOWS	
261.41472	PERSONNEL DOORS	
261.41473	SASH + GLAZING	
261.4149	PAINTING	
261.41492	STEELWORK	
261.41493	METAL DECK	
261.424	LIGHTING + SERVICE POWER	
262.	MECHANICAL EQUIPMENT	
262.1	HEAT REJECTION SYSTEM	
262.11	WATER INTAKE EQUIPMENT	
262.111	ROTATING MACHINERY	
262.1111	SCREEN WASH PUMP+MOTOR	
262.11111	SCREEN WASH PUMP	
262.11112	SCREEN WASH PUMP MOTOR	
262.114	PURIFICATION+FILTRATION EQ	
262.1141	TRAVELING SCREENS	
262.1142	TRASH RACK	
262.1143	TRASH RAKE	
262.1144	STOP LOGS	

EQUIPMENT LIST - REPORT 1

MODEL 630 - 1243 MWE/3300 MWT COAL - 2.5/1.7 IN HG AV - MIDDLETOWN,USA - LOW SULFUR - COST BASIS 07/76

ACCOUNT NUMBER	ITEM	DESCRIPTION
262.1145	SCREEN WASH STRAINER	
262.115	PIPING-SCREEN WASH	
262.1151	2 IN. + SMALLER	
262.1152	2.5 IN. + LARGER	
262.11521	CS/NNS	
262.116	VALVES-SCREEN WASH	
262.1162	CHECK	
262.1166	BUTTERFLY	
262.117	PIPING-MISC ITEMS	
262.1171	HANGERS + SUPPORTS	
262.1172	INSULATION	
262.1173	SPECIALTIES	
262.12	CIRCULATING WATER SYSTEM	
262.121	ROTATING MACHINERY	
262.1211	CIRCULATING WATER PUMP+MTR	
262.12111	CIRC WATER PUMP	
262.12112	CIRC WATER PUMP MOTOR	
262.125	PIPE	
262.1251	2 IN + SMALLER	
262.1252	2.5 IN + LARGER	
262.12521	CONCRETE/NNS	
262.12522	CS/NNS	
262.126	VALVES	

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MODEL 630 - 1243 MWE/3300 MWT COAL - 2.5/1.7 IN HG AV - MIDDLETOWN,USA - LOW SULFUR - COST BASIS 07/76

ACCOUNT NUMBER	ITEM	DESCRIPTION
262.1266	BUTTERFLY	
262.127	PIPING / MISC. ITEMS	
262.1271	HANGERS + SUPPORTS	
262.1272	INSULATION	
262.1273	SPECIALTIES	
262.1274	PIPE TRENCHING	
262.12741	EXCAVATION	
262.127411	EARTH EXCAVATION	
262.127412	ROCK EXCAVATION	
262.12742	BACKFILL	
262.12743	COMPACTED SAND BED	
262.12744	SUBSTRUCTURE CONCRETE	
262.127441	FORMWORK	
262.127442	REINF STEEL	
262.127443	CONCRETE	
262.128	INSTRUMENTATION + CONTROL	
262.129	SKIDS / FOUNDATIONS	
262.1291	CHLORINATION SYSTEM	
262.1292	SULPHURIC ACID FEED SYSTEM	
262.12921	ROTATING MACHINERY	
262.129211	SULFURIC ACID FEED PUMP+MT	
262.129212	SULF ACID FEED PUMP MOTOR	
262.12923	TANKS AND PRESSURE VESSELS	

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EQUIPMENT LIST - REPORT 1

MODEL 630 - 1243 MWE/3300 MWT COAL - 2.5/1.7 IN HG AV - MIDDLETOWN,USA - LOW SULFUR - COST BASIS 07/76

ACCOUNT NUMBER	ITEM	DESCRIPTION
262.12925	PIPING	
262.129251	2 IN + SMALLER-CS/NNS	
262.129252	2.5 IN + LARGER	
262.12926	VALVES	
262.13	COOLING TOWERS	
262.132	HEAT XFER EQUIPMENT	
262.1321	COOLING TOWERS(CT)-MAIN	
262.138	INSTRUMENTATION + CONTROL	
262.15	MAIN CT.MAKEUP+BLOWDN SYS.	
262.151	MAKE-UP WATER SYSTEM	
262.1511	ROTATING MACHINERY	
262.15111	MAKE-UP PUMP + MOTOR	
262.151111	MAKE-UP PUMP	
262.151112	MAKE-UP PUMP MOTOR	
262.1515	PIPING	
262.15151	2IN.+ SMALLER	
262.15152	2.5IN + LARGER	
262.151521	CONCRETE/NNS	
262.1516	VALVES	
262.15162	CHECK VALVES	
262.15163	GLOBE VALVES	
262.15166	BUTTERFLY VALVES	
262.1517	PIPING - MISC. ITEMS	

EQUIPMENT LIST - REPORT 1 08/15/77

MODEL 630 - 1243 MWE/3300 MWT COAL - 2.5/1.7 IN HG AV - MIDDLETOWN,USA - LOW SULFUR - COST BASIS 07/76

ACCOUNT NUMBER	ITEM	DESCRIPTION
262.15171	HANGERS + SUPPORTS	
262.15172	INSULATION	
262.15173	SPECIALTIES	
262.15174	PIPE TRENCHING	
262.151741	EXCAVATION	
262.151742	BACKFILL	
262.151743	COMPACTED SAND BED	
262.1518	INSTRUMENTATION + CONTROL	
262.152	BLOWDOWN SYSTEM	
262.1525	PIPING	
262.15251	2 IN. + SMALLER	
262.15252	2.5 IN. + LARGER	
262.152521	CONCRETE/NNS	
262.1526	VALVES	
262.15266	BUTTERFLY	
262.1527	PIPING-MISC ITEMS	
262.15271	HANGERS + SUPPORTS	
262.15272	INSULATION	
262.15273	SPECIALTIES	
262.15274	PIPE TRENCHING	
262.1528	INSTRUMENTATION & CONTROL	
262.155	MAKEUP WTR PRETREATMNT SYS	
91 .	CONSTRUCTION SERVICES	

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EQUIPMENT LIST - REPORT 1

MODEL 630 - 1243 MWE/3300 MWT COAL - 2.5/1.7 IN HG AV - MIDDLETOWN,USA - LOW SULFUR - COST BASIS 07/76

ACCOUNT NUMBER	ITEM	DESCRIPTION
911.	TEMPORARY CONSTRUCTION FAC	
911.1	TEMPORARY BUILDINGS	
911.11	FIELD OFFICE,SHOPS,WHSE.	
911.12	JANITOR SERVICES	
911.13	GUARDS - SECURITY	
911.2	TEMPORARY FACILITIES	
911.21	ROADS,PARKING,LAYDOWN AREA	
911.22	TEMPORARY ELECTRICAL SUPP	
911.23	TEMPORARY MECH. & PIPING	
911.24	TEMPORARY HEAT	
911.25	BARGE UNLOAD.FAC. - NONE	
911.26	GENERAL CLEANUP	
911.27	SNOW REMOVAL-INCL.IN911.21	
912.	CONSTRUCTION TOOLS & EQUIP	
912.1	MAJOR EQUIPMENT	
912.11	PURCHASE MAJOR EQUIPMENT	
912.12	RENTAL INCL. IN 912.11	
912.13	EQUIPMENT MAINTENANCE	
912.14	FUEL + LUBRICANTS	
912.2	MISCELLANEOUS VEHICLES	
912.21	PURCHASE INCL. IN 912.11	
912.22	RENTAL-INCL. IN 912.12	
912.23	MAINTENANCE-INCL.IN 912.13	

EQUIPMENT LIST - REPORT 1 08/15/77

MODEL 630 - 1243 MWE/3300 MWT COAL - 2.5/1.7 IN HG AV - MIDDLETOWN, USA - LOW SULFUR - COST BASIS 07/76

ACCOUNT NUMBER	ITEM	DESCRIPTION
912.24	FUEL&LUB.-INCL. IN 912.14	
912.3	PURCHASE OF SMALL TOOLS	
912.4	EXPENDABLE SUPPLIES	
913.	PAYROLL INSURANCE & TAXES	
913.1	SOCIAL SECUR. TAX .055 X L	
913.2	STATE+FED.UNEMPLOY.035 X L	
913.3	WORKMENS COMP.INS .040 X L	
913.4	P.L.+P.D. INS. .005 X L	
914.	PERMITS,INS. & LOCAL TAXES	
914.1	B ..LDERS ALL RISK INS	
914.2	FEES & PERMITS	
914.3	STATE & LOCAL SALES TAXES	
915.	TRANSPORTATION	
92 .	HOME OFFICE ENGRG.&SERVICE	
921.	HOME OFFICE SERVICES	
921.1	SALARIES	
921.11	ENGINEERING AND DESIGN	
921.13	PURCHASING & EXPEDITING	
921.14	ESTIMATING & COST CONTROL	
921.16	PLANNING AND SCHEDULING	
921.17	REPRODUCTION	
921.2	EXPENSES	
921.3	DIRECT PAYROLL COST	

EQUIPMENT LIST - REPORT 1

MODEL 630 - 1243 MWE/3300 MWT COAL - 2.5/1.7 IN HG AV - MIDDLETOWN,USA - LOW SULFUR - COST BASIS 07/76

ACCOUNT NUMBER	ITEM	DESCRIPTION
921.4	OVERHEAD LOADING	
921.5	OUTSIDE CONSULTANTS SVCS.	
921.6	FEE FOR H/O SERVICES	
922.	HOME OFFICE Q/A	
923.	HOME OFFICE CONSTRCTN MGMT	
923.1	SALARIES	
923.2	DIRECT PAYROLL COST	
923.3	OVERHEAD LOADING	
923.4	EXPENSES	
93 .	FIELD OFFICE ENGRG&SERVICE	
931.	FIELD OFFICE EXPENSES	
931.1	OFFICE FURNITURE & EQUIP.	
931.2	TELEPHONE & COMMUNICATIONS	
931.3	OFFICE SUPPLIES	
931.4	FIRST AID & MEDICAL EXP.	
932.	FIELD JOB SUPERVISION	
932.1	SALARIES	
932.3	DIRECT PAYROLL COST	
932.4	OVERHEAD LOADING	
932.5	RELOCATION EXPENSE-ALLWNCE	
932.6	FEE FOR CONSTR SRVCS	
932.61	HOME OFFICE	
932.62	FIELD	

714 323

SECTION 13

SITE DESCRIPTION

SECTION 13

SITE DESCRIPTION

13.1 GENERAL

This section provides the site and environmental data as derived from Appendix A of "Guide for Economic Evaluation of Nuclear Reactor Plant Designs", USAEC Report NUS-531, and modified to reflect Coal Plant Siting. These data form the bases of the criteria used for designing the facility and for evaluating the release of liquids and gases to the environment.

13.2 TOPOGRAPHY AND GENERAL SITE CHARACTERISTICS

The site is located on the east bank of the North River at a distance of approximately twenty-five miles south of Middletown, the nearest large city. The North River flows from north to south and is one-half mile (2600 ft) wide adjacent to the plant site. A flood plain extends from both river banks an average distance of one-half mile, ending with hilltops generally 150 to 250 ft above the river level. Beyond this area, the topography is gently rolling, with no major critical topographical features. The plant site itself extends from river level to elevations to 50 ft above river level. The primary structures and the switchyard are located on level ground at an elevation of 18 ft above the mean river level. This elevation is ten feet above the 100 year maximum river level, according to U. S. Army Corps of Engineers studies of the area.

In order to optimize land area requirements for the coal fueled plant site, maximum use of the river location is employed. The primary structure is located 1200 ft from the east bank of the river. The site land area

is approximately 500 acres. An additional 2,000 acres, approximately six miles from the plant site, are available for solid waste disposal.

13.3 SITE ACCESS

Highway access is provided to the hypothetical site by five miles of secondary road connecting to a State highway. This road is in good condition and needs no additional improvements. Railroad access is provided by constructing a railroad spur which intersects the B&M Railroad. The length of the required spur from the main line to the plant site is assumed to be five miles in length. The North River is navigable throughout the year with a 40 ft wide by 12 ft deep channel. The distance from the shoreline to the center of the ship channel is 2,000 ft. All plant shipments are assumed to be made overland except that heavy equipment may be transported by barge. The Middletown Municipal Airport is located three miles west of the State highway, 15 miles south of Middletown, and ten miles north of the site.

13.4 POPULATION DENSITY AND LAND USE

The hypothetical site is near a large city (Middletown, of 250,000 population) but in an area of low population density. Variation in population with distance from the site boundary is:

Miles	Cumulative Population
0.5	0
1.0	310
2.0	1,370
5.0	5,020
10.0	28,600
20.0	133,000
30.0	1,010,000

There are five industrial manufacturing plants within 15 miles of the hypothetical site. Four are small plants employing less than 100 people each. The fifth, near the airport, employs 2,500 people. Closely populated areas are found only in the centers of the small towns, so the total land area used for housing is small. The remaining land, including that across the river, is used as forest or cultivated crop land, except for railroads and highways.

13.5 NEARBY FACILITIES

Utilities are available as follows:

- Natural gas service is available two miles from the site boundary on the same side of the river.
- Communication lines will be furnished to the project boundaries at no cost.
- Power and water for construction activities are available at the southwest corner of the site boundary.
- The design provides a connection to the utility grid at two different voltage levels; 500 kV for the generator connection and 230 kV for the reserve auxiliary transformer connection.

13.6 METEOROLOGY AND CLIMATOLOGY

13.6.1 Ambient Temperatures

The winters in the Middletown area are moderately cold, with average temperatures in the low 30's. The summers are fairly humid with average temperatures in the low 70's, and with high temperatures averaging around 82 F. The historic maximum wet bulb and dry bulb temperatures are 78 F and 99 F respectively.

The year-round temperature duration curves for the dry bulb temperatures and coincident wet bulb temperatures are shown in Figure 13.1.

13.6.2 Prevailing Wind

According to Weather Bureau records at the Middletown Airport, located ten miles North of the site on a low plateau just east of the North River, surface winds are predominantly southwesterly 4-10 knots during the warm months of the year, and westerly 6-13 knots during the cool months.

There are no large diurnal variations in wind speed or direction. Observations of wind velocities at altitudes indicate a gradual increase in mean velocity and a gradual veering of the prevailing wind direction from southwest and west near the surface to westerly and northwesterly aloft.

In addition to the above, studies of the area indicate that there is a significant channeling of the winds below the surrounding hills into the north-south orientation of the North River. It is estimated that these winds within the river valley blow approximately parallel to the valley orientation in excess of 50 percent of the time.

13.6.3 Atmospheric Diffusion Properties

The transport and dilution of materials in the form of aerosols, vapors, or gases released into the atmosphere from the Middletown coal power station are a function of the state of the atmosphere along the plume path, the topography of the region, and the characteristics of the effluents themselves. For a routine airborne release, the concentration of materials in the surrounding region depends on the amount of effluent released, the height of the release, the windspeed, atmospheric stability, and airflow patterns of the site, and various effluent removal mechanisms. Geographic features such as hills and valleys influence diffusion and airflow patterns. Of the diffusion models that have been developed, the straight line trajectory model is utilized to calculate the atmospheric diffusion from the Middletown site.

The straight-line trajectory model assumes that the airflow transports and diffuses effluents along a straight line through the entire region of interest in the airflow direction at the release point. The version of this model which is used is the Gaussian straight-line trajectory model. In this model, the windspeed and atmospheric stability at the release point are assumed to determine the atmospheric diffusion characteristics in the direction of airflow.

13.6.4 Severe Meteorological Phenomena

A maximum instantaneous wind velocity of 100 mph has been recorded at the site. During the past 50 years, three tropical storms, all of them in

the final dissipation stages, have passed within 50 miles of the site. Some heavy precipitation and winds in excess of 40 miles/hr were recorded, but no significant damage other than to crops resulted.

The area near the site experiences an average of 35 thunderstorms a year, with maximum frequency in early summer. High winds near 60 mph, heavy precipitation, and hail are recorded about once every four years.

In forty years of record, there have been twenty tornadoes reported within fifty miles of the site. Maximum tornado frequency occurs during the months of May and June.

During the past forty years, there have been ten storms in which freezing rain has caused power transmission line disruptions. Most of these storms have occurred early in December.

13.6.5 Ambient Background Concentrations

Background concentrations of SO_2, NO_x and particulates are typical of a rural area approximately 30 miles from a major industrial metropolitan center. They are considered when determining the plant's adherence to the guidelines.

13.6.6 Air Quality Estimation

Ambient pollutant levels are estimated through the application of atmospheric diffusion models. The estimates are based primarily upon the pollutant emissions, meteorology, topography, and background concentration as previously described. Modeling techniques described in the Turner Atmospheric Dispersion Workbook are used for concentration estimates.*

13.7 HYDROLOGY

The North River provides an adequate source of raw makeup water for the station. The average maximum temperature is 75 F and the average minimum is 39 F. The mean annual temperature is 57 F.

U.S. Army Corps of Engineers' studies indicate that the 100 year maximum flood level rose to eight feet above the mean river level. There are no dams near the site whose failure could cause the river to rise above the eight foot level.

13.8 GEOLOGY AND SEISMOLOGY

13.8.1 Soil Profiles and Load Bearing Characteristics

Soil profiles for the site show alluvial soil and rock fill to a depth of eight feet; Brassfield limestone to a depth of 30 ft, blue weathered shale and fossiliferous Richmond limestone to a depth of 50 ft; and bedrock over a depth of 50 ft. Allowable soil bearing is 6,000 psf and rock bearing characteristics are 18,000 psf and 15,000 psf for Brassfield and Richmond strata, respectively. No underground cavities exist in the limestone.

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* Turner, D. B., "Workbook of Atmospheric Dispersion Estimates", Public Health Service Publication No. 999-AP-26, U.S. Department of Health, Education, and Welfare, Public Health Service, Consumer Protection and Environmental Health Service, National Air Pollution Control Administration, Cincinnati, Ohio Revised 1969.

13.8.2 Seismology

The site is located in a generally seismically inactive region. Historical records show three earthquakes have occurred in the region between 1870 and 1975.

13.9 SEWAGE AND LIQUID EFFLUENTS

All sewage receives primary and secondary treatment prior to discharge into the North River. Other wastewater is discharged in compliance with EPA effluent standards as promulgated in 40 CFR 423.

13.10 AIR EMISSIONS

Air emissions comply with EPA New Source Performance Standards as promulgated in 40 CFR 60. Discharge of SO_2, does not exceed 1.2 lb per million Btu heat input; NO_x does not exceed 0.70 lb per million Btu heat input; and particulate does not exceed 0.1 lb per million Btu heat input.

The plant air emissions do not cause air quality levels to exceed national primary and secondary air quality standards as defined in 42 CFR 410.

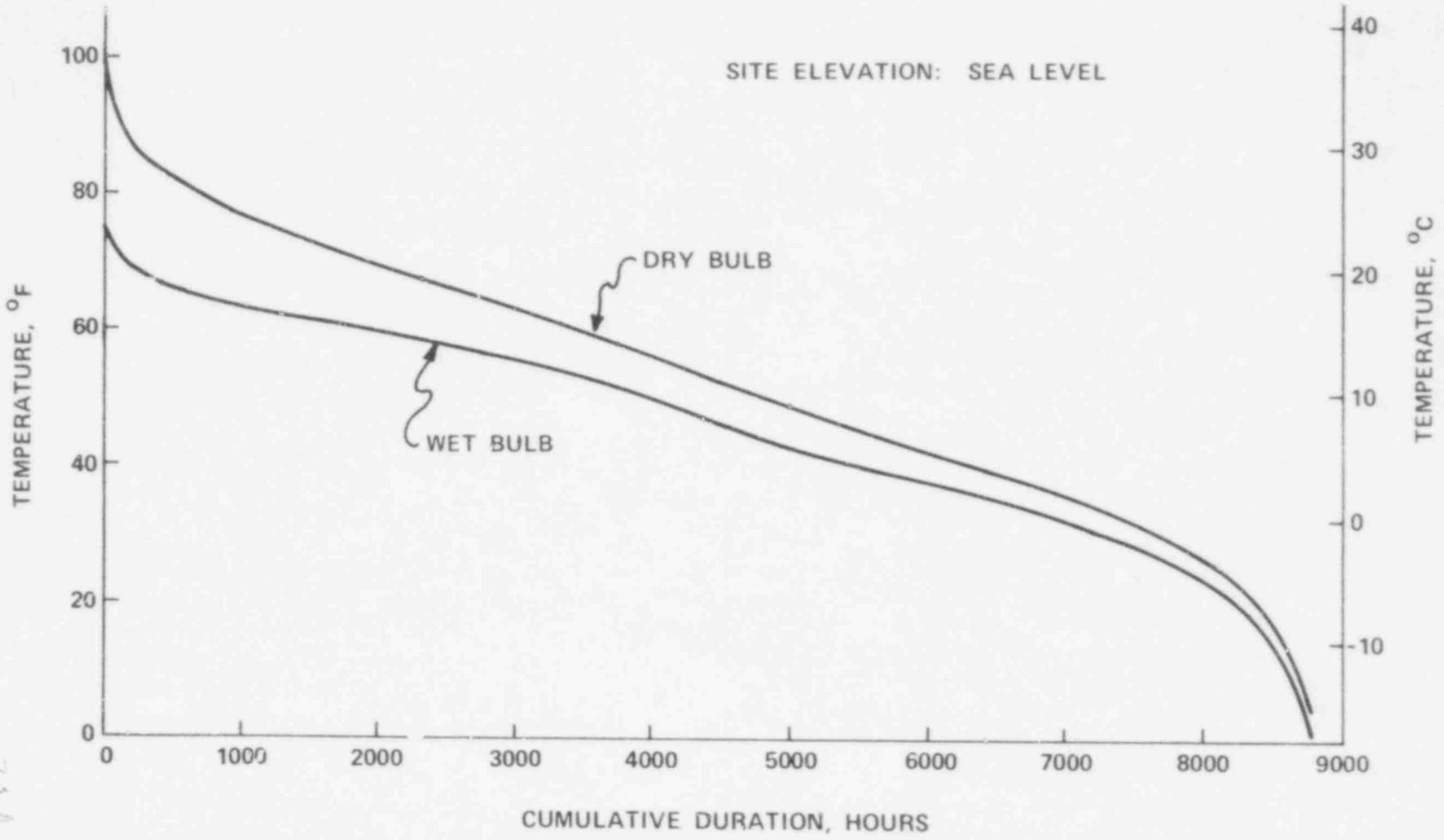

FIGURE 13-1 TEMPERATURE DURATION CURVES: MIDDLETOWN, U.S.A.

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

OFFICIAL BUSINESS
PENALTY FOR PRIVATE USE, $300

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