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DOE/OR/03054-T20(Vol.2)
(DE85000247)

DR-1007-3

UTILITIES AND OFFSITES DESIGN BASELINE

May 25, 1984
Date Revised

Work Performed Under Contract No. AC05-78OR03054

The Rust Engineering Company
Birmingham, Alabama

Technical Information Center
Office of Scientific and Technical Information
United States Department of Energy

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DOE/OR/03054-T20(Vol.2)
(DE85000247)
Distribution Category UC-89

International Coal Refining Company

UTILITIES AND OFFSITES DESIGN BASELINE

OUTSIDE BATTERY LIMITS FACILITY 6000 TPD SRC-I DEMONSTRATION PLANT

FOR

U.S. DEPARTMENT OF ENERGY

VOLUME II

Prepared By

The Rust Engineering Company
Birmingham, Alabama

REVISED MAY 25, 1984

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2.2.4 Cooling Water System

2.2.4.1 System Description (Refer to Process Flow Diagrams No. 00-16-01014D and 00-16-01015D)

2.2.4.1.1 General

The cooling water system includes two cooling tower systems, cooling tower No. 1 and cooling tower No. 2. Each cooling tower system consists of a distribution header, a collection header, the cooling tower, and cooling tower associated equipment.

2.2.4.1.2 Cooling Tower No. 1

2.2.4.1.2.1 The cooling tower (CT-16601) will be cross-flow design. The hot water enters the distribution basin in the top of the tower and falls by gravity through the cooling tower fill into a cold water basin. The cooling water supply pumps (P-16603A through F) are located in a sump at the end of the cold water basin. Removable screens are provided to prevent large solids from entering the pump suctions. The vertical turbine cooling water supply pumps will maintain a constant pressure on the distribution header. The cooling tower fans (C-16601 A-K) can be started or shutdown to provide the proper water temperature for the distribution system header. The cooling water from all areas together with the blowdowns from boilers will be collected in a central header and returned to the cooling tower.

2.2.4.1.2.2 A cooling tower chlorinator (X-16603) is provided to prevent microbiological growth in the tower or in the cooling water system. An inhibitor feed system (X-16601) will meter inhibitor into the cooing water system to provide corrosion control. The cooling tower blowdown stream will flow to the wastewater treatment area through interconnecting piping systems. A sulfuric acid feed system (X-16602) will meter acid into the

cooling water system to maintain the proper pH level. Makeup water to the cooling tower will be supplied from the process water distribution system to maintain level in the cold water basin. Other makeup water sources include evaporator condensate, treated wastewater and boiler blowdowns.

2.2.4.1.3 Cooling Tower No. 2

2.2.4.1.3.1 The cooling tower (CT-16610) will be cross-flow design. The hot water enters the distribution basin in the top of the tower and falls by gravity through the cooling tower fill into a cold water basin. The cooling water supply pumps (P-16612 A-E) are located in a sump at the end of the cold water basin. Removable screens are provided to prevent large solids from entering the pump suctions. The vertical turbine cooling water supply pumps will maintain a constant pressure on the distribution header. The cooling tower fans (C-16610 A-C) can be started or shutdown to provide the proper water temperature for the distribution system header. The cooling water from all areas will be collected in a central header and returned to the cooling tower.

2.2.4.1.3.2 A cooling tower chlorinator (X-16612) is provided to prevent microbiological growth in the tower or in the cooling water system. An inhibitor feed system (X-16610) will meter inhibitor into the cooling water system to provide corrosion control. The cooling tower blowdown stream will flow to the wastewater treatment area. A sulfuric acid feed system (X-16611) will meter acid into the cooling water system to maintain the proper pH level. Makeup water to the cooling tower will be supplied from the process water distribution system to maintain level in the cold water basin.

2.2.4.2 Utility Flow Diagrams

The following utility flow diagrams are included after this page:

00-16-01014D Cooling Water System Process and Control Diagram (Sheet 1)

00-16-01015D Cooling Water System Process and Control Diagram (Sheet 2)

00-16-01014D (SH 1 OF 2)

TK-16601 INHIBITOR STORAGE TANK

TK-16602 SULFURIC ACID STORAGE TANK

Y-16601 INHIBITOR FEED SYSTEM

X-16602 SULFURIC ACID FEED SYSTEM

M-16601A-C CHLORINE SCALES

X-16603 COOLING TOWER CHLORINATOR

CT-16601 COOLING TOWER NO.1 CAPACITY 100,000 GPM

C-16601A-K COOLING TOWER FANS

FL-16601A-D SIDESTREAM FILTERS

J-16601 COOLING TOWER CHLORINATOR EJECTOR

NOTE 2
1,540 NORM
1,740 MAX

40
76,888 NORM
90,279 MAX

115 MAX
108 NORM.

AR CL_2

00-16-03013 COOLING WATER RETURN

2,028 MAX.
1,833 NORM.

00-16-05020 FROM WASTE TREATMENT

NORM 393
MAX 2014

00-16-03014 PROCESS WATER

1775 NORM
2014 MAX

TK-16601

TANK TRUCK FILL

INTER. 15

INHIBITOR

P-16601A&B

LIC

ZC

0.5

INTER. 15

X-16601

SULFURIC ACID

X-16602

P-16602A&B

TK-16602

TANK TRUCK FILL

M-16601A-C

CT-16601

2880

FL-16601 A-D

PDI

INTER 1950

GA

93,085 MAX

LIC

LSL

P-16603A-F

FRT

3C9 NORM.
348 MAX.

C.T. BLOWDOWN

00-16-05020

CONDUCTIVITY

AIC

FRT

76,814 NORM.
90,295 MAX.

11
88

00-16-03012 COOLING WATER SUPPLY

AAHL pH

AIC pH

PRV

275 INTER

FI

J-16601

PRV

INTER. 240

M-16603

LEGEND : REFER TO DWG 00-10-220048 FOR FLOW DATA SYMBOLS.

00-16-01014 REV. D

NOTE:

1. ALL INSTRUMENT NUMBERS ON THIS DRAWING ARE PREFIXED BY 16.
2. EVAPORATION AND DRIFT LOSS IN GPM.
3. COOLING WATER FLOWRATES DIFFER FROM THE GPM DUE TO THE USE OF CIRCULATED, RATHER THAN ESTIMATED FLOWS FOR AREAS 16 & 17.
4. THE BATTERY LIMIT COOLING WATER PRESSURE IS 60 PSIG.

P-16601A&B
INHIBITOR TRANSFER PUMPS

P-16602A&B
SULFURIC ACID PUMPS

P-16603A-F
COOLING WATER SUPPLY PUMPS
CAPACITY: 20,000 GPM EA.
HEAD: 221 FT
MOTOR HP. 1,500 HP EA.

REV.	CHANGE NOTICE	REVISION DESCRIPTION	DATE	BY	CHK'D	APP'D
2		BASELINE UPDATE	2-84	MWH		
1		BASELINE UPDATE	3-82			

ADD — DATE 9/25/81

6,000 TPD SRC-I DEMONSTRATION PLANT
NEWMAN, KENTUCKY
FOR UNITED STATES DEPARTMENT OF ENERGY

INTERNATIONAL COAL REFINING COMPANY ALLENTOWN, PA.

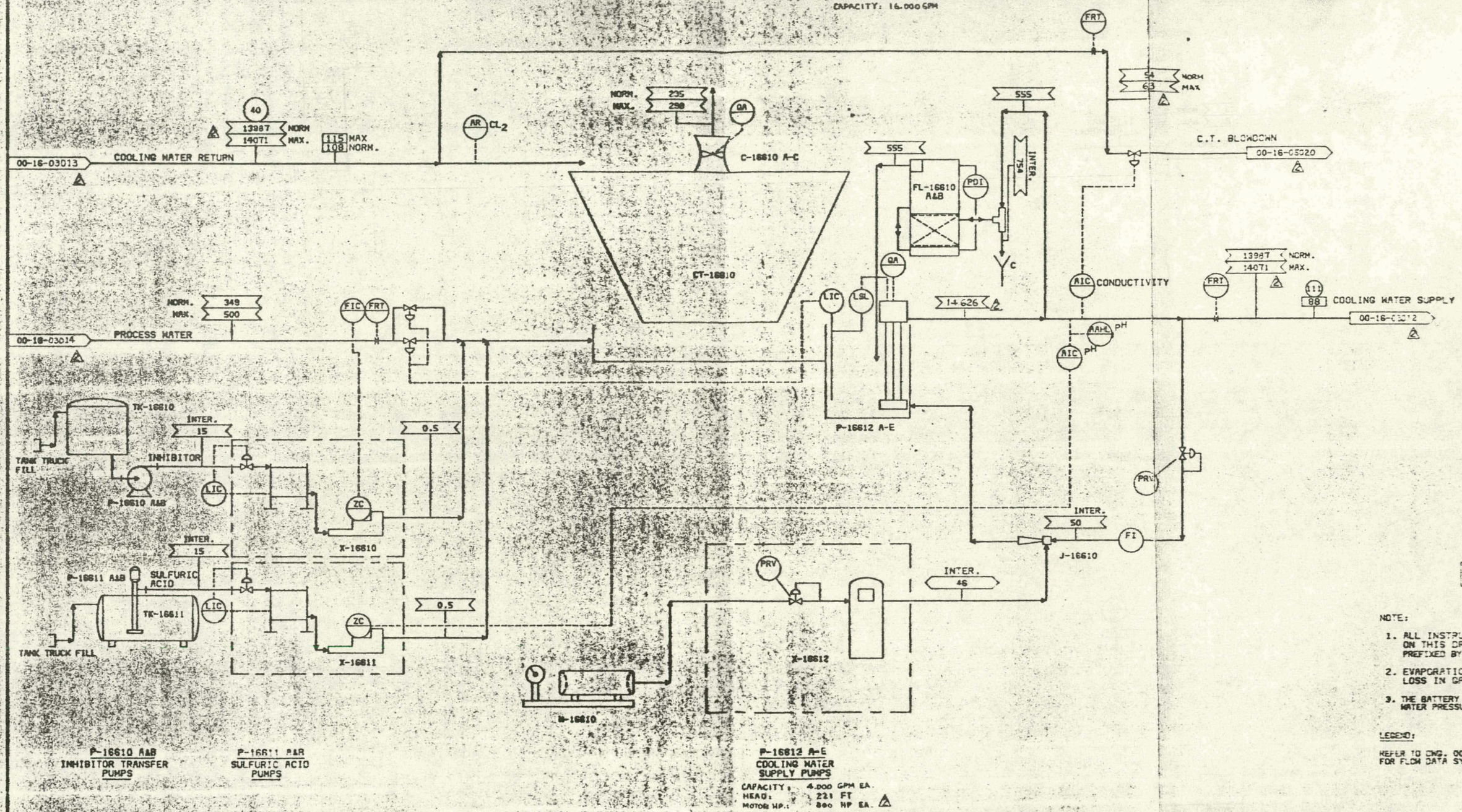
TITLE: PROCESS & CONTROL DIAGRAM COOLING WATER SYSTEM SHEET 1 OF 2

THE RUST ENGINEERING COMPANY BIRMINGHAM, ALABAMA CONTRACT NO. 19575/2548

SCALE: NONE DWG. NO. 00-16-01014D REV. 2

DMJ620

TK-16610 INHIBITOR STORAGE TANK	TK-16611 SULFURIC ACID TANK	X-16610 INHIBITOR FEED SYSTEM	X-16611 SULFURIC ACID FEED SYSTEM	M-16610 CHLORINE SCALE	M-16612 COOLING TOWER CHLORINATOR	CT-16610 COOLING TOWER NO. 2 CAPACITY: 16,000 GPM	C-16610 A-C COOLING TOWER FANS	FL-16610 A&B SIDESTREAM FILTERS	J-16610 COOLING TOWER CHLORINATOR EJECTOR



P-16610 A&B
INHIBITOR TRANSFER PUMPS

P-16611 A&B
SULFURIC ACID PUMPS

P-16612 A-E
COOLING WATER SUPPLY PUMPS

CAPACITY: 4,000 GPM EA.
HEAD: 221 FT
MOTOR HP.: 800 HP EA. ⚠

00-16-01015 REV. 0

NOTE:

1. ALL INSTRUMENT NUMBERS ON THIS DRAWING ARE PREFIXED BY 16
2. EVAPORATION AND DRIFT LOSS IN GPM.
3. THE BATTERY LIMIT COOLING WATER PRESSURE IS 60 PSIG.

LEGEND:

REFER TO DWG. 00-10-000040 FOR FLOW DATA SYMBOLS.

REV.	CHANGE NOTICE	REVISION DESCRIPTION	DATE	BY	CHK'D	APPD
2		BASELINE UPDATE	2-84	MWH		
1		BASELINE UPDATE	3-82			

ADD DRAFTSMAN 9-24-80
CHECKER
ENGINEER
APPROVED

6,000 TPD SRC-I DEMONSTRATION PLANT
HENNAN, KENTUCKY
FOR UNITED STATES DEPARTMENT OF ENERGY

TITLE
PROCESS & CONTROL DIAGRAM
COOLING WATER SYSTEM
SHEET 2 OF 2

SCALE — WT.

DWG. NO. 00-16-01015 REV. 2

INTERNATIONAL COAL REFINING COMPANY ALLENTOWN, PA.

THE RUST ENGINEERING COMPANY BIRMINGHAM, ALABAMA
CONTRACT 11-1997-2548

2.2.4.3 Utility Summary

The utility summary for the cooling water system follows this page.

Rust International Corporation

UTILITY PROCESS DATA SUMMARY SHEET

CONTRACT NO. 21-2548
AREA 16 - COOLING WATER SYSTEM
BY _____ DATE _____
SHEET 1 OF 1

CLIENT ICRC
PROJECT 6000 TPD SRC-1 DEMONSTRATION PLANT — PLANT LOCATION: NEWMAN, KENTUCKY

EQUIPMENT OR AREA NUMBER	DESCRIPTION	PROC. DUTY MM BTU/HR	PROCESS COOLING WATER SUPPLY @ 88 °F GPM	ΔT °F	HEAT TRANSFER FLUID INLET @ ___ °F GPM	ΔT °F	FIRED DUTY FUEL GAS LHV = ___ MM BTU/HR	FIRED DUTY FUEL OIL LHV = ___ MM BTU/HR	POWER INST. HP	POWER OPER. BHP	POWER OPER KW	BOILER FEEDWATER ___ PSIG ___ °F M LBS/HR	BOILER FEEDWATER ___ PSIG ___ °F M LBS/HR	STEAM IMPORT (EXPORT) ___ PSIG ___ °F M LBS/HR	___ PSIG ___ °F M LBS/HR	___ PSIG ___ °F M LBS/HR	___ PSIG ___ °F M LBS/HR	___ PSIG ___ °F M LBS/HR	___ PSIG ___ °F M LBS/HR	COND. RETURN (REQ'D) ___ PSIG ___ °F GPM	C.T. BLOW DOWN ___ PSIG GPM	UTIL. N_2 PSIG = SCFM	PLANT AIR PSIG = 100 SCFM	INSTR. AIR PSIG = 100 SCFM	PROC. WATER PSIG = 100 GPM
CT-16601	COOLING TOWER NO. 1		76814						SEE	MOTOR	LIST										309		50	50	393
CT-16610	COOLING TOWER NO. 2		13987							"											54		25	50	349
	TOTAL		90801						13,371		8402										363		75	100	742

PREPARED BY B Shah
DATE 2/24/84
APPROVED BY
DATE

REVISION △ BY	DATE	APP'D	DATE

REVISION △ BY	DATE	APP'D	DATE

REVISION △ BY	DATE	APP'D	DATE

NOTES:

FORM 44-157 (8/82)

2.2.4.4 Motor List

The motor list for the cooling water system follows this page.

COOLING WATER SYSTEM

MOTOR LIST

Equipment No.	Description	Installed Hp	Operating KW	Hours/ Day	KWH/ Day
C-16601A	Cooling Tower Fan	250	150	24	3,600
C-16601B	Cooling Tower Fan	250	150	24	3,600
C-16601C	Cooling Tower Fan	250	150	24	3,600
C-16601D	Cooling Tower Fan	250	150	24	3,600
C-16601E	Cooling Tower Fan	250	150	24	3,600
C-16601F	Cooling Tower Fan	250	150	24	3,600
C-16601G	Cooling Tower Fan	250	150	24	3,600
C-16601H	Cooling Tower Fan	250	150	24	3,600
C-16601I	Cooling Tower Fan	250	150	24	3,600
C-16601J	Cooling Tower Fan	250	150	24	3,600
C-16601K	Cooling Tower Fan	250	105	24	3,600
C-16610A	Cooling Tower Fan	125	90	24	2,160
C-16610B	Cooling Tower Fan	125	90	24	2,160
C-16610C	Cooling Tower Fan	125	90	24	2,160
P-16601A	Corrosion Inhibitor Pump	1	0.3	24	7
P-16601B	Corrosion Inhibitor Pump	1	0	0	0
P-16602A	Sulfuric Acid Pump	1	0.3	24	7
P-16602B	Sulfuric Acid Pump	1	0	0	0
P-16603A	Cooling Water Supply Pump	1,500	1,120	24	26,880
P-16603B	Cooling Water Supply Pump	1,500	1,120	24	26,880
P-16603C	Cooling Water Supply Pump	1,500	1,120	24	26,880
P-16603D	Cooling Water Supply Pump	1,500	1,120	24	26,880
P-16603E	Cooling Water Supply Pump	1,500	1,120	24	26,880
P-16603F	Cooling Water Supply Pump	1,500	0	0	0
P-16610A	Corrosion Inhibitor Pump	1	0.3	24	7
P-16610B	Corrosion Inhibitor Pump	1	0	0	0
P-16611A	Sulfuric Acid Pump	1	0.3	24	7
P-16611B	Sulfuric Acid Pump	1	0	0	0

Cooling Water System
Motor List
(Continued)

Equipment No.	Description	Installed Hp	Operating KW	Hours/ Day	KWH/ Day
P-16612A	Cooling Water Supply Pump	300	220	24	5,280
P-16612B	Cooling Water Supply Pump	300	220	24	5,280
P-16612C	Cooling Water Supply Pump	300	220	24	5,280
P-16612D	Cooling Water Supply Pump	300	200	24	5,280
P-16612E	Cooling Water Supply Pump	300	0	0	0
X-16601A	Chemical Feed Pump	1	0.1	24	2
X-16601B	Chemical Feed Pump	1	0	0	0
X-16602A	Chemical Feed Pump	1	0.1	24	2
X-16602B	Chemical Feed Pump	1	0	0	0
X-16610A	Chemical Feed Pump	1	0.1	24	2
X-16610B	Chemical Feed Pump	1	0	0	0
X-16611A	Chemical Feed Pump	1	0.1	24	2
X-16611B	Chemical Feed Pump	1	0	0	0
	TOTAL	13,371	8,402		201,636

2.2.4.5 Equipment List/Summary

The equipment list/summary for the cooling water system follows this page.

EQUIPMENT LIST/SUMMARY REV. 5 02-06-84

WBS ELEMENT: 1.4.1.1.2 ICRC AREA: 16 COOLING WATER--COOLING TOWER 1

REV.	ICRC/RUST EQUIP NO	QTY	EQUIPMENT DESCRIPTION	P.O. NUMBER	SIZE/ WEIGHT	P.O. DATE	VENDOR ENG NEED DATE	COST	DELV DATE	EQUIP COST	PURCH BY	TYPE EQUIP
5	C-16601 A thru K	11	Fan, cooling tower		250hp X 11	S 11-82 P A	S 1-83 P A	inc with CT-16601	S 9-83 P A	inc with CT-16601	CMC	FF
3	CT-16601	1	Cooling tower, 100,000 gpm, cooling range 20°F, 10°F approach, wet bulb 78°F			S 11-82 P A	S 1-83 P A	227.7	S 9-83 P A	1,927.5 M =1601.8 L = 325.7	CMC	FF
0	FL-16601 A thru D	4	Filter, side stream, cs, 720 gpm, flat top, 24" sand filter depth, top section for water storage; bottom section for sand filter, T = 88°F		12.5' dia x 15.75' high	S 10-82 P A	S 12-82 P A	5.4 ea	S 5-83 P A	45.8 ea	CMC	SF
12	J-16601	1	Ejector, chlorine, 250 lb/hour (included with chlorinator)			S 10-82 P A	S 11-82 P A	inc with X-16603	S 3-83 P A	inc with X-16603	RUST	SF
	P-16601 A and B	2	Pump, corrosion inhibitor, centrifugal, 15 gpm, 30 tdh, 110°F max, sp gr 1.84, Hastalloy C, with motor		1 hp 1,800 rpm	S 10-82 P A	S 11-82 P A	0.6 ea	S 2-83 P A	4.7 ea	RUST	SF
	P-16602 A and B	2	Pump, sulfuric acid, centrifugal, 15 gpm, 30 tdh, 110°F max, sp gr 1.84, Hastalloy C, with motor		1 hp 1,800 rpm	S 10-82 P A	S 11-82 P A	0.6 ea	S 2-83 P A	4.7 ea	RUST	SF
5	P-16603 A thru F	6	Pump, cooling water supply, vertical turbine, cs, 20,000 gpm, 221 tdh, 108°F, with motor		1,500 hp ea. rpm	S 10-82 P A	S 11-82 P A	30.3 ea	S 2-83 P A	117.7 ea	RUST	SF

NOTES:
1. All costs 1st Quarter Fiscal Year 1982 in thousand dollars.
2. Equipment costs are FOB jobsite with shipping & vendor field support less vendor engineering. 3. This equipment is Appendix C Bulks.

RUST: Rust Engineering CMC: Stone & Webster

S: Scheduled P: Projected A: Actual

FL: Field Labor M/A: Not Applicable M: Material for field fab equipment SF: Shop Fabricated FF: Field Fabricated

REV.	ICRC/RUST EQUIP NO	QTY	EQUIPMENT DESCRIPTION	P.O. NUMBER	SIZE/ WEIGHT	P.O. DATE	VENDOR ENG NEED DATE	VENDOR ENG COST	DELV DATE	EQUIP COST	PURCH BY	TYPE EQUIP
	TK-16601	1	Tank, inhibitor storage, fiberglass, 1,000 gal capacity, covered flat top, 0 psig, 90°F max		6' dia x 4.5' high	S 10-82 P A	S 12-82 P A	0.4	S 4-83 P A	3.1	CMC	SF
	TK-16602	1	Tank, sulfuric acid, cs, 10,000 gal capacity, horizontal, 0 psig, 110°F max.		12' dia x 12' TT	S 10-82 P A	S 12-82 P A	1.6	S 4-83 P A	13.4	CMC	SF
	W-16601 A thru C	3	Scale, chlorine, ton cylinder, 3,600 lb load, tank size 6.67' x 2.5' diameter			S 10-82 P A	S 11-82 P A	0.7 ea	S 3-83 P A	6.0 ea	RUST	SF
	X-16601	1	Chemical feed system, inhibitor, inc vertical tank, 316 SS, 100 gal capacity, open top		2.58' dia x 3.1' high	S 10-82 P A	S 12-82 P A	0.8	S 4-83 P A	7.0	RUST	SF
4	X-16601 con't.	2	Pump, 316 SS, diaphragm, 0.5 gpm, 100 tdh, ambient temp., sp gr 1.1, with motor		1 hp 1,800 rpm	S 10-82 P A	S 12-82 P A	inc with X-16601	S 4-83 P A	inc with X-16601	RUST	SF
	X-16602	1	Chemical feed system, sulfuric acid, inc vertical tank, 316 SS, 100 gal capacity, open top		2.58' dia x 3.1' high	S 10-82 P A	S 12-82 P A	0.6	S 4-83 P A	4.5	RUST	SF
4	X-16602 con't.	2	Pump, 316 SS, diaphragm, 0.5 gpm, 100 tdh, ambient temp, sp gr 1.84, with motor		1 hp 1,800 rpm	S 10-82 P A	S 12-82 P A	inc with X-16602	S 4-83 P A	inc with X-16602	RUST	SF

NOTES:
1. All costs 1st Quarter Fiscal Year 1982 in thousand dollars.
2. Equipment costs are FOB jobsite with shipping & vendor field support less vendor engineering. 3. This equipment is Appendix C Bulks.

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P: Projected
A: Actual

FL: Field Labor N/A: Not Applicable
M: Material for field fab equipment
SF: Shop Fabricated FF: Field Fabricated

EQUIPMENT LIST/SUMMARY REV. 4 03-26-82

WBS ELEMENT: 1.4.1.1.2 ICRC AREA: 16 COOLING WATER--COOLING TOWER 1

REV.	ICRC/RUST EQUIP NO	QTY	EQUIPMENT DESCRIPTION	P.O. NUMBER	SIZE/ WEIGHT	P.O. DATE	VENDOR ENG NEED DATE	VENDOR ENG COST	DELV DATE	EQUIP COST	PURCH BY	TYPE EQUIP
	X-16603	1	Chlorinator, cooling tower, 6,000 lb/day max			S 10-82 P A	S 11-82 P A	2.8	S 3-83 P A	28.1	RUST	SF

NOTES:
1. All costs 1st Quarter Fiscal Year 1982 in thousand dollars.
2. Equipment costs are FOB jobsite with shipping & vendor field support *less vendor engineering*. 3. This equipment is Appendix C Bulks.

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CMC: Stone & Webster

S: Scheduled
P: Projected
A: Actual

FL: Field Labor N/A: Not Applicable
M: Material for field fab equipment
SF: Shop Fabricated FF: Field Fabricated

EQUIPMENT LIST/SUMMARY REV. 5 02-06-84

WBS ELEMENT: 1.4.1.1.2 ICRC AREA: 16 COOLING WATER--COOLING TOWER 2

REV.	ICRC/RUST EQUIP NO	QTY	EQUIPMENT DESCRIPTION	P.O. NUMBER	SIZE/ WEIGHT	P.O. DATE	VENDOR ENG NEED DATE	VENDOR ENG COST	DELV DATE	EQUIP COST	PURCH BY	TYPE EQUIP
3	C-16610 A thru C	3	Fan, Cooling tower		125 hp X 3	S 11-82 P A	S 1-83 P A	inc with CT-16610	S 9-83 P A	inc with CT-16610	CMC	FF
5	CT-16610	1	Cooling tower, 16,000 gpm, cooling range 20°F, 10°F approach, wet bulb 78°F			S 11-82 P A	S 1-83 P A	39.1	S 9-83 P A	374.8 M = 294.7 L = 80.1	CMC	FF
15	FL-16610 A and B	2	Filter, side stream, cs, 278 gpm, flat top, 24' sand filter depth, top section for water storage; bottom section for sand filter, T = 88°F		8' dia x 15.75' high	S 10-82 P A	S 12-82 P A	3.3 ea	S 5-83 P A	32.5 ea	RUST	SF
	J-16610	1	Ejector, chlorine (included with chlorinator)			S 10-82 P A	S 11-82 P A	inc with X-16612	S 3-83 P A	inc with X-16612	RUST	SF
	P-16610 A and B	2	Pump, corrosion inhibitor, centrifugal, 15 gpm, 30 tdh, 90°F max, sp gr 1.1, Hastalloy C, with motor		1 hp 1,800 rpm	S 10-82 P A	S 11-82 P A	0.6 ea	S 2-83 P A	4.7 ea	RUST	SF
	P-16611 A and B	2	Pump, sulfuric acid, centrifugal, 15 gpm, 30 tdh, 110°F max, sp gr 1.84, Hastalloy C, with motor		1 hp 1,800 rpm	S 10-82 P A	S 11-82 P A	0.6 ea	S 2-83 P A	4.7 ea	RUST	SF
	P-16612 A thru E	5	Pump, cooling water supply, vertical turbine, cs, 4,000 gpm, 221 tdh, 108°F, sp gr 1.0, CI, with motor		300 hp ea rpm	S 10-82 P A	S 11-82 P A	7.2 ea	S 2-83 P A	30.1 ea	RUST	SF

NOTES:
1. All costs 1st Quarter Fiscal Year 1982 in thousand dollars.
2. Equipment costs are FOB jobsite with shipping & vendor field support less vendor engineering. 3. This equipment is Appendix C Bulks.

RUST: Rust Engineering CMC: Stone & Webster

S: Scheduled P: Projected A: Actual

FL: Field Labor N/A: Not Applicable M: Material for field fab equipment SF: Shop Fabricated FF: Field Fabricated

EQUIPMENT LIST/SUMMARY REV. 4 03-26-82

WBS ELEMENT: 1.4.1.1.2 ICRC AREA: 16 COOLING WATER--COOLING TOWER 2

REV.	ICRC/RUST EQUIP NO	QTY	EQUIPMENT DESCRIPTION	P.O. NUMBER	SIZE/ WEIGHT	P.O. DATE	VENDOR ENG NEED DATE	VENDOR ENG COST	DELV DATE	EQUIP COST	PURCH BY	TYPE EQUIP
	TK-16610	1	Tank, inhibitor storage, fiberglass, 1,000 gal capacity, covered flat top, 0 psig, 90°F max		6' dia x 4.5' high	S 10-82 P A	S 12-82 P A	0.4	S 4-83 P A	3.1	CMC	SF
	TK-16611	1	Tank, sulfuric acid, cs, 10,000 gal capacity, horizontal, 0 psig, 100°F max		12' dia x 12' TT	S 10-82 P A	S 12-82 P A	1.6	S 4-83 P A	13.4	CMC	SF
	W-16610	1	Scale, chlorine, ton cylinder, 3600 lb load, tank size 6.67' x 2.5' diameter			S 10-82 P A	S 11-82 P A	0.7	S 3-83 P A	6.0	RUST	SF
	X-16610	1	Chemical feed system, inhibitor, inc vertical tank, 316 SS, 100 gal capacity, open top		2.58' dia x 3.1' high	S 10-82 P A	S 12-82 P A	0.7	S 4-83 P A	6.2	RUST	SF
4	X-16610 con't.	2	Pump, 316 SS, diaphragm, 0.5 gpm, 100 tdh, ambient temp, sp gr 1.1, with motor		1 hp 1,800 rpm	S 10-82 P A	S 12-82 P A	inc with X-16610	S 4-83 P A	inc with X-16610	RUST	SF
	X-16611	1	Chemical feed system, sulfuric acid, inc vertical tank, 316 SS, 100 gal capacity, open top		3.5' dia x 3.9' high	S 10-82 P A	S 12-82 P A	0.7	S 4-83 P A	6.2	RUST	SF
4	X-16611 con't.	2	Pump, 316 SS, diaphragm, 0.5 gpm, 100 tdh, ambient temp, sp gr 1.8, with motor		1 hp 1,800 rpm	S 10-82 P A	S 12-82 P A	inc with X-16611	S 4-83 P A	inc with X-16611	RUST	SF

16

NOTES:
1. All costs 1st Quarter Fiscal Year 1982 in thousand dollars.
2. Equipment costs are FOB jobsite with shipping & vendor field support less vendor engineering. 3. This equipment is Appendix C Bulks.

RUST: Rust Engineering CMC: Stone & Webster

S: Scheduled P: Projected A: Actual

FL: Field Labor M: Material for field fab equipment SF: Shop Fabricated FF: Field Fabricated N/A: Not Applicable

EQUIPMENT LIST/SUMMARY REV. 4 03-26-82

WBS ELEMENT: 1.4.1.1.2 ICRC AREA: 16 COOLING WATER--COOLING TOWER 2

REV.	ICRC/RUST EQUIP NO	QTY	EQUIPMENT DESCRIPTION	P.O. NUMBER	SIZE/ WEIGHT	P.O. DATE	VENDOR ENG NEED DATE	VENDOR ENG COST	DELV DATE	EQUIP COST	PURCH BY	TYPE EQUIP
	X-16612	1	Chlorinator, cooling tower, 1200 lb/day max			S 10-82 P A	S 11-82 P A	1.7	S 3-83 P A	17.6	RUST	SF

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P: Projected
A: Actual

FL: Field Labor N/A: Not Applicable
M: Material for field fab equipment
SF: Shop Fabricated FF: Field Fabricated

EQUIPMENT LIST/SUMMARY REV. 4 03-26-82

WBS ELEMENT: 1.4.1.2.1 ICRC AREA: 17 13.8 KV DISTRIBUTION--SUBSTATION NO. 7 PAGE 1 OF 3

REV.	ICRC/RUST EQUIP NO	QTY	EQUIPMENT DESCRIPTION	P O. NUMBER	SIZE/ WEIGHT	P.O. DATE	VENDOR ENG NEED DATE	VENDOR ENG COST	DELV DATE	EQUIP COST	PURCH BY	TYPE EQUIP
	CA-17014 A	1	Capacitor, 4.16 KV, 200 KVAC, with vacuum switch and individually fused cans, complete with voltage control; all located in an all-weather metal			S 11-82 P A	S 3-83 P A	inc with TR-17010	S 6-83 P A	inc with TR-17010	CMC	SF
	CA-17014 con't.		enclosure with conduit entrance from bottom								CMC	SF
	GR-17012 A	1	Resistor, neutral grounding, rated 2,400 volts, 400 amperes for 10 seconds; complete with mounting frame and screen enclosure			S 7-83 P A	S 11-83 P A	inc with TR-17010	S 5-84 P A	inc with TR-17010	CMC	SF
	MC-17013 A	1	Motor control center, medium voltage, 4.16 KV, NEMA type I, with incoming line module and terminal lugs			S 11-82 P A	S 3-83 P A	15.5	S 6-83 P A	131.2	CMC	SF
	MC-17017 A	1	Motor control center, 0.48 KV, NEMA type I with incoming line module and terminal lugs			S 11-82 P A	S 3-83 P A	inc with MC-17013	S 6-83 P A	inc with MC-17013	CMC	SF
	SG-17011 A	1	Switchgear, 3 phase, 4.16 KV, 1,200 ampere located in an outdoor, protected-isle, all-weather metal enclosure, complete with CPT, CT's,			S 11-82 P A	S 3-83 P A	3.6	S 6-83 P A	30.4	CMC	SF
	SG-17011 con't.		and PT's for load metering, dc power supply if required, (2) relay and metering cubicles in addition to breaker cubicles, and provisions for								CMC	SF

NOTES:
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2. Equipment costs are FOB jobsite with shipping & vendor field support less vendor engineering. 3. This equipment is Appendix C Bulks.

RUST: Rust Engineering
CMC: Stone & Webster

S: Scheduled
P: Projected
A: Actual

FL: Field Labor N/A: Not Applicable
M: Material for field fab equipment
SF: Shop Fabricated FF: Field Fabricated

EQUIPMENT LIST/SUMMARY REV. 4 03-26-82

WBS ELEMENT: 1.4.1.2.1 ICRC AREA: 17 13.8 KV DISTRIBUTION--SUBSTATION NO. 7

REV.	ICRC/RUST EQUIP NO	QTY	EQUIPMENT DESCRIPTION	P.O. NUMBER	SIZE/ WEIGHT	P.O. DATE	VENDOR ENG NEED DATE	VENDOR ENG COST	DELV DATE	EQUIP COST	PURCH BY	TYPE EQUIP
	SG-17011 con't.		conduit entrance to each cubicle from top or bottom								CMC	SF
	SG-17016 A	1	Switchgear, 3 phase, 0.48 KV, 3,000 ampere, located in an outdoor, protected-isle, all-weather metal enclosure; complete with CT's and PT's			S 11-82 P A	S 3-83 P A	inc with SG-17011	S 6-83 P A	inc with SG-17011	CMC	SF
	SG-17016 con't.		for load metering, dc power supply if required, and provisions for conduit entrance to each cubicle from top or bottom								CMC	SF
	TR-17010 A	1	Transformer, primary unit substation, 3 phase, rated 1,000/1,150/1,288 KVA (55/65C), 13,800 - 4,160Y/2,400 with (2) 2½% taps above and below rated			S 7-83 P A	S 11-83 P A	4.8	S 5-84 P A	42.3	RUST	SF
	TR-17010 con't.		voltage; with fans for 480 volt 3 phase supply, top oil thermometer with alarm contacts, liquid level guage, (1) 600/5 ampere mr ct on each hv								RUST	SF
	TR-17010 con't.		bushing and lv neutral bushing, (1) 1,200/5 ampere mr ct for relaying and metering on each lv bushing; incoming line section to consist of oil filled								RUST	SF
	TR-17010 con't.		fused load break switch rated 600 amperes with termination compartment for (1) 3/c 250MCM IAC and (1) 3/c 250MCM IAC; switch and power fuses to								RUST	SF

NOTES:
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S: Scheduled P: Projected A: Actual

FL: Field Labor N/A: Not Applicable M: Material for field fab equipment SF: Shop Fabricated FF: Field Fabricated

REV.	ICRC/RUST EQUIP NO	QTY	EQUIPMENT DESCRIPTION	P.O. NUMBER	SIZE/ WEIGHT	P.O. DATE	VENDOR ENG NEED DATE	VENDOR ENG COST	DELV DATE	EQUIP COST	PURCH BY	TYPE EQUIP
	TR-17010 con't.		be located in oil filled compartment separate from the main transformer tank; outgoing section to consist of throat connection to switchgear								RUST	SF
	TR-17010 con't.		located in an outdoor, protected-isle, all-weather metal enclosure								RUST	SF
	TR-17015 A	1	Transformer, 3 phase, power center, rated 1,500/1,725/1,932 KVA (55/65c), 13,800 - 480Y/277 with (2) 2½% taps above and below rated voltage;			S 7-83 P A	S 11-83 P A	inc with TR-17010	S 5-84 P A	inc with TR-17010	RUST	SF
	TR-17015 con't.		equipped with fans for 480 volt 3 phase supply, top oil thermometer with alarm contacts, and liquid level guage; incoming line section to								RUST	SF
	TR-17015 con't.		consist of oil filled fused load break switch, rated 200 amperes, with termination compartment for (1) 3/c 250MCM IAC; switch and power fuses to								RUST	SF
	TR-17015 con't.		be located in oil filled compartment separate from the main transformer tank outgoing section to consist of throat connection to switchgear								RUST	SF
	TR-17015 con't.		located in an outdoor, protected-isle, all-weather metal enclosure								RUST	SF

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P: Projected
A: Actual
EL: Field Labor
M: Material for field fab equipment
SF: Shop Fabricated
FF: Field Fabricated
N/A: Not Applicable

EQUIPMENT LIST/SUMMARY REV. 4 03-26-82

WBS ELEMENT: 1.4.1.1.2 ICRC AREA: 16 13.8 KV DISTRIBUTION--SUBSTATION NO. 9

REV.	ICRC/RUST EQUIP NO	QTY	EQUIPMENT DESCRIPTION	P.O. NUMBER	SIZE/ WEIGHT	P.O. DATE	VENDOR ENG NEED DATE	VENDOR ENG COST	DELV DATE	EQUIP COST	PURCH BY	TYPE EQUIP
	CA-16030 A	1	Capacitor, 4.16 KV, 1,000 KVAC, with vacuum switch and individually fused cans, complete with voltage control; all located in an all weather metal			S 11-82 P A	S 3-83 P A	inc with TR-16026	S 6-83 P A	inc with TR-16026	RUST	SF
	CA-16030 con't.		enclusure with conduit entrance from bottom								RUST	SF
	GR-16028 A	1	Resistor, neutral grounding, rated 2,400 volts, 400 amperes for 10 seconds; complete with mounting frame and screen enclosure			S 7-83 P A	S 11-83 P A	inc with TR-16026	S 5-84 P A	inc with TR-16026	RUST	SF
	MC-16029 A	1	Motor control center, medium voltage, 4.16 KV, NEMA TYPE I, with incoming line module and terminal lugs			S 11-82 P A	S 2-83 P A	13.6	S 6-83 P A	114.9	CMC	SF
	MC-16033 A	1	Motor control center, 0.48 KV, nema type I with incoming line module and terminal lugs			S 11-82 P A	S 2-83 P A	inc with MC-16029	S 6-83 P A	inc with MC-16029	CMC	SF
	SG-16027 A	1	Switchgear, 3 phase, 4.16 KV, 1,200 ampere located in an outdoor, protected-isle, all-weather metal enclosure, complete with CPT, CT's,			S 11-82 P A	S 3-83 P A	72.0	S 6-83 P A	608.5	CMC	SF
	SG-16027 con't.		and PT's for load metering, dc power supply if required, (2) relay and metering cubicles in addition to breaker cubicles, and provisions for								CMC	SF

NOTES:
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EQUIPMENT LIST/SUMMARY REV. 4 03-26-82

WBS ELEMENT: 1.4.1.1.2 ICRC AREA: 16 13.8 KV DISTRIBUTION--SUBSTATION NO. 9 PAGE 2 OF 3

REV.	ICRC/RUST EQUIP NO	QTY	EQUIPMENT DESCRIPTION	P.O. NUMBER	SIZE/ WEIGHT	P.O. DATE	VENDOR ENG NEED DATE	VENDOR ENG COST	DELV DATE	EQUIP COST	PURCH BY	TYPE EQUIP
	SG-16027 con't.		conduit entrance to each cubicle from top or bottom								CMC	SF
	SG-16032 A	1	Switchgear, 3 phase, 0.48 KV, 3,000 ampere, located in an outdoor, protected-isle, all-weather, metal enclosure; complete with CT's and PT's			S 11-82 P A	S 3-83 P A	inc with SG-16026	S 6-83 P A	inc with SG-16026	CMC	SF
	SG-16032 con't.		for load metering, dc power supply if required, and provisions for conduit entrance to each cubicle from top or bottom								CMC	SF
	TR-16026 A	1	Transformer, primary unit substation, 3 phase, rated 5,000/6,250/7,000 KVA (55/65C), 13,800 - 4,160Y/2,400 with (2) 2-½% taps above and below rated			S 7-83 P A	S 11-83 P A	9.3	S 5-84 P A	87.4	RUST	SF
	TR-16026 con't.		voltage; with fans for 480 volt 3 phase supply, top oil thermometes with alarm contacts, liquid level guage, (1) 600/5 ampere MR CT on each HV								RUST	SF
	TR-16026 con't.		bushing and LV neutral bushing (1) 1,200/5 ampere MR CT for relaying and metering on each LV bushing; incoming line section to consist of oil filled								RUST	SF
	TR-16026 con't.		fused load break switch rated 600 amperes with termination compartment for (1) 3/c, 750MCM IAC and (1) 3/c 250MCM IAC; switch and power fuses to								RUST	SF

NOTES:
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REV.	ICRC/RUST EQUIP NO	QTY	EQUIPMENT DESCRIPTION	P.O. NUMBER	SIZE/ WEIGHT	P.O. DATE	VENDOR ENG NEED DATE	VENDOR ENG COST	DELV DATE	EQUIP COST	PURCH BY	TYPE EQUIP
	TR-16026 con't.		be located in oil filled compartment separate from the main transformer tank; outgoing section to consist of throat connection to switchgear								RUST	SF
	TR-16026 con't.		located in an outdoor, protected-isle, all-weather metal enclosure								RUST	SF
	TR-16031 A	1	Transformer, 3 phase, power center, rated 1,500/1,725/1,932 KVA (55/65c), 13,800 - 480Y/277 with (2) 2½% taps above and below rated voltage;			S 7-83 P A	S 11-83 P A	inc with TR-16026	S 5-84 P A	inc with TR-16026	RUST	SF
	TR-16031 con't.		equipped with fans for 480 volt 3 phase supply, top oil thermometer with alarm contacts, and liquid level guage; incoming line section to								RUST	SF
	TR-16031 con't.		consist of oil filled fused load break switch, rated 200 amperes, with termination compartment for (1) 3/c 250MCM IAC; switch and power fuses to								RUST	SF
	TR-16031 con't.		be located in oil filled compartment separate from the main transformer tank; outgoing section to consist of throat connection to switchgear located								RUST	SF
	TR-16031 con't.		in an outdoor, protected-isle, all weather metal enclosure								RUST	SF

NOTES:
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P: Projected
A: Actual
FL: Field Labor
M: Material for field fab equipment
SF: Shop Fabricated
FF: Field Fabricated
N/A: Not Applicable

2.2.4.6 Equipment Data Sheets

The equipment data sheets for the cooling tower system follow this page.

The Rust Engineering Company
A Subsidiary of Wheelabrator-Frye Inc

COOLING TOWER DATA SHEET

CONTRACT NO. 21-1997F
EQUIPMENT NO. CT-16601
NO. REQUIRED 1
SHEET 1 OF 1

CLIENT INTERNATIONAL COAL REFINING COMPANY
PROJECT 6000 TPSD SRC-I DEMONSTRATION PLANT — PLANT LOCATION NEWMAN, KENTUCKY
SERVICE PLANT COOLING WATER
VENDOR — P.O. NO.

OPERATING CONDITIONS

WATER QUANTITY (GPM)	100,000	SOLIDS IN MAKEUP WATER	20 mg/l
WATER INLET TEMP. (°F)	108 (NORM) 115 (MAX)	% BLOWDOWN	0.3
WATER OUTLET TEMP (F)	88	% DRIFT LOSS	0.02
WET BULB TEMP (°F)	78	% EVAP LOSS	2
DRY BULB TEMP (°F)		% SPRAY LOSS	0
ELEV ABOVE SEA LEVEL		TOTAL MAKEUP (GPM)	2014
TOWER EXPOSURE	UNOBSTRUCTED		
TOWER SITE DESCRIPTION	GROUND LEVEL		
DESIGN WIND LOAD (LB/SQ FT)	30	PREVAILING WIND	
TOWER PUMP HEAD (FT)	40		

TOWER DESCRIPTION

~~MECHANICAL~~ CROSS FLOW		HT. OF STACKS	10 FEET
OVERALL DIMENSIONS (W' x L' INCL STACKS)		SIZE EACH CELL	NO OF CELLS 11
BASIN DIMENSIONS. OUTSIDE (W' X L')		BASIN VOLUME	
TYPE OF FILL	PVC OR PPL	WETTED SURFACE OF FILL/CELL	
WATER RATE-GPM PER SQ FT OF TOWER AREA IN PATH OF WATER			
AIR RATE-CFM PER SQ FT OF TOWER AREA IN PATH OF AIR			
NO & SIZE OF DISTRIBUTOR PIPE CONNECTIONS		LOCATION ABOVE BASE	
FRAME MATERIAL	DOUGLAS FIR	SIZE COLUMNS	CROSS BRACES HORIZONTALS
CASING	FRP - 12 OZ.	FANS CYLS & STACKS	FRP
DRIFT ELIMINATOR	PVC		
HARDWARE	STAINLESS STEEL	NAILS	STAINLESS STEEL
DISTRIBUTORS		NOZZLES & SPRAY HEADS	

FANS, GEARS & MOTORS

NO. OF FANS 11	DIA	NO OF BLADES	MATERIAL
MAKER OF FANS		FAN RPM	MAX SAFE RPM
CFM REQUIRED PER FAN AT TOWER RATING		☐ INDUCED	☐ FORCED
FAN NOISE LEVEL 50' AWAY (INTERNATIONAL SCALE)		MOTOR HP REQUIRED	
MAKER OF GEAR	TYPE	AGMA RATING	
GEAR LUBRICATION			
DRIVE SHAFT TYPE	MAKER		
COUPLING TYPE	MATERIAL	MAKER	
ELECTRIC AREA CLASS	GROUP	DIV	

REMARKS:
FANS ARE EQUIPMENT NUMBERS C-16601 A thru K

PREPARED BY O. E. MITCHELL	REVISION △	REVISION △	REVISION △A1
DATE 3-26-82	BY DATE	BY DATE	BY DATE
APPROVED BY	APP'D DATE	APP'D DATE	APP'D DATE
DATE			

FORM 8348 (8/80)

The Rust Engineering Company
A Subsidiary of Wheelabrator-Frye Inc

COOLING TOWER DATA SHEET

CONTRACT NO. 21-199F
EQUIPMENT NO. CT-16610
NO. REQUIRED 1
SHEET 1 OF 1

CLIENT	INTERNATIONAL COAL REFINING COMPANY			
PROJECT	6000 TPSD SRC-I DEMONSTRATION PLANT		PLANT LOCATION	NEWHAM, KENTUCKY
SERVICE	ASU COOLING WATER			
VENDOR			P.O. NO.	

OPERATING CONDITIONS

WATER QUANTITY (GPM)	16,000 (1)	SOLIDS IN MAKEUP WATER	20 mg/l
WATER INLET TEMP. (°F)	108	% BLOWDOWN	0.3
WATER OUTLET TEMP (F)	88	% DRIFT LOSS	0.2
WET BULB TEMP (°F)	78	% EVAP. LOSS	2
DRY BULB TEMP (°F)		% SPRAY LOSS	0
ELEV. ABOVE SEA LEVEL		TOTAL MAKEUP (GPM)	349
TOWER EXPOSURE	UNOBSTRUCTED		
TOWER SITE DESCRIPTION	GROUND LEVEL		
DESIGN WIND LOAD (LB/SQ FT)	30	PREVAILING WIND	
TOWER PUMP HEAD (FT)	40		

TOWER DESCRIPTION

~~COUNTER~~ CROSS FLOW		HT. OF STACKS	10 FEET
OVERALL DIMENSIONS (W' x L' INCL STACKS)		SIZE EACH CELL	NO. OF CELLS 3
BASIN DIMENSIONS. OUTSIDE (W' X L')		BASIN VOLUME	
TYPE OF FILL	PVC OR PPL	WETTED SURFACE OF FILL/CELL	
WATER RATE-GPM PER SQ FT OF TOWER AREA IN PATH OF WATER			
AIR RATE-CFM PER SQ FT OF TOWER AREA IN PATH OF AIR			
NO. & SIZE OF DISTRIBUTOR PIPE CONNECTIONS		LOCATION ABOVE BASE	
FRAME MATERIAL	DOUGLAS FIR	SIZE COLUMNS	CROSS BRACES HORIZONTALS
CASING	FRP - 12 OZ.	FANS CYLS & STACKS	FRP
DRIFT ELIMINATOR	PVC		
HARDWARE	STAINLESS STEEL	NAILS	STAINLESS STEEL
DISTRIBUTORS		NOZZLES & SPRAY HEADS	

FANS, GEARS & MOTORS

NO. OF FANS 3	DIA	NO OF BLADES	MATERIAL
MAKER OF FANS		FAN RPM	MAX SAFE RPM
CFM REQUIRED PER FAN AT TOWER RATING		☒ INDUCED	☐ FORCED
FAN NOISE LEVEL 50' AWAY (INTERNATIONAL SCALE)		MOTOR HP REQUIRED	
MAKER OF GEAR	TYPE	AGMA RATING	
GEAR LUBRICATION			
DRIVE SHAFT TYPE	MAKER		
COUPLING TYPE	MATERIAL	MAKER	
ELECTRIC AREA CLASS	GROUP	DIV.	

REMARKS:

FANS ARE EQUIPMENT NUMBERS C-16610 A thru C

PREPARED BY O.E. MITCHELL	REVISION (1)	REVISION △	REVISION △ A2
DATE 3-26-82	BY DATE 2/6/84	BY DATE	BY DATE
APPROVED BY			
DATE			

The Rust Engineering Company
A Subsidiary of Wheelabrator-Frye Inc.

(GENERAL EQUIPMENT DATA SHEET)

CONTRACT NO. 21-1997F
EQUIPMENT NO. FL 16601 A-D
NO. REQUIRED 4
SHEET 1 OF 1

CLIENT INTERNATIONAL COAL REFINING COMPANY
PROJECT 6000 TPSD SRC-I DEMONSTRATION PLANT PLANT LOCATION NEWMAN, KENTUCKY
SERVICE Cooling Tower #1 Sidestream Filters
VENDOR P.O NO

Each filter unit will be rated at 720 gpm. The units will be gravity type with integral backwash water storage. The filtering media will be 24" of sand. The tank dimensions are 12'6" diameter by 15'9" high.

The filters will have automatic controls and will serve Cooling Tower CT-16601.

PREPARED BY O.E.Mitchell	REVISION 1	REVISION	REVISION 1
DATE 10/14/81	BY	BY	BY
APPROVED BY	DATE 3-26-82	DATE	DATE
DATE	APP'D	APP'D	APP'D
	DATE	DATE	DATE

FORM 9308--1 OF 2 (9/80)

The Rust Engineering Company
A Subsidiary of Wheelabrator-Frye Inc

(GENERAL EQUIPMENT DATA SHEET)

CONTRACT NO. 21-1997F
EQUIPMENT NO. FL 16610 A&B
NO. REQUIRED
SHEET 1 OF 1

CLIENT INTERNATIONAL COAL REFINING COMPANY
PROJECT 6000 TPSD SRC-I DEMONSTRATION PLANT PLANT LOCATION NEWMAN, KENTUCKY
SERVICE Cooling Tower #2 Sidestream Filters
VENDOR P.O. NO.

Each filter unit will be rated at 278 gpm. The units will be gravity type with integral backwash water storage. The filtering media will be 24" of sand. The tank dimensions are 8'0" diameter by 15'9" high.

The filters will have automatic controls and will service Cooling Tower CT-16610.

PREPARED BY O. E. Mitchell	REVISION 1	REVISION △	REVISION △ 2
DATE 10/14/81	BY	BY	BY
APPROVED BY	DATE 3-26-82	DATE	DATE
DATE	APP'D	APP'D	APP'D
	DATE	DATE	DATE

FORM 9308--1 OF 2 (9/80)

The Rust Engineering Company
A Subsidiary of Wheelabrator-Frye Inc.

CENTRIFUGAL PUMP DATA SHEET

CONTRACT NO. 21-1997F
EQUIPMENT NO. P1660lA/B
NO. REQUIRED 2
SHEET 1 OF 1

CLIENT: INTERNATIONAL COAL REFINING COMPANY
PROJECT: 6000 TPSD SRC-I DEMONSTRATION PLANT — PLANT LOCATION: NEWMAN, KENTUCKY
SERVICE: Corrosion Inhibitor ~~Transfer Pumps~~
VENDOR — P.O. NO.
TYPE — MODEL — SERIAL NO.
NO. OF MOTORS REQ'D 2 — ITEM NO. — FURN. BY Purchaser — MFR BY
NO. OF TURBINES REQ'D — ITEM NO. — FURN BY — MFR BY
NOTE: ○ INDICATES INFORMATION TO BE COMPLETED BY PURCHASER — □ BY MANUFACTURER

○ OPERATING CONDITIONS (EACH PUMP)

LIQUID Corrosion Inh'r — US GPM AT PT NOR — RATED 15
DISCHARGE, PSIG 15.2
PT F NOR — MAX 90 — SUCTION PSIG MAX 2 — RATED 1
SP GR AT PT 1.1 — DIFF PRESS, PSI 14.2
VAP PRESS AT PT PSIA — DIFF HEAD FT 30
VIS AT PT LBM/FT-HR — NPSHA FT 30
CORR/EROS CAUSED BY

CONSTRUCTION

NOZZLES	SIZE (IN)	RATING	FACING	LOCATION
SUCTION				
DISCHARGE				

CASE MT: ○ CENTERLINE ⊗ FOOT □ BRACKET □ VERT (TYPE)
SPLIT: □ AXIAL □ RAD TYPE VOLUTE: □ SGL □ DBL □ DIFFUSER
PRESS: MAX ALLOW ____ PSIG ____ F □ HYDRO TEST ____ PSIG
CONNECT: □ VENT □ DRAIN □ GAUGE □ STEAM JACKET
IMPELLER DIA: RATED ____ □ MAX ____ □ TYPE ____
MOUNT: □ BETWEEN BRGS □ OVERHUNG
BEARINGS TYPE: RADIAL ____ □ THRUST ____
LUBE: □ RING OIL □ FLOOD □ OIL MIST □ FLINGER □ PRESSURE
COUPLING: MFR ____ □ MODEL ____
DRIVER HALF MTD BY: □ PUMP MFR □ DRIVER MFR
⊗ MECH SEAL ○ PACKING ○ AUX SEAL/PACKING
MFR TYPE MODEL ____
MFR CODE ____ API CODE ____

AUXILIARY PIPING

○ C W PIPE PLAN ○ Cu ○ SS □ TUBING ○ PIPE
TOTAL COOLING WATER REQ'D GPM ____ ○ SIGHT F I. REQ'D.
□ PACKING COOL INJECTION REQ'D □ TOTAL GPM ____ □ PSIG ____
⊗ SEAL FLUSH PIPE PLAN 11 ○ C S ○ S.S. ○ TUBING ⊗ PIPE
□ EXTERNAL SEAL FLUSH FLUID ____ □ GPM ____ □ PSIG ____
□ AUXILIARY SEAL PLAN ____ ○ C S ○ S S ○ TUBING ○ PIPE
□ AUX SEAL FLUSH/QUENCH FLUID ____

MATERIALS

PUMP CASE TRIM API CLASS ____
CASING Hastelloy C — CORR ALL ____ IN
IMPELLER Hastelloy C — WEAR RINGS ____
SHAFT Hastelloy C — SLEEVE(S) Hastelloy C
CASE INT COATING/LINING ____ — GLAND ____
BASEPLATE ____ — DRIP PAN ____

○ SITE CONDITIONS

ELEVATION FT ____ — DUST/FUMES ____
AMB TEMP F ____ MAX ____ MIN ____ — AREA ELECT CL ____ GR. ____ DIV. ____
COOLING WATER SUPPLY ____ PSIG ____ F — RETURN ____ PSIG ____ °F

□ PERFORMANCE

PROPOSAL CURVE NO ____
RPM ____ NO OF STAGES ____
NPSHR FT ℄ IMPELLER ____ T O F ____
EFF ____ BHP RATED ____
MAX BHP RATED IMP ____
MAX HEAD RATED IMP ____
MIN CONTINUOUS GPM ____
ROTATION (VIEWED FROM CPLG END) ____

○ INSPECTION AND TESTS

SHOP INSPECTION	⊗ REQ'D	
HYDROSTATIC TEST	⊗ REQ'D	○ WITNESS
PERFORMANCE TEST	○ REQ'D	○ WITNESS
NPSH TEST	○ REQ'D	○ WITNESS
INT INSP AFTER TEST	○ REQ'D	○ WITNESS
____	○ REQ'D	○ WITNESS

□ INT. WEAR PARTS

WEAR RINGS □ CASE □ IMP
DIA ____ IN CLEARANCE ____ IN
INTERSTAGE BUSHINGS
DIA ____ IN. CLEARANCE ____ IN

VERTICAL PUMPS

PIT OR SUMP DEPTH ℄ ____
PUMP LENGTH ℄ ____
MIN SUBMERGENCE REQ'D □ ____
COLUMN PIPE □ FLANGED □ THREADED
LINE SHAFT □ OPEN □ ENCLOSED
BRGS □ BOWL ____ □ LINE SHAFT ____
BRG LUB □ WATER □ OIL □ GREASE
FLOAT & ROD ○ C S ○ S S ○ BRZ ○ NONE
FLOAT SWITCH ____
PUMP THRUST LB □ UP ____ □ DOWN ____
MOUNTING PLATE REQ'D □ ____

WEIGHTS AND DIMENSIONS

APPROX WT PUMP & BASE ____ LB
MOTOR ____ LB TURBINE ____ LB
BASE PLATE DIMENSIONS ____

APPLICABLE SPECIFICATIONS

○ API 610 ⊗ ANSI B73.1 B73.2 ____
⊗ PROJECT SPECIFICATIONS ____

REMARKS

PREPARED BY R. Sciascia	REVISION △	REVISION △	REVISION △ 3
DATE 10-15-81	BY / DATE	BY / DATE	BY / DATE
APPROVED BY	APP'D / DATE	APP'D / DATE	APP'D / DATE
DATE			

FORM 9316 (5/80)

The Rust Engineering Company
A Subsidiary of Wheelabrator-Frye Inc.

CENTRIFUGAL PUMP DATA SHEET

CONTRACT NO. 21-1997F
EQUIPMENT NO. P16602A/B
NO. REQUIRED 2
SHEET 1 OF 1

CLIENT: INTERNATIONAL COAL REFINING COMPANY
PROJECT: 6000 TPSD SRC-I DEMONSTRATION PLANT — PLANT LOCATION: NEWMAN, KENTUCKY
SERVICE: Sulfuric Acid Transfer Pumps
VENDOR — P.O. NO.
TYPE — MODEL — SERIAL NO.
NO. OF MOTORS REQ'D: 2 — ITEM NO. — FURN. BY: Vendor — MFR BY
NO OF TURBINES REQ'D — ITEM NO. — FURN BY — MFR BY
NOTE: ○ INDICATES INFORMATION TO BE COMPLETED BY PURCHASER — ☐ BY MANUFACTURER

○ OPERATING CONDITIONS (EACH PUMP)

LIQUID: Sulfuric Acid ($94\% H_2SO_4$) — US GPM AT PT NOR ____ RATED 15
DISCHARGE PSIG: 24.9
PT F NOR ____ MAX 110 — SUCTION PSIG MAX 3 RATED 1
SP GR AT PT 1.84 — DIFF PRESS PSI: 23.9
VAP PRESS AT PT PSIA ____ — DIFF HEAD FT: 30
VIS AT PT LBM/FT-HR ____ — NPSHA FT: 30
CORR/EROS CAUSED BY

CONSTRUCTION

NOZZLES	SIZE (IN)	RATING	FACING	LOCATION
SUCTION				
DISCHARGE				

CASE MT — CENTERLINE ☐ FOOT ☐ BRACKET ☒ VERT (TYPE) Sump
SPLIT ☐ AXIAL ☐ RAD — TYPE VOLUTE ☐ SGL ☐ DBL ☐ DIFFUSER
PRESS MAX ALLOW ____ PSIG ____ F ☐ HYDRO TEST ____ PSIG
CONNECT ☐ VENT ☐ DRAIN ☐ GAUGE ☐ STEAM JACKET
IMPELLER DIA RATED ____ ☐ MAX ____ ☐ TYPE ____
MOUNT ☐ BETWEEN BRGS ☐ OVERHUNG
BEARINGS TYPE ☐ RADIAL ____ ☐ THRUST ____
LUBE ☐ RING OIL ☐ FLOOD ☐ OIL MIST ☐ FLINGER ☐ PRESSURE
COUPLING ☐ MFR ____ ☐ MODEL ____
DRIVER HALF MTD BY ☐ PUMP MFR ☐ DRIVER MFR
☒ MECH SEAL ○ PACKING ○ AUX SEAL/PACKING
MFR TYPE MODEL ____
MFR CODE ____ API CODE ____

AUXILIARY PIPING

☐ C W PIPE PLAN ○ Cu ☐ SS ☐ TUBING ○ PIPE
☐ TOTAL COOLING WATER REQ'D GPM ____ ○ SIGHT F.I. REQ'D
☐ PACKING COOL INJECTION REQ'D ☐ TOTAL GPM ____ ☐ PSIG ____
☒ SEAL FLUSH PIPE PLAN 11 ○ C S ○ S S ○ TUBING ☒ PIPE
○ EXTERNAL SEAL FLUSH FLUID ____ ☐ GPM ____ ☐ PSIG ____
☐ AUXILIARY SEAL PLAN ____ ○ C.S. ○ S S ○ TUBING ○ PIPE
☐ AUX SEAL FLUSH/QUENCH FLUID ____

MATERIALS

☐ PUMP CASE TRIM API CLASS ____
CASING Hastelloy C — CORR ALL ____ IN.
IMPELLER Hastelloy C — WEAR RINGS ____
SHAFT Hastelloy C — SLEEVE(S) Hastelloy C
CASE INT COATING/LINING ____ — GLAND ____
☐ BASEPLATE ____ — DRIP PAN ____

○ SITE CONDITIONS

ELEVATION FT ____ — DUST/FUMES ____
AMB TEMP F ____ MAX ____ MIN ____ — AREA ELECT. CL ____ GR. ____ DIV. ____
COOLING WATER SUPPLY ____ PSIG ____ F — RETURN ____ PSIG ____ °F

☐ PERFORMANCE

PROPOSAL CURVE NO ____
RPM ____ — NO OF STAGES ____
NPSHR FT ℄ IMPELLER ____ T O F ____
EFF ____ — BHP RATED ____
MAX BHP RATED IMP ____
MAX HEAD RATED IMP ____
MIN CONTINUOUS GPM ____
ROTATION (VIEWED FROM CPLG END) ____

○ INSPECTION AND TESTS

SHOP INSPECTION	☒ REQ'D	
HYDROSTATIC TEST	☒ REQ'D	○ WITNESS
PERFORMANCE TEST	○ REQ'D	○ WITNESS
NPSH TEST	○ REQ'D	○ WITNESS
INT INSP AFTER TEST ____	○ REQ'D	○ WITNESS
____	○ REQ'D	○ WITNESS

☐ INT. WEAR PARTS

WEAR RINGS ☐ CASE ☐ IMP
DIA ____ IN CLEARANCE ____ IN
INTERSTAGE BUSHINGS
DIA ____ IN CLEARANCE ____ IN

VERTICAL PUMPS

PIT OR SUMP DEPTH ℄ 10 Ft
PUMP LENGTH ○ ____
MIN SUBMERGENCE REQ'D ☐ ____
COLUMN PIPE ☐ FLANGED ☐ THREADED
LINE SHAFT ☐ OPEN ☐ ENCLOSED
BRGS ☐ BOWL ____ ☐ LINE SHAFT ____
BRG LUB ☐ WATER ☐ OIL ☐ GREASE
FLOAT & ROD ○ C S ○ S S ○ BRZ ☒ NONE
FLOAT SWITCH ☐ ____
PUMP THRUST LB ☐ UP ____ ☐ DOWN ____
MOUNTING PLATE REQ'D ☐ ____

☐ WEIGHTS AND DIMENSIONS

APPROX WT PUMP & BASE ____ LB
MOTOR ____ LB TURBINE ____ LB
BASE PLATE DIMENSIONS ____

APPLICABLE SPECIFICATIONS

○ API 610 ○ ANSI B73.1 B73.2 ____
☒ PROJECT SPECIFICATIONS ____

REMARKS: Pump to have vapor proof construction

PREPARED BY R. Sciascia	REVISION △	REVISION △	REVISION △ 4
DATE 10-15-81	BY / DATE	BY / DATE	BY / DATE
APPROVED BY	APP'D / DATE	APP'D / DATE	APP'D / DATE
DATE			

FORM 9316 15/80

The Rust Engineering Company
A Subsidiary of Wheelabrator-Frye Inc.

CENTRIFUGAL PUMP DATA SHEET

CONTRACT NO. 21-1997F
EQUIPMENT NO. P16603A/B/C/D/E/F/1
NO REQUIRED 6/1
SHEET 1 OF 1

CLIENT: INTERNATIONAL COAL REFINING COMPANY
PROJECT: 6000 TPSD SRC-I DEMONSTRATION PLANT — PLANT LOCATION: NEWMAN, KENTUCKY
SERVICE: Cooling Water Supply Pumps
VENDOR — P.O. NO.
TYPE — MODEL — SERIAL NO.
NO. OF MOTORS REQ'D: 6/1 — ITEM NO. — FURN. BY: Vendor — MFR BY
NO OF TURBINES REQ'D — ITEM NO. — FURN BY — MFR BY
NOTE: ○ INDICATES INFORMATION TO BE COMPLETED BY PURCHASER — ☐ BY MANUFACTURER

○ OPERATING CONDITIONS (EACH PUMP) 1

LIQUID: Water — US GPM AT PT. NOR — RATED: 20,000
DISCHARGE. PSIG: 97.7
PT F NOR — MAX: 108 — SUCTION. PSIG. MAX: 5 — RATED: 2
SP GR AT PT: 1.0 — DIFF PRESS. PSI: 95.7
VAP PRESS AT PT. PSIA — DIFF HEAD. FT: 221
VIS. AT PT LB(M)/FT-HR — NPSHA. FT: 35
CORR/EROS. CAUSED BY

CONSTRUCTION

NOZZLES	SIZE (IN.)	RATING	FACING	LOCATION
SUCTION				
DISCHARGE				

CASE MT ☐ CENTERLINE ☐ FOOT ☐ BRACKET ☒ VERT. (TYPE) Turbine
SPLIT ☐ AXIAL ☐ RAD: TYPE VOLUTE ☐ SGL ☐ DBL ☐ DIFFUSER
PRESS ☐ MAX ALLOW ____ PSIG ____ °F. ☐ HYDRO TEST ____ PSIG
CONNECT ☐ VENT ☐ DRAIN ☐ GAUGE ☐ STEAM JACKET
IMPELLER DIA ☐ RATED ____ ☐ MAX ____ ☐ TYPE ____
MOUNT ☐ BETWEEN BRGS ☐ OVERHUNG
BEARINGS TYPE ☐ RADIAL ____ ☐ THRUST ____
LUBE ☐ RING OIL ☐ FLOOD ☐ OIL MIST ☐ FLINGER ☐ PRESSURE
COUPLING ☐ MFR ____ ☐ MODEL ____
DRIVER HALF MTD BY ☐ PUMP MFR ☐ DRIVER MFR
○ MECH SEAL ☒ PACKING ○ AUX. SEAL/PACKING
MFR TYPE MODEL ____
MFR CODE ____ API CODE ____

AUXILIARY PIPING

○ C W PIPE PLAN ○ Cu ○ SS ○ TUBING ○ PIPE
☐ TOTAL COOLING WATER REQ'D GPM ____ ○ SIGHT F.I. REQ'D.
☒ PACKING COOL INJECTION REQ'D ☐ TOTAL GPM ____ ☐ PSIG ____
○ SEAL FLUSH PIPE PLAN ____ ○ C S ○ S.S. ○ TUBING ○ PIPE
○ EXTERNAL SEAL FLUSH FLUID ____ ☐ GPM ____ ☐ PSIG ____
○ AUXILIARY SEAL PLAN ____ ○ C.S. ○ S.S ○ TUBING ○ PIPE
○ AUX SEAL FLUSH/QUENCH FLUID ____

MATERIALS

○ PUMP CASE TRIM API CLASS ____
CASING Cast Iron — CORR ALL ____ IN
IMPELLER Ni Resist — WEAR RINGS ____
SHAFT 416SS — SLEEVE(S) 416SS
CASE INT COATING/LINING ____ — GLAND ____
☐ BASEPLATE ____ — DRIP PAN ____

○ SITE CONDITIONS

ELEVATION FT ____ — DUST/FUMES ____
AMB TEMP F ____ MAX ____ MIN. ____ AREA ELECT CL ____ GR. ____ DIV. ____
COOLING WATER SUPPLY ____ PSIG ____ F. RETURN ____ PSIG ____ °F

☐ PERFORMANCE

PROPOSAL CURVE NO ____
RPM ____ NO OF STAGES ____
NPSHR. FT. ℄ IMPELLER ____ T.O.F ____
EFF ____ BHP RATED ____
MAX. BHP RATED IMP ____
MAX HEAD RATED IMP ____
MIN CONTINUOUS GPM ____
ROTATION (VIEWED FROM CPLG END) ____

○ INSPECTION AND TESTS

SHOP INSPECTION	☒ REQ'D	
HYDROSTATIC TEST	☒ REQ'D	○ WITNESS
PERFORMANCE TEST	☒ REQ'D	○ WITNESS
NPSH TEST	○ REQ'D	○ WITNESS
INT INSP AFTER TEST	○ REQ'D	○ WITNESS
____	○ REQ'D	○ WITNESS

☐ INT. WEAR PARTS

WEAR RINGS ☐ CASE ☐ IMP.
DIA ____ IN CLEARANCE ____ IN
INTERSTAGE BUSHINGS
DIA ____ IN CLEARANCE ____ IN

VERTICAL PUMPS

PIT OR SUMP DEPTH ☒ 15
PUMP LENGTH ○ ____
MIN. SUBMERGENCE REQ'D ☐ ____
COLUMN PIPE ☒ FLANGED ☐ THREADED
LINE SHAFT ☒ OPEN ☐ ENCLOSED
BRGS ☐ BOWL ____ ☐ LINE SHAFT ____
BRG. LUB ☐ WATER ☐ OIL ☐ GREASE
FLOAT & ROD ○ C S ○ S S ○ BRZ ☒ NONE
FLOAT SWITCH ☐ ____
PUMP THRUST LB ☐ UP ____ ☐ DOWN ____
MOUNTING PLATE REQ'D ☐ ____

☐ WEIGHTS AND DIMENSIONS

APPROX WT PUMP & BASE ____ LB
MOTOR ____ LB TURBINE ____ LB
BASE PLATE DIMENSIONS ____

APPLICABLE SPECIFICATIONS

☒ API 610 ○ ANSI B73.1, B73.2 ____
☒ PROJECT SPECIFICATIONS ____

REMARKS:

PREPARED BY R. Sciascia	REVISION 1	REVISION △	REVISION △ 5
DATE 10-15-81	BY MWH DATE 3-84	BY DATE	BY DATE
APPROVED BY	APP'D DATE	APP'D DATE	APP'D DATE
DATE			

The Rust Engineering Company
A Subsidiary of Wheelabrator-Frye Inc.

CENTRIFUGAL PUMP DATA SHEET

CONTRACT NO. 21-1997F
EQUIPMENT NO. P16610A/B
NO. REQUIRED 2
SHEET 1 OF 1

CLIENT: INTERNATIONAL COAL REFINING COMPANY
PROJECT: 6000 TPSD SRC-I DEMONSTRATION PLANT — PLANT LOCATION: NEWMAN, KENTUCKY
SERVICE: ~~Corrosion Inhibitor~~ Transfer
VENDOR — P.O. NO.
TYPE — MODEL — SERIAL NO.
NO. OF MOTORS REQ'D — ITEM NO. — FURN. BY — MFR BY
NO OF TURBINES REQ'D — ITEM NO. — FURN BY — MFR BY

NOTE: ○ INDICATES INFORMATION TO BE COMPLETED BY PURCHASER — ☐ BY MANUFACTURER

○ OPERATING CONDITIONS (EACH PUMP)

LIQUID: Corr. Inhibitor — US GPM AT PT NOR ____ RATED 16.5
DISCHARGE PSIG 24.9
PT F NOR ____ MAX 90° — SUCTION PSIG MAX 3 RATED 1
SP GR AT PT ____ DIFF PRESS PSI 23.9
VAP PRESS AT PT PSIA ____ DIFF HEAD FT 30
VIS AT PT LB(M)/FT-HR ____ NPSHA FT 30
CORR/EROS CAUSED BY ____

☐ PERFORMANCE

PROPOSAL CURVE NO. ____
RPM ____ NO OF STAGES ____
NPSHR FT @ IMPELLER ____ T.O.F. ____
EFF ____ BHP RATED ____
MAX BHP RATED IMP ____
MAX HEAD RATED IMP ____
MIN CONTINUOUS GPM ____
ROTATION (VIEWED FROM CPLG END) ____

CONSTRUCTION

NOZZLES	SIZE (IN.)	RATING	FACING	LOCATION
SUCTION				
DISCHARGE				

CASE MT: ○ CENTERLINE ☒ FOOT ☐ BRACKET ☐ VERT (TYPE) ____
SPLIT: ○ AXIAL ☐ RAD. TYPE VOLUTE ☐ SGL ☐ DBL ☐ DIFFUSER
PRESS: ○ MAX ALLOW ____ PSIG ____ F ☐ HYDRO TEST ____ PSIG
CONNECT: ○ VENT ☐ DRAIN ☐ GAUGE ☐ STEAM JACKET
IMPELLER DIA: RATED ____ ☐ MAX ____ ☐ TYPE ____
MOUNT: ○ BETWEEN BRGS ☐ OVERHUNG
BEARINGS TYPE: ○ RADIAL ____ ☐ THRUST ____
LUBE: ○ RING OIL ☐ FLOOD ☐ OIL MIST ☐ FLINGER ☐ PRESSURE
COUPLING: ○ MFR ____ ☐ MODEL ____
DRIVER HALF MTD BY ☐ PUMP MFR ☐ DRIVER MFR
☒ MECH SEAL ○ PACKING ○ AUX SEAL/PACKING
MFR TYPE MODEL ____
MFR CODE ____ API CODE ____

○ INSPECTION AND TESTS

SHOP INSPECTION	☒ REQ'D	
HYDROSTATIC TEST	☒ REQ'D	○ WITNESS
PERFORMANCE TEST	○ REQ'D	○ WITNESS
NPSH TEST	○ REQ'D	○ WITNESS
INT INSP AFTER TEST ____	○ REQ'D	○ WITNESS
	○ REQ'D	○ WITNESS

☐ INT. WEAR PARTS

WEAR RINGS ☐ CASE ☐ IMP
DIA ____ IN CLEARANCE ____ IN
INTERSTAGE BUSHINGS
DIA ____ IN CLEARANCE ____ IN

AUXILIARY PIPING

○ C W PIPE PLAN ○ Cu ○ SS ○ TUBING ☒ PIPE
○ TOTAL COOLING WATER REQ'D GPM ____ ○ SIGHT F.I. REQ'D.
○ PACKING COOL INJECTION REQ'D ☐ TOTAL GPM ____ ☐ PSIG ____
☒ SEAL FLUSH PIPE PLAN 11 ○ C S ○ S.S. ○ TUBING ☒ PIPE
○ EXTERNAL SEAL FLUSH FLUID ____ ☐ GPM ____ ☐ PSIG ____
○ AUXILIARY SEAL PLAN ____ ○ C S ○ S.S ○ TUBING ○ PIPE
○ AUX SEAL FLUSH/QUENCH FLUID ____

VERTICAL PUMPS

PIT OR SUMP DEPTH ○ ____
PUMP LENGTH ○ ____
MIN SUBMERGENCE REQ'D ☐ ____
COLUMN PIPE ☐ FLANGED ☐ THREADED
LINE SHAFT ☐ OPEN ☐ ENCLOSED
BRGS ☐ BOWL ____ ☐ LINE SHAFT ____
BRG. LUB ☐ WATER ☐ OIL ☐ GREASE
FLOAT & ROD ○ C S ○ S S ○ BRZ ○ NONE
FLOAT SWITCH ○ ____
PUMP THRUST LB ○ UP ____ ☐ DOWN ____
MOUNTING PLATE REQ'D ☐ ____

MATERIALS

○ PUMP CASE/TRIM API CLASS ____
CASING Hastelloy C COMB ALL ____ IN
IMPELLER Hastelloy C WEAR RINGS ____
SHAFT Hastelloy C SLEEVE(S) Hastelloy C
CASE INT COATING/LINING ____ GLAND ____
☐ BASEPLATE ____ DRIP PAN ____

☐ WEIGHTS AND DIMENSIONS

APPROX WT PUMP & BASE ____ LB
MOTOR ____ LB TURBINE ____ LB
BASE PLATE DIMENSIONS ____

○ SITE CONDITIONS

ELEVATION FT ____ DUST/FUMES ____
AMB TEMP F ____ MAX ____ MIN ____ AREA ELECT. CL ____ GR. ____ DIV. ____
COOLING WATER SUPPLY ____ PSIG ____ F. RETURN ____ PSIG ____ °F

APPLICABLE SPECIFICATIONS

○ API 610 ☒ ANSI B73.1, B73.2 ____
☒ PROJECT SPECIFICATIONS ____

REMARKS:

PREPARED BY R. Sciascia	REVISION 1		REVISION △		REVISION △ 6		
DATE 10-15-81							
APPROVED BY	BY	DATE 3-26-82	BY	DATE	BY	DATE	
DATE	APP'D	DATE	APP'D	DATE	APP'D	DATE	

The Rust Engineering Company
A Subsidiary of Wheelabrator-Frye Inc.

CENTRIFUGAL PUMP DATA SHEET

CONTRACT NO. 21-1997F
EQUIPMENT NO P16611A/B
NO. REQUIRED 2
SHEET 1 OF 1

CLIENT: INTERNATIONAL COAL REFINING COMPANY
PROJECT: 6000 TPSD SRC-I DEMONSTRATION PLANT — PLANT LOCATION: NEWMAN, KENTUCKY
SERVICE: Sulfuric Acid Transfer Pump
VENDOR — P.O. NO.
TYPE — MODEL — SERIAL NO.
NO. OF MOTORS REQ'D 2 — ITEM NO. — FURN. BY Purchaser — MFR BY
NO OF TURBINES REQ'D — ITEM NO. — FURN BY — MFR BY
NOTE: ○ INDICATES INFORMATION TO BE COMPLETED BY PURCHASER — ☐ BY MANUFACTURER

○ OPERATING CONDITIONS (EACH PUMP)

LIQUID Sulfuric Acid (94% H_2SO_4) — US GPM AT PT NOR — RATED 15
DISCHARGE PSIG 24.9
PT T NOR — MAX 110 — SUCTION PSIG MAX 3 — RATED 1
SP GR AT PT 1.84 — DIFF PRESS PSI 23.9
VAP PRESS AT PT PSIA — DIFF HEAD FT 30
VIS AT PT LB/M/FT-HR — NPSHA FT 30
CORR/EROS CAUSED BY

CONSTRUCTION

NOZZLES	SIZE/IN	RATING	FACING	LOCATION
SUCTION				
DISCHARGE				

CASE MT ☐ CENTERLINE ☐ FOOT ☐ BRACKET ☒ VERT (TYPE) Sump
SPLIT ☐ AXIAL ☐ RAD. TYPE VOLUTE ☐ SGL ☐ DBL ☐ DIFFUSER
PRESS ☐ MAX ALLOW — PSIG — F ☐ HYDRO TEST — PSIG
CONNECT ☐ VENT ☐ DRAIN ☐ GAUGE ☐ STEAM JACKET
IMPELLER DIA ☐ RATED — ☐ MAX — ☐ TYPE
MOUNT ☐ BETWEEN BRGS ☐ OVERHUNG
BEARINGS TYPE ☐ RADIAL — ☐ THRUST
LUBE ☐ RING OIL ☐ FLOOD ☐ OIL MIST ☐ FLINGER ☐ PRESSURE
COUPLING ☐ MFR — ☐ MODEL
DRIVER HALF MTD BY ☐ PUMP MFR ☐ DRIVER MFR
☒ MECH SEAL ○ PACKING ○ AUX SEAL/PACKING
MFR TYPE, MODEL
MFR CODE — API CODE

AUXILIARY PIPING

☐ C W PIPE PLAN ☐ Cu ☐ SS ☐ TUBING ○ PIPE
☐ TOTAL COOLING WATER REQ'D GPM ○ SIGHT F.I REQ'D
PACKING COOL INJECTION REQ'D ☐ TOTAL GPM ☐ PSIG
☒ SEAL FLUSH PIPE PLAN 11 ☐ C S ○ S.S ○ TUBING ☒ PIPE
☐ EXTERNAL SEAL FLUSH FLUID ☐ GPM ☐ PSIG
☐ AUXILIARY SEAL PLAN ☐ C S ○ S S ○ TUBING ○ PIPE
☐ AUX SEAL FLUSH/QUENCH FLUID

MATERIALS

☐ PUMP CASE TRIM API CLASS
CASING Hastelloy C — CORR ALL — IN.
IMPELLER Hastelloy C — WEAR RINGS
SHAFT Hastelloy C — SLEEVE(S) Hastelloy C
CASE INT COATING/LINING — GLAND
BASEPLATE — DRIP PAN

○ SITE CONDITIONS

ELEVATION FT — DUST/FUMES
AMB TEMP F — MAX — MIN — AREA ELECT. CL — GR. — DIV.
COOLING WATER SUPPLY — PSIG — F RETURN — PSIG — °F

☐ PERFORMANCE

PROPOSAL CURVE NO
RPM — NO OF STAGES
NPSHR FT — IMPELLER — T.O.F
EFF — BHP RATED
MAX BHP RATED IMP
MAX HEAD RATED IMP
MIN CONTINUOUS GPM
ROTATION (VIEWED FROM CPLG END)

○ INSPECTION AND TESTS

SHOP INSPECTION	☒ REQ'D	
HYDROSTATIC TEST	☒ REQ'D	○ WITNESS
PERFORMANCE TEST	○ REQ'D	○ WITNESS
NPSH TEST	○ REQ'D	○ WITNESS
INT INSP AFTER TEST	○ REQ'D	○ WITNESS
	○ REQ'D	○ WITNESS

☐ INT. WEAR PARTS

WEAR RINGS ☐ CASE ☐ IMP
DIA — IN CLEARANCE — IN
INTERSTAGE BUSHINGS
DIA — IN. CLEARANCE — IN

VERTICAL PUMPS

PIT OR SUMP DEPTH ☒ 10 Ft
PUMP LENGTH ○
MIN SUBMERGENCE REQ'D ☐
COLUMN PIPE ☐ FLANGED ☐ THREADED
LINE SHAFT ☐ OPEN ☐ ENCLOSED
BRGS ☐ BOWL — ☐ LINE SHAFT
BRG LUB ☐ WATER ☐ OIL ☐ GREASE
FLOAT & ROD ○ C S ○ S S ○ BRZ ☒ NONE
FLOAT SWITCH ☐
PUMP THRUST LB ☐ UP — ☐ DOWN
MOUNTING PLATE REQ'D ☐

☐ WEIGHTS AND DIMENSIONS

APPROX WT PUMP & BASE — LB
MOTOR — LB TURBINE — LB
BASE PLATE DIMENSIONS

APPLICABLE SPECIFICATIONS

○ API 610 ○ ANSI B73.1 B73.2
☒ PROJECT SPECIFICATIONS

REMARKS: Pump to have vapor proof construction

PREPARED BY R. Sciascia	REVISION △		REVISION △		REVISION △ 7	
DATE 1-15-81	BY	DATE	BY	DATE	BY	DATE
APPROVED BY	APP'D	DATE	APP'D	DATE	APP'D	DATE
DATE						

FORM 9316 (5/80)

The Rust Engineering Company
A Subsidiary of Wheelabrator-Frye Inc.

CENTRIFUGAL PUMP DATA SHEET

CONTRACT NO. 21-1997F
EQUIPMENT NO. P16612A-F ⚠1
NO. REQUIRED 5 ⚠1
SHEET 1 OF 1

CLIENT INTERNATIONAL COAL REFINING COMPANY
PROJECT 6000 TPSD SRC-I DEMONSTRATION PLANT — PLANT LOCATION NEWMAN, KENTUCKY
SERVICE Cooling Water Supply Pumps
VENDOR — P.O. NO.
TYPE — MODEL — SERIAL NO.
NO. OF MOTORS REQ'D 5 ⚠1 — ITEM NO. — FURN. BY — MFR BY
NO OF TURBINES REQ'D — ITEM NO. — FURN BY — MFR BY
NOTE ○ INDICATES INFORMATION TO BE COMPLETED BY PURCHASER — ☐ BY MANUFACTURER

○ OPERATING CONDITIONS (EACH PUMP) ⚠1

LIQUID Water — US GPM AT PT NOR ____ RATED 4,000
DISCHARGE PSIG 97.7
PT F NOR ____ MAX 108 — SUCTION PSIG MAX 5 RATED 2
SP GR AT PT 1.0 — DIFF PRESS PSI 95.7
VAP PRESS AT PT PSIA ____ — DIFF HEAD FT 221
VIS AT PT LB/M-FT-HR ____ — NPSHA FT 35
CORR/EROS CAUSED BY ____

CONSTRUCTION

NOZZLES	SIZE (IN)	RATING	FACING	LOCATION
SUCTION				
DISCHARGE				

CASE MT ☐ CENTERLINE ☐ FOOT ☐ BRACKET ☒ VERT. (TYPE) Turbine
SPLIT ☐ AXIAL ☐ RAD: TYPE VOLUTE ☐ SGL ☐ DBL ☐ DIFFUSER
PRESS ☐ MAX ALLOW ____ PSIG ____ F. ☐ HYDRO TEST ____ PSIG
CONNECT ☐ VENT ☐ DRAIN ☐ GAUGE ☐ STEAM JACKET
IMPELLER DIA ☐ RATED ____ ☐ MAX ____ ☐ TYPE ____
MOUNT ☐ BETWEEN BRGS ☐ OVERHUNG
BEARINGS TYPE ☐ RADIAL ____ ☐ THRUST ____
LUBE ☐ RING OIL ☐ FLOOD ☐ OIL MIST ☐ FLINGER ☐ PRESSURE
COUPLING ☐ MFR ____ ☐ MODEL ____
DRIVER HALF MTD BY ☐ PUMP MFR ☐ DRIVER MFR
☒ MECH SEAL ○ PACKING ○ AUX. SEAL/PACKING
MFR TYPE MODEL ____
MFR CODE ____ API CODE ____

AUXILIARY PIPING

○ C W PIPE PLAN ○ Cu ○ SS ○ TUBING ○ PIPE
☐ TOTAL COOLING WATER REQ'D GPM ____ ○ SIGHT F.I REQ'D.
☐ PACKING COOL INJECTION REQ'D ☐ TOTAL GPM ____ ☐ PSIG ____
☒ SEAL FLUSH PIPE PLAN 11 ☒ C S ○ S.S. ○ TUBING ☒ PIPE
○ EXTERNAL SEAL FLUSH FLUID ____ ☐ GPM ____ ☐ PSIG ____
○ AUXILIARY SEAL PLAN ____ ○ C.S. ○ S.S ○ TUBING ○ PIPE
○ AUX SEAL FLUSH/QUENCH FLUID ____

MATERIALS

○ PUMP CASE/TRIM API CLASS ____
CASING Cast Iron CORR ALL ____ IN.
IMPELLER Ni Resist WEAR RINGS ____
SHAFT 416SS SLEEVE(S) 416SS
CASE INT COATING/LINING ____ GLAND ____
☐ BASEPLATE ____ DRIP PAN ____

○ SITE CONDITIONS

ELEVATION FT ____ DUST/FUMES ____
AMB TEMP F ____ MAX ____ MIN ____ AREA ELECT. CL ____ GR. ____ DIV ____
COOLING WATER SUPPLY ____ PSIG ____ F. RETURN ____ PSIG ____ °F

☐ PERFORMANCE

PROPOSAL CURVE NO ____
RPM ____ NO OF STAGES ____
NPSHR FT ℄ IMPELLER ____ T.O.F ____
EFF ____ BHP RATED ____
MAX BHP RATED IMP ____
MAX HEAD RATED IMP ____
MIN CONTINUOUS GPM ____
ROTATION (VIEWED FROM CPLG END) ____

○ INSPECTION AND TESTS

SHOP INSPECTION	☒ REQ'D	
HYDROSTATIC TEST	☒ REQ'D	○ WITNESS
PERFORMANCE TEST	☒ REQ'D	○ WITNESS
NPSH TEST	○ REQ'D	○ WITNESS
INT INSP AFTER TEST ____	○ REQ'D	WITNESS
	○ REQ'D	○ WITNESS

☐ INT. WEAR PARTS

WEAR RINGS ☐ CASE ☐ IMP
DIA ____ IN CLEARANCE ____ IN
INTERSTAGE BUSHINGS
DIA ____ IN CLEARANCE ____ IN

VERTICAL PUMPS

PIT OR SUMP DEPTH ℄ 15
PUMP LENGTH ○ ____
MIN SUBMERGENCE REQ'D ☐ ____
COLUMN PIPE ☒ FLANGED ☐ THREADED
LINE SHAFT ☒ OPEN ☐ ENCLOSED
BRGS ☐ BOWL ____ ☐ LINE SHAFT ____
BRG. LUB ☐ WATER ☐ OIL ☐ GREASE
FLOAT & ROD ○ C S ○ S S ○ BRZ ☒ NONE
FLOAT SWITCH ☐ ____
PUMP THRUST LB ☐ UP ____ ☐ DOWN ____
MOUNTING PLATE REQ'D ☐ ____

☐ WEIGHTS AND DIMENSIONS

APPROX WT PUMP & BASE ____ LB
MOTOR ____ LB TURBINE ____ LB
BASE PLATE DIMENSIONS ____

APPLICABLE SPECIFICATIONS

○ API 610 ○ ANSI B73.1 B73.2 ____
○ PROJECT SPECIFICATIONS ____

REMARKS:

	REVISION ⚠1	REVISION △	REVISION △
PREPARED BY R. Sciascia			
DATE			
APPROVED BY	BY MWH	BY	BY
DATE 10-15-81	DATE 3-84	DATE	DATE
	APP'D DATE	APP'D DATE	APP'D DATE

The Rust Engineering Company
A Subsidiary of Wheelabrator-Frye Inc

STORAGE TANK DATA SHEET

CONTRACT NO. 21-1997E
EQUIPMENT NO. TK-16601
NO. REQUIRED 1
SHEET 1 OF 1

CLIENT: INTERNATIONAL COAL REFINING COMPANY

PROJECT: 6000 TPSD SRC-I DEMONSTRATION PLANT — PLANT LOCATION: NEWMAN, KENTUCKY

SERVICE: Inhibitor Storage

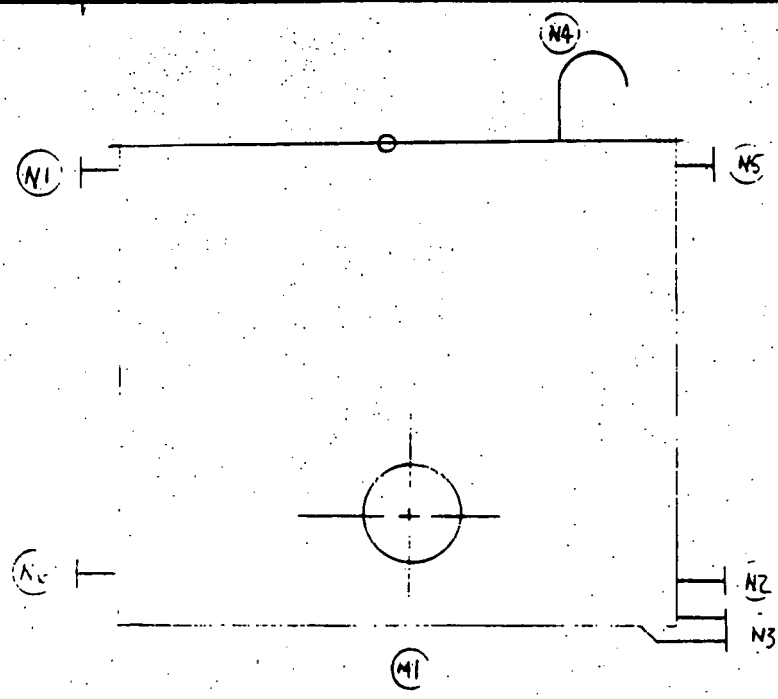
VENDOR — P.O. NO.

DIAMETER	6'Ø	HEIGHT 9.5'	FT.	MATERIAL	
CAPACITY: NORMAL	1000		GAL	SHELL FRP	THICK. IN
NET WORKING			GAL	ROOF	THICK. IN
OPERATING CONDITIONS				BOTTOM	THICK. IN
SPECIFIC GRAVITY	LIO	AT TEMP	°F	STRUCTURALS	
PUMPING RATES	IN	OUT	GPM	NOZZLE: NECK	FLANGE
VAPOR PRESS			IN WATER	COUPLINGS	
MAX. OPER. TEMP			°F	INTERNALS: FIXED	
DESIGN CONDITIONS				REMOVABLE	
CODE: API		APPENDIX		GASKETS	
DESIGN METAL TEMP			°F	BOLTING	
DESIGN PRESS			IN WATER	EST. ERECTION WT (LB)	
CORROSION ALLOW: SHELL		ROOF	IN.	NOZZLES	
BOTTOM		INTERNALS	IN.	FLANGE RATING	COUPLING RATING

ROOF TYPE	Flat Top				
ROOF LIVE LOADS			PSF		
WIND PRESS			PSF		
EARTHQUAKE CODE		ZONE			
FOUNDATION TYPE					
RADIOGRAPHY: EXTENT					
STRESS RELIEF: YES/NO		EXTENT			
INSULATION: YES		THICK: 1"	IN.		
LEAK TESTING: BOTTOM		SHELL	ROOF		
MILL TEST REPORTS: YES/NO					
PAINTING: YES	SPEC: Shop Coat				

MARK NO.	NO. REQ'D.	SIZE IN	FACING	SERVICE
N—1		3		INLET
N—2		3		OUTLET
N—3		4		DRAIN
N—4		2		RELIEF/VENT
N—5		3		INLET
N—6		3		OUTLET
N—7				
M—1		N/A		MAN WAY

SKETCH



PREPARED BY: L. A. S.	REVISION △	REVISION △	REVISION △ 9
DATE: 23 OCT 81	BY / DATE	BY / DATE	BY / DATE
APPROVED BY	APP'D / DATE	APP'D / DATE	APP'D / DATE
DATE			

The Rust Engineering Company
A Subsidiary of Wheelabrator-Frye Inc

STORAGE TANK DATA SHEET

CONTRACT NO. 21-1997-E
EQUIPMENT NO. TK-16602, TK-16611
NO. REQUIRED 2
SHEET 1 OF 1

CLIENT: INTERNATIONAL COAL REFINING COMPANY

PROJECT: 6000 TPSD SRC-I DEMONSTRATION PLANT — PLANT LOCATION: NEWMAN, KENTUCKY

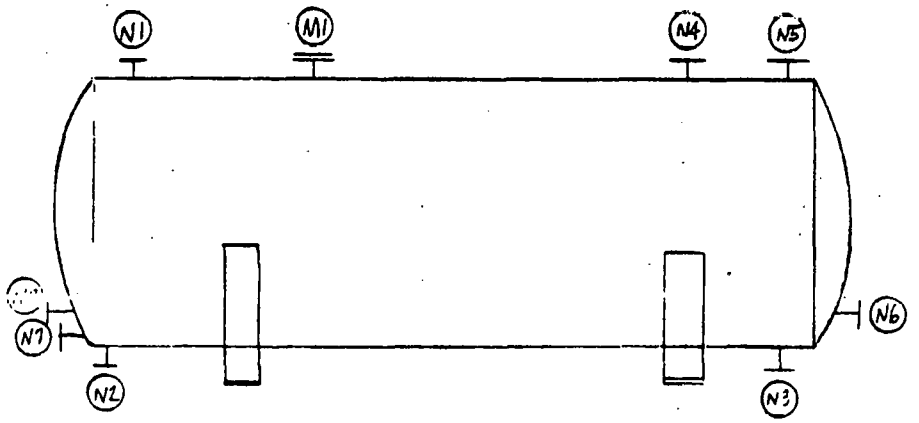
SERVICE: SULFURIC ACID STORAGE

VENDOR — P.O. NO.

DIAMETER 12'	HEIGHT 12'T-T FT.	MATERIAL	
CAPACITY: NORMAL 10 000	GAL	SHELL C.S.	THICK. IN.
NET WORKING	GAL	ROOF	THICK. IN.
OPERATING CONDITIONS		BOTTOM	THICK. IN.
SPECIFIC GRAVITY: LIQ 1.8354	AT TEMP 110 °F	STRUCTURALS	
PUMPING RATES: IN	OUT 15 GPM	NOZZLE: NECK	FLANGE
VAPOR PRESS	IN. WATER	COUPLINGS	
MAX. OPER TEMP	°F	INTERNALS: FIXED	
DESIGN CONDITIONS		REMOVABLE	
CODE: API	APPENDIX	GASKETS	
DESIGN METAL TEMP	°F	BOLTING	
DESIGN PRESS	IN. WATER	EST. ERECTION WT (LB)	
CORROSION ALLOW: SHELL	ROOF IN.	NOZZLES	
BOTTOM	INTERNALS IN.	FLANGE RATING	COUPLING RATING
ROOF TYPE HORIZONTAL			
ROOF LIVE LOADS	PSF		
WIND PRESS	PSF		
EARTHQUAKE: CODE	ZONE		
FOUNDATION TYPE			
RADIOGRAPHY: EXTENT			
STRESS RELIEF: YES/NO	EXTENT		
INSULATION: [redacted]/NO	THICK: IN.		
LEAK TESTING: BOTTOM	SHELL ROOF		
MILL TEST REPORTS: YES/NO			
PAINTING: YES[redacted] SPEC. SHOP COAT			

MARK NO.	NO. REQ'D.	SIZE IN	FACING	SERVICE
N-1		2		INLET
N-2		2		OUTLET
N-3		4		DRAIN
N-4		1		RELIEF/VENT
N-5		2		INLET
N-6		2		OUTLET
N-7		NA		
M-1		NA		MAN WAY

SKETCH



PREPARED BY W.N.S.	REVISION △	REVISION △	REVISION △ 10
DATE 23 OCT 81	BY DATE	BY DATE	BY DATE
APPROVED BY	APP'D DATE	APP'D DATE	APP'D DATE
DATE			

The Rust Engineering Company
A Subsidiary of Wheelabrator-Frye Inc

STORAGE TANK DATA SHEET

CONTRACT NO. 21-1997F
EQUIPMENT NO. TK-1661C
NO. REQUIRED 1
SHEET 1 OF 1

CLIENT: INTERNATIONAL COAL REFINING COMPANY

PROJECT: 6000 TPSD SRC-I DEMONSTRATION PLANT — PLANT LOCATION: NEWMAN, KENTUCKY

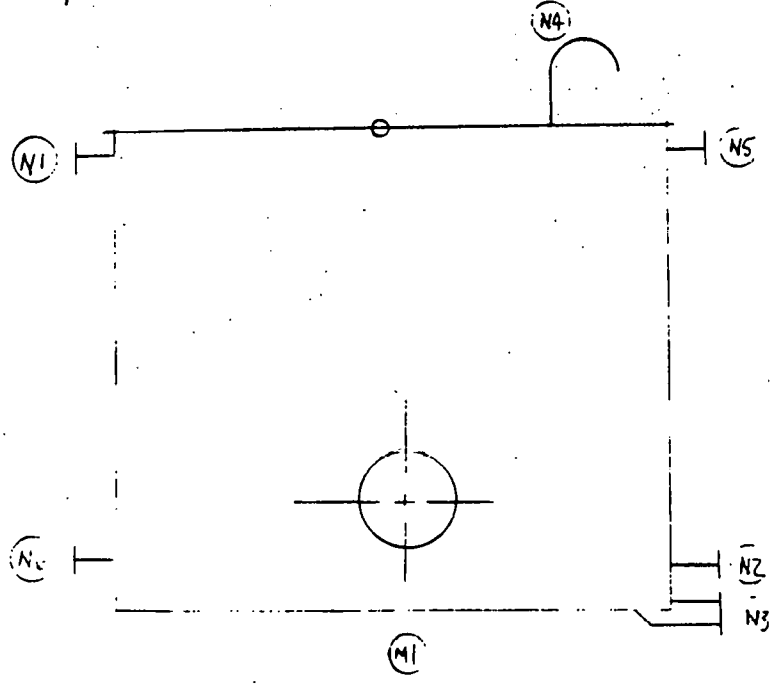
SERVICE: Inhibitor Storage

VENDOR — P.O. NO.

DIAMETER	6'	HEIGHT 4.5	FT.	MATERIAL	
CAPACITY NORMAL	1000		GAL	SHELL FRP	THICK. IN.
NET WORKING			GAL	ROOF	THICK. IN.
OPERATING CONDITIONS				BOTTOM	THICK. IN.
SPECIFIC GRAVITY LIO		AT TEMP	°F	STRUCTURALS	
PUMPING RATES: IN		OUT 15	GPM	NOZZLE: NECK	FLANGE
VAPOR PRESS			IN WATER	COUPLINGS	
MAX. OPER TEMP	90°F		°F	INTERNALS: FIXED	
DESIGN CONDITIONS				REMOVABLE	
CODE: API		APPENDIX		GASKETS	
DESIGN METAL TEMP			°F	BOLTING	
DESIGN PRESS			IN WATER	EST. ERECTION WT (LB)	
CORROSION ALLOW: SHELL		ROOF	IN.	NOZZLES	
BOTTOM		INTERNALS	IN.	FLANGE RATING	COUPLING RATING
ROOF TYPE	FLAT, Hinged				
ROOF LIVE LOADS			PSF		
WIND PRESS			PSF		
EARTHQUAKE CODE		ZONE			
FOUNDATION TYPE					
RADIOGRAPHY: EXTENT					
STRESS RELIEF: YES/NO		EXTENT			
INSULATION YES/NO		THICK: 1	IN.		
LEAK TESTING: BOTTOM		SHELL	ROOF		
MILL TEST REPORTS YES/NO					
PAINTING YES/NO	SPEC Shop Coat				

MARK NO.	NO. REQ'D.	SIZE IN	FACING	SERVICE
N-1		3		INLET
N-2		3		OUTLET
N-3		4		DRAIN
N-4		2		RELIEF/VENT
N-5		3		INLET
N-6		3		Outlet
N-7				
M-1		NA		MAN WAY

SKETCH



	REVISION △	REVISION △	REVISION △ 11
PREPARED BY			
DATE			
APPROVED BY	BY	BY	BY
DATE	APP'D DATE	APP'D DATE	APP'D DATE

The Rust Engineering Company
A Subsidiary of Whessoe Rust-Frye Inc

[GENERAL EQUIPMENT DATA SHEET]

CONTRACT NO. 21-1997F
EQUIPMENT NO. X-16603
NO. REQUIRED 1
SHEET 1 OF 1

CLIENT INTERNATIONAL COAL REFINING COMPANY
PROJECT 6000 TPSD SRC-I DEMONSTRATION PLANT PLANT LOCATION NEWMAN, KENTUCKY
SERVICE Cooling Tower #1 Chlorination
VENDOR P.O NO

A chlorine feed system with a capacity of 6000 lb/day. The chlorination equipment shall consist of a vacuum type chlorinator, chlorine solution eductor (J-16601), vacuum regulator, pressure reducing valve, flow meter, instruments and controls as required for feeding chlorine from a battery of ton chlorine containers. Weighing scales are included. (W-16601A-C)

PREPARED BY O.E. Mitchell	REVISION △	REVISION △	REVISION △ 12
DATE 10-14-81	BY DATE	BY DATE	BY DATE
APPROVED BY	APP'D DATE	APP'D DATE	APP'D DATE
DATE			

The Rust Engineering Company
A Subsidiary of Whittaker Corp.-Frye Inc.

(GENERAL EQUIPMENT DATA SHEET)

CONTRACT NO. 21-1997F
EQUIPMENT NO. See Below
NO. REQUIRED 4
SHEET 1 OF 1

CLIENT: INTERNATIONAL COAL REFINING COMPANY
PROJECT: 6000 TPSD SRC-I DEMONSTRATION PLANT — PLANT LOCATION: NEWMAN, KENTUCKY
SERVICE: Cooling Tower Chemical Feed
VENDOR — P.O. NO.

The four (4) Cooling Tower Chemical Feed Systems are as follows:

For CT - 16610	For CT - 16601
X - 16610 Inhibitor	X - 16601 Inhibitor
X - 16611 Sulfuric Acid	X - 16602 Sulfuric Acid

Each chemical feed system will consist of a 100 gallon, 316 SS vertical day tank, and two (2) positive displacement type metering pumps.

PREPARED BY O.E.Mitchell	REVISION △	REVISION △	REVISION △ 13
DATE 10/14/81	BY DATE	BY DATE	BY DATE
APPROVED BY	APP'D DATE	APP'D DATE	APP'D DATE
DATE			

FORM 9308--1 OF 2 (9/80)

The Rust Engineering Company
A Subsidiary of Wheelabrator-Frye Inc

(GENERAL EQUIPMENT DATA SHEET)

CONTRACT NO. 21-1997F
EQUIPMENT NO. X-16612
NO. REQUIRED 1
SHEET 1 OF 1

CLIENT INTERNATIONAL COAL REFINING COMPANY
PROJECT 6000 TPSD SRC-I DEMONSTRATION PLANT PLANT LOCATION NEWMAN, KENTUCKY
SERVICE Cooling Tower #2 Chlorination
VENDOR P.O NO.

A chlorine feed system with a capacity of 1200 lb/day. The chlorination equipment shall consist of a vacuum type chlorinator, chlorine solution eductor (J-16610), vacuum regulator, pressure reducing valve, flow meter, instruments and controls as required for feeding chlorine from a battery of ton chlorine containers. Weighing scales are included. (W-16610)

PREPARED BY O.E. Mitchell	REVISION △		REVISION △		REVISION △	
DATE 10/14/81	BY	DATE	BY	DATE	BY	DATE
APPROVED BY	APP'D	DATE	APP'D	DATE	APP'D	DATE
DATE						

14

2.2.5 Process Water Supply

2.2.5.1 System Description

A combination process water and fire water storage tank constructed of carbon steel will be provided. Only the upper portion of the tank, 1,600,000 gallons, will be available for process water storage. The entire tank, 3.6 million gallons, will be available for fire water storage. The process water pumps (P-17108 A-C) operating on pressure control, will provide a constant supply to the process water distribution header.

2.2.5.2 Utility Flow Diagram

Refer to the following drawing included with Process Water Treatment, Paragraph 3.1.2.

00-17-01003D Process water Treatment Process and Control Diagram (Sheet 2)

2.2.6 Potable Water Supply

2.2.6.1 System Description

A water storage tank constructed of carbon steel will provide storage for potable water. A potable water booster pump (P-17203) will be provided to maintain a constant pressure on the potable water distribution system. When the pressure in the distribution system drops, indicating an increase in demand, the potable water supply pumps (P-17204 A and B) will provide the increased flow requirement. Chlorine and sodium hexametaphosphate will be added to maintain a residual concentration of each in the distribution header. The chlorinator (X-17202) and the sodium hexametaphosphate feed system (X-17201) are further described in paragraph 3.1.1, Potable Water Treatment.

2.2.6.2 Utility Flow Diagram

Refer to the following drawing included with Potable Water Treatment, Paragraph 3.1.1.

00-17-01001D Potable Water System Process and Control Diagram

2.2.7 Nitrogen System

2.2.7.1 System Description

The nitrogen system consists of piping, valves, and flowmeters necessary to distribute nitrogen from the area 14 air separator unit to the various area contractors. All of the nitrogen producing equipment is furnished by the area 14 contractor.

2.2.7.2 Utility Flow Diagram

Refer to the following drawing included with Interconnecting Systems, Paragraph 2.3.

00-16-03009 Interconnecting Piping System, Nitrogen

2.2.8 Compressed Air System (Refer to Process Flow Diagram No. 00-16-01004D and Interconnecting Piping System, Instrument Air/Plant Air, Dwg. No. 00-16-03008)

2.2.8.1 System Description

2.2.8.1.1 General

The plant and instrument air requirements are provided by a common compressed air system, including a common distribution header. Pressure control valves are furnished for the plant air lines at the battery limits of each area contractor air user to prevent depressurization of the compressed air system. Since a common system is provided, both plant and instrument air are of the same quality at the area contractors battery limits. The system consists of three centrifugal air compressors, three prefilters, one air dryer, three afterfilters, one receiver vessel, distribution piping, and valves.

2.2.8.1.2 Air Compressors

Two of three motor-driven, packaged centrifugal air compressors (C-16701 A, B, and C) are provided to meet the normal instrument and plant air requirements. All three compressors are needed to satisfy the maximum air demand. Each air compressor has four stages of compression and includes air intake filter, three intercoolers, one aftercooler with moisture separator, inlet throttle valve, discharge check valve, bypass silencer, control panel, and lubrication system. The lubrication system provides sufficient lubrication to the compressor bearings for continuous operation, start-up, and emergency loss of power conditions.

2.2.8.1.3 Prefilters

Following the compressors, the compressed air enters the coalescing, cartridge type prefilters (FL-16702 A, B, and C) for removal of any entrained

moisture or oil. Two of the prefilters are adequate to meet maximum plant and instrument air demands.

2.2.8.1.4 Air Dryer

After the prefilters, the compressed air passes through a desiccant type, heat regenerated, twin tower air dryer (D-16701) for dew point suppression to -40°F at 100 psig pressure. One air dryer is furnished and is sized for maximum plant and instrument air demand.

2.2.8.1.5 Afterfilters

Three cartridge-type afterfilters (FL-16703A, B and C) are furnished on the outlet of the dryer to remove dust or desiccant carryover from the dryer. Two of the afterfilters are adequate to meet the maximum plant and instrument air demand.

2.2.8.1.6 Air Receiver

One common air receiver (V-16701) vessel is furnished for the compressed air system and is sized for the maximum air demand conditions. The receiver is a vertical, cylindrical pressure vessel designed and fabricated in accordance with the ASME Boiler and Pressure Vessel Code.

2.2.8.2 Utility Flow Diagram

The following utility flow diagram is included after this page:

00-16-01004D Compressed Air System Process Flow Diagram

00-16-0100 4D

C-16701A,B,C
AIR COMPRESSOR
4000 ICFM
110 PSIG
800 HP

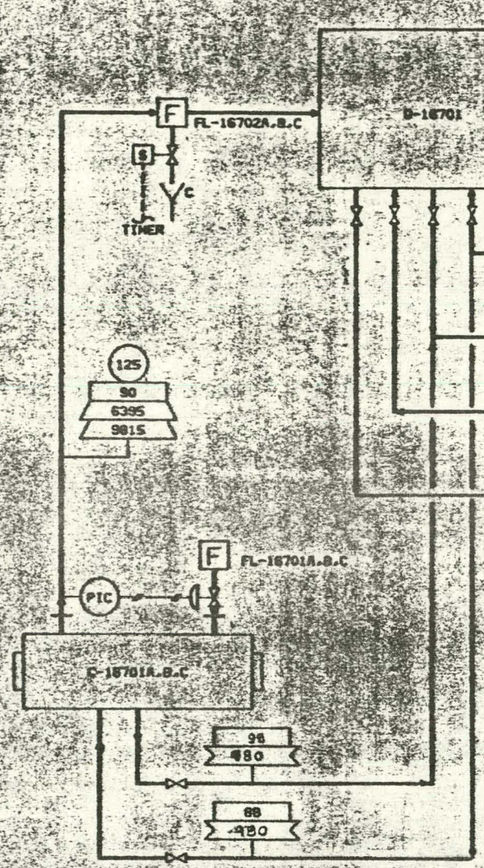
FL-16701A,B,C
INTAKE FILTER

FL-16702A,B,C
PREFILTER

D-16701
AIR DRYER

FL-16703A,B,C
AFTERFILTER

V-16701
AIR RECIEVER



NOTE:

1. REFER TO DWG. NO. 00-16-32004D FOR LEGEND FOR STANDARD SYMBOLS. LEGEND FOR SPECIAL SYMBOLS FOR THIS DWG. ARE SHOWN BELOW.

2. WHEN TWO FLOWS ARE SHOWN FOR A LINE, THE UPPER VALUE IS NORMAL FLOW. THE LOWER VALUE IS MAXIMUM FLOW.

00-16-0100 4

EQUIPMENT NO.	DESCRIPTION
C-16701A,B,C	AIR COMPRESSOR
D-16701	AIR DRYER
FL-16701A,B,C	INTAKE FILTER
FL-16702A,B,C	PREFILTER
FL-16703A,B,C	AFTERFILTER
V-16701	AIR RECIEVER

NO	DESCRIPTION	BY	DATE
2	BASELINE UPDATE/GENERAL REVISIONS	3-84	MWH
1			8/24/81

6,000 TPD SRC-1 DEMONSTRATION PLANT
MEMPHIS, KENTUCKY
FOR UNITED STATES
DEPARTMENT OF ENERGY

INTERNATIONAL COAL REFINING COMPANY
ALLENTOWN, PA.

PROCESS FLOW DIAGRAM
AREA - 16

THE M. W. KELLOGG COMPANY

2.2.8.3 Utility Summary

The utility summary for the Compressed Air System follows this page.

Rust International Corporation

UTILITY PROCESS DATA SUMMARY SHEET

CONTRACT NO. 21-2548
AREA 16- COMPRESSED AIR SYSTEM
BY _____ DATE _____
SHEET 1 OF 1

CLIENT ICRC
PROJECT 6000 TPD SRC-1 DEMONSTRATION PLANT — PLANT LOCATION: NEWMAN, KENTUCKY

EQUIPMENT OR AREA NUMBER	DESCRIPTION	PROC. DUTY MM BTU/HR	PROCESS COOLING WATER INLET @ 88 °F GPM	PROCESS COOLING WATER INLET @ 88 °F Δ°F	HEAT TRANSFER FLUID INLET @ ___ °F GPM	HEAT TRANSFER FLUID INLET @ ___ °F Δ°F	FIRED DUTY FUEL GAS LHV = MM BTU/HR	FIRED DUTY FUEL OIL LHV = MM BTU/HR	POWER INST. HP	POWER OPER. BHP	POWER OPER KW	BOILER FEEDWATER ___ PSIG ___ °F M LBS/HR	BOILER FEEDWATER ___ PSIG ___ °F M LBS/HR	STEAM IMPORT (EXPORT) 150 PSIG ___ °F LBS/HR	STEAM IMPORT (EXPORT) ___ PSIG ___ °F LBS/HR	STEAM IMPORT (EXPORT) ___ PSIG ___ °F LBS/HR	STEAM IMPORT (EXPORT) ___ PSIG ___ °F LBS/HR	STEAM IMPORT (EXPORT) ___ PSIG ___ °F LBS/HR	STEAM IMPORT (EXPORT) ___ PSIG ___ °F LBS/HR	COND. RETURN (REQ'D) ___ PSIG ___ °F M LBS/HR	BLOW DOWN ___ PSIG	UTIL. N2 PSIG =	PLANT AIR PSIG = 100 SCFM	INSTR. AIR PSIG = 100 SCFM	PROC. WATER PSIG = GPM
V-16701	AIR RECEIVER								SEE															6395	
										MOTOR															
D-16701	AIR DRYER		20								LIST			580						580					
C-16701 A, B, C	AIR COMPRESSOR		980																						
	TOTAL		1,000						2,700		1,340			580						580			6395		

PREPARED BY B Shah
DATE 2/24/84
APPROVED BY
DATE

REVISION △ BY DATE APP'D DATE
REVISION △ BY DATE APP'D DATE
REVISION △ BY DATE APP'D DATE

NOTES:

FORM 44-157 (8/82)

2.2.8.4 Motor List

The motor list for the Compressed Air System follows this page.

COMPRESSED AIR SYSTEM

MOTOR LIST

Equipment No.	Description	Installed Hp	Operating KW	HR/ Day	KWH/ DAY
C-16701A	Air Compressor	900	670	24	16,080
C-16701B	Air Compressor	900	670	24	16,080
C-16701C	Air Compressor	900	0	0	0
	TOTAL	2,700	1,340		32,160

2.2.8.5 Equipment List/Summary

The equipment list/summary for the compressed air system follows this page.

EQUIPMENT LIST/SUMMARY REV. 4 03-26-82

WBS ELEMENT: 1.4.1.1.2 ICRC AREA: 16 COMPRESSED AIR

REV.	ICRC/RUST EQUIP NO	QTY	EQUIPMENT DESCRIPTION	P.O. NUMBER	SIZE/ WEIGHT	P.O. DATE	VENDOR ENG NEED DATE	VENDOR ENG COST	DELV DATE	EQUIP COST	PURCH BY	TYPE EQUIP
	C-16701 A thru C	3	Air compressor, cs, centrifugal, 4,000 icfm, 110 psig discharge pressure, 90°F inlet temp., with motor drive		900 hp 1,800 rpm	S 10-82 P A	S 1-83 P A	14.9 ea	S 6-83 P A	138.4 ea	RUST	SF
4	D-16701 A and B	2	Air dryer, desiccant type, 8 hr., NEMA cycle, 150 psig design, 10,000 scfm, 150 psig steam heater, -40°F outlet dew point			S 10-82 P A	S 1-83 P A	4.3 ea	S 9-83 P A	82.7 ea	RUST	SF
2	FL-16701 A thru C	3	Filter, air intake, cs, 4000 scfm, 0 psig, 90°F, 118 sq ft effective filter area			S 10-82 P A	S 1-83 P A	1.0 ea	S 6-83 P A	7.8 ea	RUST	SF
	FL-16702 A and B	2	Air prefilter, coalescing elements, 5,000 scfm, 150 psig design, 100 psig operating, 90°F, 214.2 sq ft effective filter area, 8" flange outlet			S 10-82 P A	S 1-83 P A	inc with FL-16701	S 6-83 P A	inc with FL-16701	RUST	SF
	FL-16703 A and B	2	Air prefilter, particulate elements, 5,000 scfm, 150 psig design, 100 psig operating, 90°F, 214.2 sq ft effective filter area, 8" flange outlet			S 10-82 P A	S 1-83 P A	inc with FL-16701	S 6-83 P A	inc with FL-16701	RUST	SF
	V-16701	1	Air receiver, vertical, cs, 150 psig design, ASME VIII-1, 5,565 gal capacity		7' dia x 20' high	S 10-82 P A	S 11-82 P A	2.1	S 2-83 P A	17.7	RUST	SF

NOTES:
1. All costs 1st Quarter Fiscal Year 1982 in thousand dollars.
2. Equipment costs are FOB jobsite with shipping & vendor field support less vendor engineering. 3. This equipment is Appendix C Bulks.

RUST: Rust Engineering
CMC: Stone & Webster
S: Scheduled
P: Projected
A: Actual
FL: Field Labor
M: Material for field fab equipment
N/A: Not Applicable
SF: Shop Fabricated
FF: Field Fabricated

2.2.8.6 Equipment Data Sheets

The equipment data sheets for the compressed air system follow this page.

The Rust Engineering Company
A Subsidiary of Wheelabrator-Frye Inc

CENTRIFUGAL COMPRESSOR DATA SHEET

PAGE 1 OF 5

CONTRACT NO. 21-1997 F
EQUIPMENT NO. C-16701 A, B & C
NO. REQUIRED 3
SHEET 1 OF 2

CLIENT: INTERNATIONAL COAL REFINING COMPANY

PROJECT: 6000 TPSD SRC-I DEMONSTRATION PLANT — PLANT LOCATION: NEWHAM, KENTUCKY

SERVICE: Plant and Instrument Air

VENDOR — P.O. NO.

MODEL — SERIAL NO.

DRIVER: Motor — EQUIPMENT NO.: C-16701 A, B, & C

NOTE: ○ INDICATES INFORMATION TO BE COMPLETED BY PURCHASER ☐ BY MANUFACTURER

Intake Filters FL-16701 A, B, & C Included W/Compressors

OPERATING CONDITIONS

(ALL DATA ON PER UNIT BAIS)

	NORMAL	RATED	OTHER CONDITIONS A	B	C	D
○ GAS HANDLED	Air	Air				
○ MMSCFD (14.7 PSIA & 60°F) WET	5.014	5.328				
○ SCFM (14.7 PSIA & 60°F) WET	3482	3700				
○ MMSCFD (14.7 PSIA & 60°F) DRY	4.910	5.157				
○ SCFM (14.7 PSIA & 60°F) DRY	3410	3581				
○ LB/MOLES/HR—WET	550.5	585.5				
○ LB/MOLES/HR—DRY	539.1	566.2				
○ WEIGHT FLOW—LB/MIN.—WET	263.7	279.0				
○ WEIGHT FLOW—LB/MIN-DRY	260.3	273.4				
○ INLET CONDITIONS:						
○ PRESSURE (PSIA) @388 Ft Alt	14.49	14.49				
○ TEMPERATURE (°F)	80	94				
○ RELATIVE HUMIDITY (%)	60	60				
○ MOLECULAR WEIGHT (M)	28.74	28.61				
○ CP/CV (K_1) OR	1.4	1.4				
○ COMPRESSIBILITY (Z_1) OR						
○ INLET VOLUME. ICFM	3668	4000				
○ DISCHARGE CONDITIONS:						
○ PRESSURE (PSIA)	124.49	124.49				
☐ TEMPERATURE (°F)	90	90				
☐ CP/CV (K_2) OR						
☐ COMPRESSIBILITY (Z_2) OR						
☐ COMPRESSION RATIO P_2/P_1						
☐ BHP REQUIRED (ALL LOSSES INCL.)						
☐ SPEED (RPM)						
☐ EST. SURGE. ICFM (AT SPEED ABOVE)						
☐ POLYTROPIC HEAD (FT.)						
☐ POLYTROPIC EFFICIENCY (%)						
☐ GUARANTEE POINT						
☐ PERFORMANCE CURVE NO						

PROCESS CONTROL:

METHOD
- ○ BYPASS FROM — TO
- ⊗ ANTI-SURGE BYPASS ○ MANUAL ○ AUTO
- ⊗ SUCTION THROTTLING FROM — TO
- ○ SPEED VARIATION FROM — TO
- ○ OTHER

SIGNAL
- ○ SOURCE
- ○ TYPE
- ○ RANGE FOR PNEUMATIC CONTROL — RPM @ PSIG & RPM @ PSIG
- OTHER

PREPARED BY	V. F. Duckett	REVISION △		REVISION △		REVISION △ 1	
DATE	10-15-81	BY	DATE	BY	DATE	BY	DATE
APPROVED BY		APP'D	DATE	APP'D	DATE	APP'D	DATE
DATE							

FORM 9319—1 OF 5 (5/80)

The Rust Engineering Company
A Subsidiary of Wheelabrator-Frye Inc

CENTRIFUGAL COMPRESSOR DATA SHEET

PAGE 2 OF 5

CONTRACT NO. 21-1997F
EQUIPMENT NO. C-16701 A, B, & C
NO. REQUIRED 3
SHEET 2 OF 2

GAS ANALYSIS ○ MOL% ○	NORMAL	RATED	OTHER CONDITIONS A	B	C	D	REMARKS
Dry Air	97.9	96.8					
Moisture	2.1	3.2					
TOTAL	100.0	100.0					
AVG. MOL WT	28.74	28.61					

LOCATION:
- ◉ INDOOR ○ HEATED ○ UNDER ROOF
- ○ OUTDOOR ○ UNHEATED ○ PARTIAL SIDES
- ○ GRADE ○ MEZZANINE
- ○ ELECT AREA CLASS _____ GR. _____ DIV. _____
- ○ WINTERIZATION REQ'D ○ TROPICALIZATION REQ'D.

SITE DATA:
- ○ ELEVATION 388 FT BAROMETER 14.49 PSIA
- ○ RANGE OF AMBIENT TEMPS

	DRY BULB	WET BULB
SITE RATED °F		
NORMAL °F	60	
MAXIMUM °F	94	
MINIMUM °F	10	

UNUSUAL CONDITIONS: ○ DUST ○ FUMES
○ OTHER _____

NOISE SPECIFICATIONS:
APPLICABLE TO MACHINE
SEE SPECIFICATION _____
APPLICABLE TO NEIGHBORHOOD
SEE SPECIFICATION _____
ACCOUSTIC HOUSING ○ YES ○ NO

APPLICABLE SPECIFICATIONS:
API 617 CENT COMPR FOR GEN REFINERY SERVICES

PAINTING
- ◉ MANUFACTURER'S STD
- ○ OTHERS _____

SHIPMENT:
- ◉ DOMESTIC ○ OUTDOOR STORAGE OVER 3 MONTHS
- ○ EXPORT ○ EXPORT BOXING REQ'D

2

The Rust Engineering Company
A Subsidiary of Wheelabrator-Frye Inc.

(GENERAL EQUIPMENT DATA SHEET)

CONTRACT NO. 21-1997F
EQUIPMENT NO. D-16701
NO. REQUIRED 1
SHEET 1 OF 1

CLIENT INTERNATIONAL COAL REFINING COMPANY

PROJECT 6000 TPSD SRC-I DEMONSTRATION PLANT PLANT LOCATION NEWMAN, KENTUCKY

SERVICE Compressed Air Dryer

VENDOR P.O. NO.

OPERATING CONDITIONS

Normal Flow	SCFM
Rated Flow	10,000 SCFM
Operating Pressure	100 PSIG
Operating Temperature	90°F
Outlet Dew Point	-40°F @ 100 PSIG

DESIGN

Code	ASME, B&PV, Section VIII-I
Stamped	Yes
National Board Registration	Yes
Design Pressure	150 PSIG
Design Temperature	200°F
Desiccant	Activated Alumina
Nema Cycle	8 Hour
Regeneration Method	Steam Heater

MATERIALS

Shell	SA-285, GRC	Heads	SA-285, GRC
Supports	SA-36	Nozzles	SA-106, GRB

PREPARED BY V. F. Duckett		REVISION △		REVISION △		REVISION △ 3	
DATE 10-15-81							
APPROVED BY	BY	DATE	BY	DATE	BY	DATE	
DATE	APP'D	DATE	APP'D	DATE	APP'D	DATE	

FORM 9308--1 OF 2 (9/80)

The Rust Engineering Company
A Subsidiary of Wheelabrator-Frye Inc

FILTER DATA SHEET

CONTRACT NO. 21-1997F
EQUIPMENT NO. FL-16702 A, B, & C
NO. REQUIRED 3
SHEET 1 OF 1

CLIENT	INTERNATIONAL COAL REFINING COMPANY	
PROJECT 6000 TPSD SRC-I DEMONSTRATION PLANT		PLANT LOCATION NEWMAN, KENTUCKY
SERVICE Compressed Air Prefilter		
VENDOR		P.O. NO.
MODEL		SERIAL NO

NOTE ○ INDICATES INFORMATION TO BE COMPLETED BY PURCHASER ☐ BY MANUFACTURER

BASIC DATA

○ OPERATING CONDITIONS	
RATED FLOW ~~(LB/HR) (GPM)~~ SCFM	5000 Compressed Air
MOLECULAR WEIGHT	28.9
SPECIFIC GRAVITY	
VISCOSITY (LB-MASS/FT-HR)	
INLET PRESSURE (PSIG)	110
INLET TEMP (°F)	90
CORROSIVE CONTAMINANT	Oil & Moisture
SUSPENDED SOLIDS	
CHARACTERISTICS OF SOLID	
PARTICLE SIZE (AVERAGE)	
SOLIDS BY WT (%)	
MAX ALLOW PRESSURE DROP CLEAN (PSI)	One
RETENTION (NOMINAL) %	98% Of 3 Microns Or Better
☐ FILTER TYPE	
NO OF ELEMENTS	
TYPE OF ELEMENTS	
MATERIAL OF ELEMENTS	
MESH SIZE	
☐ CONSTRUCTION OF FILTER	
FILTER DIA BY LENGTH	
POSITION OF FILTER VERT — HORIZ.	
EFFECTIVE FILTER SURFACE AREA	
WEIGHT (LB)	
○ DESIGN CONDITIONS	
DESIGN PRESSURE (PSIG)	150
DESIGN TEMPERATURE (°F)	200
CORROSION ALLOWANCE (IN)	0.10
MATERIALS—SHELL & HEADS	SA-285,GRC
INSULATION—PAINT	
⊗ ASME CODE DESIGN ⊗ STAMPED	

CONNECTIONS	QUAN.	SIZE	RATING-FACE	REMARKS
⊗ INLET	1	8	Flg	
⊗ OUTLET	1	8	Flg	
⊗ VENT	1			
⊗ DRAIN	1			
○ RELIEF VALVE				
○ PRESS INDICATOR				
○ LEVEL GAUGE				
○ QUICK OPENING COVER				

PREPARED BY V. T. Duckett	REVISION △	REVISION △	REVISION △ 4
DATE 10-15-81	BY DATE	BY DATE	BY DATE
APPROVED BY	APP'D DATE	APP'D DATE	APP'D DATE
DATE			

FORM 9320 (5/80)

The Rust Engineering Company
A Subsidiary of Wheelabrator-Frye Inc

FILTER DATA SHEET

CONTRACT NO. 21-1997F
EQUIPMENT NO. FL-16703 A, B, & C
NO. REQUIRED 3
SHEET 1 OF 1

CLIENT	INTERNATIONAL COAL REFINING COMPANY
PROJECT	6000 TPSD SRC-I DEMONSTRATION PLANT — PLANT LOCATION NEWMAN, KENTUCKY
SERVICE	Compressed Air AfterFilter
VENDOR	P.O. NO.
MODEL	SERIAL NO.

NOTE ○ INDICATES INFORMATION TO BE COMPLETED BY PURCHASER ☐ BY MANUFACTURER

BASIC DATA

○ OPERATING CONDITIONS	
RATED FLOW ~~(LB/HR) (GPM)~~ SCFM	5000 Compressed Air
MOLECULAR WEIGHT	28.9
SPECIFIC GRAVITY	
VISCOSITY (LB-MASS/FT-HR)	
INLET PRESSURE (PSIG)	105
INLET TEMP (°F)	90
CORROSIVE CONTAMINANT	Dust & Desiccant
SUSPENDED SOLIDS	
CHARACTERISTICS OF SOLID	
PARTICLE SIZE (AVERAGE)	
SOLIDS BY WT (%)	
MAX ALLOW. PRESSURE DROP CLEAN (PSI)	One
RETENTION (NOMINAL) %	98% Of 3 Microns Or Better
☐ FILTER TYPE	
NO OF ELEMENTS	
TYPE OF ELEMENTS	
MATERIAL OF ELEMENTS	
MESH SIZE	
☐ CONSTRUCTION OF FILTER	
FILTER DIA BY LENGTH	
POSITION OF FILTER VERT — HORIZ	
EFFECTIVE FILTER SURFACE AREA	
WEIGHT (LB)	
○ DESIGN CONDITIONS	
DESIGN PRESSURE (PSIG)	150
DESIGN TEMPERATURE (°F)	200
CORROSION ALLOWANCE (IN)	0.10
MATERIALS—SHELL & HEADS	SA-285,GR C
INSULATION—PAINT	
○ ASME CODE DESIGN ○ STAMPED	

CONNECTIONS:	QUAN.	SIZE	RATING-FACE	REMARKS
○ INLET	1	8	Flng	
○ OUTLET	1	8	Flng	
○ VENT	1			
○ DRAIN	1			
○ RELIEF VALVE				
○ PRESS INDICATOR				
○ LEVEL GAUGE				
○ QUICK OPENING COVER				

	REVISION △	REVISION △	REVISION △ 5
PREPARED BY V. F. Duckett			
DATE 10-15-81			
APPROVED BY	BY DATE	BY DATE	BY DATE
DATE	APP'D DATE	APP'D DATE	APP'D DATE

FORM 9320 (5/80)

The Rust Engineering Company
A Subsidiary of Wheelabrator Frye Inc.

VERTICAL PRESSURE VESSEL DATA SHEET

CONTRACT NO. 21-1997F
EQUIPMENT NO. V-16701
NO. REQUIRED 1
SHEET 1 OF 1

CLIENT: INTERNATIONAL COAL REFINING COMPANY
PROJECT: 6000 TPSD SRC-I DEMONSTRATION PLANT — PLANT LOCATION: NEWMAN, KENTUCKY
SERVICE: Compressed Air Receiver
VENDOR — P.O. NO.

DIAMETER INSIDE	IN	OUTSIDE	84	IN.
VERT HT T/L TO T/L	20	FT	0	IN
BTM T/L FROM GRADE	2	FT	6	IN

OPERATING CONDITIONS

OPER TEMP	90	°F
MAX TEMP	100	°F
OPER PRESSURE	100	PSIG
MAX OPER PRESSURE	110	PSIG
SPECIFIC GRAVITY LIQ	AT TEMP	°F

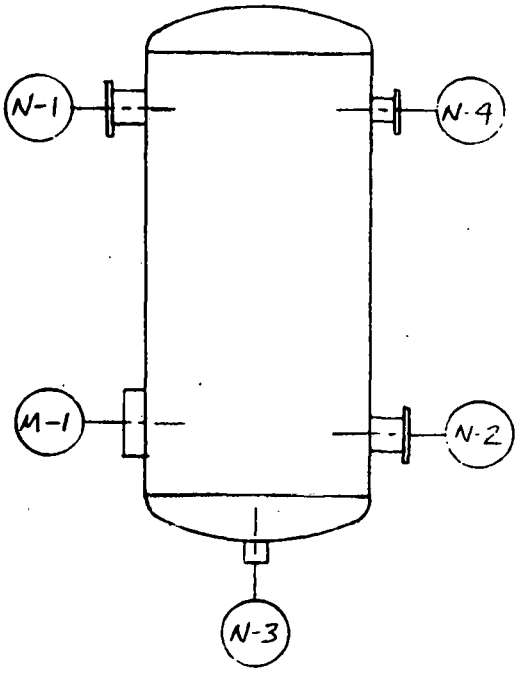
MATERIALS

SHELL	SA-515,GR70	HEADS	SA-515, GR70
SUPPORT	SA-36	GASKETS	
NOZZLE NECK	SA-106,B	FLANGE	SA-105
COUPLINGS		TYPE	
INTERNALS FIXED		REMOVABLE	
BOLTING PRESSURE		INTERNAL	
EST ERECTION WT (LB)			

DESIGN

CODE ASME SEC VIII DIV 1		~~X~~ STAMPED	
NATIONAL BOARD REGISTRATION	Yes		
DESIGN TEMP	200	°F	
DESIGN PRESS INTERNAL	125	PSIG	
EXTERNAL (VAC)		PSI	
MAX ALLOW WORKING PRESS/TEMP		PSIG/ F	
CORR ALLOW SHELL/HEADS	0.10	IN INTERNALS 0.10	IN.
SHELL		THICK	IN.
HEAD TYPE	Dished	THICK	IN
HYDROTEST PRESS/TEMP			PSIG/°F
RADIOGRAPHY EXTENT		CODE	
POSTWELD HEAT TREAT YES/NO			
EARTHQUAKE CODE		ZONE	
WIND PRESS			PSF
INSULATION YES NO THICK			IN
FIREPROOFING YES/NO THICK			IN
VESSEL SUPPORT TYPE	Skirt		

SKETCH



NOZZLES

MARK NO	NO REQ'D	SIZE IN	FACING	SERVICE
N-1	1	16	RF Flng	INLET
N-2	1	16	RF Flng	OUTLET
N-3	1	2	Screwed	DRAIN
N-4	2	2½	RF Flng	RELIEF
N-5				
N-6				
N-7				
N-8				
N-9				
N-10				
N-11				
N-12				
M-1	1	11x15		MANHOLE W COVER
H-1				HANDHOLE W BLIND

FLANGE RATING — COUPLING RATING

LIQUID LEVEL	FROM BOTTOM T	NORMAL	FT	IN
		MAX	FT	IN
		MIN	FT	IN

PREPARED BY V.R. Duckett
DATE 1-15-81
APPROVED BY
DATE

REVISION △	BY	DATE	APP'D	DATE

REVISION △	BY	DATE	APP'D	DATE

REVISION △ 6	BY	DATE	APP'D	DATE

FORM 9313 19 801

2.2.9 Flare and Incinerators

2.2.9.1 System Description

2.2.9.1.1 Flare System

2.2.9.1.1.1 Design Criteria

Hydrocarbon Release (Refer to Design Basis Memorandum, Paragraph 1-b of this document)

Max allowable flare tip delta P, psi	0.5
Ambient temperature (average), ^{o}F	70.0
Wind velocity, mph	20.0
Max radiation at grade, Btu/hr-ft^2	2,000.0
Max radiation at liquid or solid storage facilities, Btu/hr-ft^2	1,500.0
Max mach number at flare tip	0.5
Max allowable backpressure at unit battery limits, psig	20.0
Max HC rate for smokeless operation, MM lbs/hr	0.2
Steam rate for smokeless operation, lb steam/lb HC	0.5

2.2.9.1.1.2 Description

2.2.9.1.1.2.1 The 6,000 TPD demonstration plant will have a single derrick-type elevated flare, designed to handle 1.0 million pounds per hour of hydrocarbon emissions.

2.2.9.1.1.2.2 The flare system will include a relief valve collecting manifold within each of the process areas. To minimize piping requirements, the individual relief valves will tie into collecting branches, which will join into a single manifold discharging into a blow-down drum.

2.2.9.1.1.2.3 Each process area will have a captive blow-down drum. Each drum will operate at 20 psig maximum. The dissolver area blow-down drum will operate at 230 psig. The high pressure blow-down drum will discharge into the Catalytic process area blow-down drum. Each operating area blow-down drum will have facilities to pump out disengaged liquid, and/or vaporize it by steam heating, using dimple jackets or coils.

2.2.9.1.1.2.4 The dissolver area high pressure blow-down drum will also have a quenching system designed to spray cold quench liquid at 1,500 gpm maximum into the dissolver relief valve effluent. The quench liquid for this application will be stored in a captive 5,000 bbl cone-roof storage tank. The quench liquid supply pumps will be steam turbine and electric motor driven and instrumented so that operation will be automatic, anticipating a dissolver malfunction. If the system is activated by the anticipating signal and no release occurs, the blow-down drum pumps will return the quench liquid to storage. Should a release occur, the quenched material will be returned to the process area for reprocessing.

2.2.9.1.1.2.5 Each process area blow-down drum will discharge into a main flare line manifold, which will then discharge into a vertical 44 ft diameter by 69 ft separator. The separator will be designed to disengage liquid and provide the proper elevation at the battery limits so that the main flare line will have the proper downward slope (0.1 inch each 10 feet) to the knockout drum located at the flare derrick base.

2.2.9.1.1.2.6 The main flare line will be 46 inches od. It will start at the vertical separator and extend 3,000 feet to the horizontal separator at the base of the flare derrick.

2.2.9.1.1.2.7 The main flare line will have 8 full-moment anchors at 400 foot intervals. Each 400 foot section will have eight other pipe supports and a thermal expansion loop designed to keep the stresses within allowable limits for a 1.1 mm pounds per hour release. A total of 68 pipe supports will be required.

2.2.9.1.1.2.8 The horizontal 22 ft dia by 80 ft knockout drum at the base of the flare derrick will have pumping and vaporizing capabilities to return condensate to process and/or vaporize it for flaring. This drum and all associated peripheral piping will be insulated for an environmental factor of 0.1. Sections will be fireproofed as required.

2.2.9.1.1.2.9 Vapors from the horizontal 22 ft diameter by 80 ft drum will discharge into the flare stack seal pot, which will isolate the main flare header from the derrick stack by a water seal. The pressure required to break this water seal will not exceed 0.5 psi. Under normal, no-emission conditions, the only material being sent to the flare stack will be either purge nitrogen or purge fuel gas. Use of these materials will be minimized by the molecular seal upstream of the flare tip.

2.2.9.1.1.2.10 The flare stack and all required utility lines will be supported by the derrick. The flare stack will be held by loose joints, to permit vertical expansion. The utility lines attached to the stack will move vertically with the stack.

2.2.9.1.1.2.11 For improved service life, the upper 50 feet of flare stack will be 316 stainless steel, including the molecular seal, flare tip, pilots, and utility piping. The flare tip will have six continuously-burning LPG pilots.

2.2.9.1.1.2.12 The ignitor system will be an integral package with LPG backup, located out of the "dead zone". The system will be housed in an open shack facing away from the flare line-of-sight. The roof and walls facing the flare will be insulated and covered with reflective material.

2.2.9.1.1.3 Sizing Criteria

2.2.9.1.1.3.1 Flare sizing was done following a system analysis, which reviewed in detail all causes and the resulting flare loads from the individual process areas. The resulting flow rates were based on data

supplied by the individual area contractors, overall process material balances, and unit flow diagrams. The following cases were individually reviewed:

Item	Type of Failure
1	Plant wide cooling water
2	Plant wide electrical power
3	Instrument air
4	Local failure caused by misoperation
5	Fire condition

2.2.9.1.1.3.2 The governing condition for this plant is a combination of plant wide cooling water and power failure, resulting in the maximum emission rate given in the Design Basis Memorandum. This includes hydrocarbon emissions, vapors containing odorous or noxious gases, and flammable or otherwise hazardous vapors. Streams containing air were not included, as they would be disposed of in a vapor incinerator.

2.2.9.1.1.4 Mechanical Design Criteria

2.2.9.1.1.4.1 All vent and blow-down sub-headers will slope from the relief valves to the main branches, with a minimum slope of 0.2 inch each 10 feet. The same requirements will apply to the branches leading to the main flare header. All individual entries to and from sub-headers will be made at the top of the line. The main flare slope will be 0.1 inch each 10 feet, minimum.

2.2.9.1.1.4.2 The main flare line will be provided with 26 20-inch manways, equally spaced, for maintenance and clean-out. These manways will be horizontal with hinged davits to support the blind flange.

2.2.9.1.1.4.3 The flare stack will have a caged access ladder extending to the top of the tube, with rest platforms every 30 feet. A 360 degree work platform will be provided at the flare tip for maintenance. This service area will include a permanently-installed davit and hoisting device to facilitate removing and changing the flare tip assembly.

2.2.9.1.1.4.4 The flare stack will be mounted on top of the seal drum, which will be anchored to its own ground-level foundation. The flare stack will be guided by the derrick; however, it will not be anchored at any point, to allow for free expansion.

2.2.9.1.1.4.5 The upper 50 feet of flare stack, molecular seal, flare tip, ignitors, and service piping will be 316 stainless steel.

2.2.9.1.2 Liquid and Gas Incinerators

2.2.9.1.2.1 General Description

2.2.9.1.2.1.1 To dispose of waste liquids, low-pressure hydrocarbon vents, purge gases, oxygen contaminated streams, and blanketing gases, the plant will be provided with two incinerators, one for liquids, the other for gases.

2.2.9.1.2.1.2 Each incinerator will incorporate a waste heat recovery system which will generate saturated steam at 150 psig. Each unit will also include an individual boiler feedwater recirculation system, chemical treatment facilities, and local combustion controls with flame supervision capability. Major alarms and current operating status will be linked to the central control room by a pan-alarm system. Each incinerator will use fuel gas as an auxiliary fuel.

2.2.9.1.2.1.3 Each incinerator will have a sampling platform at the required height for flue gas composition and solid load analysis sampling. All critical temperatures, flows, and pressures required for performance calculations will be permanently recorded.

2.2.9.1.2.2 Liquid Thermal Oxidizer

2.2.9.1.2.2.1 The waste liquid incinerator will include a nitrogen-blanketed surge tank where the waste liquids from the various plant sources will be received. Venting from this tank will be disposed of in a special burner in the incinerator.

2.2.9.1.2.2.2 Waste liquids, at a maximum rate of 3,019 pounds per hour, will be pumped on level control from the surge tank to the main burner. To improve waste liquid combustion and assist in mechanical atomization, the waste liquid will be preheated by steam, to the required temperature where viscosity is no longer a controlling factor. The required pumping and preheating equipment will be part of the incinerator package.

2.2.9.1.2.2.3 To completely incinerate the anticipated wastes, the firebox must operate at above 2,000°F at a slightly negative pressure.

2.2.9.1.2.3 Vent Gas Incinerator

2.2.9.1.2.3.1 The vent gas incinerator will include an induced draft fan to collect low-pressure hydrocarbon vent gases from the various sources. The induced draft fan will maintain a constant volume to the incinerator, using an atmospheric air trim to maintain a constant sub-atmospheric pressure. The maximum anticipated combustible material flow rate will be about 2,500 pounds per hour.

2.2.9.1.2.3.2 To separate entrained liquids, the vent gas collecting manifold will discharge into a knock-out drum. The condensed liquid will then be pumped to the liquid thermal oxidizer surge tank for disposal. The vapors will be enriched, if required, with fuel gas to the minimum level that will support steady combustion.

2.2.9.1.2.3.3 The enriched vapors will be mixed with combustion air in a low-pressure-drop, high-efficiency burner. Expected firebox temperature for complete vapor oxidation is about 2,500°F at a slightly negative pressure.

2.2.9.2 Utility Flow Diagrams

The following utility flow diagrams are included after this page:

00-16-01021D Emergency Flare System
00-16-01022D Emergency Flare System Process Flow Diagram
00-16-01030D Liquid Thermal Oxidizer Process Flow Diagram
00-16-01031D Vent Gas Incinerator Process Flow Diagram

00-16-01021D

TR-16806
QUENCH LIQUID STORAGE TANK

V-16808
VERTICAL K.O. DRUM

FROM L.C. FINER & COKER/CALCINER — 10,820 — 35 — 615 — 26"

TO PROCESS

BY LUMMUS

BY LUMMUS

FROM DEA & ASWA — 16,722 — 24" — 35 — 250

TO PROCESS

BY PARSON

BY PARSON

FROM HEAVIES RECOV. — 49,237 — 30" — 35 — 70

TO PROCESS

BY PARSON

BY PARSON

FROM SELEXOL — 15,350 — 24"

TO PROCESS

BY PARSON

BY PARSON

FROM SRC DISSOLVERS

LTO BY TRUCK

LTO BY TRUCK

FROM SRC & (NO DISSOLVERS) CSD

46" — 39,460 — 400

38" — 18,090 — 750

35 — 100 — 1611 — 16" — FROM FUEL GAS HEADER

35 — 225 — 17,818 — 34" — FROM HYDROGEN COMPRESSOR

35 — 100 — 14,830 — 46" x 24" — 24" — FROM CO SHIFT

BY CATALYTIC

BY CATALYTIC

BY CATALYTIC

P-16803 A&B

46" — TO FLARE 00-16-010220

V-16808

BY TRUCK LIQ. RECOVERY

P-16804 A & B

200 — NITROGEN BLANKET 00-16-03

TO VENT GAS 00-16-01031D INCINERATOR

PROCESS SOLVENT 00-1

IK-16806

1500 gal

12" — 12"

P-16801 A&B

00-16-01021 — REV. D

P-16803 A&B
K.O. PUMP

P-16801 A&B
QUENCH LIQUID PUMP

P-16804 A&B
LIQUID RECOVERY PUMP

					ADD	10-6-81
2		BASELINE UPDATE (COMPLETE REVISION)	1/84	BS		
1		BASELINE UPDATE	8-82			

6,000 TPD SRC-I DEMONSTRATION PLANT
MERHAM, KENTUCKY
FOR UNITED STATES DEPARTMENT OF ENERGY

TITLE: EMERGENCY FLARE SYSTEM

INTERNATIONAL COAL REFINING COMPANY
ALLENTOWN, PA.

THE RUST ENGINEERING COMPANY
BIRMINGHAM, ALABAMA
CONTRACT No. 1997F/2548

DWG. NO. 00-16-01021D — REV. 2

00-16-01022D

V-16809
EMERGENCY FLARE K.O. DRUM

X-16810
EMERGENCY FLARE

900#, 850°F STEAM
00-16-03003

SILENCER

106,000

FUEL GAS
00-16-03010

LPG
00-16-03010

INST. AIR
00-16-03008

INST. AIR AS REQ'D

477

7.6

PLANT AIR
00-16-03008

100

46"

00-16-01021D

46"

102,000

PT

PI

LG

V-16809

LT

TI

PLANT CONDENSOR

6"

4"

TO LTO BY TRUCK

P-16805 A&B

P-16805 A&B
FLARE DRUM PUMP

00-16-01022 D

2		BASELINE UPDATE (STREAM FLAG & LINE SIZE ADDED)	12/83	BSY		
1		BASELINE UPDATE	9-82			

ACO DRAFTSMAN 10/7/8: DATE
CHECKED
ENGINEER

6,000 TPD SRC-I DEMONSTRATION PLANT
KENNAN, KENTUCKY
FOR UNITED STATES
DEPARTMENT OF ENERGY

TITLE: EMERGENCY FLARE SYSTEM PROCESS FLOW DIAGRAM

INTERNATIONAL COAL REFINING COMPANY
ALLENTOWN, PA.

THE RUST ENGINEERING COMPANY
BIRMINGHAM, ALABAMA
CONTRACT No. 1997F/254 A

SCALE: NONE DWG. NO. 00-16-01022D REV. 2

LP BFW
00-16-03010
FUEL GAS
00-16-03010
LPS
00-16-03010
FROM AREA 13
00-16-05010
SLOP OIL
2"
INT.
21,750
FROM AREA 15
00-16-05015
SLOP OIL
2"
INT.
12,010
40,240
235
220
477 MAX.
137 NORM.
85
105
85
100
7.6
TRUCK UNLOADING
TK-16911 A & B
77°F
FROM PHENOL STORAGE TANK
00-11-01017D
77°F
2219.1
3019.1
P-16912 A&B
34.5 PSIA
95°F
19139
AIR
PI
PI
SAMPLE PORTS
TIC
MAN WAY
IN-16913
SIGHT PORT
165
365
TO 150# STEAM HEADER
00-16-03005
39,342
V-16914
P-16915 A&B
365
COOLING WATER
00-16-03013
RETURN
398
00-16-01030
REV. 0124 D

P-16912 A&B
LIQUID INCINERATOR PUMP

P-16915
BOILER FEED WATER PUMP

REV.	CHANGE NOTICE	REVISION DESCRIPTION	DATE	BY	CHK'D	APPD
2		BASELINE UPDATE (COMPLETE REVISION)	12/83	ESY		
1		BASELINE UPDATE	3/82			

ADO DRAFTSMAN 10/1/81
CHECKED
ENGINEER
APPROVED

8,000 TPD SRC-I DEMONSTRATION PLANT
MENHAM, KENTUCKY
FOR UNITED STATES
DEPARTMENT OF ENERGY

TITLE
LIQUID THERMAL
OXIDIZER PFD

SCALE WT.

INTERNATIONAL COAL REFINING COMPANY
ALLENTOWN, PA.

THE RUST ENGINEERING COMPANY
BIRMINGHAM, ALABAMA
CONTRACT No. 1997F/2548

DWG. NO. 00-16-010300 REV. 2

DR3677

KNOCKOUT DRUM

GAS INCINERATOR

V-16920
BOILER FEED WATER DRUM

LP BFW
00-16-03002

FUEL GAS
00-16-03010

AREA 11

AREA 12

AREA 13

AREA 14

AREA 15

AREA 16

AREA 17

26,412

235
220

477

85
105

76

85
100

LPG
00-16-03010

V-16918

C-16917

P-16918 A&B

FLAME ARRESTOR

SAMPLE PORTS

MAN WAY

SIGHT PORT

IN-16919

PI

PI

PI

165
365

TO 150 # STEAM HEADER
00-16-03005
26150

V-16920

P-16921 A&B

365

BLOW DOWN
262

COOLING WATER
00-16-03013
RETURN

00-16-01031 Sht 2 Rev D

BY TRUCK

TO LIQUID
THERMAL OXIDIZER

C-16917
INDUCED DRAFT FAN

P-16918 A&B
CONDENSATE TRANSFER PUMP

P-16921 A&B
BOILER FEED WATER PUMP

REV.	CHANGE NOTICE	REVISION DESCRIPTION	DATE	BY	CHK'D	APP'D
2		BASELINES UPDATE	12/83	BSY		
1		BASELINE UPDATE	3-82			

ADD
DRAFTSMAN — DATE 10/1/81
CHECKED
ENGINEER
APPROVED

6,000 TPD SRC-I DEMONSTRATION PLANT
NEWMAN, KENTUCKY
FOR UNITED STATES
DEPARTMENT OF ENERGY

TITLE
VENT GAS INCINERATOR
PROCESS FLOW DIAGRAM

SCALE — NT.

INTERNATIONAL COAL REFINING COMPANY
ALLENTOWN, PA.

THE RUST ENGINEERING COMPANY
BIRMINGHAM, ALABAMA
CONTRACT 21-1987F/C548

DWG. NO. 00-16-01031D REV. 2

2.2.9.3 Material and Energy Balances

The material and energy balances for the liquid thermal oxidizer system are included after this page.

FOR PROCESS FLOW DIAGRAM NO. 00-16-01030D

MATERIAL BALANCE SUMMARY

Rust International Corporation

CONTRACT NO. 21-2548
PROJECT: 6000 TPD SRC-I Demonstration Plant
PLANT LOCATION: Newman, KY
CLIENT: ICRC

PREPARED BY BSY
DATE 1-14-84
APPROVED BY
DATE

	STREAM NUMBER/NAME		2101 Fuel Gas			2102 LPG			2103 Slop Oil			2104 Phenol			2105 Air		
	PHASE		Gas			Gas			Liquid			Liquid			Gas		
	TEMPERATURE, °F		105			100			77			77			95		
	PRESSURE,PSIA		85			85									14.5		
	COMPONENTS	MOLE WT.	lb-mol/hr	WT. %	MOL %	lb-mol/hr	WT. %	MOL %	lb-atom/hr	WT. %	MOL%	lb-atom/hr	WT. %	MOL%	lb mol/hr	WT. %	MOL %
1	H_2	2.016	3.57	1.47	16.46												
2	N_2	28.013	1.41	3.05	6.48										2,453.29	76.71	79.00
3	Ar	39.948	0.16	1.31	0.74												
4	CO	28.010	1.49	3.51	6.85												
5	CH_4	16.043	8.93	29.26	41.11												
6	C_2H_6	30.070	3.26	20.03	15.02	0.01	0.43	0.70									
7	C_3H_8	44.097	1.53	13.83	7.07	0.77	57.29	63.80									
8	C_4H_{10}	58.124	0.97	11.58	4.49	0.41	40.92	34.57									
9	C_5H_{12}	72.151	0.24	3.53	1.10	0.01	1.36	0.93									
10	C6-250oF	86.178	0.12	2.10	0.55												
11	250-350oF	100.205	0.01	0.13	0.03												
12	CO_2	44.010	0.02	0.70	0.10												
13	O_2	31.999													652.14	23.29	21.00
14																	
15	Slop Oil/Phenol																
16	C	12.011							48.39	72.60		141.52	75.6				
17	H	1.008							61.86	7.80		140.89	6.4				
18	S	32.064							0.09	0.37							
19	N	14.007							0.29	0.55							
20	O	15.999							1.84	3.68		23.58	17.0				
21	TOTAL (DRY)		21.71	100.00	100.00	1.20	100.00	100.00	(Lb-Mol/Hr)				100.0		3,105.43	100.00	100.00
22	WATER	18.016							6.66	15.00					93.16	1.90	3.00
23	TOTAL (WET)		21.71	100.00	100.00	1.20	100.00	100.00		100.00			100.0		3,198.59	101.90	103.00
24	TOTAL lbs/hr		489.51			58.93			800.0			2,219.0			91,270		
25	MMSCFD		0.198												27.6		
26	GPM @ FTP								1.52			4.48					
27	ACFM		26.02			1,413									21,887		
28	MOLECULAR WEIGHT		22.55			49.108									28.84		
29	DENSITY @ FTP LB/FT³		0.314			0.694			65.52			61.78					
30	VISCOSITY LBM/FT-HR																
31	HEAT CAPACITY BTU/LB °F																
32	THERM. COND BTU/HR-FT-°F																
33	ENTHALPY BTU/lb *		-891.02			-611.43			-776.79			-589.18			30,710		

REMARKS

*ENTHALPY DATUM C(c), H_2(g), O_2(g), N_2(g), Ar(g), S(c) @ OoR, 0 psia

DESCRIPTION | BY | DATE | REV. NO.

FORM 44-150 (6/82)

FOR PROCESS FLOW DIAGRAM NO. 00-16-01030 D

MATERIAL BALANCE SUMMARY

SHEET 2 OF 2

Rust International Corporation

CONTRACT NO. 21-2548
PROJECT: 6000 T/D SRC-I Demonstration Plant
PLANT LOCATION: Newman, KY
CLIENT: ICRC

PREPARED BY BSY
DATE 1-19-84
APPROVED BY
DATE

	STREAM NUMBER/NAME		2106 Flue Gas			2107 Boiler Feed Water			2108 Steam			2109 Blow Down					
	PHASE		Gas			Liquid			Vapor			Liquid					
	TEMPERATURE, °F		500			220			365			365					
	PRESSURE PSIA		14.7			235			165			165					
	COMPONENTS	MOLE WT.	lb mol/hr	WT. %	MOL %	lb mol/hr	WT. %	MOL %	lb mol/hr	WT. %	MOL%	lb mol/hr	WT. %	MOL%		WT. %	MOL %
1	O_2	31.999	368.60	13.06	12.102												
2	N_2	28.013	2,454.70	76.14	80.62												
3	Ar	39.948	0.16	0.01	0.005												
4	CO_2	44.010	221.35	10.79	7.27												
5	SO_2	64.065	0.09	0.00	0.003												
6																	
7																	
8																	
9																	
10																	
11																	
12																	
13																	
14																	
15																	
16																	
17																	
18																	
19																	
20																	
21	TOTAL (DRY)		3,044.90	100.00	100.00												
22	WATER	18.016	250.97	5.01	8.24	2,235.56	100.00	100.00	2,213.44	100.00	100.00	22.11	100.00	100.00			
23	TOTAL (WET)		3,295.87	105.01	108.24	2,235.56	100.00	100.00	2,213.44	100.00	100.00	22.11	100.00	100.00			
24	TOTAL lbs/hr		94,837			40,240			39,842			398					
25	MMSCFD		30.02														
26	GPM @ FTP					84.18						0.90					
27	ACFM		38,485														
28	MOLECULAR WEIGHT		28.76			18.016			18.016			18.016					
29	DENSITY @ FTP LB/FT³		0.0411			59.61			0.363			55.01					
30	VISCOSITY LBM/FT-HR																
31	HEAT CAPACITY BTU/LB-°F																
32	THERM. COND BTU/HR-FT-°F																
33	ENTHALPY BTU/lb *		-427.51			-6,372.8			-5,365.2			-6,222.4					
34																	
35																	
36																	
37																	
38																	
39																	
40																	
41																	
42																	
43																	
44																	
45																	
46																	
47																	
48																	

REMARKS

DESCRIPTION | DATE | BY | REV. NO.

*ENTHALPY DATUM C(c), H_2(g), O_2(g), N_2(g), Ar(g), S(c) @ 0°R, 0 psia

FORM 44-150 (8/82)

2.2.9.4 Utility Summary

The utility summary for the flare and incinerators follows this page.

Rust International Corporation

UTILITY PROCESS DATA SUMMARY SHEET

CONTRACT NO. 21-2548
AREA Flare & Incinerators Area
BY BSY DATE 1-24-84
SHEET ____ OF ____

CLIENT ICRC
PROJECT 6000 TPD SRC-I DEMONSTRATION PLAN PLANT LOCATION: Newman, Kentucky

EQUIPMENT OR AREA NUMBER	DESCRIPTION	PROC. DUTY MM BTU/HR	PROCESS COOLING WATER INLET @ ___ °F: GPM	ΔT °F	HEAT TRANSFER FLUID INLET @ ___ °F: GPM	ΔT °F	FIRED DUTY: FUEL GAS LHV = (1000 BTU)/HR	FUEL OIL LHV =	POWER: INST. HP	OPER. BHP	OPER KW	BOILER FEEDWATER: 220 PSIG / 220 °F (M LBS/HR)	___ PSIG / ___ °F	STEAM IMPORT (EXPORT): ___ PSIG / ___ °F	900 PSIG / 850 °F (M LBS/HR)	150 PSIG / 365 °F (M LBS/HR)	___ PSIG / ___ °F	___ PSIG / ___ °F	IPG: 85 PSIG / 100 °F (SCFM)	COND. RETURN (REQ'D): ___ PSIG / ___ °F (M LBS/HR)	BLOW DOWN ___ PSIG (M LBS/HR)	UTIL. N_2 PSIG = 88	PLANT AIR PSIA = 14.5	INSTRU AIR PSIG =	PROC. WATER PSIG = (GPM)
TK-16806	Quench Liquid Storage Tank								See													200			
X-16810	Emergency Flare						30.2			Motor					106.0				7.6				100	75	
V-16809	Emergency Flare K.O. Drum										List														
IN-16913	Liquid Thermal Oxidizer						30.2												7.6				200	75	
V-16914	Boiler Feed Water Drum											40.24				[37.34]					6.90				
IN-16919	Gas Incinerator						30.2												7.6				200	75	
V-16920	Boiler Feed Water Drum											26.41				[76.15]					0.26				
	TOTAL (Max Usage)						90.6		2,006		765	66.65			106.0	[65.99]			22.8		0.66	200	500	225	

PREPARED BY 1-24-84
DATE BSY
APPROVED BY
DATE

REVISION △ BY DATE APP'D DATE
REVISION △ BY DATE APP'D DATE
REVISION △ BY DATE APP'D DATE

NOTES:

FORM 44-157 (8/82)

2.2.9.5 Motor List

The motor list for the flare and incinerators follows this page.

FLARE AND INCINERATORS AREA
MOTOR LIST

Item	Description	Conn HP	Oper KW	Hrs/ Day	KWH/ Day
P-16801A	Quench Liquid Pump	500	360	0	0
P-16801B	Quench Liquid Pump	500	0	0	0
P-16802A	Knockout Pump	20	15	0	0
P-16802B	Knockout Pump	20	0	0	0
P-16806A	Knockout Pump	60	45	0	0
P-16806B	Knockout Pump	60	0	0	0
P-16807A	Knockout Pump	20	15	0	0
P-16807B	Knockout Pump	20	0	0	0
P-16803A	Knockout Pump	200	150	0	0
P-16803B	Knockout Pump	200	0	0	0
P-16804A	Liquid Recovery Pump	20	15	0	0
P-16804B	Liquid Recovery Pump	20	0	0	0
P-16805A	Flare Drum Pump	20	15	0	0
P-16805B	Flare Drum Pump	20	0	0	0
C-16917	Induced Draft Fan	100	75	24	1,800
P-16918A	Condensate Transfer Pump	10	6.5	24	156
P-16918B	Condensate Transfer Pump	10	0	0	0
P-16921A	Boiler Feedwater Pump	40	30	24	720
P-16921B	Boiler Feedwater Pump	40	0	0	0
P-16912A	Liquid Incinerator Pump	3	1.5	24	36
P-16912B	Liquid Incinerator Pump	3	0	0	0
P-16915A	Boiler Feedwater Pump	60	37	24	888
P-16915B	Boiler Feedwater Pump	60	0	0	0
	TOTAL	2,006	765		3,600

2.2.9.6 Equipment List/Summary

The equipment list/summary for the flare and incinerators follows this page.

EQUIPMENT LIST/SUMMARY

REV. 5 — 12-30-83

WBS ELEMENT: 1.4.1.1.2 — ICRC AREA: 16 — FLARE AND INCINERATORS--EMERGENCY FLARE

REV.	ICRC/RUST EQUIP. NO.	QTY	EQUIPMENT DESCRIPTION	P. O. NUMBER	SIZE/ WEIGHT	P. O. DATE	VENDOR ENG NEED DATE	VENDOR ENG COST	DELV DATE	EQUIP COST	PURCH BY	TYPE EQUIP.
5	P-16801 A and B	2	Pump, quench liquid, sp gr 1.0, 1,500 gpm, 750 tdh, cs with ss trim, with motor		500 hp	S 10-82 P A	S 12-82 P A	7.0 ea	S 6-83 P A	59.5 ea	RUST	SF
5	P-16803 A and B	2	Pump, knockout, sp gr 1.0, 1,500 gpm, 250 tdh, cs with ss trim, with motor		200 hp	S 10-82 P A	S 12-82 P A	2.3 ea	S 6-83 P A	19.2	RUST	SF
5	P-16804 A and B	2	Pump, liquid recovery, sp gr 1.0, 150 gpm, 250 tdh, cs with ss trim, with motor		20 hp	S 10-82 P A	S 12-82 P A	0.9 ea	S 6-83 P A	7.8 ea	RUST	SF
5	P-16805 A and B	2	Pump, flare drum, sp gr 1.0, 150 gpm, 250 tdh, cs with ss trim, with motor		20 hp	S 10-82 P A	S 12-82 P A	0.9 ea	S 6-83 P A	7.8 ea	RUST	SF
5	TK-16806	1	Tank, storage, quench liquid, 5,000 bbl nominal, cs, API 650		35' dia x 30'	S 10-82 P A	S 1-83 P A	6.4 ea	S 10-83 P A	54.4	CMC	FF

NOTES:

1. All costs 1st Quarter Fiscal Year 1982 in thousand dollars.
2. Equipment costs are FOB jobsite with shipping & vendor field support less vendor engineering.
3. This equipment is Appendix C Bulks

RUST: RUST Engineering
CMC: Stone & Webster

S: Scheduled
P: Projected
A: Actual

FL: Field Labor
M: Material for field fab equipment
SF: Shop Fabricated

N/A: Not Applicable
FF: Field Fabricated

EQUIPMENT LIST/SUMMARY

REV. 5 12-30-83

WBS ELEMENT: 1.4.1.1.2 ICRC AREA: 16 FLARE AND INCINERATORS--EMERGENCY FLARE

REV.	ICRC/RUST EQUIP. NO.	QTY	EQUIPMENT DESCRIPTION	P. O. NUMBER	SIZE/ WEIGHT	P. O. DATE	VENDOR ENG NEED DATE	VENDOR ENG COST	DELV DATE	EQUIP COST	PURCH BY	TYPE EQUIP.
5	V-16808	1	Knockout drum, vertical, 150 psig, 900°F, c.s.		44' dia x 69' TT	S 10-82 P A	S 1-83 P A	70.0	S 10-83 P A	660.0	RUST	SF
5	V-16809	1	Knockout drum, 150 psig, 650°F, cs		22' dia x80' TT	S 10-82 P A	S 1-83 P A	34.0	S 10-83 P A	291.0	RUST	SF
5	X-16810	1	Elevated flare, derrick supported, complete with molecular seal, pilots, and ignitor, 1.1 x 10^6 lb/hr non-smokeless, 200,000 lb/hr smokeless		46" dia x 250' high	S 10-82 P A	S 11-82 P A	77.0	S 2-83 P A	663.8	CMC	SF
4	X-16810 cont.		26.0 molecular weight, 0.5 lb/hr steam/lb hc.,								CMC	SF

NOTES:

1. All costs 1st Quarter Fiscal Year 1982 in thousand dollars.
2. Equipment costs are FOB jobsite with shipping & vendor field support less vendor engineering.
3. This equipment is Appendix C Bulks

RUST: RUST Engineering
CMC: Stone & Webster

S: Scheduled
P: Projected
A: Actual

FL: Field Labor
M: Material for field fab equipment
SF: Shop Fabricated

N/A: Not Applicable
FF: Field Fabricated

EQUIPMENT LIST/SUMMARY REV. 5 12-30-83

WBS ELEMENT: 1.4.1.1.2 ICRC AREA: 16 FLARE AND INCINERATORS--LIQUID THERMAL OXIDIZER

REV.	ICRC/RUST EQUIP. NO.	QTY	EQUIPMENT DESCRIPTION	P. O. NUMBER	SIZE/ WEIGHT	P. O. DATE	VENDOR ENG NEED DATE	VENDOR ENG COST	DELV DATE	EQUIP COST	PURCH BY	TYPE EQUIP.
5	IN-16913	1	Oxidizer, liquid thermal, 3,600 lb/hr combined capacity complete with peripherals and instrumentation, 125 ft dispersive stack; 150 psig waste heat boiler			S 10-82 P A	S 12-82 P A	30.3	S 6-83 P A		RUST	SF
	P-16912 A and B	2	Pump, liquid incinerator, 20 gpm x 231 tdh, c.s. with ss trim, with motor		3 hp	S 10-82 P A	S 12-82 P A	inc w/ IN-16913	S 6-83 P A	inc w/ IN-16913	RUST	SF
5	P-16915 A and B	2	Pump, boiler feedwater, 900 gpm x 131 tdh, sp.gr.=0.882, c.s. with ss trim, with motor		60 hp	S 10-82 P A	S 12-82 P A	inc w/ IN-16913	S 6-83 P A	inc w/ IN-16913	RUST	SF
	V-16911	1	Knockout drum, 150 psig, 650°F, metal weight, 9,788 lb			S 10-82 P A	S 1-83 P A	2.1	S 10-83 P A	17.8	RUST	SF
	V-16914	1	Drum, boiler feedwater			S 10-82 P A	S 1-83 P A	inc w/ IN-16913	S 10-83 P A	inc w/ IN-16913	RUST	SF

NOTES:
1. All costs 1st Quarter Fiscal Year 1982 in thousand dollars.
2. Equipment costs are FOB jobsite with shipping & vendor field support less vendor engineering.
3. This equipment is Appendix C Bulks

RUST: RUST Engineering
CMC: Stone & Webster

S: Scheduled
P: Projected
A: Actual

FL: Field Labor
M: Material for field fab equipment
SF: Shop Fabricated

N/A: Not Applicable
FF: Field Fabricated

EQUIPMENT LIST/SUMMARY

REV. 5 12-30-83

WBS ELEMENT: 1.4.1.1.2 ICRC AREA: 16 FLARE AND INCINERATORS--VENT GAS INCINERATOR

REV.	ICRC/RUST EQUIP. NO.	QTY	EQUIPMENT DESCRIPTION	P. O. NUMBER	SIZE/ WEIGHT	P. O. DATE	VENDOR ENG NEED DATE	VENDOR ENG COST	DELV DATE	EQUIP COST	PURCH BY	TYPE EQUIP.
5	C-16917	1	Fan, induced draft		100 hp	S 10-82	S 12-82	inc with IN-16919	S 6-83	inc. w/ IN-16919	RUST	SF
	IN-16919	1	Incinerator, vent gas, 2,500 lb/hr combined capacity complete with peripherals and instrumentation; 325 ft dispersive stack; 150 psig waste heat boiler			S 10-82 P A	S 1-83 P A	24.8	S 7-83 P A	221.1	RUST	SF
5	P-16918 A and B	2	Pump, transfer, condensate, 150 gpm x 116 tdh, cs with ss trim, with motor		10 Hp	S 10-82 P A	S 12-82 P A	inc w/ IN-16919	S 6-83 P A	inc w/ IN-16919	RUST	SF
5	P-16921 A and B	2	Pump, boiler feedwater, sp.gr.=0.882, cs with ss trim, 700 gpm x 131 tdh, with motor		40 hp	S 10-82 P A	S 12-82 P A	inc w/ IN-16919	S 6-83 P A	inc w/ IN-16919	RUST	SF
3	TK-16911 A and B	2	Slop oil and liquid preparation unit, 2,500 bbl			S 10-82 P A	S 12-82 P A	inc w/ IN-16919	S 9-83 P A	116.3 ea M=110.4 L= 5.9	RUST	FF
	V-16916	1	Knockout drum, 75 psig, 650°F, weight 3,691 lb			S 10-82 P A	S 1-83 P A	1.0	S 10-83 P A	8.6	RUST	SF
	V-16920	1	Drum, boiler feedwater			S 10-82 P A	S 1-83 P A	inc w/ IN-16919	S 10-83 P A	inc w/ IN-16919	RUST	SF

NOTES:
1. All costs 1st Quarter Fiscal Year 1982 in thousand dollars.
2. Equipment costs are FOB jobsite with shipping & vendor field support less vendor engineering.
3. This equipment is Appendix C Bulks

RUST: RUST Engineering
CMC: Stone & Webster

S: Scheduled
P: Projected
A: Actual

FL: Field Labor
M: Material for field fab equipment
SF: Shop Fabricated

N/A: Not Applicable
FF: Field Fabricated

2.2.9.7 Equipment Data Sheets

The equipment data sheets for the flare and incinerators follow this page.

RUST ENGINEERING
BIRMINGHAM ALABAMA

CENTRIFUGAL FAN DATA SHEET

CONTRACT NO. 21-1997-F
EQUIPMENT NO. C-16 917 A
NO. REQUIRED 1
SHEET 1 OF 1

CLIENT INTERNATIONAL COAL REFINING COMPANY
PROJECT 6000 TPSD SRC-I DEMONSTRATION PLANT PLANT LOCATION NEWMAN, KENTUCKY
SERVICE INDUCED DRAFT FAN
VENDOR P.O. NO.
MODEL SERIAL NO.
DRIVER EQUIPMENT NO.
NOTE: ○ INDICATES INFORMATION TO BE COMPLETED BY PURCHASER ☐ BY MANUFACTURER

○ OPERATING CONDITIONS

○ FORCED DRAFT ○ INDUCED DRAFT
○ GAS COMPOSITION
○ MOLECULAR WEIGHT
○ K avg (Cp/Cv)
○ REL. HUMIDITY, %
○ CORROSION/EROSION DUE TO
○ INLET CAPACITY, ICFM:
RATED
NORMAL
STARTUP
○ INLET TEMPERATURE, °F
RATED
NORMAL
STARTUP
MAX./MIN. DESIGN
○ INLET PRESS. PSIA/IN. W.C.
○ DISCH. STATIC PRESS. PSIA/IN. W.C.
○ CAPACITY CONTROL
○ CONTROL SIGNAL RANGE:
● MIN. FLOW PSIG/mA
● MAX. FLOW PSIG/mA

THIS IS PART OF THE VENT GAS INCINERATOR PACKAGE. TO BE DETERMINED LATTER
SZ 10-21-81

○ ACCESSORIES

○ INLET GUIDE VANES
○ DISCHARGE DAMPER ○ SLIDE GATE
○ REMOTE CONTROL ACUATOR
○ INLET STACK, HEIGHT FT
○ INLET DUCTING (ATT. SKETCH)
○ EXPANSION JOINTS ○ INLET ○ DISCHARGE
○ BASEPLATE ○ SOLEPLATES
○ FAN ONLY ○ DRIVER AND GEAR
○ COMMON FOR FAN AND DRIVER

○ SITE DATA

○ ELEVATION, FT.
○ AMB. TEMP. °F MAX. MIN.
○ COOLING WATER
SUPPLY PSIG °F
RETURN PSIG °F/(MAX.)
○ ELECT. AREA CLASS GROUP DIV.
○ WINTERIZATION ○ TROPICALIZATION REQ'D.
○ SHIPMENT
○ PACKING

○ SHOP TESTING

RUN TEST ○ REQ'D. ○ WITNESSED
PERF. TEST ○ REQ'D. WITNESSED
REMARKS:

☐ MANUFACTURERS DATA

FAN TYPE SIZE
IMPELLER TYPE
DIA., RATED IN. MAX. IN.
RATED SPEED, RPM
RATED HP
MAX. HP TED IMP.
MA V. CPM
PM
IAL
ST
NG SUPPORT
WATER, GPM
FT SEAL, TYPE
MATERIAL
FLANGE ORIENTATION, INLET
DISCH.

☐ MATERIALS OF CONSTRUCTION

CASING
THICKNESS, IN.
IMPELLER:
SHAFT
BEARINGS
BEARING PEDESTALS
STACK, DUCTING
THICKNESS, IN.
INT. COATING

☐ DRIVE TRAIN

DRIVERS ☐ DIRECT COUPLED
☐ GEARED ☐ V-BELTS, NO.
☐ COUPLING TYPE
MANUFACTURER
LUBRICATION
☐ GEAR, TYPE
MANUF., MODEL
HP RATING, S.F.
☐ DRIVERS, TYPE
RATED HP
RATED RPM

○ APPLICABLE SPECIFICATIONS

PREPARED BY SZ	REVISION 1	REVISION △	REVISION △
DATE 10-21-81	BY BSY DATE 12-29-83	BY DATE	BY DATE
APPROVED BY			

The Rust Engineering Company
A Subsidiary of Wheelabrator-Frye Inc

CENTRIFUGAL PUMP DATA SHEET

CONTRACT NO. 21-1991E
EQUIPMENT NO. P-16801 A&B
NO. REQUIRED 2
SHEET 1 OF 1

CLIENT INTERNATIONAL COAL REFINING COMPANY
PROJECT 6000 TPSD SRC-I DEMONSTRATION PLANT — PLANT LOCATION NEWMAN, KENTUCKY
SERVICE QUENCH LIQUID PUMP
VENDOR — P.O. NO.
TYPE — MODEL — SERIAL NO.
NO. OF MOTORS REQ'D — ITEM NO. — FURN. BY — MFR BY
NO OF TURBINES REQ'D — ITEM NO. — FURN BY — MFR BY
NOTE ○ INDICATES INFORMATION TO BE COMPLETED BY PURCHASER — □ BY MANUFACTURER

○ OPERATING CONDITIONS (EACH PUMP)

LIQUID — US GPM AT PT. NOR 1500 RATED —
DISCHARGE, PSIG 325
PT. °F NOR 60 MAX. — SUCTION PSIG. MAX 0 RATED —
SP GR AT PT 1.0 — DIFF. PRESS., PSI 325
VAP PRESS AT PT. PSIA NIL — DIFF. HEAD. FT 750
VIS AT PT LB/(MI)/FT-HR — — NPSHA FT —
CORR/EROS CAUSED BY NONE — WHP 284.0

CONSTRUCTION

NOZZLES	SIZE (IN.)	RATING	FACING	LOCATION
SUCTION	Ø	150#	R.F.	
DISCHARGE	Ø	150#	R.F.	

CASE MT □ CENTERLINE □ FOOT □ BRACKET □ VERT (TYPE) —
SPLIT □ AXIAL □ RAD TYPE VOLUTE □ SGL □ DBL □ DIFFUSER
PRESS □ MAX ALLOW — PSIG — °F □ HYDRO TEST — PSIG
CONNECT □ VENT □ DRAIN □ GAUGE □ STEAM JACKET
IMPELLER DIA □ RATED — □ MAX — □ TYPE —
MOUNT □ BETWEEN BRGS □ OVERHUNG
BEARINGS TYPE □ RADIAL — □ THRUST —
LUBE □ RING OIL □ FLOOD □ OIL MIST □ FLINGER □ PRESSURE
COUPLING □ MFR FAST □ MODEL —
DRIVER HALF MTD BY □ PUMP MFR □ DRIVER MFR
○ MECH SEAL ○ PACKING ○ AUX SEAL/PACKING
MFR TYPE MODEL —
MFR CODE — API CODE —

AUXILIARY PIPING

○ C W PIPE PLAN ○ Cu ○ SS ○ TUBING ○ PIPE
□ TOTAL COOLING WATER REQ'D GPM — ○ SIGHT F.I. REQ'D
○ PACKING COOL INJECTION REQ'D □ TOTAL GPM — □ PSIG —
○ SEAL FLUSH PIPE PLAN — ○ C.S ○ S.S ○ TUBING ○ PIPE
○ EXTERNAL SEAL FLUSH FLUID — □ GPM — □ PSIG —
○ AUXILIARY SEAL PLAN — ○ C.S ○ S.S ○ TUBING ○ PIPE
○ AUX SEAL FLUSH/QUENCH FLUID —

MATERIALS

○ PUMP CASE/TRIM API CLASS —
CASING — CORR ALL — IN.
IMPELLER — WEAR RINGS —
SHAFT — SLEEVE(S) —
CASE INT COATING/LINING — GLAND —
□ BASEPLATE — DRIP PAN —

○ SITE CONDITIONS

ELEVATION FT 385 — DUST/FUMES —
AMB TEMP °F — MAX — MIN — AREA ELECT CL — GR. — DIV. —
COOLING WATER SUPPLY — PSIG — °F RETURN — PSIG — °F

○ PERFORMANCE

PROPOSAL CURVE NO. —
RPM 1750 NO OF STAGES —
NPSHR. FT. @ IMPELLER — T.O.F. —
EFF. — BHP RATED —
MAX. BHP RATED IMP —
MAX HEAD RATED IMP —
MIN CONTINUOUS GPM —
ROTATION (VIEWED FROM CPLG END) —

○ INSPECTION AND TESTS

SHOP INSPECTION	○ REQ'D	
HYDROSTATIC TEST	○ REQ'D	○ WITNESS
PERFORMANCE TEST	○ REQ'D	○ WITNESS
NPSH TEST	○ REQ'D	○ WITNESS
INT INSP AFTER TEST	○ REQ'D	○ WITNESS
—	○ REQ'D	○ WITNESS

□ INT. WEAR PARTS

WEAR RINGS □ CASE □ IMP
DIA — IN CLEARANCE — IN
INTERSTAGE BUSHINGS
DIA — IN CLEARANCE — IN

VERTICAL PUMPS

PIT OR SUMP DEPTH ○ —
PUMP LENGTH ○ —
MIN SUBMERGENCE REQ'D. □ —
COLUMN PIPE □ FLANGED □ THREADED
LINE SHAFT □ OPEN □ ENCLOSED
BRGS □ BOWL — □ LINE SHAFT —
BRG LUB □ WATER □ OIL □ GREASE
FLOAT & ROD ○ C S ○ S S ○ BRZ ○ NONE
FLOAT SWITCH □ —
PUMP THRUST LB □ UP — □ DOWN —
MOUNTING PLATE REQ'D □

○ WEIGHTS AND DIMENSIONS

APPROX. WT PUMP & BASE — LB
MOTOR — LB TURBINE — LB
BASE PLATE DIMENSIONS —

APPLICABLE SPECIFICATIONS

○ API 610 ○ ANSI B73.1, B73.2 —
○ PROJECT SPECIFICATIONS —

REMARKS (1) VENDOR SPECIFY

PREPARED BY	REVISION 1	REVISION 2	REVISION 3
R. M.	BY	BY	BY
DATE 10-6-81	DATE	DATE	DATE
APPROVED BY	APP'D	APP'D	APP'D

The Rust Engineering Company
A Subsidiary of Wheelabrator-Frye Inc

CENTRIFUGAL PUMP DATA SHEET

CONTRACT NO. 21-1997F
EQUIPMENT NO. P-16803 A & B
NO. REQUIRED 2
SHEET 1 OF 1

CLIENT: INTERNATIONAL COAL REFINING COMPANY
PROJECT: 6000 TPSD SRC-I DEMONSTRATION PLANT — PLANT LOCATION: NEWMAN, KENTUCKY
SERVICE: KNOCKOUT PUMP
VENDOR — P.O NO.
TYPE — MODEL — SERIAL NO.
NO OF MOTORS REQ'D — ITEM NO. — FURN. BY — MFR BY
NO OF TURBINES REQ'D — ITEM NO. — FURN BY — MFR BY

NOTE: ○ INDICATES INFORMATION TO BE COMPLETED BY PURCHASER — □ BY MANUFACTURER

○ OPERATING CONDITIONS (EACH PUMP)

LIQUID — US GPM AT PT NOR 1500 RATED —
DISCHARGE. PSIG 108
PT. °F NOR 60 MAX — SUCTION PSIG. MAX 0 RATED —
SP GR AT PT 1.0 DIFF. PRESS. PSI 108
VAP PRESS AT PT. PSIA NIL DIFF HEAD FT 250
VIS AT PT LB(M)/FT-HR — NPSHA FT —
CORR/EROS CAUSED BY NONE WHP 94.7

CONSTRUCTION

NOZZLES	SIZE (IN.)	RATING	FACING	LOCATION
SUCTION	⌀	150 #	R.F.	
DISCHARGE	⌀	150 #	R.F.	

CASE MT □ CENTERLINE □ FOOT □ BRACKET □ VERT (TYPE) —
SPLIT □ AXIAL □ RAD. TYPE VOLUTE □ SGL □ DBL □ DIFFUSER
PRESS □ MAX ALLOW — PSIG — °F. □ HYDRO TEST — PSIG
CONNECT □ VENT □ DRAIN □ GAUGE □ STEAM JACKET
IMPELLER DIA □ RATED — □ MAX — □ TYPE —
MOUNT □ BETWEEN BRGS □ OVERHUNG
BEARINGS TYPE □ RADIAL — □ THRUST —
LUBE □ RING OIL □ FLOOD □ OIL MIST □ FLINGER □ PRESSURE
COUPLING □ MFR FAST □ MODEL —
DRIVER HALF MTD BY □ PUMP MFR □ DRIVER MFR
○ MECH SEAL ○ PACKING ○ AUX SEAL/PACKING
MFR TYPE MODEL —
MFR CODE — API CODE —

AUXILIARY PIPING

○ C W PIPE PLAN ○ Cu ○ SS ○ TUBING ○ PIPE
□ TOTAL COOLING WATER REQ'D GPM — ○ SIGHT F.I. REQ'D
○ PACKING COOL INJECTION REQ'D □ TOTAL GPM — □ PSIG —
○ SEAL FLUSH PIPE PLAN — ○ C.S. ○ S S ○ TUBING ○ PIPE
○ EXTERNAL SEAL FLUSH FLUID — □ GPM — □ PSIG —
○ AUXILIARY SEAL PLAN — ○ C.S ○ S.S ○ TUBING ○ PIPE
○ AUX SEAL FLUSH/QUENCH FLUID —

MATERIALS

□ PUMP CASE/TRIM API CLASS —
CASING — CORR ALL — IN.
IMPELLER — WEAR RINGS —
SHAFT — SLEEVE(S) —
CASE INT COATING/LINING — GLAND —
□ BASEPLATE — DRIP PAN —

○ SITE CONDITIONS

ELEVATION FT 385 DUST/FUMES —
AMB TEMP F — MAX — MIN — AREA ELECT CL — GR. — DIV. —
COOLING WATER SUPPLY — PSIG — F RETURN — PSIG — °F

□ PERFORMANCE

PROPOSAL CURVE NO. —
RPM 1750 NO OF STAGES —
NPSHR. FT. ℄ IMPELLER — T.O F. —
EFF 0.6 BHP RATED —
MAX BHP RATED IMP —
MAX HEAD RATED IMP —
MIN CONTINUOUS GPM —
ROTATION (VIEWED FROM CPLG END) —

○ INSPECTION AND TESTS

SHOP INSPECTION	○ REQ'D	
HYDROSTATIC TEST	○ REQ'D	○ WITNESS
PERFORMANCE TEST	○ REQ'D	○ WITNESS
NPSH TEST	○ REQ'D	○ WITNESS
INT INSP AFTER TEST	○ REQ'D	○ WITNESS
—	○ REQ'D	○ WITNESS

□ INT WEAR PARTS

WEAR RINGS □ CASE □ IMP
DIA — IN CLEARANCE — IN
INTERSTAGE BUSHINGS
DIA — IN CLEARANCE — IN

VERTICAL PUMPS

PIT OR SUMP DEPTH ○ —
PUMP LENGTH ○ —
MIN SUBMERGENCE REQ'D. □ —
COLUMN PIPE □ FLANGED □ THREADED
LINE SHAFT □ OPEN □ ENCLOSED
BRGS □ BOWL — □ LINE SHAFT —
BRG LUB □ WATER □ OIL □ GREASE
FLOAT & ROD ○ C S ○ S S ○ BRZ ○ NONE
FLOAT SWITCH □ —
PUMP THRUST LB □ UP — □ DOWN —
MOUNTING PLATE REQ'D □ —

□ WEIGHTS AND DIMENSIONS

APPROX WT PUMP & BASE — LB
MOTOR — LB TURBINE — LB
BASE PLATE DIMENSIONS —

APPLICABLE SPECIFICATIONS

○ API 610 ○ ANSI B73.1, B73.2 —
○ PROJECT SPECIFICATIONS —

REMARKS ① VENDOR SPECIFY

PREPARED BY	R. M.
DATE	10-6-81
APPROVED BY	

REVISION △	BY	DATE
REVISION △	BY	DATE
REVISION △	BY	DATE

The Rust Engineering Company
A Subsidiary of Wheelabrator-Frye Inc.

CENTRIFUGAL PUMP DATA SHEET

CONTRACT NO. 21-1997F
EQUIPMENT NO. P-16804 A & B
NO. REQUIRED TWO
SHEET 1 OF 1

CLIENT INTERNATIONAL COAL REFINING COMPANY
PROJECT 6000 TPSD SRC-I DEMONSTRATION PLANT — PLANT LOCATION NEWMAN, KENTUCKY
SERVICE LIQUID RECOVERY PUMP
VENDOR — P.O. NO.
TYPE — MODEL — SERIAL NO.
NO. OF MOTORS REQ'D — ITEM NO. — FURN. BY — MFR BY
NO OF TURBINES REQ'D — ITEM NO. — FURN BY — MFR BY
NOTE ○ INDICATES INFORMATION TO BE COMPLETED BY PURCHASER — ☐ BY MANUFACTURER

○ OPERATING CONDITIONS (EACH PUMP)

LIQUID — US GPM AT PT. NOR 150 RATED —
DISCHARGE PSIG 108
PT. °F NOR 60 MAX — SUCTION PSIG MAX 0 RATED —
SP GR AT PT 1.0 DIFF PRESS., PSI 108
VAP PRESS AT PT. PSIA NIL DIFF HEAD, FT 250
VIS AT PT LB(M)/FT-HR — NPSHA FT
CORR/EROS CAUSED BY NONE WHP 9.5

CONSTRUCTION

NOZZLES	SIZE (IN.)	RATING	FACING	LOCATION
SUCTION	8	150 #	RF	
DISCHARGE	8	150 #	RF	

CASE MT ☐ CENTERLINE ☐ FOOT ☐ BRACKET ☐ VERT. (TYPE)
SPLIT ☐ AXIAL ☐ RAD TYPE VOLUTE ☐ SGL ☐ DBL ☐ DIFFUSER
PRESS ☐ MAX ALLOW — PSIG — °F. ☐ HYDRO TEST — PSIG
CONNECT ☐ VENT ☐ DRAIN ☐ GAUGE ☐ STEAM JACKET
IMPELLER DIA ☐ RATED — ☐ MAX — ☐ TYPE
MOUNT ☐ BETWEEN BRGS ☐ OVERHUNG
BEARINGS TYPE ☐ RADIAL — ☐ THRUST —
LUBE ☐ RING OIL ☐ FLOOD ☐ OIL MIST ☐ FLINGER ☐ PRESSURE
COUPLING ☐ MFR FAST ☐ MODEL —
DRIVER HALF MTD BY ☐ PUMP MFR ☐ DRIVER MFR
○ MECH SEAL ○ PACKING ○ AUX SEAL/PACKING
MFR TYPE MODEL —
MFR CODE — API CODE —

AUXILIARY PIPING

○ C W PIPE PLAN ○ Cu ○ SS ○ TUBING ○ PIPE
☐ TOTAL COOLING WATER REQ'D GPM — ○ SIGHT F.I. REQ'D
○ PACKING COOL INJECTION REQ'D ☐ TOTAL GPM — ☐ PSIG —
○ SEAL FLUSH PIPE PLAN — ○ C.S ○ S S ○ TUBING ○ PIPE
○ EXTERNAL SEAL FLUSH FLUID — ☐ GPM — ☐ PSIG —
○ AUXILIARY SEAL PLAN — ○ C.S ○ S.S ○ TUBING ○ PIPE
○ AUX SEAL FLUSH/QUENCH FLUID —

MATERIALS

○ PUMP CASE/TRIM API CLASS —
CASING — CORR ALL — IN.
IMPELLER — WEAR RINGS —
SHAFT — SLEEVE(S) —
CASE INT COATING/LINING — GLAND —
☐ BASEPLATE — DRIP PAN —

○ SITE CONDITIONS

ELEVATION FT 385 DUST/FUMES —
AMB TEMP °F — MAX — MIN — AREA ELECT CL — GR. — DIV. —
COOLING WATER SUPPLY — PSIG — °F RETURN — PSIG — °F

☐ PERFORMANCE

PROPOSAL CURVE NO —
RPM 1750 NO OF STAGES —
NPSHR, FT @ IMPELLER — T.O.F. —
EFF. 0.6 BHP RATED —
MAX BHP RATED IMP —
MAX HEAD RATED IMP —
MIN CONTINUOUS GPM —
ROTATION (VIEWED FROM CPLG END) —

○ INSPECTION AND TESTS

SHOP INSPECTION	○ REQ'D	
HYDROSTATIC TEST	○ REQ'D	○ WITNESS
PERFORMANCE TEST	○ REQ'D	○ WITNESS
NPSH TEST	○ REQ'D	○ WITNESS
INT INSP AFTER TEST —	○ REQ'D	○ WITNESS
—	○ REQ'D	○ WITNESS

☐ INT WEAR PARTS

WEAR RINGS ☐ CASE ☐ IMP
DIA — IN CLEARANCE — IN
INTERSTAGE BUSHINGS
DIA — IN CLEARANCE — IN

VERTICAL PUMPS

PIT OR SUMP DEPTH ○ —
PUMP LENGTH ○ —
MIN SUBMERGENCE REQ'D ☐ —
COLUMN PIPE ☐ FLANGED ☐ THREADED
LINE SHAFT ☐ OPEN ☐ ENCLOSED
BRGS ☐ BOWL — ☐ LINE SHAFT —
BRG LUB ☐ WATER ☐ OIL ☐ GREASE
FLOAT & ROD ○ C S ○ S S ○ BRZ ○ NONE
FLOAT SWITCH ☐ —
PUMP THRUST LB ☐ UP — ☐ DOWN —
MOUNTING PLATE REQ'D ☐ —

☐ WEIGHTS AND DIMENSIONS

APPROX. WT PUMP & BASE — LB
MOTOR — LB TURBINE — LB
BASE PLATE DIMENSIONS

APPLICABLE SPECIFICATIONS

○ API 610 ○ ANSI B73.1, B73.2 —
○ PROJECT SPECIFICATIONS —

REMARKS ① VENDOR SPECIFY

PREPARED BY R. M.	REVISION 1	REVISION	REVISION
DATE 10-6-81	BY BS DATE 12-30-83	BY DATE	BY DATE
APPROVED BY			

The Rust Engineering Company
A Subsidiary of Wheelabrator-Frye Inc

CENTRIFUGAL PUMP DATA SHEET

CONTRACT NO. 21-19975
EQUIPMENT NO. P-16805 A&B
NO. REQUIRED 2
SHEET 1 OF 1

CLIENT: INTERNATIONAL COAL REFINING COMPANY
PROJECT: 6000 TPSD SRC-I DEMONSTRATION PLANT — PLANT LOCATION: NEWMAN, KENTUCKY
SERVICE: FLARE DRUM PUMP
VENDOR — P.O. NO.
TYPE — MODEL — SERIAL NO.
NO. OF MOTORS REQ'D — ITEM NO. — FURN. BY — MFR BY
NO OF TURBINES REQ'D — ITEM NO. — FURN BY — MFR BY
NOTE: ○ INDICATES INFORMATION TO BE COMPLETED BY PURCHASER — ☐ BY MANUFACTURER

○ OPERATING CONDITIONS (EACH PUMP)

LIQUID — US GPM AT PT. NOR 150 RATED —
DISCHARGE. PSIG 108
PT. °F NOR 60 MAX. — SUCTION PSIG. MAX 0 RATED —
SP. GR AT PT 1.0 — DIFF. PRESS., PSI 108
VAP PRESS AT PT. PSIA NIL — DIFF HEAD. FT 250
VIS AT PT LB/M1/FT-HR — — NPSHA. FT —
CORR/EROS CAUSED BY NONE — WHP 9.5

CONSTRUCTION

NOZZLES	SIZE(IN.)	RATING	FACING	LOCATION
SUCTION	Ø	150 #	R.F.	
DISCHARGE	Ø	150 #	R.F.	

CASE MT ☐ CENTERLINE ☐ FOOT ☐ BRACKET ☐ VERT. (TYPE) —
SPLIT ☐ AXIAL ☐ RAD. TYPE VOLUTE ☐ SGL ☐ DBL ☐ DIFFUSER
PRESS ☐ MAX ALLOW — PSIG — °F. ☐ HYDRO TEST — PSIG
CONNECT ☐ VENT ☐ DRAIN ☐ GAUGE ☐ STEAM JACKET
IMPELLER DIA ☐ RATED — ☐ MAX. — ☐ TYPE —
MOUNT ☐ BETWEEN BRGS ☐ OVERHUNG
BEARINGS TYPE ☐ RADIAL — ☐ THRUST —
LUBE ☐ RING OIL ☐ FLOOD ☐ OIL MIST ☐ FLINGER ☐ PRESSURE
COUPLING ☐ MFR FAST ☐ MODEL —
DRIVER HALF MTD BY ☐ PUMP MFR ☐ DRIVER MFR
○ MECH SEAL ○ PACKING ○ AUX SEAL/PACKING
MFR TYPE MODEL —
MFR CODE — API CODE —

AUXILIARY PIPING

○ C W PIPE PLAN ○ Cu. ○ SS. ○ TUBING ○ PIPE
☐ TOTAL COOLING WATER REQ'D GPM — ○ SIGHT F.I. REQ'D.
○ PACKING COOL INJECTION REQ'D ☐ TOTAL GPM — ☐ PSIG —
○ SEAL FLUSH PIPE PLAN — ○ C.S. ○ S.S ○ TUBING ○ PIPE
○ EXTERNAL SEAL FLUSH FLUID — ☐ GPM — ☐ PSIG —
○ AUXILIARY SEAL PLAN — ○ C.S ○ S.S ○ TUBING ○ PIPE
○ AUX SEAL FLUSH/QUENCH FLUID —

MATERIALS

☐ PUMP CASE/TRIM API CLASS —
CASING — CORR ALL — IN.
IMPELLER — WEAR RINGS —
SHAFT — SLEEVE(S) —
CASE INT COATING/LINING — GLAND —
☐ BASEPLATE — DRIP PAN —

○ SITE CONDITIONS

ELEVATION. FT 385 — DUST/FUMES —
AMB TEMP F — MAX — MIN — AREA ELECT. CL — GR. — DIV. —
COOLING WATER SUPPLY — PSIG — F RETURN: — PSIG — °F

☐ PERFORMANCE

PROPOSAL CURVE NO. —
RPM 1750 — NO. OF STAGES —
NPSHR. FT.: @ IMPELLER — T.O.F. —
EFF. — % — BHP RATED —
MAX. BHP RATED IMP —
MAX HEAD RATED IMP —
MIN CONTINUOUS GPM —
ROTATION (VIEWED FROM C'PLG END) —

○ INSPECTION AND TESTS

SHOP INSPECTION	○ REQ'D	
HYDROSTATIC TEST	○ REQ'D	○ WITNESS
PERFORMANCE TEST	○ REQ'D	○ WITNESS
NPSH TEST	○ REQ'D	○ WITNESS
INT. INSP AFTER TEST	○ REQ'D	○ WITNESS
—	○ REQ'D	○ WITNESS

☐ INT. WEAR PARTS

WEAR RINGS ☐ CASE ☐ IMP.
DIA. — IN. CLEARANCE — IN
INTERSTAGE BUSHINGS.
DIA — IN. CLEARANCE — IN

VERTICAL PUMPS

PIT OR SUMP DEPTH ○ —
PUMP LENGTH ○ —
MIN. SUBMERGENCE REQ'D. ☐ —
COLUMN PIPE ☐ FLANGED ☐ THREADED
LINE SHAFT. ☐ OPEN ☐ ENCLOSED
BRGS. ☐ BOWL — ☐ LINE SHAFT —
BRG. LUB ☐ WATER ☐ OIL ☐ GREASE
FLOAT & ROD ○ C.S ○ S.S ○ BRZ ○ NONE
FLOAT SWITCH ☐ —
PUMP THRUST LB ☐ UP — ☐ DOWN —
MOUNTING PLATE REQ'D ☐ —

☐ WEIGHTS AND DIMENSIONS

APPROX. WT PUMP & BASE — LB
MOTOR — LB. TURBINE — LB
BASE PLATE DIMENSIONS —

APPLICABLE SPECIFICATIONS

○ API 610 ○ ANSI B73.1, B73.2 —
○ PROJECT SPECIFICATIONS —

REMARKS: ① VENDOR SPECIFY

PREPARED BY R.M.
DATE 10-6-81
APPROVED BY —

REVISION △	BY	DATE
REVISION △	BY	DATE
REVISION △	BY	DATE

The Rust Engineering Company
A Subsidiary of Wheelabrator-Frye Inc.

CENTRIFUGAL PUMP DATA SHEET

CONTRACT NO 21-1997/2548
EQUIPMENT NO. P-16915 A&B
NO. REQUIRED 2
SHEET 1 OF 1

CLIENT INTERNATIONAL COAL REFINING COMPANY
PROJECT 6000 TPSD SRC-I DEMONSTRATION PLANT — PLANT LOCATION NEWMAN, KENTUCKY
SERVICE BOILER FEEDWATER PUMP
VENDOR — P.O. NO.
TYPE — MODEL — SERIAL NO.
NO. OF MOTORS REQ'D 2 — ITEM NO. — FURN. BY Vendor — MFR BY
NO OF TURBINES REQ'D — ITEM NO. — FURN BY — MFR BY
NOTE ○ INDICATES INFORMATION TO BE COMPLETED BY PURCHASER — ☐ BY MANUFACTURER

○ OPERATING CONDITIONS (EACH PUMP)

LIQUID BOILER WATER — US GPM AT PT. NOR 900 RATED —
DISCHARGE. PSIG 200
PT F. NOR. 365 MAX. 400 — SUCTION. PSIG. MAX 150 RATED —
SP GR AT PT 0.882 — DIFF PRESS.. PSI 50
VAP PRESS AT PT. PSIA — DIFF HEAD. FT 131
VIS. AT PT LB/M/FT-HR — NPSHA. FT
CORR/EROS CAUSED BY WHP: 26.3

CONSTRUCTION

NOZZLES	SIZE (IN.)	RATING	FACING	LOCATION
SUCTION				
DISCHARGE				

CASE MT ☐ CENTERLINE ☐ FOOT ☐ BRACKET ○ VERT. (TYPE) —
SPLIT ☐ AXIAL ☐ RAD: TYPE VOLUTE ☐ SGL ☐ DBL ☐ DIFFUSER
PRESS ☐ MAX. ALLOW. — PSIG — F. ☐ HYDRO TEST — PSIG
CONNECT ☐ VENT ☐ DRAIN ☐ GAUGE ☐ STEAM JACKET
IMPELLER DIA ☐ RATED — ☐ MAX — ☐ TYPE —
MOUNT ☐ BETWEEN BRGS ☐ OVERHUNG
BEARINGS TYPE ☐ RADIAL — ☐ THRUST —
LUBE ☐ RING OIL ☐ FLOOD ☐ OIL MIST ☐ FLINGER ☐ PRESSURE
COUPLING ☐ MFR. — ☐ MODEL —
DRIVER HALF MTD BY ☐ PUMP MFR ☐ DRIVER MFR
◉ MECH SEAL ○ PACKING ○ AUX. SEAL/PACKING
MFR TYPE MODEL —
MFR CODE — API CODE

AUXILIARY PIPING

○ C W PIPE PLAN ○ Cu ○ SS ○ TUBING ○ PIPE
☐ TOTAL COOLING WATER REQ'D GPM — ○ SIGHT F.I. REQ'D.
○ PACKING COOL INJECTION REQ'D ☐ TOTAL GPM — ☐ PSIG —
◉ SEAL FLUSH PIPE PLAN 11 ◉ C.S. ○ S.S. ○ TUBING ◉ PIPE
○ EXTERNAL SEAL FLUSH FLUID — ☐ GPM — ☐ PSIG —
○ AUXILIARY SEAL PLAN — ○ C.S. ○ S.S ○ TUBING ○ PIPE
○ AUX. SEAL FLUSH/QUENCH FLUID —

MATERIALS

○ PUMP CASE/TRIM API CLASS —
CASING Cast Iron CORR. ALL — IN.
IMPELLER Cast Iron WEAR RINGS Cast Iron
SHAFT 316SS SLEEVE(S) 316SS
CASE INT. COATING/LINING — GLAND —
☐ BASEPLATE — DRIP PAN —

○ SITE CONDITIONS

ELEVATION. FT — DUST/FUMES —
AMB TEMP F — MAX — MIN. — AREA ELECT. CL — GR. — DIV. —
COOLING WATER SUPPLY — PSIG — F RETURN — PSIG — °F

☐ PERFORMANCE

PROPOSAL CURVE NO —
RPM — NO OF STAGES —
NPSHR. FT @ IMPELLER — T.O.F —
EFF. — BHP RATED —
MAX BHP RATED IMP —
MAX HEAD RATED IMP —
MIN CONTINUOUS GPM —
ROTATION (VIEWED FROM CPLG END) —

○ INSPECTION AND TESTS

SHOP INSPECTION	◉ REQ'D	
HYDROSTATIC TEST	◉ REQ'D	○ WITNESS
PERFORMANCE TEST	◉ REQ'D	○ WITNESS
NPSH TEST	○ REQ'D	○ WITNESS
INT INSP AFTER TEST	○ REQ'D	○ WITNESS
—	○ REQ'D	○ WITNESS

☐ INT. WEAR PARTS

WEAR RINGS ☐ CASE ☐ IMP.
DIA — IN CLEARANCE — IN
INTERSTAGE BUSHINGS
DIA. — IN CLEARANCE — IN

VERTICAL PUMPS

PIT OR SUMP DEPTH ○ —
PUMP LENGTH ○ —
MIN. SUBMERGENCE REQ'D ☐ —
COLUMN PIPE ☐ FLANGED ☐ THREADED
LINE SHAFT ☐ OPEN ☐ ENCLOSED
BRGS. ☐ BOWL — ☐ LINE SHAFT —
BRG. LUB ☐ WATER ☐ OIL ☐ GREASE
FLOAT & ROD ○ C.S. ○ S.S ○ BRZ ○ NONE
FLOAT SWITCH ☐ —
PUMP THRUST. LB ☐ UP — ☐ DOWN —
MOUNTING PLATE REQ'D ☐

☐ WEIGHTS AND DIMENSIONS

APPROX WT. PUMP & BASE — LB
MOTOR — LB TURBINE — LB
BASE PLATE DIMENSIONS

APPLICABLE SPECIFICATIONS

○ API 610 ○ ANSI B73.1 B73.2 —
◉ PROJECT SPECIFICATIONS —

REMARKS:

PREPARED BY / DATE / APPROVED BY / DATE	REVISION 1	REVISION Δ	REVISION Δ
	BY BSY	BY	BY
	DATE 12/29/83	DATE	DATE
	APP'D	APP'D	APP'D
	DATE	DATE	DATE

The Rust Engineering Company
A Subsidiary of Wheelabrator-Frye Inc.

CENTRIFUGAL PUMP DATA SHEET

CONTRACT NO. 21-1997F/2548
EQUIPMENT NO. P-1618 A&B
NO. REQUIRED 2
SHEET ____ OF ____

CLIENT: INTERNATIONAL COAL REFINING COMPANY
PROJECT: 6000 TPSD SRC-I DEMONSTRATION PLANT — PLANT LOCATION: DEWMAN, KENTUCKY
SERVICE: CONDENSATE TRANSFER PUMP
VENDOR — P.O. NO.
TYPE — MODEL — SERIAL NO.
NO. OF MOTORS REQ'D 2 — ITEM NO. — FURN. BY Vendor — MFR BY
NO. OF TURBINES REQ'D — ITEM NO. — FURN BY — MFR BY
NOTE: ○ INDICATES INFORMATION TO BE COMPLETED BY PURCHASER — ☐ BY MANUFACTURER

○ OPERATING CONDITIONS (EACH PUMP)

LIQUID SLOP OIL — US GPM AT PT NOR 150 RATED ____
DISCHARGE, PSIG 50
PT. F. NOR 77 MAX 150 SUCTION, PSIG. MAX 0 RATED ____
SP GR AT PT 1.0 DIFF PRESS., PSI 50
VAP PRESS AT PT, PSIA ____ DIFF HEAD, FT 116
VIS. AT PT LB/M/FT-HR ____ NPSHA, FT ____
CORR/EROS. CAUSED BY ____ WHP: 4.39

CONSTRUCTION

NOZZLES	SIZE/IN	RATING	FACING	LOCATION
SUCTION				
DISCHARGE				

CASE MT ☐ CENTERLINE ☐ FOOT ☐ BRACKET ☐ VERT. (TYPE) ____
SPLIT ☐ AXIAL ☐ RAD: TYPE VOLUTE ☐ SGL ☐ DBL ☐ DIFFUSER
PRESS ☐ MAX ALLOW. ____ PSIG ____ F. ☐ HYDRO TEST ____ PSIG
CONNECT ☐ VENT ☐ DRAIN ☐ GAUGE ☐ STEAM JACKET
IMPELLER DIA ☐ RATED ____ ☐ MAX ____ ☐ TYPE ____
MOUNT. ☐ BETWEEN BRGS ☐ OVERHUNG
BEARINGS TYPE ☐ RADIAL ____ ☐ THRUST ____
LUBE ☐ RING OIL ☐ FLOOD ☐ OIL MIST ☐ FLINGER ☐ PRESSURE
COUPLING. ☐ MFR. ____ ☐ MODEL ____
DRIVER HALF MTD BY: ☐ PUMP MFR ☐ DRIVER MFR
⊗ MECH SEAL ○ PACKING ○ AUX SEAL/PACKING
MFR. TYPE, MODEL ____
MFR CODE ____ API CODE ____

AUXILIARY PIPING

○ C W PIPE PLAN ○ Cu ○ SS ○ TUBING ○ PIPE
☐ TOTAL COOLING WATER REQ'D GPM ____ ○ SIGHT F.I. REQ'D.
○ PACKING COOL INJECTION REQ'D ☐ TOTAL GPM ____ ☐ PSIG ____
⊗ SEAL FLUSH PIPE PLAN 11 ⊗ C.S. ○ S.S. ○ TUBING ⊗ PIPE
○ EXTERNAL SEAL FLUSH FLUID ____ ☐ GPM ____ ☐ PSIG ____
○ AUXILIARY SEAL PLAN ____ ○ C.S. ○ S.S ○ TUBING ○ PIPE
○ AUX. SEAL FLUSH/QUENCH FLUID ____

MATERIALS

○ PUMP CASE/TRIM API CLASS ____
CASING Cast Iron CORR. ALL ____ IN.
IMPELLER Cast Iron WEAR RINGS Cast Iron
SHAFT 316SS SLEEVE(S) 316SS
CASE INT. COATING/LINING ____ GLAND ____
☐ BASEPLATE ____ DRIP PAN ____

○ SITE CONDITIONS

ELEVATION, FT ____ DUST/FUMES ____
AMB TEMP F ____ MAX ____ MIN. ____ AREA ELECT. CL ____ GR. ____ DIV. ____
COOLING WATER SUPPLY: ____ PSIG ____ F RETURN ____ PSIG ____ °F

☐ PERFORMANCE

PROPOSAL CURVE NO ____
RPM ____ NO OF STAGES ____
NPSHR, FT ____ IMPELLER ____ T.O.F ____
EFF. ____ BHP RATED ____
MAX. BHP RATED IMP ____
MAX HEAD RATED IMP ____
MIN CONTINUOUS GPM ____
ROTATION (VIEWED FROM CPLG END): ____

○ INSPECTION AND TESTS

SHOP INSPECTION	⊗ REQ'D	
HYDROSTATIC TEST	⊗ REQ'D	○ WITNESS
PERFORMANCE TEST	⊗ REQ'D	○ WITNESS
NPSH TEST	○ REQ'D	○ WITNESS
INT INSP AFTER TEST	○ REQ'D	○ WITNESS
____	○ REQ'D	○ WITNESS

☐ INT. WEAR PARTS

WEAR RINGS ☐ CASE ☐ IMP.
DIA ____ IN CLEARANCE ____ IN
INTERSTAGE BUSHINGS
DIA. ____ IN CLEARANCE ____ IN

VERTICAL PUMPS

PIT OR SUMP DEPTH ○ ____
PUMP LENGTH ○ ____
MIN. SUBMERGENCE REQ'D ☐ ____
COLUMN PIPE ☐ FLANGED ☐ THREADED
LINE SHAFT ☐ OPEN ☐ ENCLOSED
BRGS. ☐ BOWL ____ ☐ LINE SHAFT ____
BRG. LUB ☐ WATER ☐ OIL ☐ GREASE
FLOAT & ROD ○ C.S. ○ S.S ○ BRZ ○ NONE
FLOAT SWITCH ☐ ____
PUMP THRUST, LB ☐ UP ____ ☐ DOWN ____
MOUNTING PLATE REQ'D ☐ ____

☐ WEIGHTS AND DIMENSIONS

APPROX WT. PUMP & BASE ____ LB
MOTOR ____ LB. TURBINE ____ LB
BASE PLATE DIMENSIONS ____

APPLICABLE SPECIFICATIONS

○ API 610 ○ ANSI B73.1, B73.2 ____
⊗ PROJECT SPECIFICATIONS ____

REMARKS:

PREPARED BY	REVISION △	REVISION △	REVISION △
DATE			
APPROVED BY	BY / DATE	BY / DATE	BY / DATE
DATE	APP'D / DATE	APP'D / DATE	APP'D / DATE

The Rust Engineering Company
A Subsidiary of Wheelabrator-Frye Inc.

CENTRIFUGAL PUMP DATA SHEET

CONTRACT NO. 21-1997/2548
EQUIPMENT NO. P-16921 A&B
NO. REQUIRED 2
SHEET ____ OF ____

CLIENT: INTERNATIONAL COAL REFINING COMPANY
PROJECT: 6000 TPSD SRC-I DEMONSTRATION PLANT — PLANT LOCATION: NEWHAM, KENTUCKY
SERVICE: BOILER FEED WATER PUMP
VENDOR — P.O. NO.
TYPE — MODEL — SERIAL NO.
NO. OF MOTORS REQ'D 2 — ITEM NO. — FURN. BY Vendor — MFR BY
NO OF TURBINES REQ'D — ITEM NO. — FURN BY — MFR BY
NOTE: ○ INDICATES INFORMATION TO BE COMPLETED BY PURCHASER — ☐ BY MANUFACTURER

○ OPERATING CONDITIONS (EACH PUMP)

LIQUID: BOILER WATER
US GPM AT PT. NOR 700 RATED ____
DISCHARGE, PSIG 200
PT F NOR 365 MAX 406
SUCTION, PSIG, MAX 150 RATED ____
SP GR AT PT 0.882
DIFF PRESS., PSI 50
VAP PRESS AT PT, PSIA ____
DIFF HEAD FT 131
VIS. AT PT. LB/M/FT-HR ____
NPSHA, FT ____
CORR/EROS. CAUSED BY ____
WHP: 20.4

CONSTRUCTION

NOZZLES	SIZE (IN.)	RATING	FACING	LOCATION
SUCTION				
DISCHARGE				

CASE MT ☐ CENTERLINE ☐ FOOT ☐ BRACKET ☐ VERT. (TYPE) ____
SPLIT ☐ AXIAL ☐ RAD: TYPE VOLUTE ☐ SGL ☐ DBL ☐ DIFFUSER
PRESS ☐ MAX. ALLOW. ____ PSIG ____ F. ☐ HYDRO TEST ____ PSIG
CONNECT ☐ VENT ☐ DRAIN ☐ GAUGE ☐ STEAM JACKET
IMPELLER DIA ☐ RATED ____ ☐ MAX ____ ☐ TYPE ____
MOUNT ☐ BETWEEN BRGS ☐ OVERHUNG
BEARINGS TYPE ☐ RADIAL ____ ☐ THRUST ____
LUBE ☐ RING OIL ☐ FLOOD ☐ OIL MIST ☐ FLINGER ☐ PRESSURE
COUPLING ☐ MFR. ____ ☐ MODEL ____
DRIVER HALF MTD BY ☐ PUMP MFR ☐ DRIVER MFR
⊗ MECH SEAL ○ PACKING ○ AUX SEAL/PACKING
MFR TYPE, MODEL ____
MFR CODE ____ API CODE ____

AUXILIARY PIPING

○ C W PIPE PLAN ○ Cu ○ SS ○ TUBING ○ PIPE
☐ TOTAL COOLING WATER REQ'D GPM ____ ○ SIGHT F.I. REQ'D.
☐ PACKING COOL INJECTION REQ'D ☐ TOTAL GPM ____ ☐ PSIG ____
⊗ SEAL FLUSH PIPE PLAN 11 ⊗ C.S. ○ S.S. ○ TUBING ⊗ PIPE
○ EXTERNAL SEAL FLUSH FLUID ____ ☐ GPM ____ ☐ PSIG ____
○ AUXILIARY SEAL PLAN ____ ○ C.S. ○ S.S ○ TUBING ○ PIPE
○ AUX. SEAL FLUSH/QUENCH FLUID ____

MATERIALS

○ PUMP CASE/TRIM API CLASS ____
CASING Cast Iron CORR ALL ____ IN.
IMPELLER Cast Iron WEAR RINGS Cast Iron
SHAFT 316SS SLEEVE(S) 316SS
CASE INT. COATING/LINING ____ GLAND ____
☐ BASEPLATE ____ DRIP PAN ____

○ SITE CONDITIONS

ELEVATION, FT ____ DUST/FUMES ____
AMB TEMP F ____ MAX ____ MIN. ____ AREA ELECT. CL ____ GR. ____ DIV. ____
COOLING WATER SUPPLY ____ PSIG ____ F RETURN ____ PSIG ____ °F

☐ PERFORMANCE

PROPOSAL CURVE NO ____
RPM ____ NO OF STAGES ____
NPSHR, FT ℄ IMPELLER ____ T O F ____
EFF. ____ BHP RATED ____
MAX. BHP RATED IMP ____
MAX HEAD RATED IMP ____
MIN CONTINUOUS GPM ____
ROTATION (VIEWED FROM CPLG END) ____

○ INSPECTION AND TESTS

SHOP INSPECTION	⊗ REQ'D	
HYDROSTATIC TEST	⊗ REQ'D	○ WITNESS
PERFORMANCE TEST	⊗ REQ'D	○ WITNESS
NPSH TEST	○ REQ'D	○ WITNESS
INT INSP AFTER TEST ____	○ REQ'D	○ WITNESS
	○ REQ'D	○ WITNESS

☐ INT. WEAR PARTS

WEAR RINGS ☐ CASE ☐ IMP.
DIA ____ IN CLEARANCE ____ IN
INTERSTAGE BUSHINGS
DIA. ____ IN CLEARANCE ____ IN

VERTICAL PUMPS

PIT OR SUMP DEPTH ____
PUMP LENGTH ○ ____
MIN SUBMERGENCE REQ'D ☐ ____
COLUMN PIPE ☐ FLANGED ☐ THREADED
LINE SHAFT ☐ OPEN ☐ ENCLOSED
BRGS ☐ BOWL ____ ☐ LINE SHAFT ____
BRG. LUB ☐ WATER ☐ OIL ☐ GREASE
FLOAT & ROD ○ C.S. ○ S.S ○ BRZ ○ NONE
FLOAT SWITCH ☐ ____
PUMP THRUST, LB ☐ UP ____ ☐ DOWN ____
MOUNTING PLATE REQ'D ☐ ____

☐ WEIGHTS AND DIMENSIONS

APPROX WT. PUMP & BASE ____ LB
MOTOR ____ LB TURBINE ____ LB
BASE PLATE DIMENSIONS

APPLICABLE SPECIFICATIONS

○ API 610 ○ ANSI B73.1 B73.2 ____
⊗ PROJECT SPECIFICATIONS ____

REMARKS:

PREPARED BY	REVISION △	REVISION △	REVISION △
DATE			
APPROVED BY	BY DATE	BY DATE	BY DATE
DATE	APP'D DATE	APP'D DATE	APP'D DATE

The Rust Engineering Company
A Subsidiary of Wheelabrator-Frye Inc

CENTRIFUGAL PUMP DATA SHEET

CONTRACT NO. 21-1997F/2548
EQUIPMENT NO. P-16912 A&B
NO REQUIRED 2
SHEET 1 OF 1

CLIENT: INTERNATIONAL COAL REFINING COMPANY
PROJECT: 6000 TPSD SRC-I DEMONSTRATION PLANT — PLANT LOCATION: NEWMAN, KENTUCKY
SERVICE: LIQUID INCINERATOR PUMP
VENDOR — P.O. NO.
TYPE — MODEL — SERIAL NO.
NO. OF MOTORS REQ'D 2 — ITEM NO. — FURN BY Vendor — MFR BY
NO OF TURBINES REQ'D — ITEM NO. — FURN BY — MFR BY
NOTE: ○ INDICATES INFORMATION TO BE COMPLETED BY PURCHASER — □ BY MANUFACTURER

○ OPERATING CONDITIONS (EACH PUMP)

LIQUID SLOP OIL & PHENOL — US GPM AT PT NOR 6.0 RATED 20
DISCHARGE, PSIG 100
PT F NOR 77 MAX 150 — SUCTION, PSIG MAX 0 RATED
SP GR AT PT 1.0 — DIFF PRESS., PSI 100
VAP PRESS AT PT, PSIA — DIFF HEAD, FT 231
VIS. AT PT., LBM/FT-HR — NPSHA, FT
CORR/ERUS CAUSED BY — WHP: 17

CONSTRUCTION

NOZZLES	SIZE (IN.)	RATING	FACING	LOCATION
SUCTION				
DISCHARGE				

CASE MT □ CENTERLINE □ FOOT □ BRACKET □ VERT. (TYPE)
SPLIT □ AXIAL □ RAD: TYPE VOLUTE □ SGL □ DBL □ DIFFUSER
PRESS. □ MAX. ALLOW. ____ PSIG ____ F. □ HYDRO TEST ____ PSIG
CONNECT □ VENT □ DRAIN □ GAUGE □ STEAM JACKET
IMPELLER DIA □ RATED ____ □ MAX ____ □ TYPE ____
MOUNT □ BETWEEN BRGS □ OVERHUNG
BEARINGS TYPE □ RADIAL ____ □ THRUST ____
LUBE □ RING OIL □ FLOOD □ OIL MIST □ FLINGER □ PRESSURE
COUPLING □ MFR. ____ □ MODEL ____
DRIVER HALF MTD BY: □ PUMP MFR □ DRIVER MFR
⊗ MECH SEAL ○ PACKING ○ AUX SEAL/PACKING
MFR TYPE, MODEL ____
MFR CODE ____ API CODE ____

AUXILIARY PIPING

○ C.W. PIPE PLAN ○ Cu ○ SS ○ TUBING ○ PIPE
□ TOTAL COOLING WATER REQ'D GPM ____ ○ SIGHT F.I. REQ'D.
○ PACKING COOL INJECTION REQ'D □ TOTAL GPM ____ □ PSIG ____
⊗ SEAL FLUSH PIPE PLAN 11 ⊗ C.S. ○ S.S. ○ TUBING ⊗ PIPE
○ EXTERNAL SEAL FLUSH FLUID ____ □ GPM ____ □ PSIG ____
○ AUXILIARY SEAL PLAN ____ ○ C.S. ○ S.S. ○ TUBING ○ PIPE
○ AUX. SEAL FLUSH/QUENCH FLUID ____

MATERIALS

○ PUMP CASE/TRIM API CLASS ____
CASING Cast Iron CORR. ALL ____ IN.
IMPELLER Cast Iron WEAR RINGS Cast Iron
SHAFT 316SS SLEEVE(S) 316SS
CASE INT. COATING/LINING ____ GLAND ____
□ BASEPLATE ____ DRIP PAN ____

○ SITE CONDITIONS

ELEVATION, FT ____ DUST/FUMES ____
AMB TEMP F ____ MAX ____ MIN. ____ AREA ELECT. CL ____ GR. ____ DIV. ____
COOLING WATER SUPPLY: ____ PSIG ____ F RETURN ____ PSIG ____ °F

○ PERFORMANCE

PROPOSAL CURVE NO ____
RPM ____ NO OF STAGES ____
NPSHR, FT ℄ IMPELLER ____ T.O.F. ____
EFF. ____ BHP RATED ____
MAX. BHP RATED IMP ____
MAX HEAD RATED IMP ____
MIN CONTINUOUS GPM ____
ROTATION (VIEWED FROM CPLG END) ____

○ INSPECTION AND TESTS

SHOP INSPECTION	⊗ REQ'D	
HYDROSTATIC TEST	⊗ REQ'D	○ WITNESS
PERFORMANCE TEST	⊗ REQ'D	○ WITNESS
NPSH TEST	○ REQ'D	○ WITNESS
INT INSP AFTER TEST	○ REQ'D	○ WITNESS
____	○ REQ'D	○ WITNESS

□ INT. WEAR PARTS

WEAR RINGS □ CASE □ IMP.
DIA ____ IN CLEARANCE ____ IN
INTERSTAGE BUSHINGS
DIA. ____ IN CLEARANCE ____ IN

VERTICAL PUMPS

PIT OR SUMP DEPTH ○ ____
PUMP LENGTH ○ ____
MIN SUBMERGENCE REQ'D □ ____
COLUMN PIPE □ FLANGED □ THREADED
LINE SHAFT □ OPEN □ ENCLOSED
BRGS. □ BOWL ____ □ LINE SHAFT ____
BRG. LUB □ WATER □ OIL □ GREASE
FLOAT & ROD ○ C.S. ○ S.S. ○ BRZ ○ NONE
FLOAT SWITCH □ ____
PUMP THRUST, LB □ UP ____ □ DOWN ____
MOUNTING PLATE REQ'D □ ____

□ WEIGHTS AND DIMENSIONS

APPROX WT. PUMP & BASE ____ LB
MOTOR ____ LB TURBINE ____ LB
BASE PLATE DIMENSIONS ____

APPLICABLE SPECIFICATIONS

○ API 610 ○ ANSI B73.1, B73.2 ____
⊗ PROJECT SPECIFICATIONS ____

REMARKS:

PREPARED BY SZ
DATE 10-21-81
APPROVED BY
DATE

REVISION 1	REVISION △	REVISION △
BY BSY	BY	BY
DATE 12/29/83	DATE	DATE
APP'D	APP'D	APP'D
DATE	DATE	DATE

ATMOSPHERIC TANK DATA SHEET

PAGE 1 OF 2

CONTRACT NO. 21-1997F
EQUIPMENT NO. TK-16806
NO. REQUIRED 1
SHEET 1 OF 2

CLIENT: INTERNATIONAL COAL REFINING COMPANY
PROJECT: 6000 TPSD SRC-I DEMONSTRATION PLANT — PLANT LOCATION: HEWIAN, KENTUCKY
SERVICE: QUENCH LIQUID STORAGE TANK
VENDOR — P.O. NO.

TYPE TANK (CHECK ONE)
- ☐ CONE ROOF TANK
- ☐ DOME ROOF TANK
- ☐ OPEN TOP FLOATING ROOF TANK
- ☐ COVERED FLOATING ROOF TANK

DIAMETER 33'0" : HEIGHT 30'0" FT △
CAPACITY: NORMAL 5,141 BBLS △
NEW WORKING 5000 BBLS

DESIGN DATA

PRODUCT STORED: QUENCH LIQUID
STORAGE TEMP. °F: 40
SPECIFIC GRAVITY: 1.0
VISCOSITY, SSU/SSF:
VAPOR PRESSURE, PSIA: NIL
POUR POINT, °F:
FLASH POINT, °F:
AROMATICS, % VOL:
SUSPENDED SOLIDS: (YES/NO) NO
TANK FILLING RATE, GPM:
TANK WITHDRAWAL RATE, GPM:
METAL TEMPERATURE, °F:
CORROSION ALLOWANCE
(TOP 50% OF SHELL) (IN.):

DESIGN CODES

- API 650 STANDARD DESIGN ☒
- API 650 ALTERNATE DESIGN ☐
  - STRESS RELIEF REQUIRED ☐
  - SPECIAL RADIOGRAPHY REQUIRED ☐

GENERAL DESIGN

BOTTOM TYPE
CONE ☒, CROWNED ☐, RIDGE CROWNED ☐, FLAT ☐
SLOPE (IN./10 FT)
FLOATING ROOF TYPE
PAN ☐, PONTOON ☐, DOUBLE DECK ☐
MINIMUM AIR TO PRODUCT EXPOSURE ☐
FOUNDATION
CRUSHED STONE RING ☐
CONCRETE RING ☒
SPECIAL ☐

TANK FITTINGS AND APPURTENANCES

SHELL	REQ'D.	SIZE △
INLET-NOZZLE	1	6"
OUTLET-NOZZLE	1	16" △
HEATING STEAM - INLET		
HEATING CONDENSATE-OUTLET		
SUCTION HEATER MANWAYS		
SHELL MANWAYS	1	24"
MIXER MANWAYS		
NOZZLE MOUNTED ON MIXER M/W COVER		
FLUSH TYPE CLEANOUT		
BOLTED DOORSHEET		
LIT & LS Conn	6	2"
ROOF Drain	1	2"
SPECIAL GAS TIGHT MANUAL GAGE HATCH WITH SAMPLING LOCK		
PRESS/VAC VENT VALVE NOZZLES	2	6"
OPEN VENTS	1	4"
ROOF MANWAYS	1	24"
SPECIAL ROOF MANWAY		
PRIMARY ROOF DRAINS		
FOAM DAMS		
FLOATING ROOF SEALS:		
METAL SHOE		
RESILIENT-FOAM FILLED		
LIQUID FILLED		

INTERNAL	REQ'D.	SIZE
INLET EXTENSION PIECE		
INLET RELAXATION CHAMBER		
SWING LINES		
STATIC ELIMINATING CONNECTIONS		
VORTEX ELIMINATOR		
SUCTION BAFFLE		
MIXER BAFFLE		
CENTER SUMP SUCTION LINE		
CENTER PRODUCT SUCTION SUMP		

MISCELLANEOUS
GROUND TO ROOF STAIRWAY: RADIAL / SPIRAL
AUTOMATIC GROUND READING GAGE
MFG/MODEL /
MIXERS:
MFG/MODEL /
NO. @ BHP
INSULATION
MAT'L/THICKNESS /
INTERNAL COATING
MFG/TYPE /
SHOP PICKLING & SPECIAL PRIMING
SHOP PAINTING OF PLATES: INSIDE / OUTSIDE

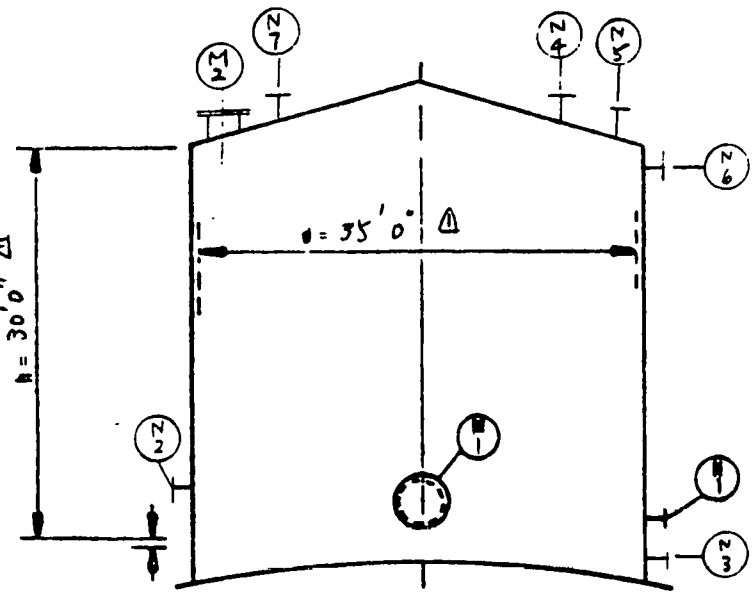
	REVISION △1	REVISION △	REVISION △
PREPARED BY SZ			
DATE 10-21-81			
APPROVED BY	BY BST DATE 12-28-83	BY DATE	BY DATE

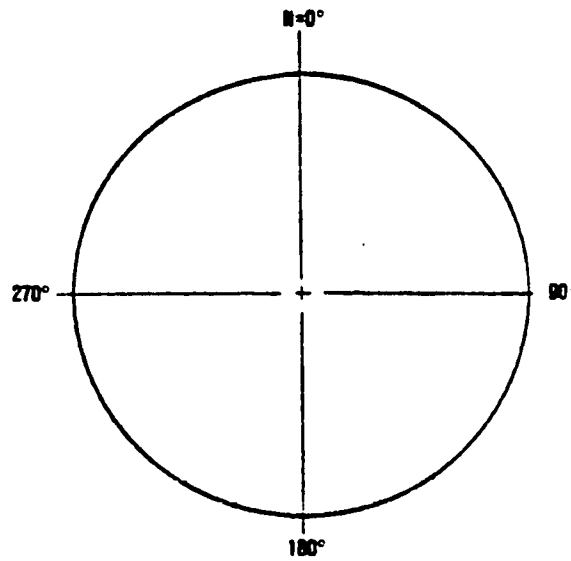
Rust International Corporation

ATMOSPHERIC TANK DATA SHEET

PAGE 2 OF 2

CONTRACT NO 21-2548
EQUIPMENT NO. TK-1806
NO. REQUIRED 1
SHEET 2 OF 2





MARK	SIZE/ RATING	NO. REQ.	ORIENT. θ = 0°	HT. FROM BOTTOM	DIST. FROM CENTER	SERVICE
N-1	16"-150# S.O.	1	△			Outlet Nozzle
N-2	6"-150# S.O.	1	△			Inlet Nozzle
N-3	2"-150# S.O.	1				Drain △
N-4	6"-150# S.O.	1				Pressure Relief △
N-5	4"-150# S.O.	1				Liquid Overflow △
N-6	2"-150# S.O.	6				LIT & LS Conn △
N-7	6"-150# S.O.	1				Vaccum Relief △
M-1	24"-API650	1				SHELL MANWAY
M-2	24"-API650	1				ROOF MANWAY △

CONNECTION SCHEDULE

- SHELL MANWAYS PER FIG. _____ ○ ALT. _____ NOTE ____ PROJ. IN _____
- ROOF MANWAYS PER FIG. _____ ○ OTHER _____ PROJ IN _____
- SHELL NOZZLES PER FIG. _____ ○ SINGLE ○ DOUBLE ○ SPECIAL PROJ. IN _____
- ROOF NOZZLES PER FIG _____ & ____ PROJ IN _____ SHELL COUP PER FIG _____ TYPE _____
- NOZZLE FLANGE PER FIG _____ ○ PLATE ○ SLIP ON ○ WELD NECK
- * PER API STANDARD _____ , APPENDIX _____

COMMENTS:

The Rust Engineering Company

(GENERAL EQUIPMENT DATA SHEET)

CONTRACT NO. 21-1997#
EQUIPMENT NO. JK-1691F A AND B
NO. REQUIRED 1
SHEET ____ OF ____

CLIENT INTERNATIONAL COAL REFINING COMPANY

PROJECT 6000 TPSD SRC-I DEMONSTRATION PLANT — PLANT LOCATION NEWMAN, KENTUCKY

SERVICE SLOP OIL AND WASTE LIQUID PREPARATION SYSTEM

VENDOR — P.O. NO.

THIS IS A PRELIMINARY DESCRIPTION OF A SLOP OIL AND WASTE LIQUID PREPARATION SYSTEM. THE BASIC CONCEPT WAS PRIMARILY INTENDED FOR EQUIPMENT COST DETERMINATION. SPECIFIC DETAILS WILL BE DEVELOPED DURING THE DETAIL DESIGN PHASE.

THE SLOP OIL AND WASTE LIQUID PREPARATION SYSTEM WILL CONSIST OF TWO 2,500 BBL NITROGEN BLANKETED STORAGE TANKS WHERE WASTE LIQUIDS CAN BE BROUGHT IN BY TRUCK OR BY TRANSFER LINE. THE DUAL TANK SYSTEM WILL ALLOW MATERIAL SEGREGATION AS WELL AS INDIVIDUAL MIXTURE PREPARATION OR CONDITIONING FOR EFFECTIVE OXIDATION.

THE INDIVIDUAL TANKS WILL INCLUDE HIGH TURN OVER MIXERS WITH COOLING AND HEATING COILS USING COOLING WATER AND SUPERHEATED STEAM RESPECTIVELY. THE INTER TANK PUMPING / CIRCULATING MANIFOLD ALLOWS FOR MATERIAL TRANSFER BETWEEN THE TANKS AS WELL AS TO A STATIC MIXER SECTION FOR CHEMICAL ADDITION. ALL CHEMICALS LIKE EMULSSION BREAKERS NEUTRALIZERS INHIBITORS POLYMERS, ECT. WILL HAVE INDIVIDUAL FEEDING AND METERING TANKS.

PREPARED BY SZ	REVISION △	REVISION △	REVISION △
DATE 10-21-81	BY DATE	BY DATE	BY DATE
APPROVED BY			

The Rust Engineering Company
A Subsidiary of Whessoe/Baker-Frye Inc

VERTICAL PRESSURE VESSEL DATA SHEET

CONTRACT NO. 21-1957F
EQUIPMENT NO. V-16808
NO. REQUIRED ONE
SHEET 1 OF 3

CLIENT	INTERNATIONAL COAL REFINING COMPANY		
PROJECT	6000 TPSD SRC-I DEMONSTRATION PLANT	PLANT LOCATION: NEWMAN, KENTUCKY	
SERVICE	VERTICAL FLARE K.O. DRUM	P.O. NO.	
VENDOR			
DIAMETER: INSIDE	528 IN., OUTSIDE	IN.	MATERIALS
VERT. HT T/L TO T/L	69 FT	0 IN.	SHELL SA-516-70 HEADS SA-516-70
BTM. T/L FROM GRADE	17 FT	0 IN.	SUPPORT SA-36 GASKETS SEE NOTE 14
OPERATING CONDITIONS			NOZZLE: NECK SA-53-B/SA106-B FLANGE SA-105 / SA-181
OPER TEMP		°F	COUPLINGS — TYPE —
MAX TEMP	800°F		INTERNALS: FIXED SA-36 REMOVABLE —
OPER PRESSURE	MAX. OPER. PRESSURE 20 PSIG		BOLTING: PRESSURE SA-193-B7 INTERNAL —
SPECIFIC GRAVITY, LIQ	1.0 AT TEMP 400 °F		EST. ERECTION WT (LB) LATER

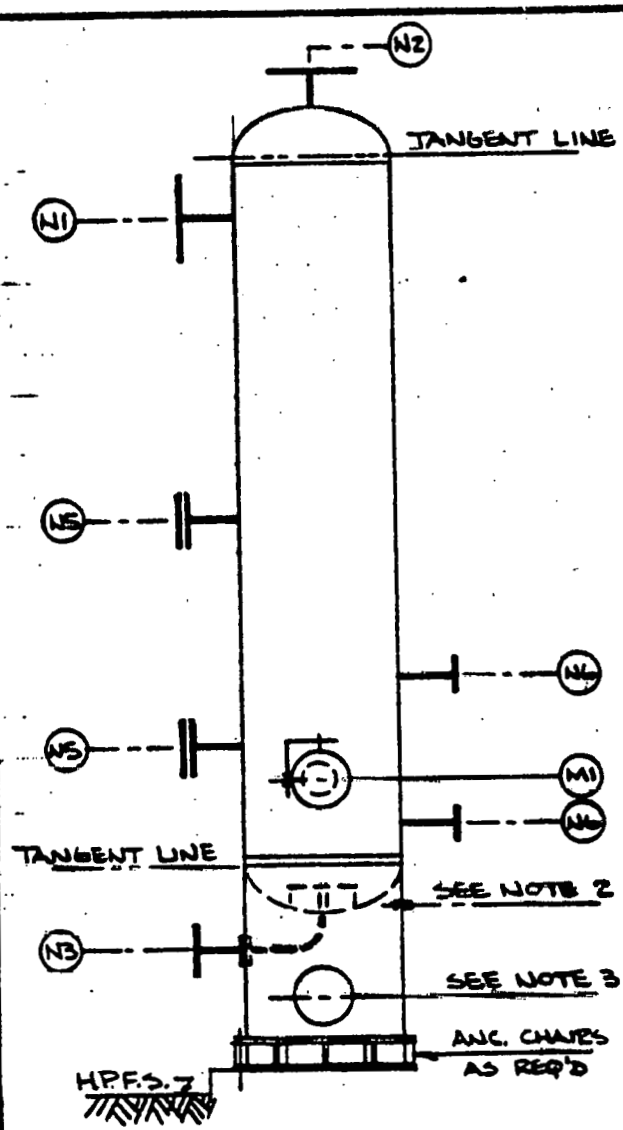
DESIGN		
CODE: ASME SEC VIII, DIV. 1	☒ STAMPED	
NATIONAL BOARD REGISTRATION	YES	
DESIGN TEMP	900°F	
DESIGN PRESS: INTERNAL	150	PSIG
EXTERNAL (VAC)	—	PSI
MAX ALLOW WORKING PRESS/TEMP	SEE NOTE 10	PSIG/°F
CORROSION ALLOW: SHELL/HEADS	1/4	IN.
INTERNALS	1/4	IN.
HEAD TYPE	2:1 SEMI-ELLIPTICAL	
HYDROTEST PRESS/TEMP	1.5 x MAWP (N+C) (NOTE 9)	PSIG/°F
RADIOGRAPHY: EXTENT	SPOT CODE ASME; SEC VIII	
POSTWELD HEAT TREAT:	NO	
EARTHQUAKE CODE	(SEE NOTE 15) ZONE TWO	
WIND PRESS	(SEE NOTE 15)	25 PSF
INSULATION: NO	THICK: —	IN.
FIREPROOFING: YES	THICK: SEE NOTE 11	IN.
VESSEL SUPPORT TYPE:	SKIRT	

NOZZLES

FLANGE RATING 150# COUPLING RATING

MARK NO.	NO. REQ'D.	SIZE IN	FACING	SERVICE
N-1	1	46	R.F.W.N.	INLET (SEE NOTE 7)
N-2	1	46	R.F.W.N.	OUTLET (SEE NOTE 7)
N-3	1	8 Δ	R.F.S.O.	DRAIN
N-4				RELIEF
N-5	2	6	R.F.S.O.	FUTURE (W/BLD. FLGE.)
N-6	2	1½	R.F.S.O.	LIQUID LEVEL CONN.
N-7				
N-8				
N-9				
N-10				
N-11				
N-12				
M-1	1	20		MANHOLE W/COVER & DAVIT
H-1				HANDHOLE W/BLIND

LIQUID LEVEL (FROM BOTTOM T/L) NORMAL	3 FT	0 IN.
MAX.	5 FT	0 IN.
MIN.	1 FT	0 IN.



PREPARED BY	B. MAKADIA	REVISION 1		REVISION 2		REVISION 3	
DATE	10-6-81						
APPROVED BY	S. ZANUDA	BY	DATE 3-26-82	BY BJY	DATE 12-27-83	BY	DATE
DATE	10-7-81	APP'D	DATE	APP'D	DATE	APP'D	DATE

44—071
11/8/80

TI Rust Engineering Company
A Subsidiary of Whittaker-Frye Inc

GENERAL EQUIPMENT DATA SHEET

CLIENT INTERNATIONAL COAL REFINING COMPANY		CONTRACT NO. 21-1997 F
ADDRESS		BY P. MAKADIA DATE 10-5-81
PLANT LOCATION NEWMAN, KENTUCKY		APPROVED DATE
ITEM VERTICAL FLARE K.O. DRUM		EQUIP. IDENT. NO. V-161 01

1. ALL FLANGES 26" AND LARGER TO MEET API-605 STD. ALL FLANGES UNDER 26" TO MEET ANSI B16.5.

2. SKIRT VENT (1 REQUIRED) TO BE A 4"-SCH 40 PIPE SLEEVE, LOCATE AS HIGH AS POSSIBLE ON SKIRT.

3. SKIRT ACCESS OPENING (1 REQUIRED) TO BE 20" NOM. DIA.

4. ALL NOZZLES TO BE REINFORCED AS REQUIRED PER THE A.S.M.E. CODE, SECTION VIII DIVISION 1.

5. ALL NOZZLES TO HAVE A 6" MIN. CENTERLINE PROJECTION FROM OUTSIDE OF VESSEL WALL.

6. O.D. OF SKIRT SHALL MATCH O.D. OF VESSEL. SUPPLIER SHALL FURNISH THE SKIRT AND BASE PL THICKNESS AND ANCHOR BOLT DESIGN CALCULATIONS. THE SKIRT SHALL BE 3/8" MINIMUM THICKNESS.

7. SUPPLIER SHALL DESIGN & FURNISH TWO LIFTING LUGS.

8. SUPPLIER SHALL FURNISH TWO ELECTRICAL GROUNDING CLIPS.

9. SUPPLIER SHALL CALCULATE THE MAWP, NEW AND COLD, USING AS BUILT THICKNESSES. SHOP HYDROTEST PRESSURE SHALL BE A MINIMUM OF 1.5 TIMES THIS MAWP. THE LIMITING COMPONENT SHALL BE SPECIFIED ON THE DRAWING.

REMARKS

REV NO	REVISION	BY	DATE	APPD	DATE	VENDOR
						P.O. NO

44-071
11/3/80

The Rust Engineering Company
A Subsidiary of Wheelabrator-Frye Inc

GENERAL EQUIPMENT DATA SHEET

1	CLIENT INTERNATIONAL COAL REFINING COMPANY	CONTRACT NO. 21-1997 F
2	ADDRESS	BY B. MAKADIA DATE 10-3-84
3	PLANT LOCATION NEWMAN, KENTUCKY	APPROVED DATE
4	ITEM VERTICAL FLARE K.O. DRUM	EQUIP. IDENT. NO. V-168 OS

10. SUPPLIER SHALL UPRATE THE VESSEL TO THE MAWP IN THE FULLY CORRODED CONDITION AND THEN UPRATE TO THE MAXIMUM TEMPERATURE. THIS MAWP, FUTURE HYDRO-TEST PRESSURE IN VERTICAL POSITION AND LIMITING COMPONENT SHALL BE SPECIFIED ON THE DRAWING.

11. THE VESSEL SKIRT SHALL BE FIREPROOFED BY OTHERS WITH 2" OF SHOTCRETE (GUNITE OR EQUAL) ON OUTSIDE ONLY.

12. AFTER COMPLETION, THE SUPPLIER SHALL REMOVE ALL FOREIGN MATERIAL FROM INSIDE AND OUTSIDE THE VESSEL WALL. THE SUPPLIER SHALL SANDBLAST ALL EXTERIOR SURFACES TO NEAR WHITE METAL (SSPC-SP10) AND THEN APPLY 2-3 MILS D.F.T. ZINC PRIMER.

13. ALL FLANGE BOLT HOLES SHALL STRADDLE THE VESSEL CENTERLINES.

14. SUPPLIER SHALL FURNISH A NEW SET OF GASKETS FOR ALL BLIND FLANGED NOZZLES. THE GASKETS SHALL BE 1/16" THICK COMPRESSED ASBESTOS, JM #60 OR EQ..

15. SUPPLIER SHALL DESIGN THIS VESSEL IN ACCORDANCE WITH ASME SECTION VIII, DIVISION 1 CODE. SEISMIC AND WIND LOADING SHALL BE PER ANSI A58.1-1972 STD. USE 80 MPH BASIC WIND SPEED, EXPOSURE "C" AND SEISMIC ZONE 2.

16. THE SUPPLIER HAS THE OPTION TO GIVE ALTERNATE QUOTE, IF PROVEN ECONOMICAL FOR ANY CARBON STEEL SUBSTITUTE MAT'L.

17. SUPPLIER SHALL FURNISH VORTEX BREAKER FOR NOZZLE N3.

REMARKS

SHT. 3 OF 3

REV NO	REVISION	BY	DATE	APPD	DATE	VENDOR

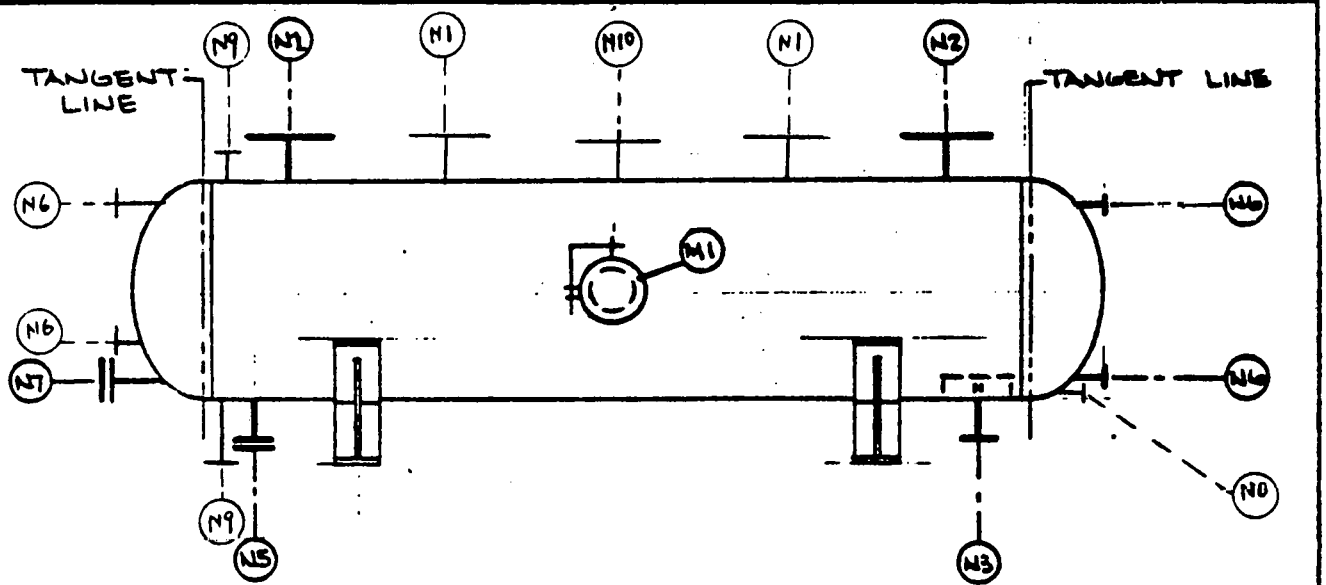
The Rust Engineering Company
A Subsidiary of Wheelabrator-Frye Inc

HORIZONTAL PRESSURE VESSEL DATA SHEET

CONTRACT NO. 21-1997F
EQUIPMENT NO. V-16B09
NO. REQUIRED ONE
SHEET 1 OF 3

CLIENT	INTERNATIONAL COAL REFINING COMPANY		
PROJECT	6000 TPSD SRC-I DEMONSTRATION PLANT	PLANT LOCATION: NEWMAN, KENTUCKY	
SERVICE	HORIZONTAL FLARE K.O. DRUM		
VENDOR		P.O. NO.	
DIAMETER INSIDE	264 (A) IN., OUTSIDE IN.	MATERIALS	
HORIZ. LENGTH T/L TO T/L	80 FT (A) IN.	SHELL SA-516-70	HEADS SA-516-70
BTM. T/L FROM GRADE	FT IN.	SUPPORT SA-36	BASKETS SA-36 NOTE 6
OPERATING CONDITIONS		NOZZLE: NECK SA-53-B/SA-106-B	FLANGE SA-105 / SA-181
OPER. TEMP	°F	COUPLINGS —	TYPE —
MAX TEMP	500°F	INTERNALS: FIXED SA-36	REMOVABLE LATER
OPER PRESS	MAX OPER PRESS 20 PSIG	BOLTING PRESSURE SA-193-B7	INTERNAL —
SPECIFIC GRAVITY, LIQ	1.0 AT TEMP 400 °F	EST. ERECTION WT (LB)	LATER
LIQ. LEVEL NORMAL	MAX MIN.		
DESIGN		NOZZLES	
CODE: ASME SEC VIII, DIV. 1 STAMPED	YES	FLANGE RATING	COUPLING RATING
NATIONAL BOARD REGISTRATION	YES		
DESIGN TEMP	650°F		
DESIGN PRESS: INTERNAL	(A) 150 PSIG		
EXTERNAL (VAC)	PSI		
MAX. ALLOW WORKING PRESS/TEMP	SEE NOTE 6 PSIG/°F		
CORROSION ALLOW: SHELL/HEADS	1/4 IN.		
INTERNALS	1/4 IN.		
HEAD TYPE	2:1 SEMI-ELLIPTICAL		
HYDROTEST PRESS/TEMP	1.5 x MAWP (N/C) NOTE 5 PSIG/°F		
RADIOGRAPHY: EXTENT	FULL CODE A.S.M.E. SEC. VIII		
POSTWELD HEAT TREAT:	NO		
EARTHQUAKE	CODE SEE NOTE 7 ZONE TWO		
WIND PRESS	SEE NOTE 7 PSF		
INSULATION: YES	THICK: SEE NOTE 4 IN.		
FIREPROOFING: YES	THICK: SEE NOTE 4 IN.		
VESSEL SUPPORT TYPE	SADDLES. SEE NOTE 14		

MARK NO.	NO. REQ'D.	SIZE IN	FACING	SERVICE
N-1	2	30 (A)	R.F.W.N.	INLET (NOTE 7A)
N-2	2	24 (A)	R.F.W.N.	OUTLET (NOTE 7A)
N-3	1	8 (A)	R.F.S.O.	DRAIN
N-4				RELIEF
N-5	1	6	R.F.S.O.	FUTURE (W/BLD PLG.)
N-6	24 (B)	1½	R.F.S.O.	LIQUID LEVEL CONN.
N-7	1	18	R.F.S.O.	BAYONET (NOTE 10)
N-8	1	4	R.F.S.O.	Flushing (A)
N-9	2	1½	R.F.S.O.	Instrument (A)
N-10	1	30	R.F.S.O.	Outlet (NOTE 7A) (A)
N-11				
M-1	1	20		MANHOLE W/COVER & DAVIT
H-1				HANDHOLE W/BLIND



PREPARED BY B. MAKADIA	REVISION (1)	REVISION (2)	REVISION (3)	
DATE 10-8-81	BY	BY BSJ	BY	BY
APPROVED BY S. ZAMUDIO	DATE 3-26-82	DATE 12-28-83	DATE	DATE
DATE 10-7-81	APP'D	APP'D	APP'D	APP'D
	DATE	DATE	DATE	DATE

FORM 9314 (5/80) DATE

The Rust Engineering Company
A Subsidiary of Whessoe Rust Pipe Inc

HORIZONTAL PRESSURE VESSEL DATA SHEET

CONTRACT NO. 21-1997F
EQUIPMENT NO. V-16920
NO. REQUIRED 1
SHEET ____ OF ____

LIENT: INTERNATIONAL COAL REFINING COMPANY

PROJECT: 6000 TPSD SRC-I DEMONSTRATION PLANT — PLANT LOCATION: NEWMAN, KENTUCKY

SERVICE: BOILER FEED WATER DRUM AND STEAM GENERATOR, VENT INCINERATOR

VENDOR — P.O. NO.

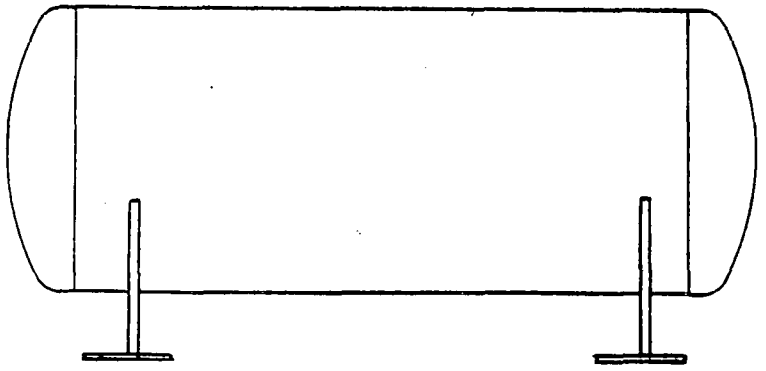
DIAMETER INSIDE	IN OUTSIDE	IN.	MATERIALS
HORIZ LENGTH T/L TO T/L	FT	IN.	SHELL ____ HEADS ____
BTM T/L FROM GRADE	FT	IN.	SUPPORT ____ GASKETS ____
OPERATING CONDITIONS			NOZZLE: NECK ____ FLANGE ____
OPER TEMP		F	COUPLINGS ____ TYPE ____
MAX TEMP		F	INTERNALS: FIXED ____ REMOVABLE ____
OPER PRESS	MAX OPER PRESS	PSIG	BOILING PRESSURE ____ INTERNAL ____
SPECIFIC GRAVITY LIQ	AT TEMP	F	CONSTRUCTION WT (LB) ____
LIQ LEVEL NORMAL	MAX	MIN	
DESIGN			
CODE ASME SEC VIII, DIV	STAMPED		
NATIONAL BOARD REGISTRATION			
DESIGN TEMP			
DESIGN PRESS INTERNAL			
EXTERNAL (VAC)			
MAX ALLOW WORKING PRESS/TEMP			
CORR ALLOW SHELL/HEADS		IN.	
SHELL		IN.	
HEAD TYPE		IN.	
HYDROTEST PRESS/TEMP		PSIG/ F	
RADIOGRAPHY EXTENT	CODE		
POSTWELD HEAT TREAT YES/NO			
EARTHQUAKE	CODE	ZONE	
WIND PRESS		PSF	
INSULATION YES/NO THICK		IN.	
FIREPROOFING YES/NO THICK		IN.	
VESSEL SUPPORT TYPE			

THIS IS PART OF THE VAPOR INCINERATOR PACKAGE TO BE DETERMINED AT A LATER DATE
SZ 10-21-91

NOZZLES

	O.D.	SIZE IN	FACING	COUPLING RATING SERVICE
N-1				INLET
N-2				OUTLET
N-3				DRAIN
N-4				RELIEF
N-5				
N-6				
N-7				
N-8				
N-9				
N-10				
N-11				
M-1				MANHOLE W/COVER
H-1				HANDHOLE W/BLIND

SKETCH



	REVISION △	REVISION △	REVISION △ 2
PREPARED BY SZ			
DATE 10-21-91			
APPROVED BY	BY / DATE	BY / DATE	BY / DATE
DATE	APP'D / DATE	APP'D / DATE	APP'D / DATE

FORM 0715.10-P01

44-071
11/5/80

The Rust Engineering Company
A Subsidiary of Wheelabrator-Frye Inc

GENERAL EQUIPMENT DATA SHEET

1	CLIENT INTERNATIONAL COAL REFINING COMPANY	CONTRACT NO. 2L-1997F
2	ADDRESS	BY B. MAKADIA DATE 10.6.81
3	PLANT LOCATION NEWMAN, KENTUCKY	APPROVED DATE
4	ITEM HORIZONTAL FLARE K.O. DRUM	EQUIP. IDENT. NO. V-1809 A

1. ALL FLANGES 26" AND LARGER TO MEET API-605 STD. ALL FLANGES UNDER 26" TO MEET ANSI B16.5.

2. ALL NOZZLES TO BE REINFORCED AS REQUIRED PER THE A.S.M.E. CODE, SECTION VIII DIVISION 1.

3. ALL NOZZLES TO HAVE A 6" MIN. CENTERLINE PROJECTION FROM OUTSIDE OF VESSEL WALL.

4. THIS VESSEL TO BE INSULATED BY OTHERS WITH 2" OF ASBESTOS FREE CALSIUM SILICATE INSULATION SHALL BE COVERED WITH .016" THICK ALUMINUM JACKETING AND BANDED WITH STAINLESS STEEL. THE SADDLES SHALL BE FIREPROOFED BY OTHERS WITH 2" OF SHOTCRETE (GUNITE OR EQ.)

5. SUPPLIER SHALL CALCULATE THE MAWP, NEW AND COLD, USING AS BUILT THICKNESSES. SHOP HYDROTEST PRESSURE SHALL BE A MINIMUM OF 1.5 TIMES THIS MAWP. THE LIMITING COMPONENT SHALL BE SPECIFIED ON THE DRAWING.

6. SUPPLIER SHALL UPRATE THE VESSEL TO THE MAWP IN THE FULLY CORRODED CONDITION AND THEN UPRATE TO THE MAXIMUM TEMPERATURE. THIS MAWP, FUTURE HYDRO-TEST PRESSURE AND LIMITING COMPONENT SHALL BE SPECIFIED ON DRAWING.

7. THE SUPPLIER SHALL DESIGN THIS VESSEL IN ACCORDANCE WITH ASME, SECTION VIII DIVISION 1 CODE. SEISMIC AND WIND LOADING SHALL BE PER ANSI A58.1-1972 STANDARD. USE 80 MPH BASIC WIND SPEED, EXPOSURE "C" AND SEISMIC ZONE 2.

REMARKS

SHT. 2 OF 3

REV NO	REVISION	BY	DATE	APPD.	DATE	VENDOR
						P.O. NO

44-071
11/5/80

The Rust Engineering Company
A Subsidiary of Wheelabrator-Frye Inc

GENERAL EQUIPMENT DATA SHEET

CLIENT INTERNATIONAL COAL REFINING COMPANY		CONTRACT NO. 21-1997F
ADDRESS		BY B. MAKADIA DATE 10-6-81
PLANT LOCATION NEWMAN, KENTUCKY		APPROVED DATE
ITEM HORIZONTAL FLARE K.O. DRUM		EQUIP. IDENT. NO. V-16809 A

8. SUPPLIER SHALL FURNISH A NEW SET OF GASKETS FOR ALL BLIND FLANGED NOZZLES. THE GASKETS SHALL BE 1/16" THICK COMPRESSED ASBESTOS, JM #60 OR EQUAL.

9. SUPPLIER SHALL FURNISH VORTEX BREAKER FOR NOZZLE N3.

10. THE BAYONET HEATER INSTALLED THRU NOZZLE N7 WILL BE SUPPLIED BY OTHERS.

11. ALL FLANGE BOLT HOLES SHALL STRADDLE THE VESSEL CENTERLINES.

12. THE SUPPLIER HAS THE OPTION TO GIVE ALTERNATE QUOTE IF PROVEN ECONOMICAL FOR ANY CARBON STEEL SUBSTITUTE MAT'L

13. THE SUPPLIER SHALL FURNISH AN ELECTRICAL GROUNDING CLIP FOR EACH SADDLE.

14. THE SUPPLIER SHALL DESIGN THE SADDLE SUPPORTS. WHEN CALCULATING THE BENDING STRESS AT THE HORN OF THE SADDLE SUPPORT, THE THICKNESS OF THE WEAR PLATE SHALL NOT BE CONSIDERED. STIFFENER RINGS OR INCREASED SHELL PLATE THICKNESS MAY BE USED, IF REQUIRED, TO REDUCE STRESSES AT THE SADDLES.

REMARKS

SHT. 3 OF 3

REV NO	REVISION	BY	DATE	APPD	DATE	VENDOR
						P.O. NO

The Rust Engineering Company
A Subsidiary of Wheelabrator-Frye Inc

HORIZONTAL PRESSURE VESSEL DATA SHEET

CONTRACT NO. 21-1997F
EQUIPMENT NO. V-16914
NO REQUIRED 1
SHEET ____ OF ____

CLIENT: INTERNATIONAL COAL REFINING COMPANY

PROJECT: 6000 TPSD SRC-I DEMONSTRATION PLANT — PLANT LOCATION: NEWMAN, KENTUCKY

SERVICE: BOILER FEED WATER DRUM AND STEAM GENERATOR, LIQ. THERMAL OXIDIZER

VENDOR — P.O. NO.

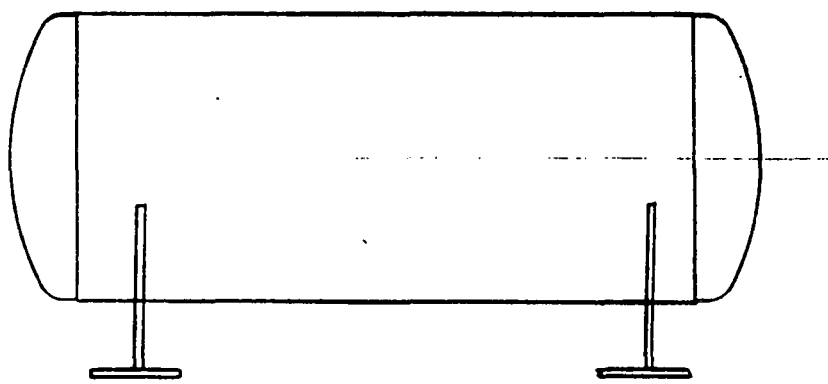
DIAMETER INSIDE	IN	OUTSIDE	IN	MATERIALS	
HORIZ LENGTH T/L TO T/L	FT		IN.	SHELL	HEADS
BTM T/L FROM GRADE	FT		IN.	SUPPORT	GASKETS
OPERATING CONDITIONS				NOZZLE NECK	FLANGE
OPER TEMP			F	COUPLINGS	TYPE
MAX TEMP			F	INTERNALS. FIXED	REMOVABLE
OPER PRESS	MAX OPER PRESS		PSIG	BOLTING PRESSURE	INTERNAL
SPECIFIC GRAVITY. LIQ	AT TEMP		F	EST. ERECTION WT (LB)	
LIQ LEVEL NORMAL	MAX	MIN			

DESIGN		NOZZLES				
CODE ASME SEC VIII. DIV	STAMPED	FLA…		…ZE	FACING	COUPLING RATING SERVICE
NATIONAL BOARD REGISTRATION						
DESIGN TEMP						
DESIGN PRESS INTERNAL						INLET
EXTERNAL (VAC)						OUTLET
MAX ALLOW WORKING PRESS/TEMP						DRAIN
CORR ALLOW SHELL/HEADS	IN					RELIEF
SHELL		-5				
HEAD TYPE		N—6				
HYDROTEST PRESS/TEMP		N—7				
RADIOGRAPHY EXTENT	CODE	N—8				
POSTWELD HEAT TREAT	YES/NO	N—9				
EARTHQUAKE	CODE ZONE	N—10				
WIND PRESS	PSF	N—11				
INSULATION YES/NO	THICK IN					
FIREPROOFING YES/NO	THICK IN.	M—1				MANHOLE W/COVER
VESSEL SUPPORT TYPE		H—1				HANDHOLE W/BLIND

THIS IS PART OF THE LIQUID OXIDIZER PACKAGE. TO BE DETERMINED LATER

SZ 10-21-81

SKETCH



PREPARED BY SZ	REVISION △	REVISION △	REVISION △ 26
DATE 10-21-81	BY DATE	BY DATE	BY DATE
APPROVED BY	APP'D DATE	APP'D DATE	APP'D DATE
DATE			

FORM 9314 19/R01

The Rust Engineering Company
A Subsidiary of Whelan and Foster Inc.

VERTICAL PRESSURE VESSEL DATA SHEET

CONTRACT NO. 21-1997F
EQUIPMENT NO. V-16916
NO. REQUIRED 1
SHEET ____ OF ____

CLIENT: INTERNATIONAL COAL REFINING COMPANY
PROJECT: 6000 TPSD SRC-I DEMONSTRATION PLANT — PLANT LOCATION: NEWMAN, KENTUCKY
SERVICE: KNOCK OUT DRUM - VENT GAS INCINERATOR
VENDOR — P.O NO.

DIAMETER INSIDE	IN	OUTSIDE	IN
VERT HT T/L TO T/L	FT		IN
BTM T/L FROM GRADE	FT		IN

OPERATING CONDITIONS

OPER TEMP	F
MAX TEMP	°F
OPER PRESSURE	PSIG
MAX OPER PRESSURE	PSIG
SPECIFIC GRAVITY LIQ	AT TEMP °F

DESIGN

CODE ASME SEC VIII DIV	1	☒ STAMPED
NATIONAL BOARD REGISTRATION	YES	
DESIGN TEMP	650	F
DESIGN PRESS INTERNAL	75	PSIG
EXTERNAL (VAC)		PSI
MAX ALLOW WORKING PRESS/TEMP	102/650	PSIG/°F
CORR ALLOW SHELL/HEADS	1/8 IN	INTERNALS 1/8 IN.
SHELL	SA-516-70	THICK 3/8" IN
HEAD TYPE	2:1 ELLIPTICAL	THICK 7/16 MIN IN
HYDROTEST PRESS/TEMP	153	PSIG/°F
RADIOGRAPHY EXTENT	SPOT	CODE ASME SEC VIII-1
POST WELD HEAT TREAT YES/NO		
EARTHQUAKE CODE		ZONE 2
WIND PRESS		PSF
INSULATION YES/NO THICK		IN
FIREPROOFING YES/NO THICK		IN
VESSEL SUPPORT TYPE	SKIRT	

MATERIALS

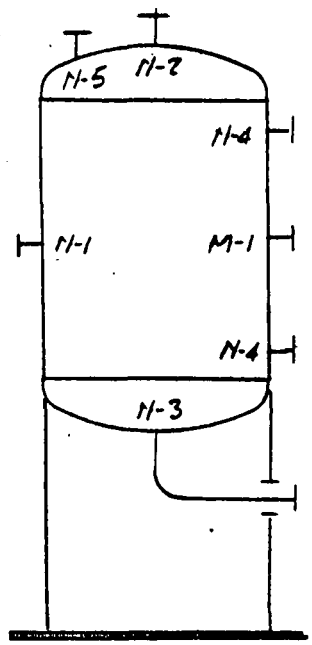
SHELL	SA 516 GR 70	HEADS	SA 516 GR 70
SUPPORT	SA 36	GASKETS	1/16" COMP. ASB.
NOZZLE NECK	SA-53B/SA106B	FLANGE	SA-105/SA-181
COUPLINGS		TYPE	
INTERNALS FIXED		REMOVABLE	
BOLTING PRESSURE	SA-193-B7	INTERNAL	
EST ERECTION WT (LB)			

NOZZLES

MARK NO	NO REQ'D	SIZE IN	FACING	SERVICE	FLANGE RATING	COUPLING RATING
N-1	1	4	RF	150# INLET		
N-2	1	4	RF	150# OUTLET, VAPOR		
N-3	1	2	RF	150# OUTLET, LIQUID		
N-4	2	1½	RF	150# LEVEL		
N-5	1	(WATER)	RF	150# RELIEF		
N-6						
N-7						
N-8						
N-9						
N-10						
N-11						
N-12						
M-1	1	20		MANHOLE W COVER W/DAVIT		
H-1	1			HANDHOLE W BLIND		

LIQUID LEVEL (FROM BOTTOM T/L)	NORMAL	FT	IN
	MAX	FT	IN
	MIN	FT	IN

SKETCH



PREPARED BY SF
DATE 10-21-81
APPROVED BY
DATE

REVISION △	BY	DATE	APP'D	DATE
REVISION △	BY	DATE	APP'D	DATE
REVISION △ 27	BY	DATE	APP'D	DATE

FORM 9317 IC 80

The Rust Engineering Company

(GENERAL EQUIPMENT DATA SHEET)

CONTRACT NO. 21-1997F
EQUIPMENT NO. X-16B10 "
NO. REQUIRED 1
SHEET ____ OF ____

CLIENT: INTERNATIONAL COAL REFINING COMPANY

PROJECT: 6000 TPSD SRC-I DEMONSTRATION PLANT — PLANT LOCATION: NEWMAN, KENTUCKY

SERVICE: FLARE ASSEMBLY

VENDOR — P.O. NO.

THIS IS A PRELIMINARY DESCRIPTION OF AN ELEVATED FLARE SUPPORTED BY A DERRICK. THE BASIC CONCEPT WAS PRIMARILY INTENDED FOR EQUIPMENT COST DEVELOPMENT. SPECIFIC DETAILS WILL PROVIDED DURING THE DETAIL DESIGN PHASE.

PROCESS REQUIREMENTS

THE FLAME FROM THE FLARE SHALL BE SMOKELESS WITH THE SMOKELESS CAPACITY OF 200,000 #/HR USING 0.5 LBS OF STEAM PER LB OF HYDROCARBON. THE EMERGENCY RELEASE CAPACITY OF THE FLARE SHALL BE 1,100,000 #/HR (NON-SMOKELESS)

THE FLARE HEIGH WILL BE 250 FT, MOL. WT. 26, FLOW TEMPERATURE 400°F. ALLOWABLE TIP $\Delta P = 0.5$ PSI

FLARE SYSTEM SHALL BE COMPLETE WITH SUPPORTING DERRICK, MOLECULAR SEAL, WATER SEAL AT THE BASE ACCESS WORK PLATFORM AT TOP, CAGED LADDERS WITH REST PLATFORMS EVERY 30 FT., IGNITOR, AND PILOTS.

PREPARED BY SZ	REVISION △	REVISION △	REVISION △
DATE 10-21-81	BY DATE	BY DATE	BY DATE
APPROVED BY			

The Rust Engineering Company

(GENERAL EQUIPMENT DATA SHEET)

CONTRACT NO. 21-1997 F
EQUIPMENT NO. 11Y-16913
REQ. REQUIRED ONE
SHEET 1 OF 1

CLIENT INTERNATIONAL COAL REFINING COMPANY

PROJECT 6000 TPSD SRC-I DEMONSTRATION PLANT PLANT LOCATION NEWHAM, KENTUCKY

SERVICE LIQUID THERMAL OXIDIZER

VENDOR P.O. NO.

THIS IS A PRELIMINARY DESCRIPTION OF A SLOP OIL AND WASTE LIQUID OXIDIZING SYSTEM. THE BASIC CONCEPT WAS PRIMARILY INTENDED FOR EQUIPMENT COST DETERMINATION. SPECIFIC DETAILS AS WELL AS THE FINAL DATA SHEETS AND SPECIFICATIONS WILL BE DEVELOPED DURING THE DETAIL DESIGN PHASE.

THE THERMAL OXIDIZER SHALL BE CAPABLE OF DISPOSING OF SLOP OIL AND WASTE LIQUID MIXTURES OF VARING CALORIFIC VALUE USING FUEL GAS AS AUXILIARY FUEL. THE WASTE LIQUIDS WILL BE PUMPED TO THE BURNER AT THE PROPER TEMPERATURE PRESSURE, AND ADJUSTED COMPOSITION FROM THE PREPARATION AREA. THE OXIDIZER WILL INCORPORATE A WASTE HEAT RECOVERY SYSTEM WHICH WILL GENERATE Saturated STEAM AT 150 PSIG. △1
EACH UNIT WILL INCLUDE AN INDIVIDUAL FEED △1
WATER RECIRCULATION SYSTEM, CHEMICAL TREATMENT FACILITIES, AND LOCAL COMBUSTION CONTROLS WITH FLAME SUPERVISION CAPABILITY. MAJOR ALARMS AND CURRENT OPERATING STATUS WILL BE LINKED TO THE CENTRAL CONTROL ROOM BY A PAM-ALARM SYSTEM.

BASIC OXIDIZER RATING:

ITEM		
1.-	WASTE LIQUID, #/HR	3,019 △1
2.-	AUXILIARY FUEL NORMAL DUTY, MMBTU/HR	10.0 △1
3.-	AUXILIARY FUEL MAXIMUM DUTY MMBTU/HR	30.0 △1
4.-	MAXIMUM DUTY, MMBTU/HR	45.0 △1

THE OXIDIZER FLUE GAS STACK WILL HAVE A MINIMUM HEIGHT OF 125 FT. MINIMUM FIRE BOX TEMPERATURE 2,000°F. △1

PREPARED BY	REVISION △1	REVISION △	REVISION △
DATE			
APPROVED BY	BY BSY DATE 12-29-83	BY DATE	BY DATE

The Rust Engineering Company

(GENERAL EQUIPMENT DATA SHEET)

CONTRACT NO. 21-199-1E
EQUIPMENT NO. IN-16919
NO. REQUIRED 1
SHEET 1 OF 1

CLIENT INTERNATIONAL COAL REFINING COMPANY

PROJECT 6000 TPSD SRC-I DEMONSTRATION PLANT PLANT LOCATION NEWMAN, KENTUCKY

SERVICE GAS INCINERATOR

VENDOR P.O. NO.

THIS IS A PRELIMINARY DESCRIPTION FOR A VENT GAS INCINERATOR. THE BASIC CONCEPT WAS PRIMARILY INTENDED FOR EQUIPMENT COST DETERMINATION. SPECIFIC DETAILS AS WELL AS THE FINAL DATA SHEETS AND SPECIFICATIONS WILL BE DEVELOPED DURING THE DETAIL DESIGN PHASE.

THE VENT GAS INCINERATOR SHALL BE CAPABLE OF DISPOSING OF HYDROCARBON CONTAMINATED NITROGEN BLANKETING VAPORS FROM THE STORAGE, PROCESS, AND LOADING AREAS. THESE VENT GASES WILL HAVE A VARING CALORIFIC VALUE AND WILL REQUIRE FUEL GAS FOR AUXILIARY FUEL.

THE INCINERATOR WILL INCLUDE AN INDUCED DRAFT FAN DOWN STREAM OF A KNOCK OUT DRUM FOR MIST AND LIQUID SEPARATION. THE KNOCK OUT DRUM SUPPLY HEADER IS MAINTAINED AT A SELECTED SUB ATMOSPHERIC PRESSURE AND IT IS CONNECTED TO ALL THE SOURCES VIA SUB HEADERS.

THE INCINERATOR WILL INCORPORATE A WASTE HEAT RECOVERY SYSTEM WHICH WILL GENERATE Saturated STEAM AT 150 PSIG △1
OF. EACH UNIT WILL INCLUDE AN INDIVIDUAL FEED △1
WATER RECIRCULATION SYSTEM, CHEMICAL TREATMENT FACILITIES, AND LOCAL COMBUSTION CONTROLS WITH FLAME SUPERVISION CAPABILITY. MAJOR ALARMS AND CURRENT OPERATING STATUS WILL BE LINKED TO THE CENTRAL CONTROL ROOM BY A PAN-ALARM SYSTEM.

BASIC OXIDIZER RATING:

ITEM	
1) VENT VAPORS, #/HR	2500
2) AUXILIARY FUEL NORMAL DUTY, MMBTU/HR	20.0
3) AUXILIARY FUEL MAX DUTY, MMBTU/HR △1	30.0
4) MAXIMUM DUTY, MM BTU/HR	35.0

THE OXIDIZER FLUE GAS STACK WILL HAVE A MINIMUM HEIGHT OF 125 FT. MINIMUM FIRE BOX TEMPERATURE 2,000 °F. △1

PREPARED BY	REVISION △1	REVISION △	REVISION △
DATE			
APPROVED BY	BY BSY DATE 12-29-83	BY DATE	BY DATE

2.2.10 Fuels

2.2.10.1 System Description

Plant fuels, which include fuel oil, plant generated gaseous fuel, excess plant generated hydrogen, and LPG are distributed to the various area contractors as required. Separate piping system headers are provided for gaseous and liquid fuels.

2.2.10.2 Utility Flow Diagrams

Refer to the following drawings included with Interconnecting Systems, Paragraph 2.3.

00-16-03010 Interconnecting Piping System, Fuel Gas, Hydrogen & LPG
00-16-03011 Interconnecting Piping System, Fuel Oil

2.3 INTERCONNECTING SYSTEMS

2.3.1 Facilities Description

2.3.1.1 The interconnecting system will consist of a structurally designed pipe bridge that will be approximately 20 feet wide with a clearance of 30 feet from finish grade at all road and railroad crossings. The bridge will be designed with two and three tiers as required to accommodate the various pipe sizes. All process lines will be located on the 1st tier; steam and condensate lines will be located on the 2nd tier; all other utility lines will be located on the 3rd tier where possible. A 4th tier will be installed, as required, to accommodate all electrical cable trays and instrumentation lines. The minimum spacing between each tier will be 6 feet.

2.3.1.2 The north-south run of pipe bridge will be installed at coordinates N.2000 by E.15000, approximately. The bridge will run north to coordinates N.4850 by E.14300 to the liquid storage area. At this coordinate, the pipe bridge will terminate and all piping will be installed on pipe sleepers for the liquid storage and solids storage (area 11) and coal preparation (area 11).

2.3.1.3 All sleepers will be installed a maximum of 30 inches from finish grade. Any pipe in storage areas that must penetrate a diked area will be installed in a pipe sleeve 2 inches larger than the carrier pipes, and will be sealed at the end inside the diked area to prevent leakage from the diked area in case of spillage or rupture of the storage tank.

2.3.1.4 In areas where pipe runs will consist of small diameter pipe, or with only a few lines involved, pipe will be installed on T-pole supports. These T-pole supports will be spaced in a manner to support the smallest diameter pipe in the run.

2.3.1.5 All T-pole supports will be constructed of round pipe of proper size and will be installed in a concrete footer. The cross members of the T-pole supports will be structural steel welded to the pipe.

2.3.1.6 The T-pole supports will be 8 feet wide and the bottom of the cross members will have a clearance of 20 feet from finish grade. Where T-pole supports traverse a road or railroad, the bottom of the cross members will be 30 feet from finish grade.

2.3.1.7 In areas where two-tier pipe bridges will be used, all process and steam lines (if required) will be installed on the first tier, the second tier will be used for all other utilities. A third tier will be installed as required to accommodate electrical cable trays and instrumentation. A 6 foot minimum spacing will be maintained between each tier.

2.3.1.8 Provisions will be made for electrical cable trays and instrumentation on sleepers and T-pole supports in liquid and solid storage areas.

2.3.1.9 The strong wastewaters, which consist primarily of ammonia sulfide water, stripper (ASWS) bottoms, GKT blowdown, and hazardous waste landfill leachate will be conveyed in above ground pipes to the strong wastewater treatment system. A single sewer system will be provided to convey weak wastes (contaminated runoff and sanitary waste) to the weak waste treatment system. A ditch system will be provided to collect stormwater from uncurbed areas.

2.3.1A ICRC Interface Integration

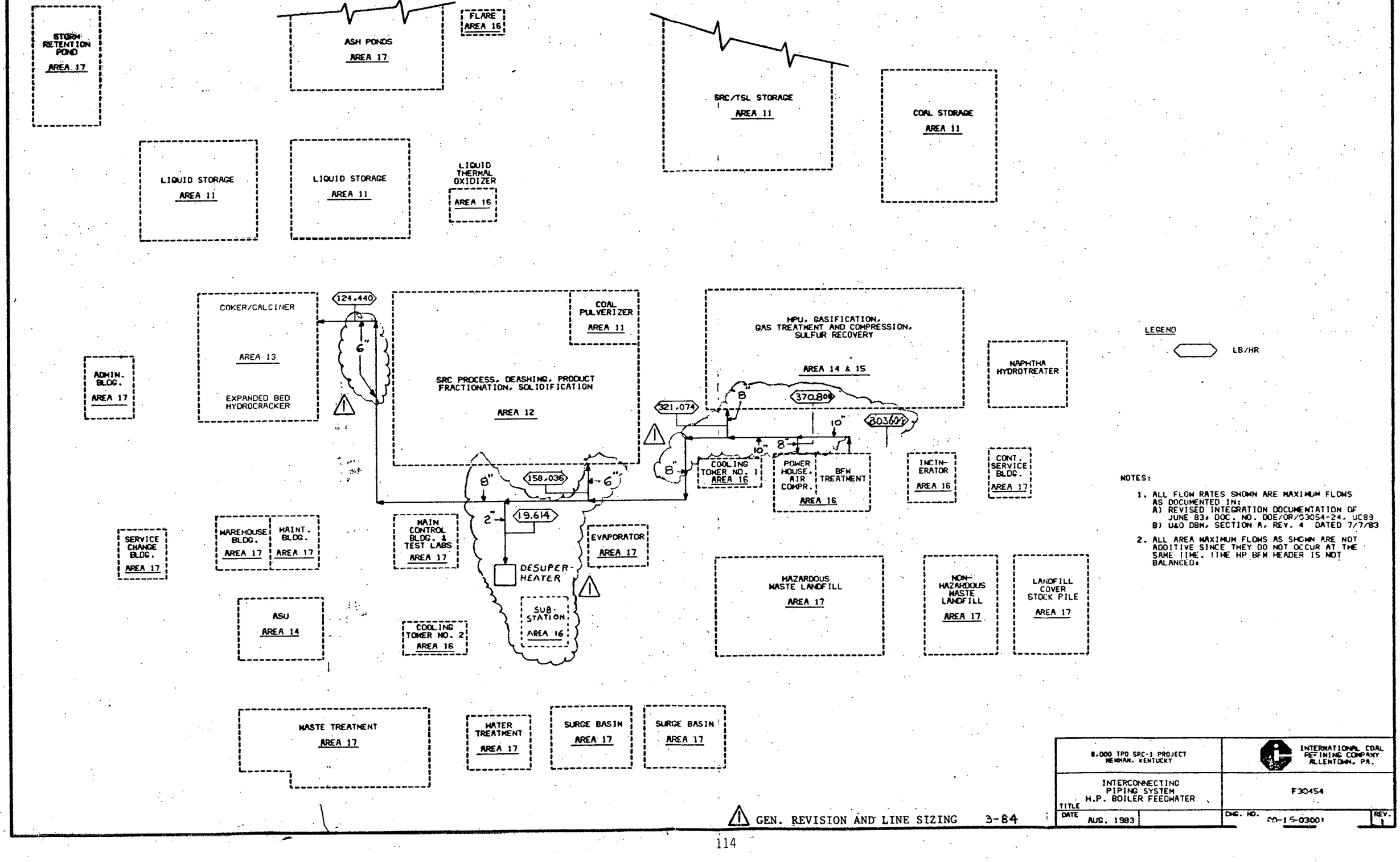
Please refer to the ICRC "Revised Integration Documentation" dated June, 1983, Document No. DOE/OR/03054-24, UC-89. This document defines baseline interface information and compiles interconnecting stream information into two categories: the process interface streams and the utilities interface streams.

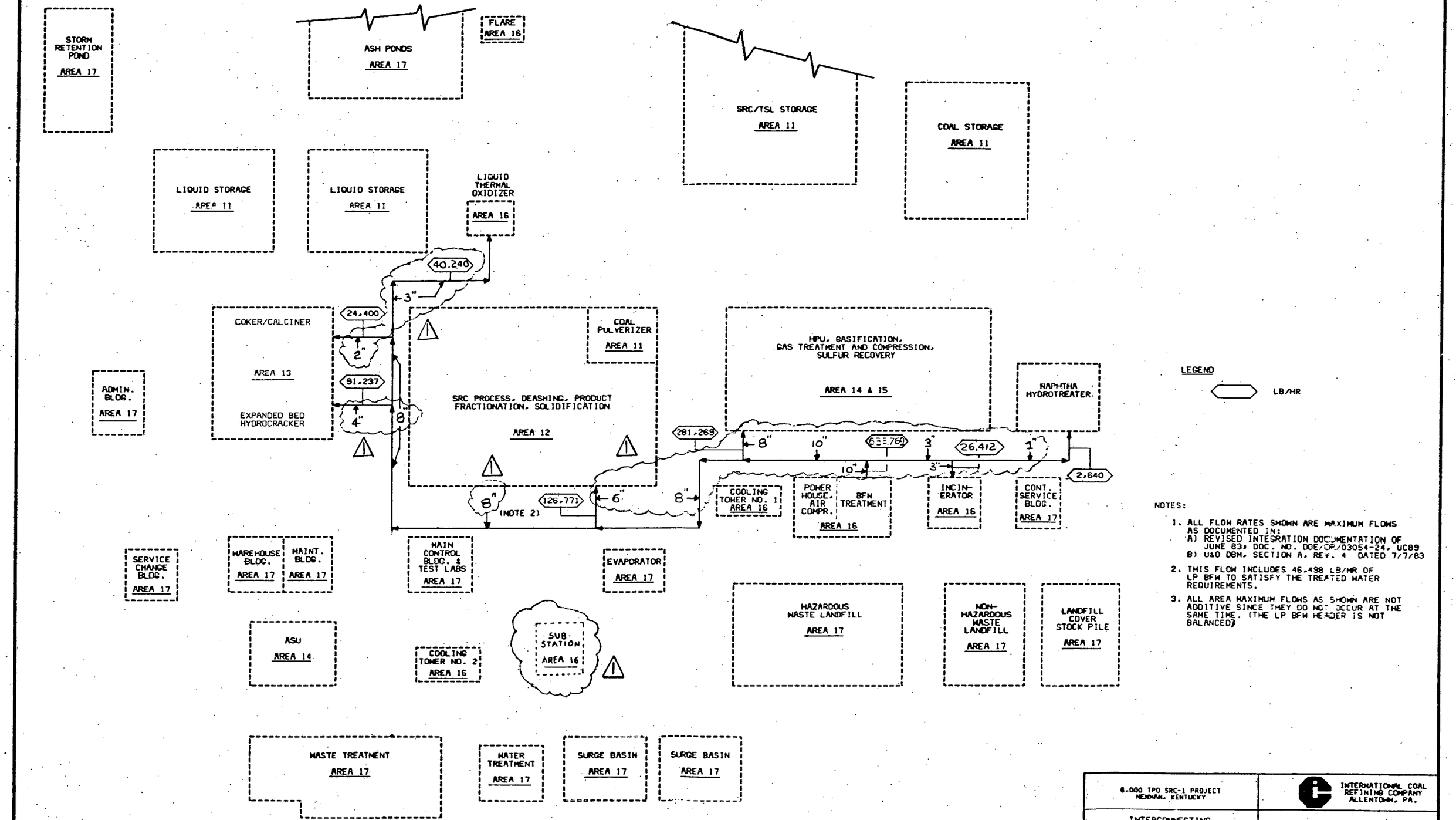
2.3.2 Interconnecting Diagrams

The following interconnecting diagrams, together with the line calculations summary sheets, are included in this section:

00-16-03001	Interconnecting Piping System, H.P. Boiler Feed Water
00-16-03002	Interconnecting Piping System, L. P. Boiler Feed Water
00-16-03003	Interconnecting Piping System, 900# Steam
00-16-03004	Interconnecting Piping System, 450# Steam
00-16-03005	Interconnecting Piping System, 150# Steam
00-16-03006	Interconnecting Piping System, 75# Steam
00-16-03007	Interconnecting Piping System, 27# Steam
00-16-03008	Interconnecting Piping System, Instrument Air/Plant Air
00-16-03009	Interconnecting Piping System, Nitrogen
00-16-03010	Interconnecting Piping System, Fuel Gas, Hydrogen & LPG
00-16-03011	Interconnecting Piping System, Fuel Oil
00-16-03012	Interconnecting Piping System, Cooling Water Supply
00-16-03013	Interconnecting Piping System, Cooling Water Return
00-16-03014	Interconnecting Piping System, Process Water
00-16-03015	Interconnecting Piping System, Potable Water
00-16-03016	Interconnecting Piping System, Condensate
00-16-05001	Interconnecting Piping System, Process Lines-Process Solvents and Flushing Oil
00-16-05002	Interconnecting Piping System, Process Lines - Coal and KMAC
00-16-05003	Interconnecting Piping System, Process Lines - Crude Liquid Products

00-16-05004	Interconnecting Piping System, Process Lines-SRC & TSL-SRC
00-16-05005	Interconnecting Piping System, Process Lines - Fractionated Liquid Products to Tank Farm
00-16-05006	Interconnecting Piping System, Process Lines - Sour Waters
00-16-05007	Interconnecting Piping System, Process Lines - Sour Gases
00-16-05008	Interconnecting Piping System, Process Lines - Liquid Products from EBH to Product Fractionation
00-16-05009	Interconnecting Piping System, Process Lines - Vent Gases to Incinerator
00-16-05010	Interconnecting Piping System, Process Lines - Coker/Calciner Liquid Effluents
00-16-05011	Interconnecting Piping System, Process Lines - Oxygen
00-16-05012	Interconnecting Piping System, Process Lines - Gas System Waste Streams
00-16-05013	Interconnecting Piping System, Process Lines - GKT Ash Slurry
00-16-05014	Interconnecting Piping System, Process Lines - Hydrogen
00-16-05015	Interconnecting Piping System, Process Lines - Gas System Liquid Hydrocarbon Effluents
00-16-05016	Interconnecting Piping System, Process Lines - Gas System Vent Gases
00-16-05017	Interconnecting Piping System, Process Lines - Gas System Waste Water
00-16-05018	Interconnecting Piping System, Process Lines - Gas System Waste Streams
00-16-05019	Interconnecting Piping System, Process Lines - Naphtha Hydrotreating
00-16-05020	Interconnecting Piping System, Process Lines - Miscellaneous Waste Streams


STORM RETENTION POND AREA 17
ASH PONDS AREA 17
FLARE AREA 16
SRC/TSL STORAGE AREA 11
COAL STORAGE AREA 11
LIQUID STORAGE AREA 11
LIQUID STORAGE AREA 11
LIQUID THERMAL OXIDIZER AREA 16
COKER/CALCINER AREA 13 EXPANDED BED HYDROCRACKER
124,440
6"
COAL PULVERIZER AREA 11
SRC PROCESS, DEASHING, PRODUCT FRACTIONATION, SOLIDIFICATION AREA 12
HPU, GASIFICATION, GAS TREATMENT AND COMPRESSION, SULFUR RECOVERY AREA 14 & 15
NAPHTHA HYDROTREATER
ADMIN. BLDG. AREA 17
321,074
370,800
303,604
8"
10"
8"
10"
8"
158,036
6"
2"
19,614
COOLING TOWER NO. 1 AREA 16
POWER HOUSE, AIR COMPR. AREA 16
BFW TREATMENT
INCIN-ERATOR AREA 16
CONT. SERVICE BLDG. AREA 17
SERVICE CHANGE BLDG. AREA 17
WAREHOUSE BLDG. AREA 17
MAINT. BLDG. AREA 17
MAIN CONTROL BLDG. & TEST LABS AREA 17
EVAPORATOR AREA 17
DESUPER-HEATER
SUB-STATION AREA 16
HAZARDOUS WASTE LANDFILL AREA 17
NON-HAZARDOUS WASTE LANDFILL AREA 17
LANDFILL COVER STOCK PILE AREA 17
ASU AREA 14
COOLING TOWER NO. 2 AREA 16
WASTE TREATMENT AREA 17
WATER TREATMENT AREA 17
SURGE BASIN AREA 17
SURGE BASIN AREA 17
LEGEND
LB/HR
NOTES:
1. ALL FLOW RATES SHOWN ARE MAXIMUM FLOWS AS DOCUMENTED IN:
A) REVISED INTEGRATION DOCUMENTATION OF JUNE 83, DOC. NO. DOE/OR/03054-24, UC89
B) U&O DBM, SECTION A, REV. 4 DATED 7/7/83
2. ALL AREA MAXIMUM FLOWS AS SHOWN ARE NOT ADDITIVE SINCE THEY DO NOT OCCUR AT THE SAME TIME. (THE HP BFW HEADER IS NOT BALANCED)
1 GEN. REVISION AND LINE SIZING 3-84
8,000 TPD SRC-I PROJECT NEWHAM, KENTUCKY
INTERNATIONAL COAL REFINING COMPANY ALLENTOWN, PA.
TITLE: INTERCONNECTING PIPING SYSTEM H.P. BOILER FEEDWATER
F30454
DATE AUG. 1983
DWG. NO. 00-15-03001
REV. 1



NOTES:

1. ALL FLOW RATES SHOWN ARE MAXIMUM FLOWS AS DOCUMENTED IN:
   A) REVISED INTEGRATION DOCUMENTATION OF JUNE 83, DOC. NO. DOE/CP/03054-24, UC89
   B) U&O DBM, SECTION A, REV. 4 DATED 7/7/83
2. THIS FLOW INCLUDES 46,498 LB/HR OF LP BFW TO SATISFY THE TREATED WATER REQUIREMENTS.
3. ALL AREA MAXIMUM FLOWS AS SHOWN ARE NOT ADDITIVE SINCE THEY DO NOT OCCUR AT THE SAME TIME. (THE LP BFW HEADER IS NOT BALANCED)

⚠1 GEN. REVISION AND LINE SIZING 3-84

6,000 TPD SRC-I PROJECT NEWHAN, KENTUCKY	INTERNATIONAL COAL REFINING COMPANY ALLENTOWN, PA.
TITLE: INTERCONNECTING PIPING SYSTEM L.P. BOILER FEEDWATER	F30455
DATE: AUG. 1983	DWG. NO. 00-1E-03002 REV. 1

STORM RETENTION POND
AREA 17

ASH PONDS
AREA 17

FLARE
AREA 16

106000

SRC/TSL STORAGE
AREA 11

COAL STORAGE
AREA 11

LIQUID STORAGE
AREA 11

LIQUID STORAGE
AREA 11

LIQUID THERMAL OXIDIZER
AREA 16

6"

122,000

COKER/CALCINER
AREA 13
EXPANDED BED HYDROCRACKER

10"

5,256

3"

COAL PULVERIZER
AREA 11

SRC PROCESS, DEASHING, PRODUCT FRACTIONATION, SOLIDIFICATION
AREA 12

HPU, GASIFICATION, GAS TREATMENT AND COMPRESSION, SULFUR RECOVERY
AREA 14 & 15

NAPHTHA HYDROTREATER

ADMIN. BLDG.
AREA 17

237,195

12"

5,000

14"

360,000

2"

3"

1,440

COOLING TOWER NO. 1
AREA 16

POWER HOUSE, AIR COMPR.
RFW TREATMENT
AREA 16

INCIN-ERATOR
AREA 16

CONT. SERVICE BLDG.
AREA 17

12,720

4"

10"

10"

SERVICE CHANGE BLDG.
AREA 17

WAREHOUSE BLDG.
AREA 17

MAINT. BLDG.
AREA 17

MAIN CONTROL BLDG. & TEST LABS
AREA 17

4"

90,784

EVAPORATOR
AREA 17

3"

18,645

DESUPERHEATER

450 PSIG STEAM HEADER

SUB STATION AREA 15

ASU
AREA 14

COOLING TOWER NO. 2
AREA 16

HAZARDOUS WASTE LANDFILL
AREA 17

NON-HAZARDOUS WASTE LANDFILL
AREA 17

LANDFILL COVER STOCK PILE
AREA 17

WASTE TREATMENT
AREA 17

WATER TREATMENT
AREA 17

SURGE BASIN
AREA 17

SURGE BASIN
AREA 17

LEGEND

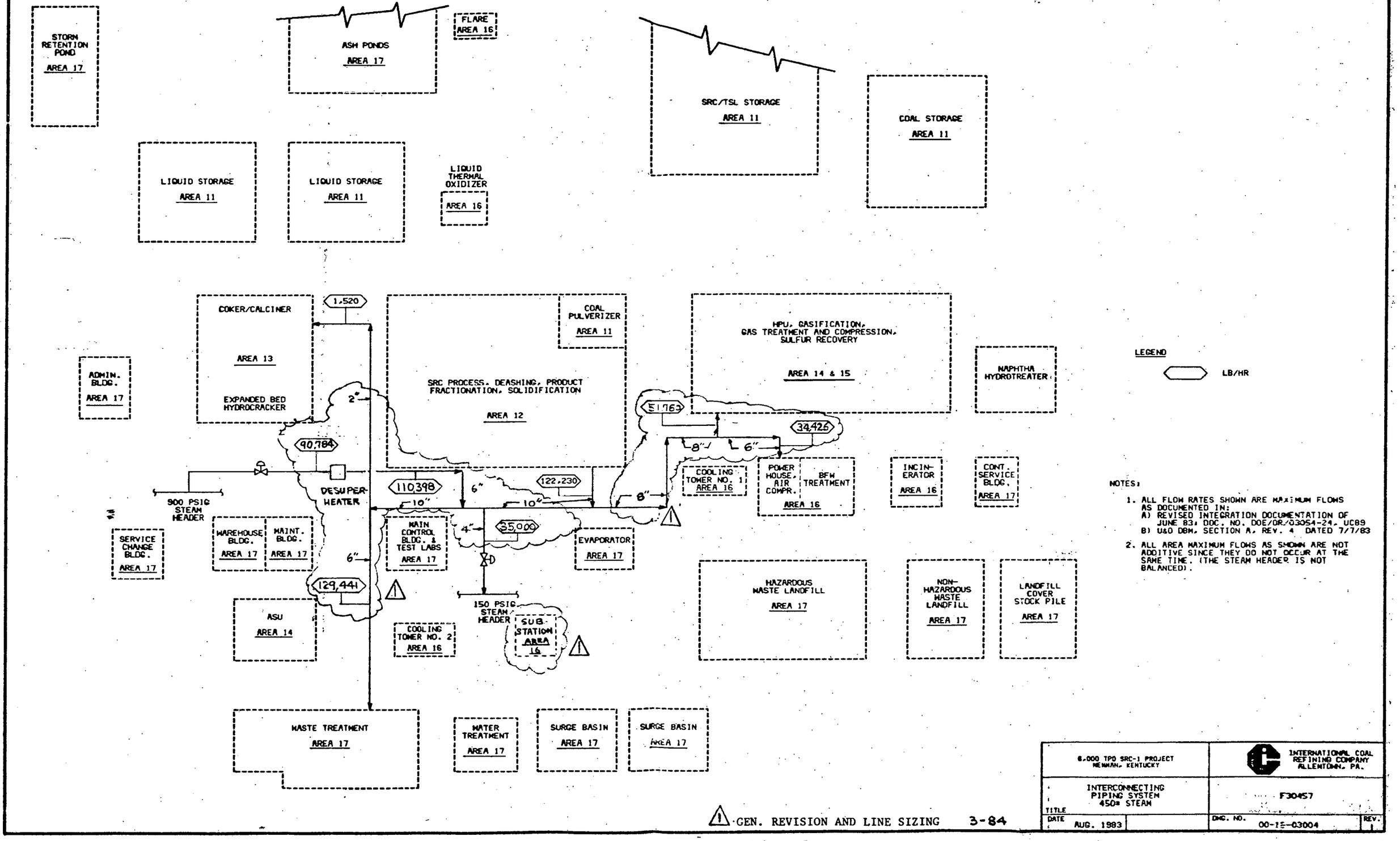
LB/HR

NOTES:

1. ALL FLOW RATES SHOWN ARE MAXIMUM FLOWS AS DOCUMENTED IN:
   A) REVISED INTEGRATION DOCUMENTATION OF JUNE 83, DOC. NO. DOE/OR/03054-24, UC89
   B) U&O DBM, SECTION A, REV. 4 DATED 7/7/83
2. ALL AREA MAXIMUM FLOWS AS SHOWN ARE NOT ADDITIVE SINCE THEY DO NOT OCCUR AT THE SAME TIME. (THE STEAM HEADER IS NOT BALANCED).

⚠1 GEN. REVISION AND LINE SIZING 3-84

6,000 TPD SRC-I PROJECT HENNAH, KENTUCKY	INTERNATIONAL COAL REFINING COMPANY ALLENTOWN, PA.
TITLE: INTERCONNECTING PIPING SYSTEM 900# STEAM	F30456
DATE: AUG. 1983	DWG. NO. 00-16-03003 REV. 1

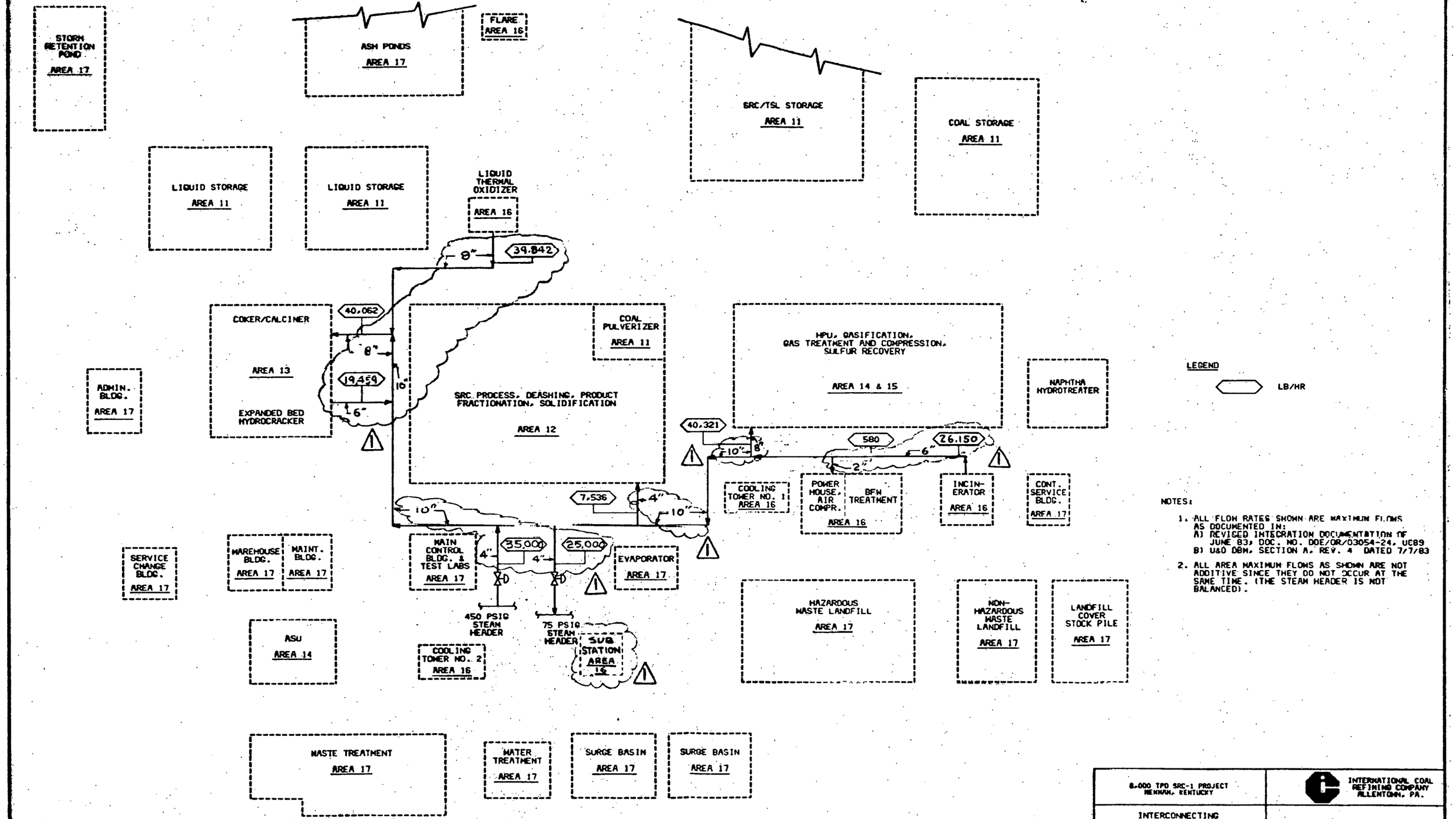


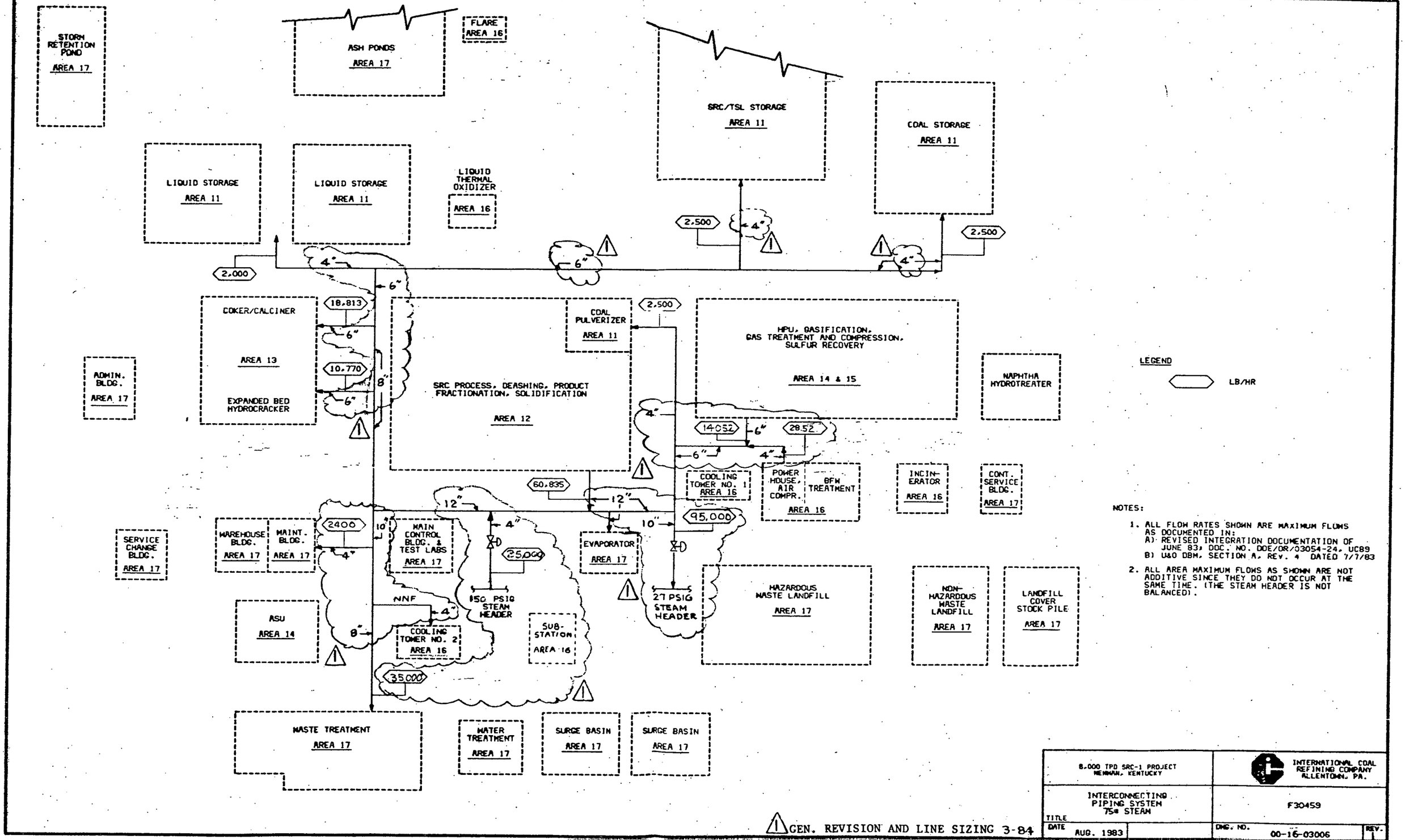
NOTES:

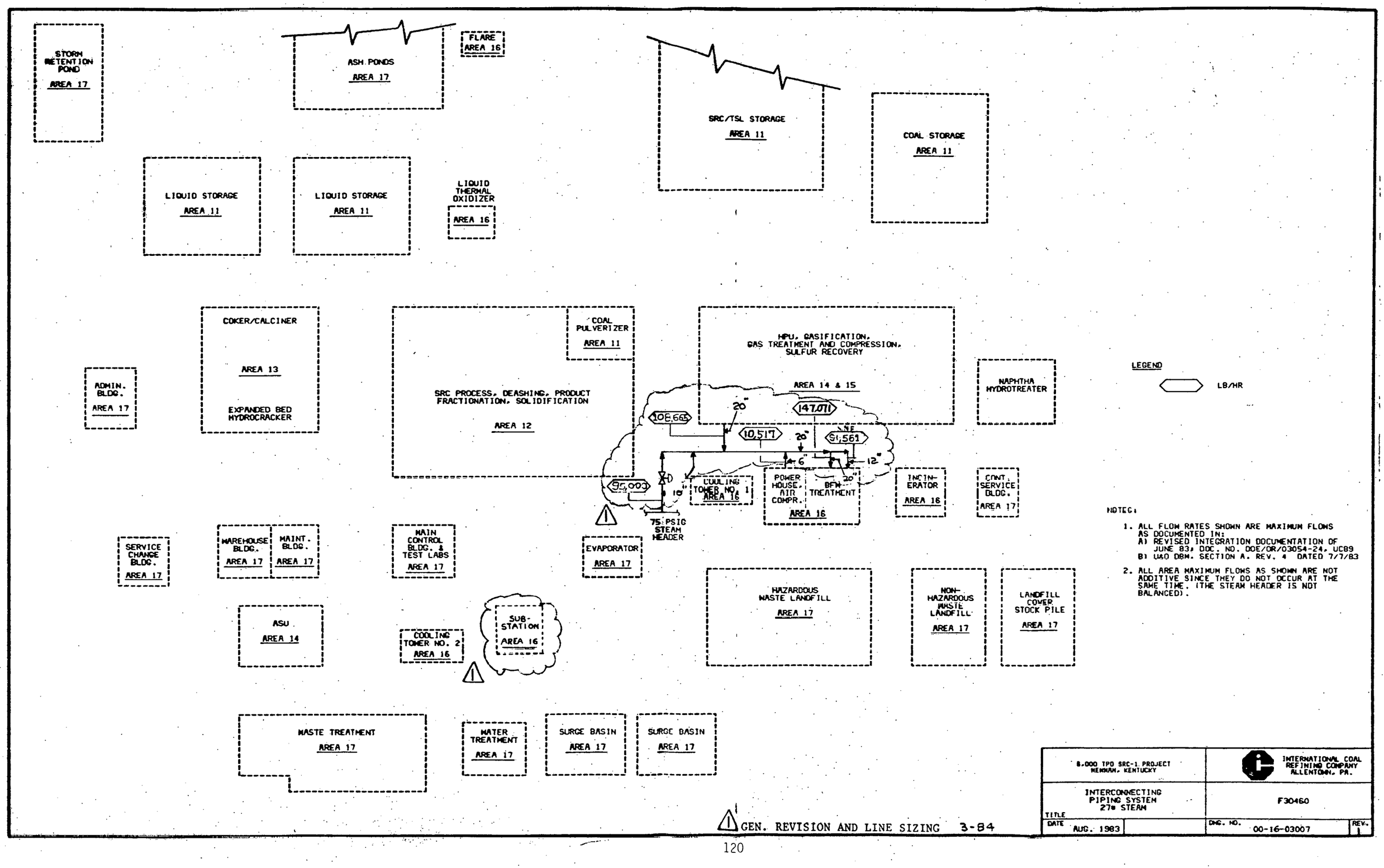
1. ALL FLOW RATES SHOWN ARE MAXIMUM FLOWS AS DOCUMENTED IN:
   A) REVISED INTEGRATION DOCUMENTATION OF JUNE 83, DOC. NO. DOE/OR/03054-24, UC89
   B) U&O DBM, SECTION A, REV. 4 DATED 7/7/83
2. ALL AREA MAXIMUM FLOWS AS SHOWN ARE NOT ADDITIVE SINCE THEY DO NOT OCCUR AT THE SAME TIME. (THE STEAM HEADER IS NOT BALANCED).

⚠1 GEN. REVISION AND LINE SIZING 3-84

6,000 TPD SRC-I PROJECT NEWHAN, KENTUCKY	INTERNATIONAL COAL REFINING COMPANY ALLENTOWN, PA.
TITLE: INTERCONNECTING PIPING SYSTEM 450# STEAM	F30457
DATE: AUG. 1983	DWG. NO. 00-1E-03004 REV.


STORM RETENTION POND AREA 17
ASH PONDS AREA 17
FLARE AREA 16
SRC/TSL STORAGE AREA 11
COAL STORAGE AREA 11
LIQUID STORAGE AREA 11
LIQUID STORAGE AREA 11
LIQUID THERMAL OXIDIZER AREA 16
39,842
9"
40,062
8"
19,459
6"
10"
COKER/CALCINER AREA 13
EXPANDED BED HYDROCRACKER
COAL PULVERIZER AREA 11
SRC PROCESS, DEASHING, PRODUCT FRACTIONATION, SOLIDIFICATION AREA 12
HPU, GASIFICATION, GAS TREATMENT AND COMPRESSION, SULFUR RECOVERY AREA 14 & 15
NAPHTHA HYDROTREATER
ADMIN. BLDG. AREA 17
40,321
10"
8"
580
6"
26,150
2"
COOLING TOWER NO. 1 AREA 16
POWER HOUSE, AIR COMPR. BFW TREATMENT AREA 16
INCIN-ERATOR AREA 16
CONT. SERVICE BLDG. AREA 17
7,536
4"
10"
10"
SERVICE CHANGE BLDG. AREA 17
WAREHOUSE BLDG. AREA 17
MAINT. BLDG. AREA 17
MAIN CONTROL BLDG. & TEST LABS AREA 17
35,000
25,000
4"
4"
EVAPORATOR AREA 17
450 PSIG STEAM HEADER
75 PSIG STEAM HEADER
SUB STATION AREA 15
ASU AREA 14
COOLING TOWER NO. 2 AREA 16
HAZARDOUS WASTE LANDFILL AREA 17
NON-HAZARDOUS WASTE LANDFILL AREA 17
LANDFILL COVER STOCK PILE AREA 17
WASTE TREATMENT AREA 17
WATER TREATMENT AREA 17
SURGE BASIN AREA 17
SURGE BASIN AREA 17
LEGEND
LB/HR
NOTES:
1. ALL FLOW RATES SHOWN ARE MAXIMUM FLOWS AS DOCUMENTED IN:
A) REVISED INTEGRATION DOCUMENTATION OF JUNE 83, DOC. NO. DOE/OR/03054-24, UC89
B) U&O DBM, SECTION A, REV. 4 DATED 7/7/83
2. ALL AREA MAXIMUM FLOWS AS SHOWN ARE NOT ADDITIVE SINCE THEY DO NOT OCCUR AT THE SAME TIME. (THE STEAM HEADER IS NOT BALANCED).
1 GEN. REVISION AND LINE SIZING 3-84
8,000 TPD SRC-1 PROJECT
WILSONVILLE, KENTUCKY
INTERNATIONAL COAL REFINING COMPANY
ALLENTOWN, PA.
INTERCONNECTING PIPING SYSTEM 150# STEAM
F30458
TITLE
DATE AUG. 1983
DWG. NO. 00-16-03005
REV. 1


STORM RETENTION POND
AREA 17
ASH PONDS
AREA 17
FLARE
AREA 16
SRC/TSL STORAGE
AREA 11
COAL STORAGE
AREA 11
LIQUID STORAGE
AREA 11
LIQUID STORAGE
AREA 11
LIQUID THERMAL OXIDIZER
AREA 16
2,500
4"
2,500
2,000
4"
6"
4"
2,500
6"
18,813
COKER/CALCINER
AREA 13
EXPANDED BED HYDROCRACKER
COAL PULVERIZER
AREA 11
2,500
HPU, GASIFICATION, GAS TREATMENT AND COMPRESSION, SULFUR RECOVERY
AREA 14 & 15
NAPHTHA HYDROTREATER
ADMIN. BLDG.
AREA 17
6"
10,770
8"
6"
SRC PROCESS, DEASHING, PRODUCT FRACTIONATION, SOLIDIFICATION
AREA 12
4"
14052
6"
20.52
6"
4"
COOLING TOWER NO. 1
AREA 16
POWER HOUSE, AIR COMPR.
AREA 16
BFW TREATMENT
INCIN-ERATOR
AREA 16
CONT. SERVICE BLDG.
AREA 17
60,835
12"
12"
10"
95,000
SERVICE CHANGE BLDG.
AREA 17
WAREHOUSE BLDG.
AREA 17
MAINT. BLDG.
AREA 17
2400
10"
4"
MAIN CONTROL BLDG. & TEST LABS
AREA 17
4"
25,000
EVAPORATOR
AREA 17
HAZARDOUS WASTE LANDFILL
AREA 17
NON-HAZARDOUS WASTE LANDFILL
AREA 17
LANDFILL COVER STOCK PILE
AREA 17
NNF
4"
150 PSIG STEAM HEADER
27 PSIG STEAM HEADER
ASU
AREA 14
8"
COOLING TOWER NO. 2
AREA 16
SUB-STATION
AREA 16
35,000
WASTE TREATMENT
AREA 17
WATER TREATMENT
AREA 17
SURGE BASIN
AREA 17
SURGE BASIN
AREA 17
LEGEND
LB/HR
NOTES:
1. ALL FLOW RATES SHOWN ARE MAXIMUM FLOWS AS DOCUMENTED IN:
A) REVISED INTEGRATION DOCUMENTATION OF JUNE 83, DOC. NO. DOE/OR/03054-24, UC89
B) U&O DBM, SECTION A, REV. 4 DATED 7/7/83
2. ALL AREA MAXIMUM FLOWS AS SHOWN ARE NOT ADDITIVE SINCE THEY DO NOT OCCUR AT THE SAME TIME. (THE STEAM HEADER IS NOT BALANCED).
1 GEN. REVISION AND LINE SIZING 3-84
8,000 TPD SRC-1 PROJECT
MERRIAM, KENTUCKY
INTERNATIONAL COAL REFINING COMPANY
ALLENTOWN, PA.
TITLE
INTERCONNECTING PIPING SYSTEM 75# STEAM
F30459
DATE
AUG. 1983
DWG. NO.
00-16-03006
REV.
1

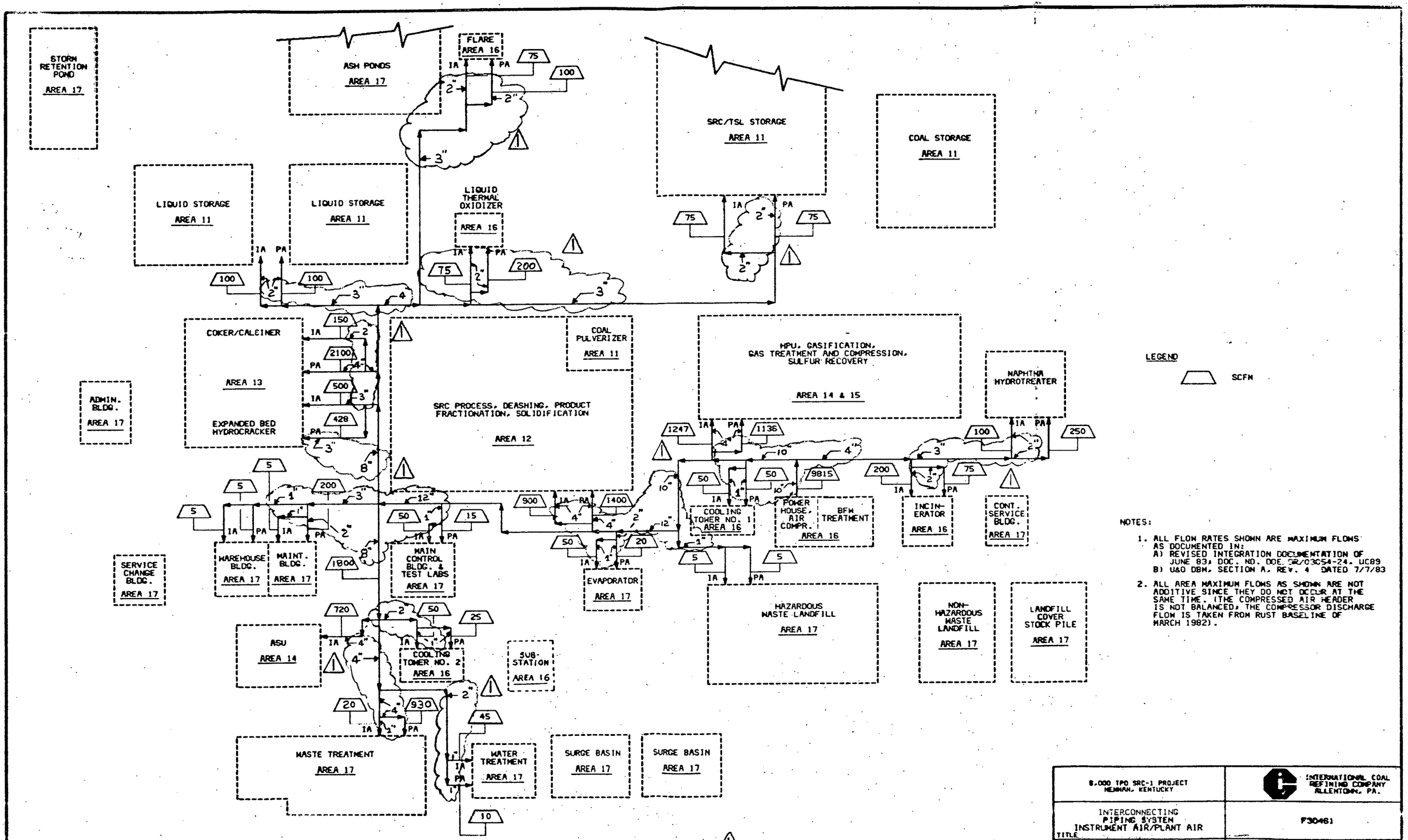


NOTES:

1. ALL FLOW RATES SHOWN ARE MAXIMUM FLOWS AS DOCUMENTED IN:
   A) REVISED INTEGRATION DOCUMENTATION OF JUNE 83, DOC. NO. DOE/OR/03054-24, UC89
   B) U&O DBM, SECTION A, REV. 4 DATED 7/7/83
2. ALL AREA MAXIMUM FLOWS AS SHOWN ARE NOT ADDITIVE SINCE THEY DO NOT OCCUR AT THE SAME TIME. (THE STEAM HEADER IS NOT BALANCED).

⚠1 GEN. REVISION AND LINE SIZING 3-84

8,000 TPD SRC-1 PROJECT NEWHAN, KENTUCKY	INTERNATIONAL COAL REFINING COMPANY ALLENTOWN, PA.
TITLE: INTERCONNECTING PIPING SYSTEM 27# STEAM	F30460
DATE: AUG. 1983	DWG. NO. 00-16-03007 REV. 1

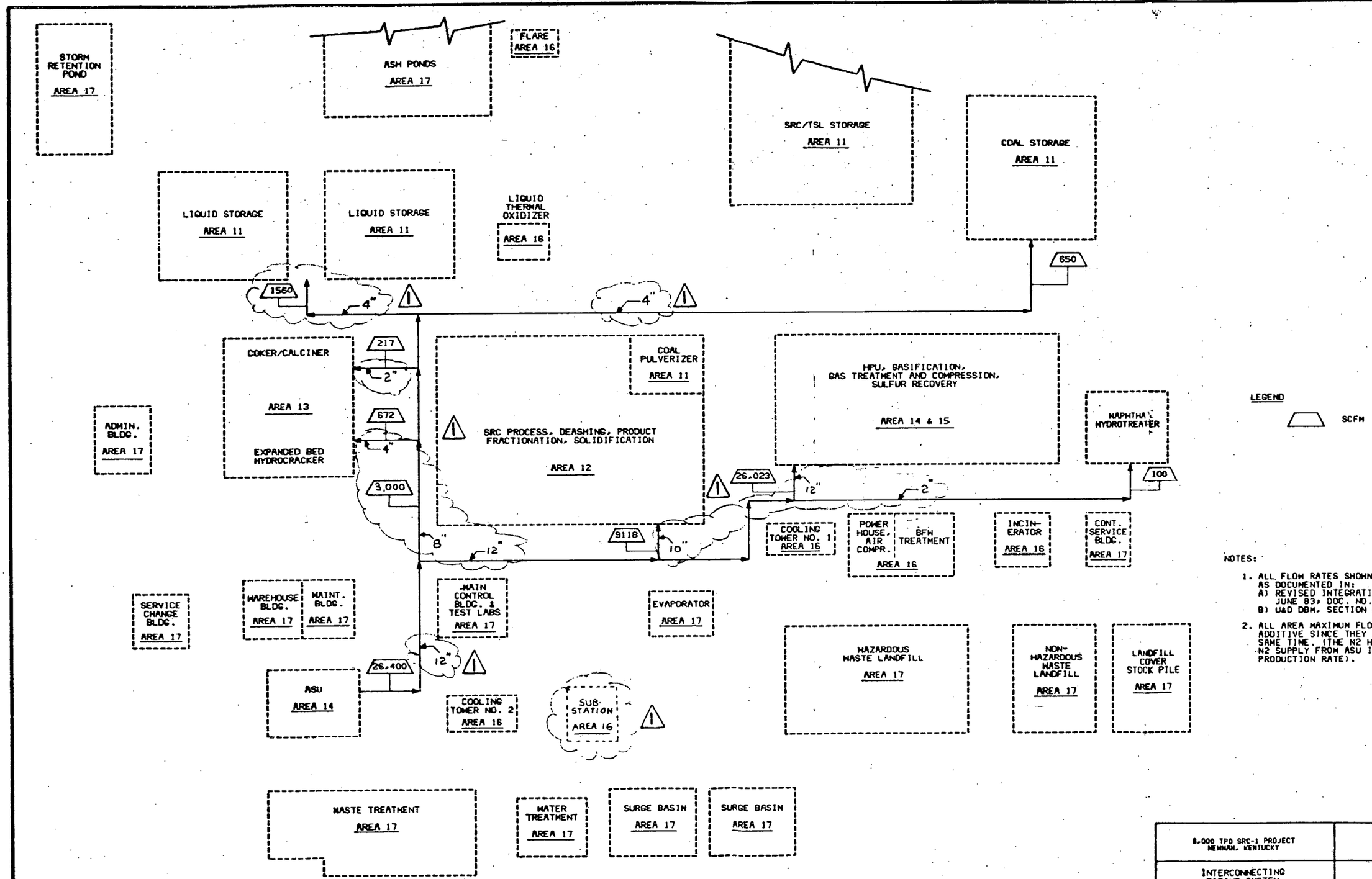


NOTES:

1. ALL FLOW RATES SHOWN ARE MAXIMUM FLOWS AS DOCUMENTED IN:
   A) REVISED INTEGRATION DOCUMENTATION OF JUNE 83, DOC. NO. DOE/SR/03054-24. UC89
   B) U&O DBM, SECTION A, REV. 4 DATED 7/7/83
2. ALL AREA MAXIMUM FLOWS AS SHOWN ARE NOT ADDITIVE SINCE THEY DO NOT OCCUR AT THE SAME TIME. (THE COMPRESSED AIR HEADER IS NOT BALANCED, THE COMPRESSOR DISCHARGE FLOW IS TAKEN FROM RUST BASELINE OF MARCH 1982).

1 GEN, REVISION AND LINE SIZING 3-84

6,000 TPD SRC-1 PROJECT NEWHAN, KENTUCKY	INTERNATIONAL COAL REFINING COMPANY ALLENTOWN, PA.
TITLE: INTERCONNECTING PIPING SYSTEM INSTRUMENT AIR/PLANT AIR	F30481
DATE: AUG. 1983	DWG. NO. 00-1E-03308 REV. 1

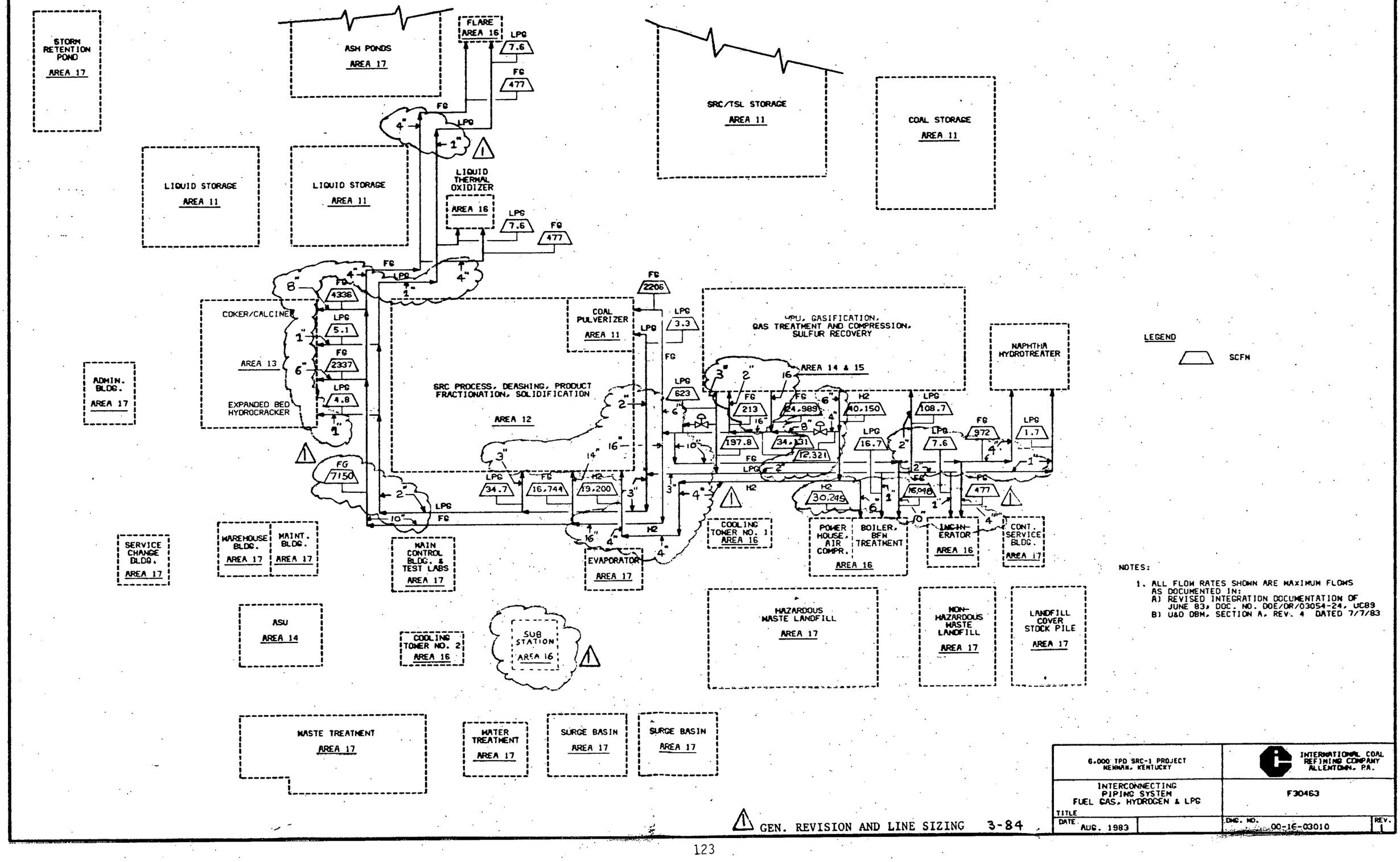


NOTES:

1. ALL FLOW RATES SHOWN ARE MAXIMUM FLOWS AS DOCUMENTED IN:
   A) REVISED INTEGRATION DOCUMENTATION OF JUNE 83, DOC. NO. DOE/OR/03054-24, DCB9
   B) U&O DBM, SECTION A, REV. 4 DATED 7/7/83
2. ALL AREA MAXIMUM FLOWS AS SHOWN ARE NOT ADDITIVE SINCE THEY DO NOT OCCUR AT THE SAME TIME. (THE N2 HEADER IS NOT BALANCED; N2 SUPPLY FROM ASU IS THE MAXIMUM PRODUCTION RATE).

⚠ GEN. REVISION AND LINE SIZING 3-84

6,000 TPD SRC-I PROJECT NEWHAN, KENTUCKY	INTERNATIONAL COAL REFINING COMPANY ALLENTOWN, PA.
TITLE: INTERCONNECTING PIPING SYSTEM NITROGEN	F30462
DATE: AUG. 1983	DWG. NO. 00-16-03009 REV.

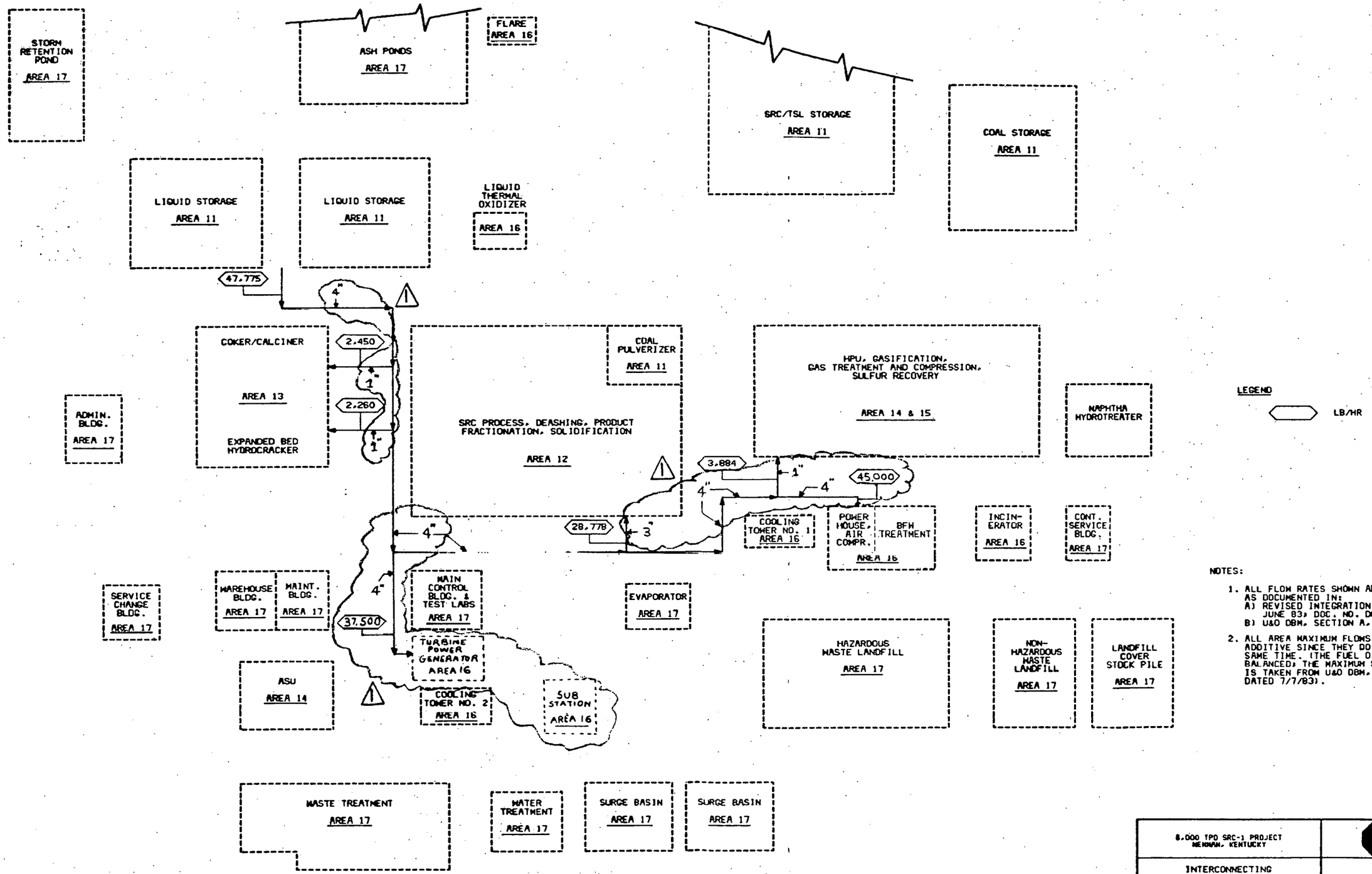


NOTES:

1. ALL FLOW RATES SHOWN ARE MAXIMUM FLOWS AS DOCUMENTED IN:
   A) REVISED INTEGRATION DOCUMENTATION OF JUNE 83, DOC. NO. DOE/OR/03054-24, UC89
   B) U&D DBM, SECTION A, REV. 4 DATED 7/7/83

⚠ GEN. REVISION AND LINE SIZING 3-84

6,000 TPD SRC-1 PROJECT MERRIAM, KENTUCKY	INTERNATIONAL COAL REFINING COMPANY ALLENTOWN, PA.
INTERCONNECTING PIPING SYSTEM FUEL GAS, HYDROGEN & LPG	F30463
TITLE	
DATE AUG. 1983	DWG. NO. 00-1C-03010 REV. 1



NOTES:

1. ALL FLOW RATES SHOWN ARE MAXIMUM FLOWS AS DOCUMENTED IN:
   A) REVISED INTEGRATION DOCUMENTATION OF JUNE 83, DOC. NO. DOE/OR/03054-24, UC89
   B) U&O DBM, SECTION A, REV. 4 DATED 7/7/83
2. ALL AREA MAXIMUM FLOWS AS SHOWN ARE NOT ADDITIVE SINCE THEY DO NOT OCCUR AT THE SAME TIME. (THE FUEL OIL HEADER IS NOT BALANCED; THE MAXIMUM SUPPLY FROM STORAGE IS TAKEN FROM U&O DBM, REV. 4 DATED 7/7/83).

⚠ GEN. REVISION AND LINE SIZING 3-84

6,000 TPD SRC-I PROJECT MEMPHIS, KENTUCKY	INTERNATIONAL COAL REFINING COMPANY ALLENTOWN, PA.
TITLE: INTERCONNECTING PIPING SYSTEM FUEL OIL	F30464
DATE: AUG. 1983	DWG. NO. 00-1E-03011 REV. 1

STORM RETENTION POND
AREA 17

ASH PONDS
AREA 17

FLARE
AREA 16

SRC/TSL STORAGE
AREA 11

COAL STORAGE
AREA 11

LIQUID STORAGE
AREA 11

LIQUID STORAGE
AREA 11

LIQUID THERMAL OXIDIZER
AREA 16

ADMIN. BLDG.
AREA 17

COKER/CALCINER
AREA 13

EXPANDED BED HYDROCRACKER

COAL PULVERIZER
AREA 11

SRC PROCESS, DEASHING, PRODUCT FRACTIONATION, SOLIDIFICATION
AREA 12

HPU, GASIFICATION, GAS TREATMENT AND COMPRESSION, SULFUR RECOVERY
AREA 14 & 15

NAPHTHA HYDROTREATER

LEGEND
GPM

1,791
10"
2,424
10"
18"
4,215
73,890
24"
48"
90,205
48"
10"
2,500
4"
200
24"
10,100
20"
18"
14,315
COOLING WATER SUPPLY

COOLING TOWER NO. 1
AREA 16

POWER HOUSE, AIR COMPR.
AREA 16

BFW TREATMENT

INCIN-ERATOR
AREA 16

CONT. SERVICE BLDG.
AREA 17

EVAPORATOR
AREA 17

SERVICE CHANGE BLDG.
AREA 17

WAREHOUSE BLDG.
AREA 17

MAINT. BLDG.
AREA 17

MAIN CONTROL BLDG. & TEST LABS
AREA 17

NOTES:

1. ALL FLOW RATES SHOWN ARE MAXIMUM FLOWS AS DOCUMENTED IN:
   A) REVISED INTEGRATION DOCUMENTATION OF JUNE 83, DOC. NO. DOE/OR/03054-24, UC89
   B) U&O DBM, SECTION A, REV. 4 DATED 7/7/83

13,551
COOLING WATER SUPPLY
14071
-24"
6"
520

ASU
AREA 14

COOLING TOWER NO. 2
AREA 16

SUB STATION
AREA 16

HAZARDOUS WASTE LANDFILL
AREA 17

NON-HAZARDOUS WASTE LANDFILL
AREA 17

LANDFILL COVER STOCK PILE
AREA 17

WASTE TREATMENT
AREA 17

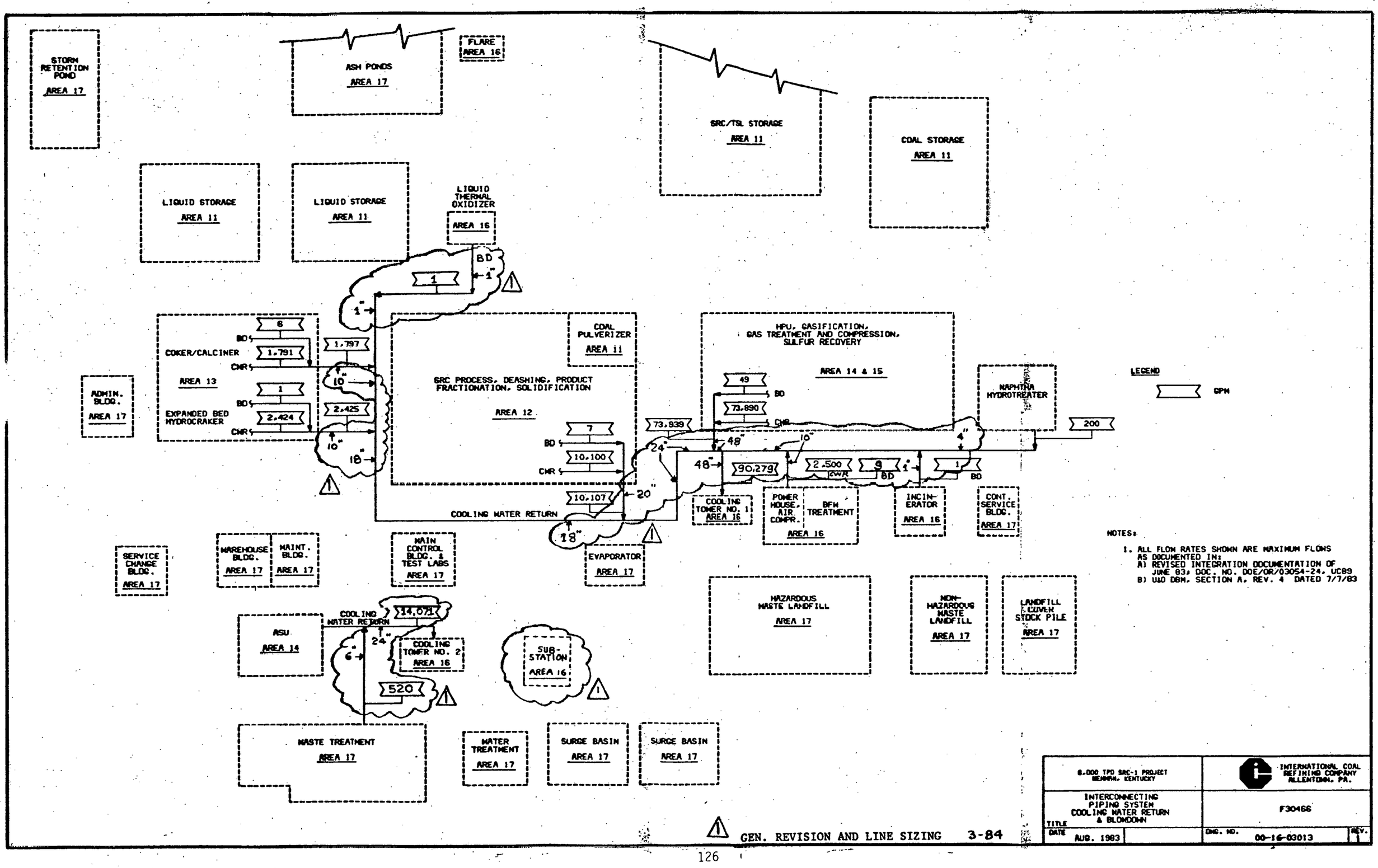
WATER TREATMENT
AREA 17

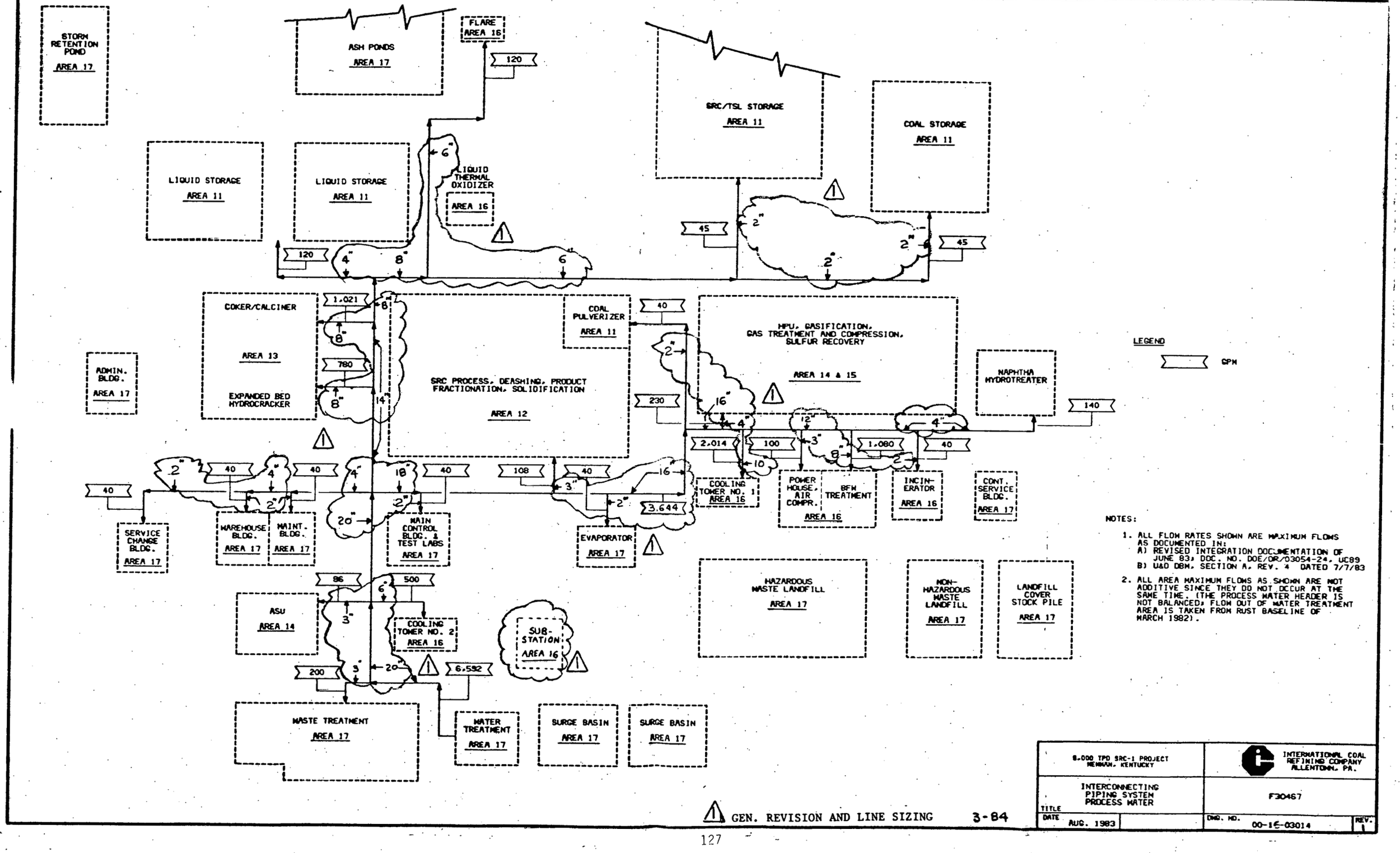
SURGE BASIN
AREA 17

SURGE BASIN
AREA 17

1 GEN. REVISION AND LINE SIZING 3-84

8,000 TPD SRC-I PROJECT NEWHAM, KENTUCKY	INTERNATIONAL COAL REFINING COMPANY ALLENTOWN, PA.
INTERCONNECTING PIPING SYSTEM COOLING WATER SUPPLY	F30465
TITLE DATE AUG. 1983	DWG NO. 00-16-03012 REV. 1


STORM RETENTION POND
AREA 17
ASH PONDS
AREA 17
FLARE
AREA 16
SRC/TSL STORAGE
AREA 11
COAL STORAGE
AREA 11
LIQUID STORAGE
AREA 11
LIQUID STORAGE
AREA 11
LIQUID THERMAL OXIDIZER
AREA 16
BD
1"
1
1"
6
BD
COKER/CALCINER
1,791
CNR
AREA 13
1
BD
EXPANDED BED HYDROCRAKER
2,424
CNR
1,797
10"
2,425
10"
18"
ADMIN. BLDG.
AREA 17
COAL PULVERIZER
AREA 11
SRC PROCESS, DEASHING, PRODUCT FRACTIONATION, SOLIDIFICATION
AREA 12
7
BD
10,100
CNR
10,107
20"
COOLING WATER RETURN
18"
EVAPORATOR
AREA 17
HPU, GASIFICATION, GAS TREATMENT AND COMPRESSION, SULFUR RECOVERY
AREA 14 & 15
49
BD
73,890
CNR
73,939
24"
48"
10"
48"
90,279
2,500
CWR
9
BD
1
1
BD
4"
NAPHTHA HYDROTREATER
200
COOLING TOWER NO. 1
AREA 16
POWER HOUSE, AIR COMPR.
BFW TREATMENT
AREA 16
INCIN-ERATOR
AREA 16
CONT. SERVICE BLDG.
AREA 17
LEGEND
GPM
NOTES:
1. ALL FLOW RATES SHOWN ARE MAXIMUM FLOWS AS DOCUMENTED IN:
A) REVISED INTEGRATION DOCUMENTATION OF JUNE 83, DOC. NO. DOE/OR/03054-24, UC89
B) U&O DBM, SECTION A, REV. 4 DATED 7/7/83
SERVICE CHANGE BLDG.
AREA 17
WAREHOUSE BLDG.
AREA 17
MAINT. BLDG.
AREA 17
MAIN CONTROL BLDG. & TEST LABS
AREA 17
HAZARDOUS WASTE LANDFILL
AREA 17
NON-HAZARDOUS WASTE LANDFILL
AREA 17
LANDFILL COVER STOCK PILE
AREA 17
COOLING WATER RETURN
14,071
24"
6"
COOLING TOWER NO. 2
AREA 16
520
ASU
AREA 14
SUB-STATION
AREA 16
WASTE TREATMENT
AREA 17
WATER TREATMENT
AREA 17
SURGE BASIN
AREA 17
SURGE BASIN
AREA 17
1 GEN. REVISION AND LINE SIZING 3-84
8,000 TPD SRC-I PROJECT
MEDNAN, KENTUCKY
INTERNATIONAL COAL REFINING COMPANY
ALLENTOWN, PA.
INTERCONNECTING PIPING SYSTEM COOLING WATER RETURN & BLOWDOWN
TITLE
F30466
DATE
AUG. 1983
DWG. NO.
00-16-03013
REV.

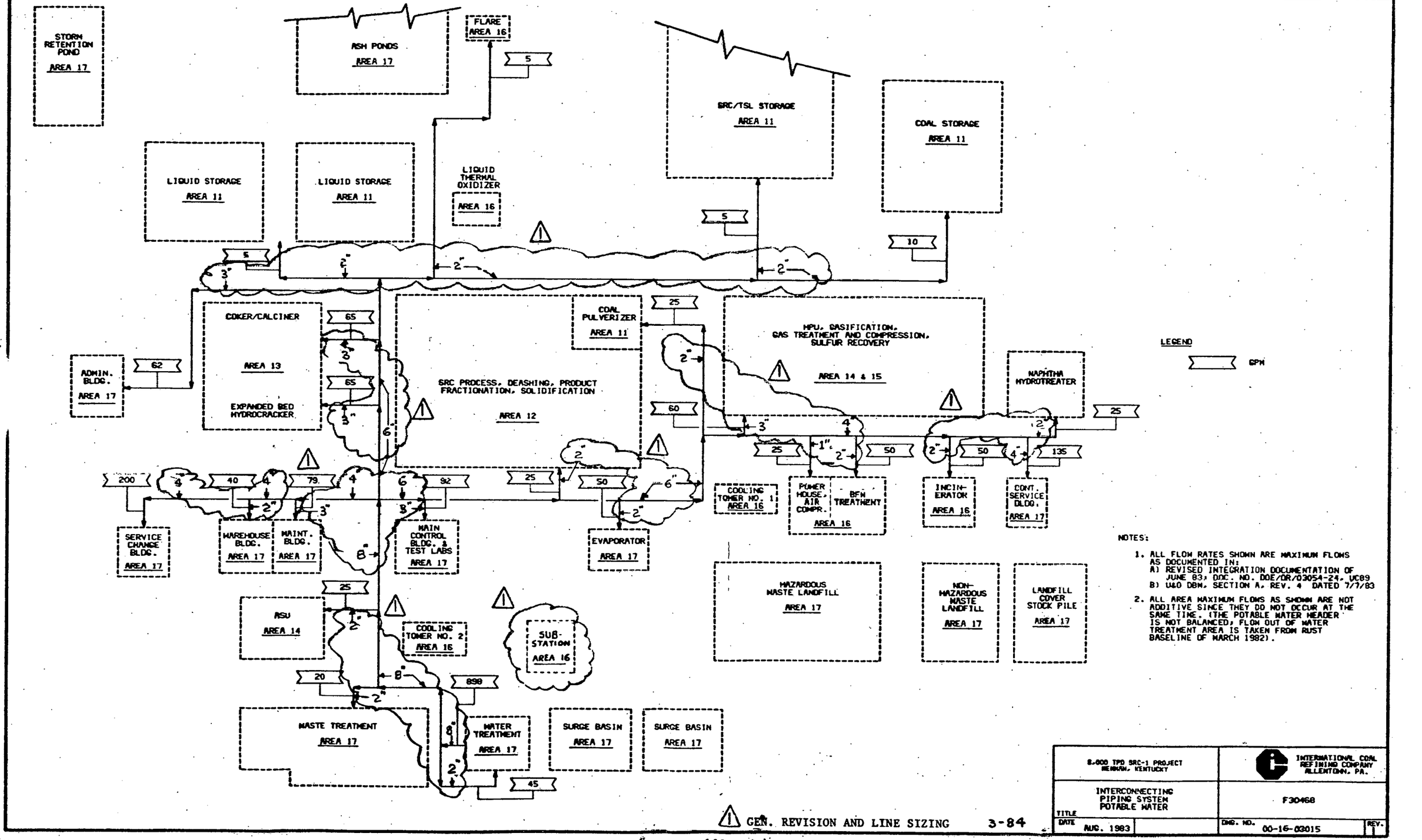


NOTES:

1. ALL FLOW RATES SHOWN ARE MAXIMUM FLOWS AS DOCUMENTED IN:
   A) REVISED INTEGRATION DOCUMENTATION OF JUNE 83, DOC. NO. DOE/DR/03054-24, UC89
   B) U&O DBM, SECTION A, REV. 4 DATED 7/7/83
2. ALL AREA MAXIMUM FLOWS AS SHOWN ARE NOT ADDITIVE SINCE THEY DO NOT OCCUR AT THE SAME TIME. (THE PROCESS WATER HEADER IS NOT BALANCED; FLOW OUT OF WATER TREATMENT AREA IS TAKEN FROM RUST BASELINE OF MARCH 1982).

⚠ GEN. REVISION AND LINE SIZING 3-84

6,000 TPD SRC-I PROJECT MEMPHIS, KENTUCKY	INTERNATIONAL COAL REFINING COMPANY ALLENTOWN, PA.
TITLE: INTERCONNECTING PIPING SYSTEM PROCESS WATER	F30467
DATE: AUG. 1983	DWG. NO. 00-16-03014 REV. 1


STORM RETENTION POND AREA 17
ASH PONDS AREA 17
FLARE AREA 16
SRC/TSL STORAGE AREA 11
COAL STORAGE AREA 11
LIQUID STORAGE AREA 11
LIQUID STORAGE AREA 11
LIQUID THERMAL OXIDIZER AREA 16
COKER/CALCINER AREA 13
EXPANDED BED HYDROCRACKER
COAL PULVERIZER AREA 11
SRC PROCESS, DEASHING, PRODUCT FRACTIONATION, SOLIDIFICATION AREA 12
HPU, GASIFICATION, GAS TREATMENT AND COMPRESSION, SULFUR RECOVERY AREA 14 & 15
NAPHTHA HYDROTREATER
ADMIN. BLDG. AREA 17
SERVICE CHANGE BLDG. AREA 17
WAREHOUSE BLDG. AREA 17
MAINT. BLDG. AREA 17
MAIN CONTROL BLDG. & TEST LABS AREA 17
EVAPORATOR AREA 17
COOLING TOWER NO. 1 AREA 16
POWER HOUSE, AIR COMPR.
BFW TREATMENT AREA 16
INCIN-ERATOR AREA 16
CONT. SERVICE BLDG. AREA 17
ASU AREA 14
COOLING TOWER NO. 2 AREA 16
SUB-STATION AREA 16
WASTE TREATMENT AREA 17
WATER TREATMENT AREA 17
SURGE BASIN AREA 17
SURGE BASIN AREA 17
HAZARDOUS WASTE LANDFILL AREA 17
NON-HAZARDOUS WASTE LANDFILL AREA 17
LANDFILL COVER STOCK PILE AREA 17
LEGEND
GPM
NOTES:
1. ALL FLOW RATES SHOWN ARE MAXIMUM FLOWS AS DOCUMENTED IN:
A) REVISED INTEGRATION DOCUMENTATION OF JUNE 83, DOC. NO. DOE/OR/03054-24, UC89
B) U&O DBM, SECTION A, REV. 4 DATED 7/7/83
2. ALL AREA MAXIMUM FLOWS AS SHOWN ARE NOT ADDITIVE SINCE THEY DO NOT OCCUR AT THE SAME TIME. (THE POTABLE WATER HEADER IS NOT BALANCED, FLOW OUT OF WATER TREATMENT AREA IS TAKEN FROM RUST BASELINE OF MARCH 1982).
1 GEN. REVISION AND LINE SIZING 3-84
8,000 TPD SRC-1 PROJECT
BEHRAM, KENTUCKY
INTERNATIONAL COAL REFINING COMPANY
ALLENTOWN, PA.
INTERCONNECTING PIPING SYSTEM POTABLE WATER
TITLE
F30468
DATE AUG. 1983
DWG. NO. 00-16-03015
REV. 1

STORM RETENTION POND
AREA 17

ASH PONDS
AREA 17

FLARE
AREA 16

SRC/TSL STORAGE
AREA 11

COAL STORAGE
AREA 11

LIQUID STORAGE
AREA 11

LIQUID STORAGE
AREA 11

LIQUID THERMAL OXIDIZER
AREA 16

2000

MAX. FLOW (INT.)
10,000
2"

18,065
2"

6,571
2"

COKER/CALCINER
AREA 13

EXPANDED BED HYDROCRACKER

COAL PULVERIZER
AREA 11

SRC PROCESS, DEASHING, PRODUCT FRACTIONATION, SOLIDIFICATION
AREA 12

HPU, GASIFICATION, GAS TREATMENT AND COMPRESSION, SULFUR RECOVERY
AREA 14 & 15

NAPHTHA HYDROTREATER

ADMIN. BLDG.
AREA 17

LEGEND
LB/HR

3"

432,870
8"
10"

24,489
3"
66,725

8"
23,778
3"
8"

COOLING TOWER NO. 1
AREA 16

POWER HOUSE, AIR COMPR.
BFW TREATMENT
AREA 16

INCIN-ERATOR
AREA 16

CONT. SERVICE BLDG.
AREA 17

SERVICE CHANGE BLDG.
AREA 17

WAREHOUSE BLDG.
AREA 17

MAINT. BLDG.
AREA 17

2,400
2"

MAIN CONTROL BLDG. & TEST LABS
AREA 17

EVAPORATOR
AREA 17

HAZARDOUS WASTE LANDFILL
AREA 17

NON-HAZARDOUS WASTE LANDFILL
AREA 17

LANDFILL COVER STOCK PILE
AREA 17

6"

ASU
AREA 14

SUB-STATION
AREA 16

COOLING TOWER NO. 2
AREA 16

162,091

WASTE TREATMENT
AREA 17

WATER TREATMENT
AREA 17

SURGE BASIN
AREA 17

SURGE BASIN
AREA 17

1 GEN. REVISION AND LINE SIZING 3-84

6,000 TPD SRC-I PROJECT HENNAH, KENTUCKY	INTERNATIONAL COAL REFINING COMPANY ALLENTOWN, PA.
TITLE: INTERCONNECTING PIPING SYSTEM CONDENSATE	F30459
DATE: AUG. 1983	DWG. NO. 00-16-03016 REV. 1

RUST, BIRMINGHAM, ALABAMA

PROPOSAL OR JOB NO. 21-2548

FOR 6,000 T/D SRC-I DEMONSTRATION PLANT

DATE 1/12/84

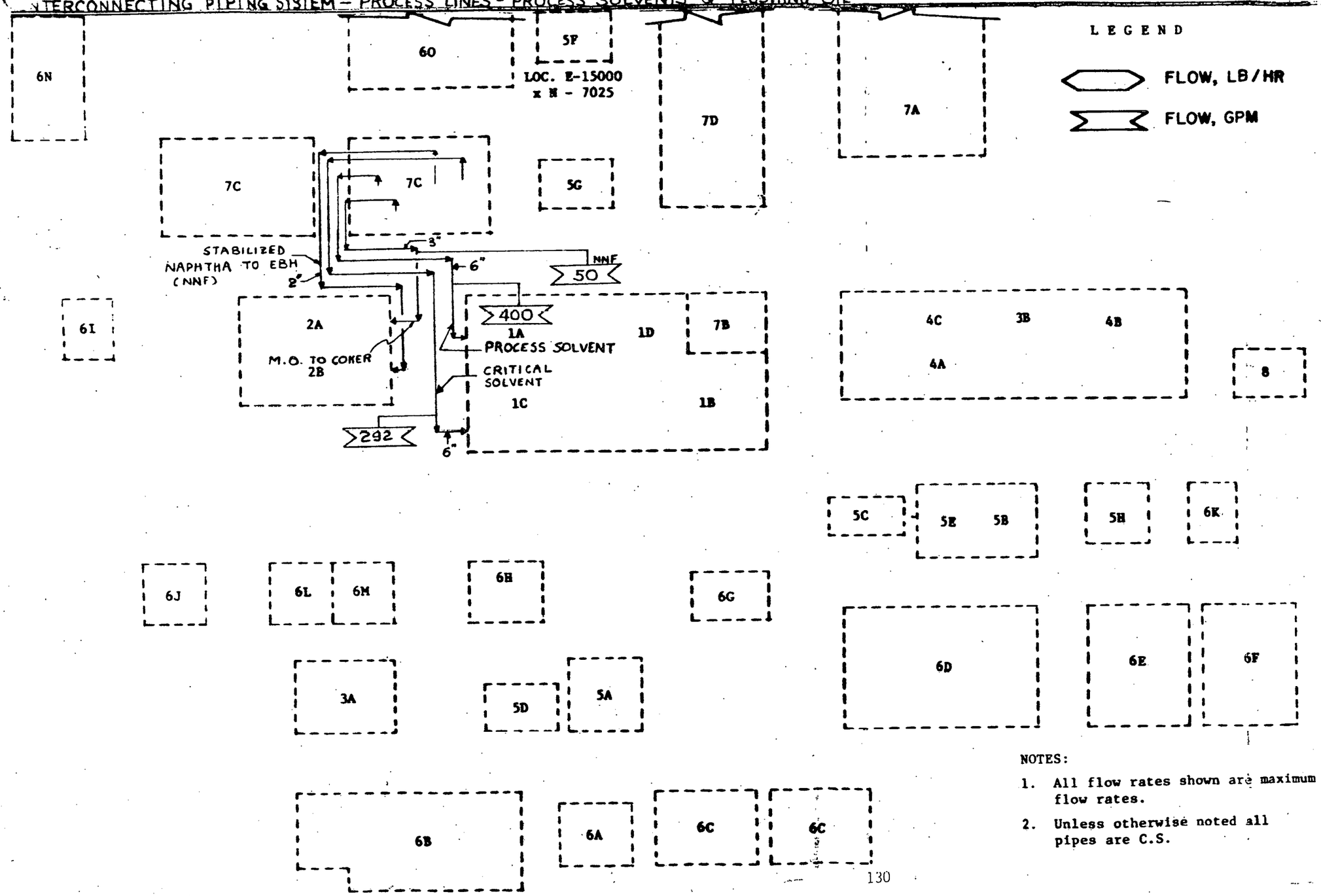
AT NEWMAN, KENTUCKY

BY B. Shah CHKD.

SCRIPTION II&O DESIGN BASELINE UPDATE MARCH 1984

DWG. 00-16-05001, REV. 0

NTERCONNECTING PIPING SYSTEM – PROCESS LINES - PROCESS SOLVENTS & FLUSHING OIL



LEGEND

FLOW, LB/HR

FLOW, GPM

1 AREA 12 SRC
1A SRC Process
1B Deashing
1C Product Fractionation
1D Solidification

2 AREA 13 PRODUCT UPGRADING
2A Coker/Calciner
2B Expanded-bed Hydrocracker

3 AREA 14 CRYOGENIC SEPARATION
3A Air Separation
3B Hydrogen Purification

4 AREA 15 GAS SYSTEMS
4A Gasification
4B Gas Treatment
4C Sulfur Recovery

5 AREA 16 UTILITIES
5A Main Substation
5B BFW Treatment
5C Cooling Tower No. 1
5D Cooling Tower No. 2
5E Power House and Air Compressor
5F Flare
5G Liquid Thermal Oxidizer
5H Gas Incinerator

6 AREA 17 OFFSITES
6A Water Treatment
6B Wastewater Treatment
6C Surge Basin
6D Hazardous Waste Landfill
6E Non-Hazardous Waste Landfill
6F Landfill Cover Stock Pile
6G Evaporator
6H Central Control Building
6I Administration Building
6J Service Change Building
6K Contract Maintenance Change Bldg.
6L Warehouse Building
6M Maintenance Building
6N Storm Retention Pond
6O Ash Ponds

7 AREA 11 RAW MATERIAL & PRODUCT STORAGE
7A Coal Storage
7B Coal Pulverizer
7C Liquid Storage
7D SRC/TSL Storage

8 NAPHTHA HYDROTREATER

NOTES:

1. All flow rates shown are maximum flow rates.
2. Unless otherwise noted all pipes are C.S.

RUST, BIRMINGHAM, ALABAMA

FOR 6,000 T/D SRC-I DEMONSTRATION PLANT
NEWMAN, KENTUCKY

CRIPTION U&O DESIGN BASELINE UPDATE MARCH 1984

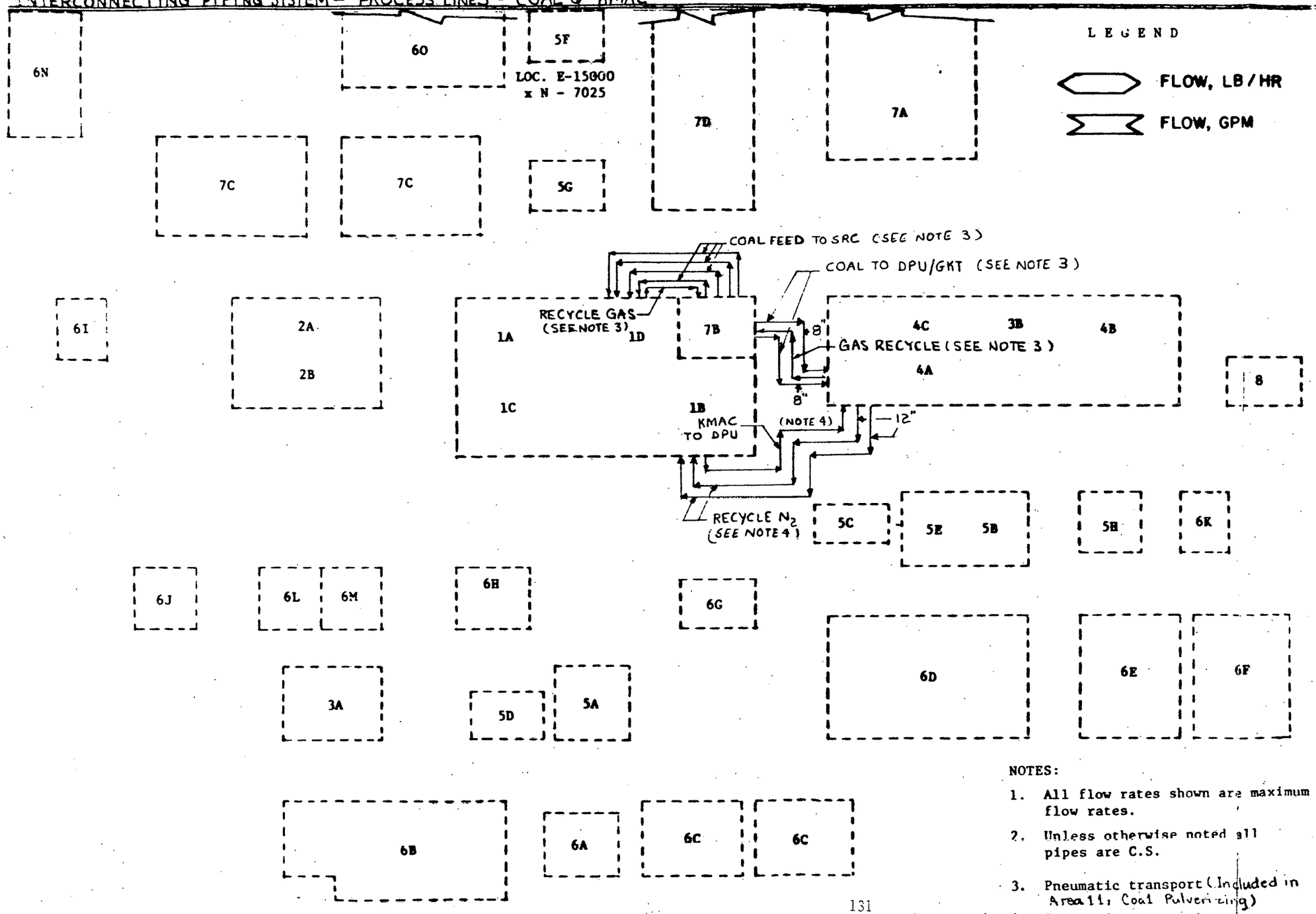
PROPOSAL OR JOB NO. 21-2548

DATE 1/12/84

BY B Shah CKD.

DWG. 00-16-05002, REV 0

INTERCONNECTING PIPING SYSTEM — PROCESS LINES - COAL & KMAC



LEGEND

FLOW, LB/HR

FLOW, GPM

1 AREA 12 SRC
1A SRC Process
1B Deashing
1C Product Fractionation
1D Solidification

2 AREA 13 PRODUCT UPGRADING
2A Coker/Calciner
2B Expanded-bed Hydrocracker

3 AREA 14 CRYOGENIC SEPARATION
3A Air Separation
3B Hydrogen Purification

4 AREA 15 GAS SYSTEMS
4A Gasification
4B Gas Treatment
4C Sulfur Recovery

5 AREA 16 UTILITIES
5A Main Substation
5B BFW Treatment
5C Cooling Tower No. 1
5D Cooling Tower No. 2
5E Power House and Air Compressor
5F Flare
5G Liquid Thermal Oxidizer
5H Gas Incinerator

6 AREA 17 OFFSITES
6A Water Treatment
6B Wastewater Treatment
6C Surge Basin
6D Hazardous Waste Landfill
6E Non-Hazardous Waste Landfill
6F Landfill Cover Stock Pile
6G Evaporator
6H Central Control Building
6I Administration Building
6J Service Change Building
6K Contract Maintenance Change Bldg.
6L Warehouse Building
6M Maintenance Building
6N Storm Retention Pond
6O Ash Ponds

7 AREA 11 RAW MATERIAL & PRODUCT STORAGE
7A Coal Storage
7B Coal Pulverizer
7C Liquid Storage
7D SRC/TSL Storage

8 NAPHTHA HYDROTREATER

NOTES:

1. All flow rates shown are maximum flow rates.
2. Unless otherwise noted all pipes are C.S.
3. Pneumatic transport (Included in Area 11, Coal Pulverizing)
4. Pneumatic transport.

RUST, BIRMINGHAM, ALABAMA

FOR 6,000 T/D SRC-I DEMONSTRATION PLANT

AT NEWMAN, KENTUCKY

CRIPTION: U&O DESIGN BASELINE UPDATE MARCH 1984

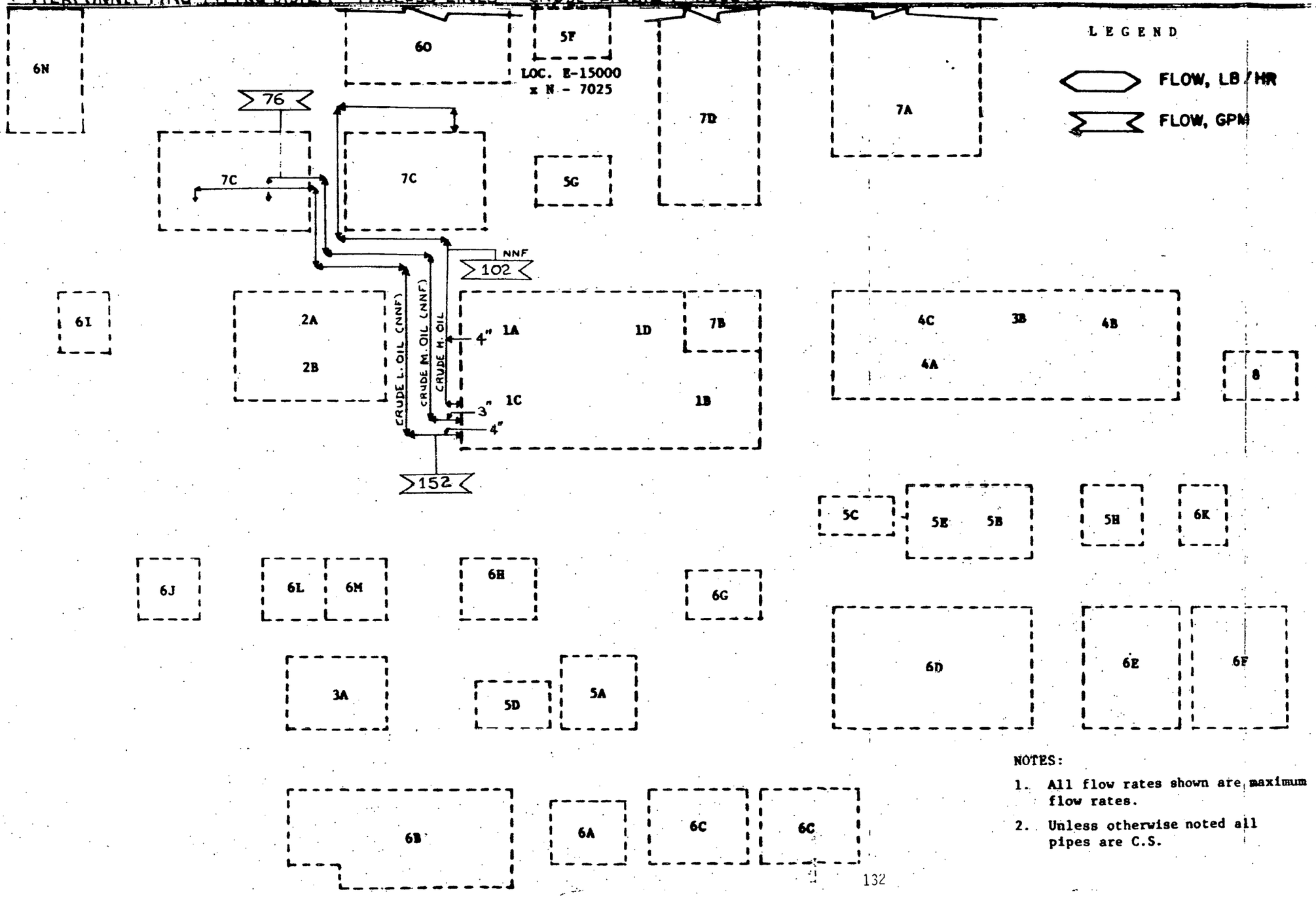
PROPOSAL OR JOB NO. 21-2548

DATE 1/12/84

BY B. Shah CKD.

DWG. 00-16-05003, REV.0

INTERCONNECTING PIPING SYSTEM - PROCESS LINES - CRUDE LIQUID PRODUCTS



LEGEND

FLOW, LB/HR

FLOW, GPM

1 AREA 12 SRC
1A SRC Process
1B Deashing
1C Product Fractionation
1D Solidification

2 AREA 13 PRODUCT UPGRADING
2A Coker/Calciner
2B Expanded-bed Hydrocracker

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5H Gas Incinerator

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6M Maintenance Building
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6O Ash Ponds

7 AREA 11 RAW MATERIAL & PRODUCT STORAGE
7A Coal Storage
7B Coal Pulverizer
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7D SRC/TSL Storage

8 NAPHTHA HYDROTREATER

NOTES:

1. All flow rates shown are maximum flow rates.
2. Unless otherwise noted all pipes are C.S.

RUST, BIRMINGHAM, ALABAMA

PROPOSAL OR JOB NO. 21-2548

FOR 6,000 T/D SRC-I DEMONSTRATION PLANT

AT NEWMAN, KENTUCKY

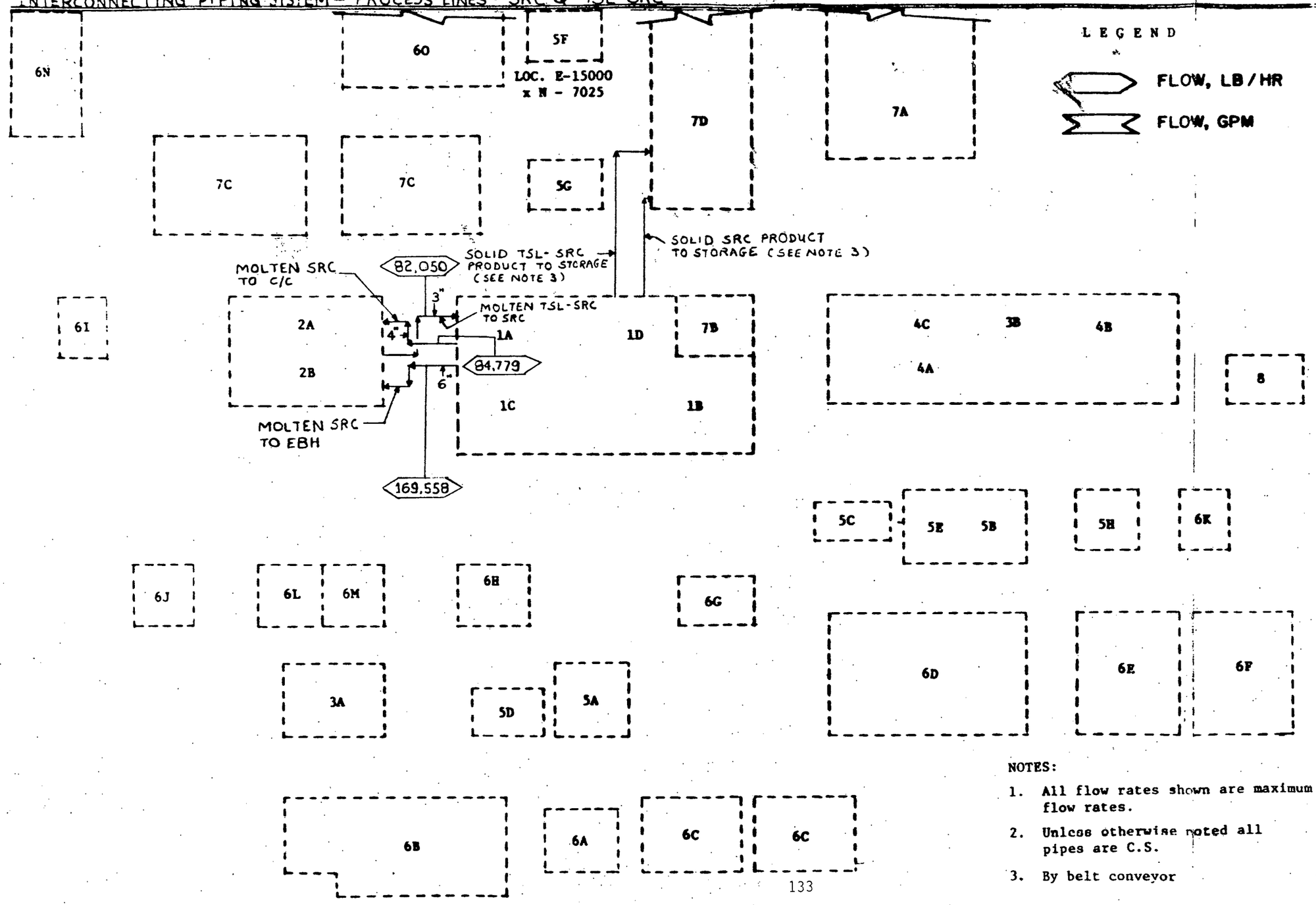
DESCRIPTION U&O DESIGN BASELINE UPDATE MARCH 1984

DATE 1/12/84

BY B. Shah CKD.

DWG. 00-16-05004, REVO

INTERCONNECTING PIPING SYSTEM – PROCESS LINES - SRC & TSL-SRC



LEGEND

FLOW, LB/HR

FLOW, GPM

1 AREA 12 SRC
1A SRC Process
1B Deashing
1C Product Fractionation
1D Solidification

2 AREA 13 PRODUCT UPGRADING
2A Coker/Calciner
2B Expanded-bed Hydrocracker

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4 AREA 15 GAS SYSTEMS
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6O Ash Ponds

7 AREA 11 RAW MATERIAL & PRODUCT STORAGE
7A Coal Storage
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7C Liquid Storage
7D SRC/TSL Storage

8 NAPHTHA HYDROTREATER

NOTES:

1. All flow rates shown are maximum flow rates.
2. Unless otherwise noted all pipes are C.S.
3. By belt conveyor

RUST, BIRMINGHAM, ALABAMA

FOR 6,000 T/D SRC-I DEMONSTRATION PLANT

AT NEWMAN, KENTUCKY

SCRIPTION U&O DESIGN BASELINE UPDATE MARCH 1984

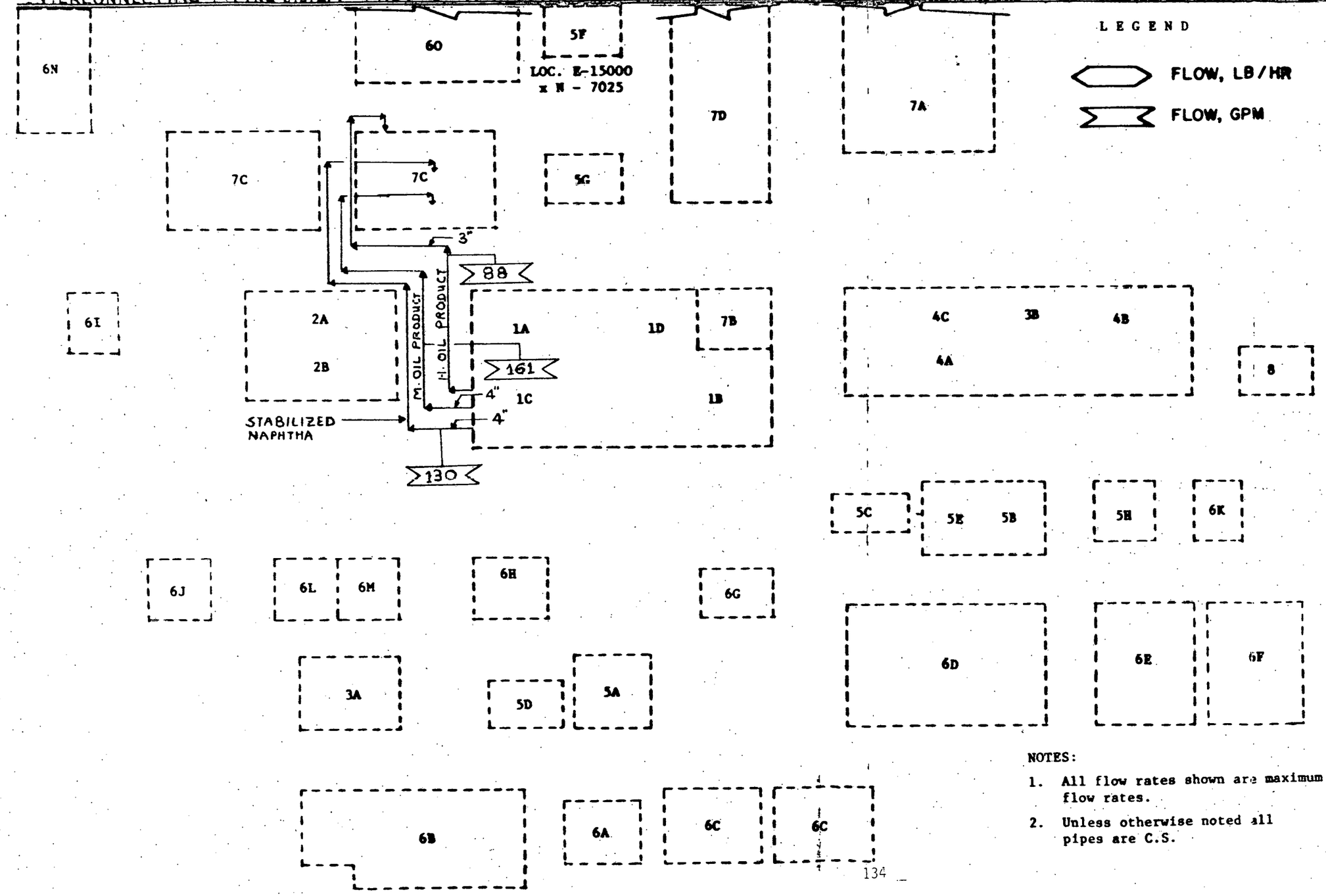
PROPOSAL OR JOB NO. 21-2548

DATE 1/12/84

BY B. Shah CKD.

DWG. 00-16-05005, REV 0

INTERCONNECTING PIPING SYSTEM – PROCESS LINES - FRACTIONATED LIQUID PRODUCTS TO TANK FIRM



LEGEND

FLOW, LB/HR

FLOW, GPM

1 AREA 12 SRC
1A SRC Process
1B Deashing
1C Product Fractionation
1D Solidification

2 AREA 13 PRODUCT UPGRADING
2A Coker/Calciner
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5H Gas Incinerator

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8 NAPHTHA HYDROTREATER

NOTES:

1. All flow rates shown are maximum flow rates.
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RUST, BIRMINGHAM, ALABAMA

PROPOSAL OR JOB NO. 21-2548

FOR 6,000 T/D SRC-I DEMONSTRATION PLANT

AT NEWMAN, KENTUCKY

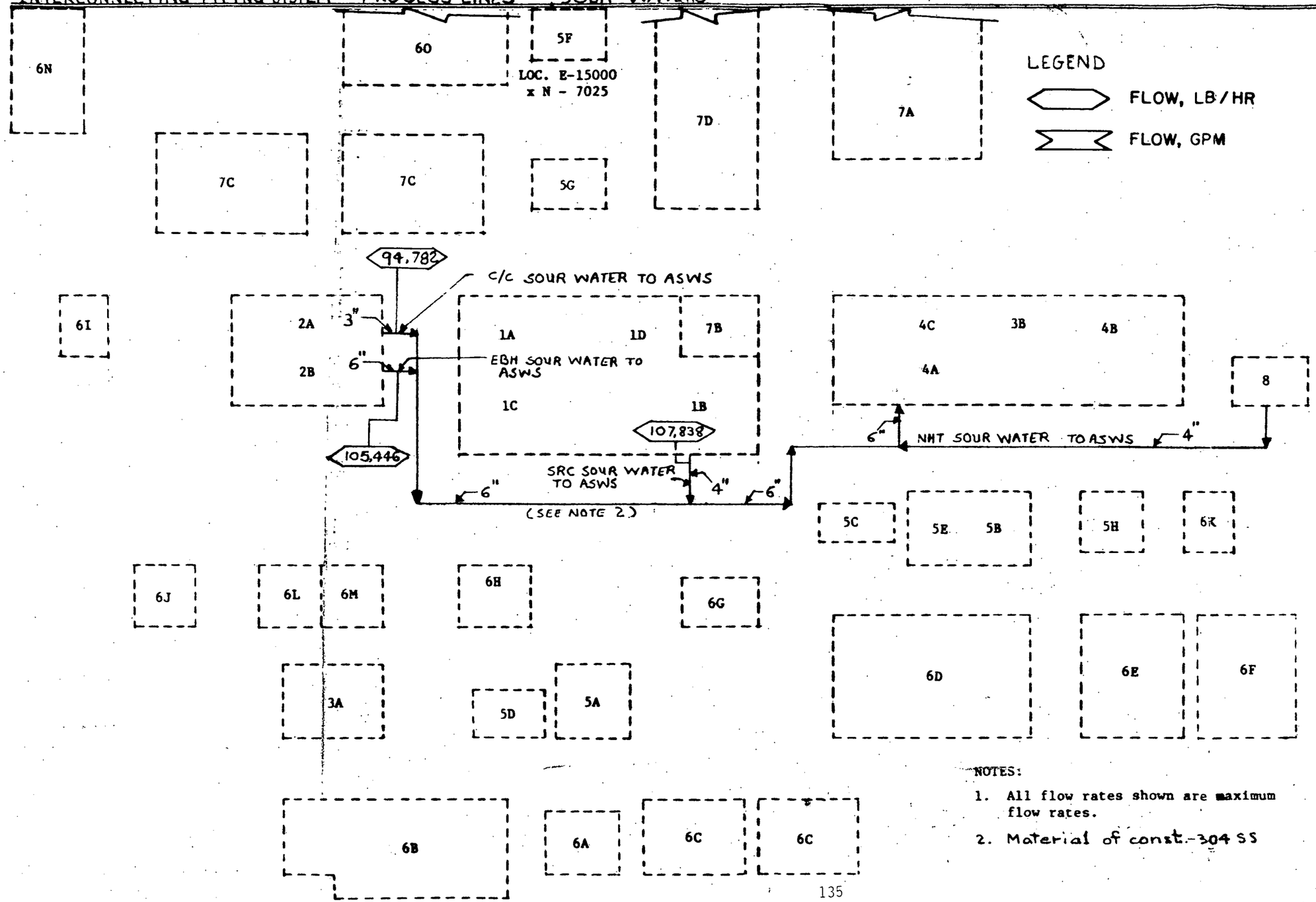
DESCRIPTION U&O DESIGN BASELINE UPDATE MARCH 1984

DATE 1/3/84

BY B.Bhat CKD.

DWG. 00-16-05006, REV 0

INTERCONNECTING PIPING SYSTEM – PROCESS LINES - SOUR WATERS



LEGEND

FLOW, LB/HR

FLOW, GPM

1 AREA 12 SRC
1A SRC Process
1B Deashing
1C Product Fractionation
1D Solidification

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7A Coal Storage
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8 NAPTHA HYDROTREATER

NOTES:

1. All flow rates shown are maximum flow rates.
2. Material of const.-304 SS

RUST, BIRMINGHAM, ALABAMA

PROPOSAL OR JOB NO. 21-2548

FOR 6,000 T/D SRC-I DEMONSTRATION PLANT

AT NEWMAN, KENTUCKY

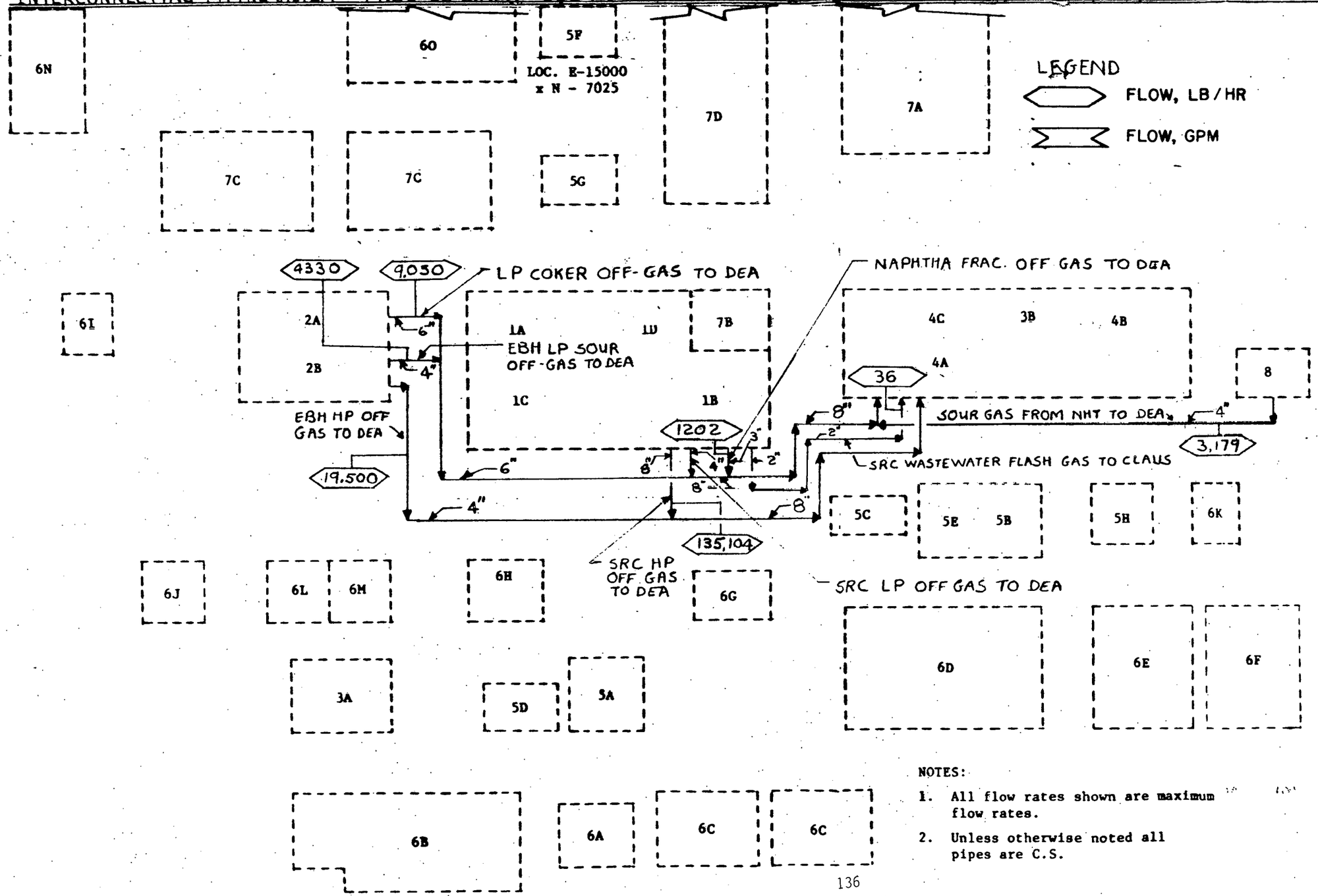
DATE 1/3/84

BY B.Shah CKD.

DESCRIPTION U&O DESIGN BASELINE UPDATE MARCH 1984

DWG. 00-16-05007, REV. 0

INTERCONNECTING PIPING SYSTEM – PROCESS LINES - SOUR GASES



NOTES:

1. All flow rates shown are maximum flow rates.
2. Unless otherwise noted all pipes are C.S.

1 AREA 12 SRC
1A SRC Process
1B Deashing
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8 NAPTHA HYDROTREATER

RUST, BIRMINGHAM, ALABAMA

PROPOSAL OR JOB NO. 21-2548

FOR 6,000 T/D SRC-I DEMONSTRATION PLANT

AT NEWMAN, KENTUCKY

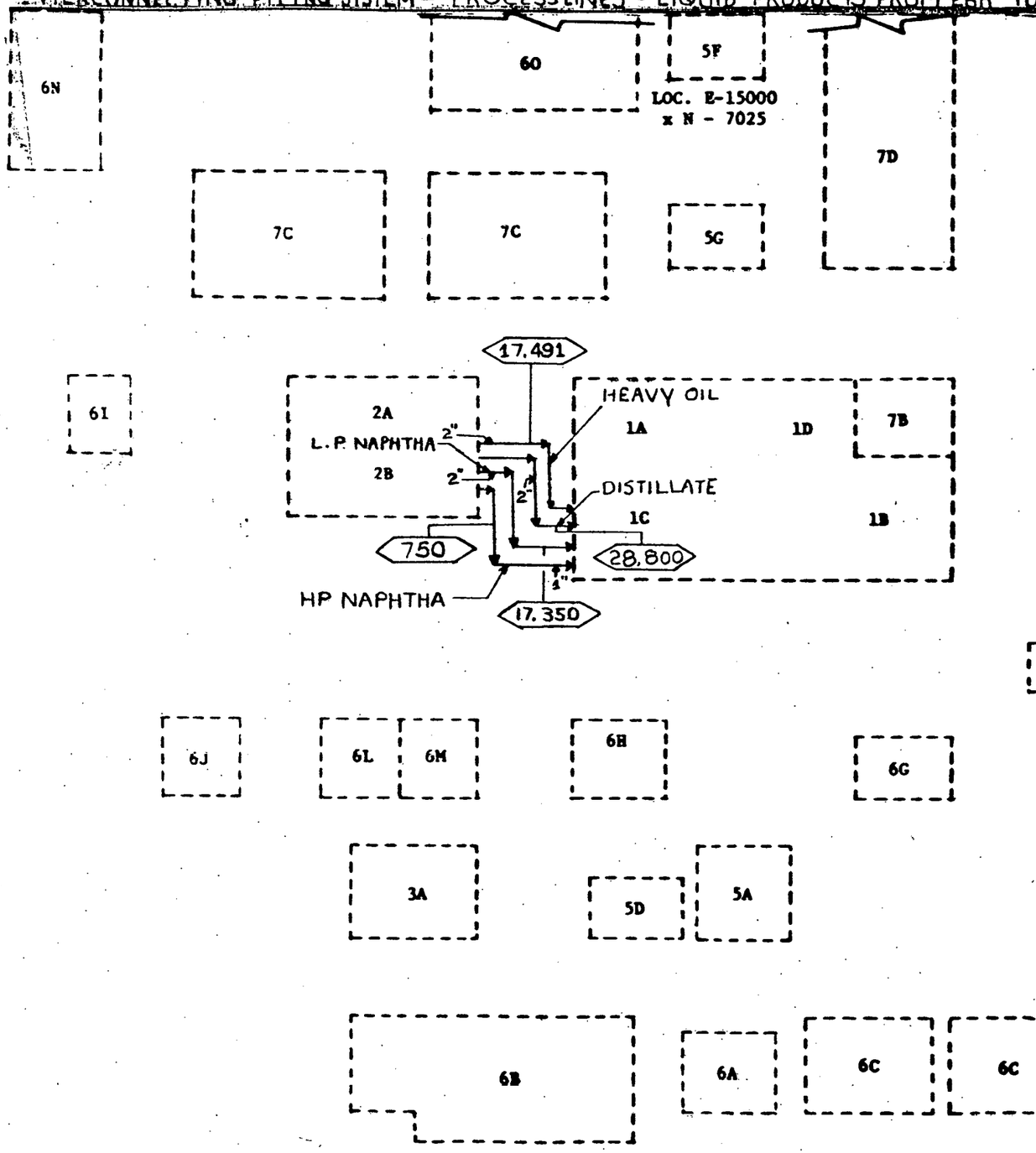
DATE 1/12/83

BY B Shah CKD.

DESCRIPTION U&O DESIGN BASELINE UPDATE MARCH 1984

DWG. 00-16-05008, REV. 0

INTERCONNECTING PIPING SYSTEM - PROCESS LINES - LIQUID PRODUCTS FROM EBH TO PRODUCT FRACTIONATION



LEGEND

FLOW, LB/HR

FLOW, GPM

NOTES:

1. All flow rates shown are maximum flow rates.
2. Unless otherwise noted all pipes are C.S.

1 AREA 12 SRC
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7 AREA 11 RAW MATERIAL & PRODUCT STORAGE
7A Coal Storage
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8 NAPHTHA HYDROTREATER

RUST. BIRMINGHAM, ALABAMA

FOR 6,000 T/D SRC-I DEMONSTRATION PLANT

AT NEWMAN, KENTUCKY

DESCRIPTION U&O DESIGN BASELINE UPDATE MARCH 1984

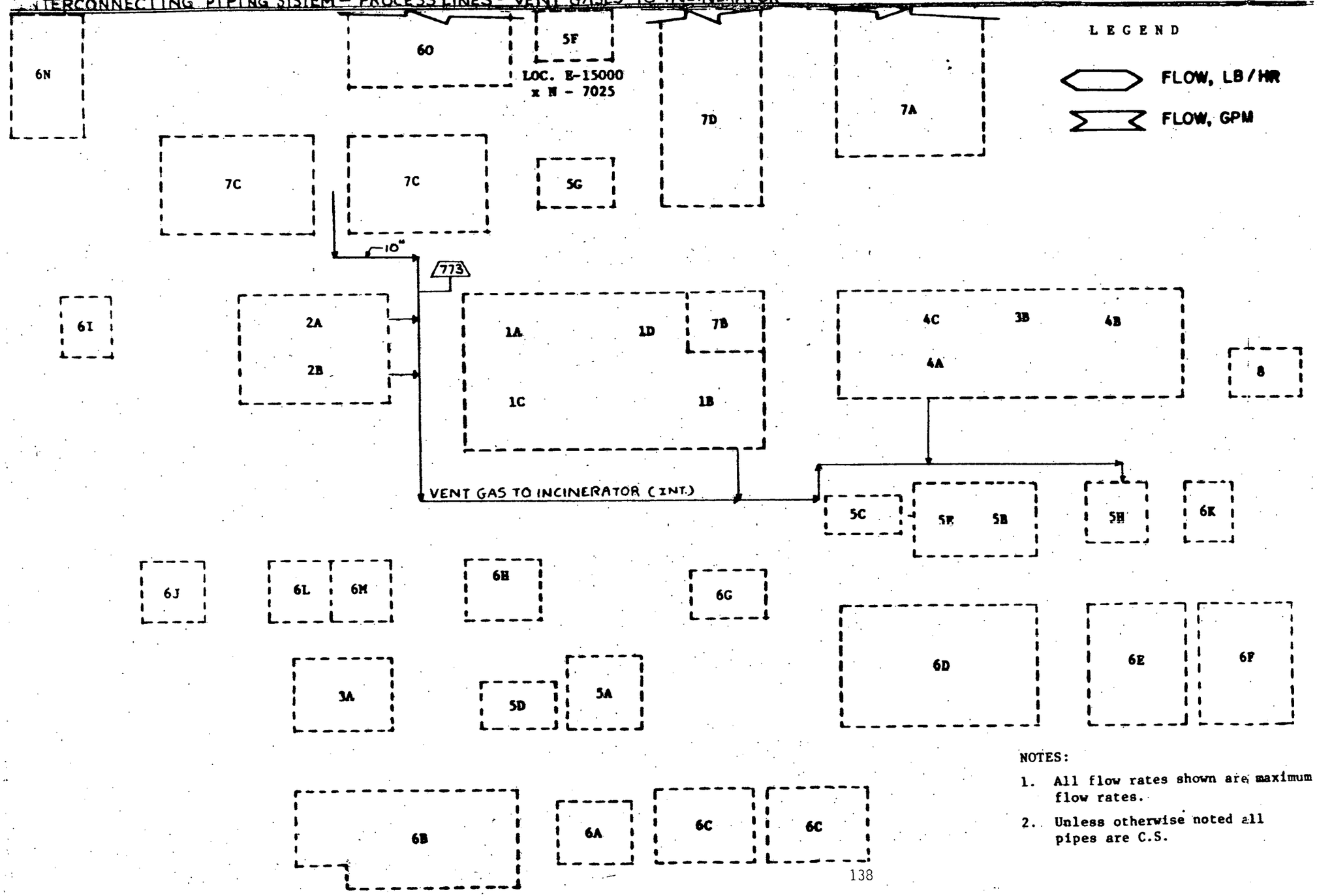
PROPOSAL OR JOB NO. 21-2548

DATE 1/12/84

BY B. Shah CKD.

DWG. 00-16-05009, REV. 0

INTERCONNECTING PIPING SYSTEM – PROCESS LINES - VENT GASES TO INCINERATOR



LEGEND

FLOW, LB/HR

FLOW, GPM

NOTES:

1. All flow rates shown are maximum flow rates.
2. Unless otherwise noted all pipes are C.S.

1 AREA 12 SRC
1A SRC Process
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7 AREA 11 RAW MATERIAL & PRODUCT STORAGE
7A Coal Storage
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7D SRC/TSL Storage

8 NAPHTHA HYDROTREATER

RUST, BIRMINGHAM, ALABAMA

PROPOSAL OR JOB NO. 21-2548

FOR 6,000 T/D SRC-I DEMONSTRATION PLANT

AT NEWMAN, KENTUCKY

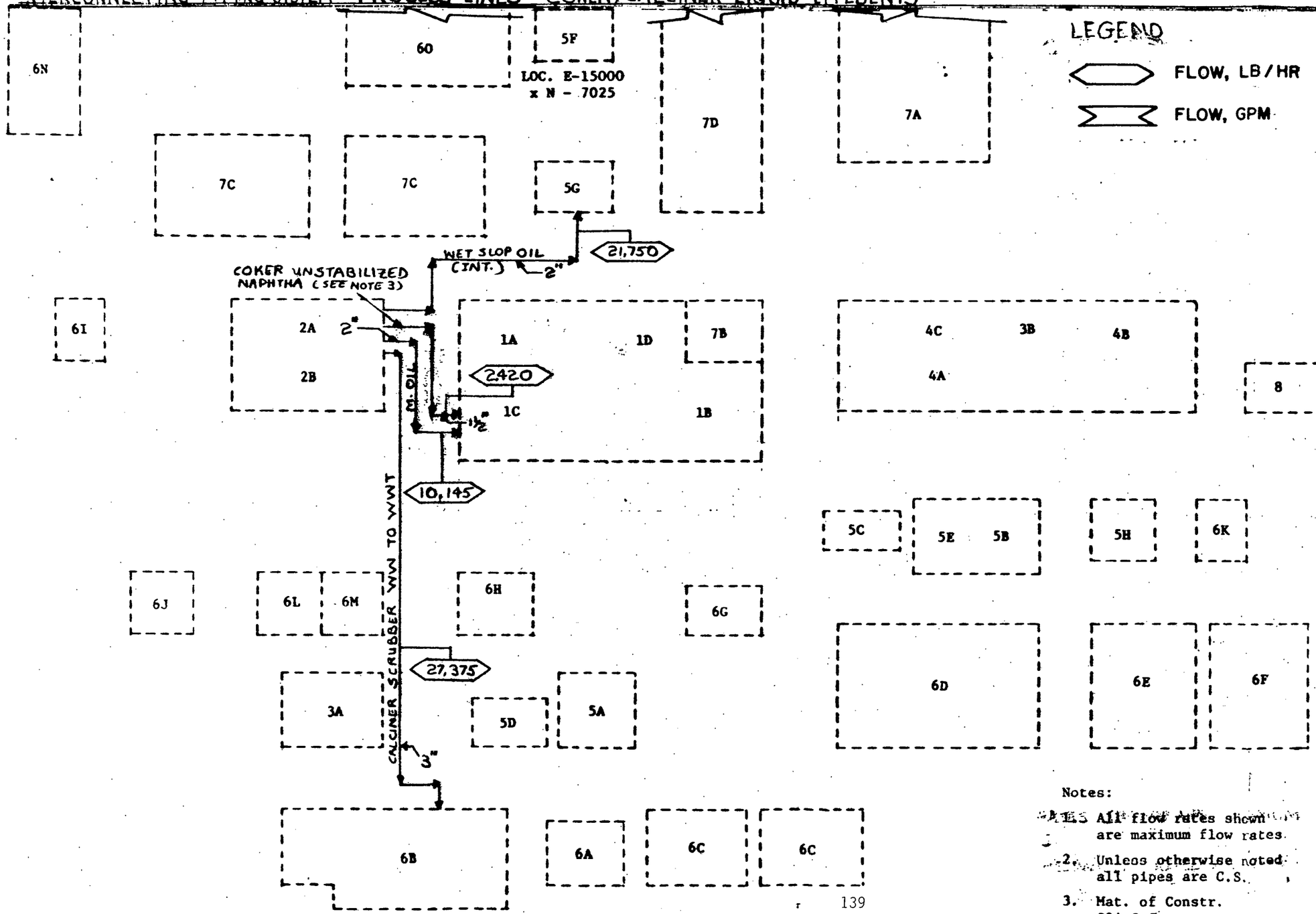
DATE 1/3/84

BY B. Shah CKD.

DESCRIPTION U&O DESIGN BASELINE UPDATE MARCH 1984

DWG. 00-16-05010, REV. 0

INTERCONNECTING PIPING SYSTEM – PROCESS LINES - COKER/CALCINER LIQUID EFFLUENTS



LEGEND

FLOW, LB/HR

FLOW, GPM

1 AREA 12 SRC
1A SRC Process
1B Deashing
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8 NAPTHA HYDROTREATER

Notes:

1. All flow rates shown are maximum flow rates.
2. Unless otherwise noted all pipes are C.S.
3. Mat. of Constr. 304 S.S.

RUST, BIRMINGHAM, ALABAMA

PROPOSAL OR JOB No. 21-2548

FOR 6,000 T/D SRC-I DEMONSTRATION PLANT

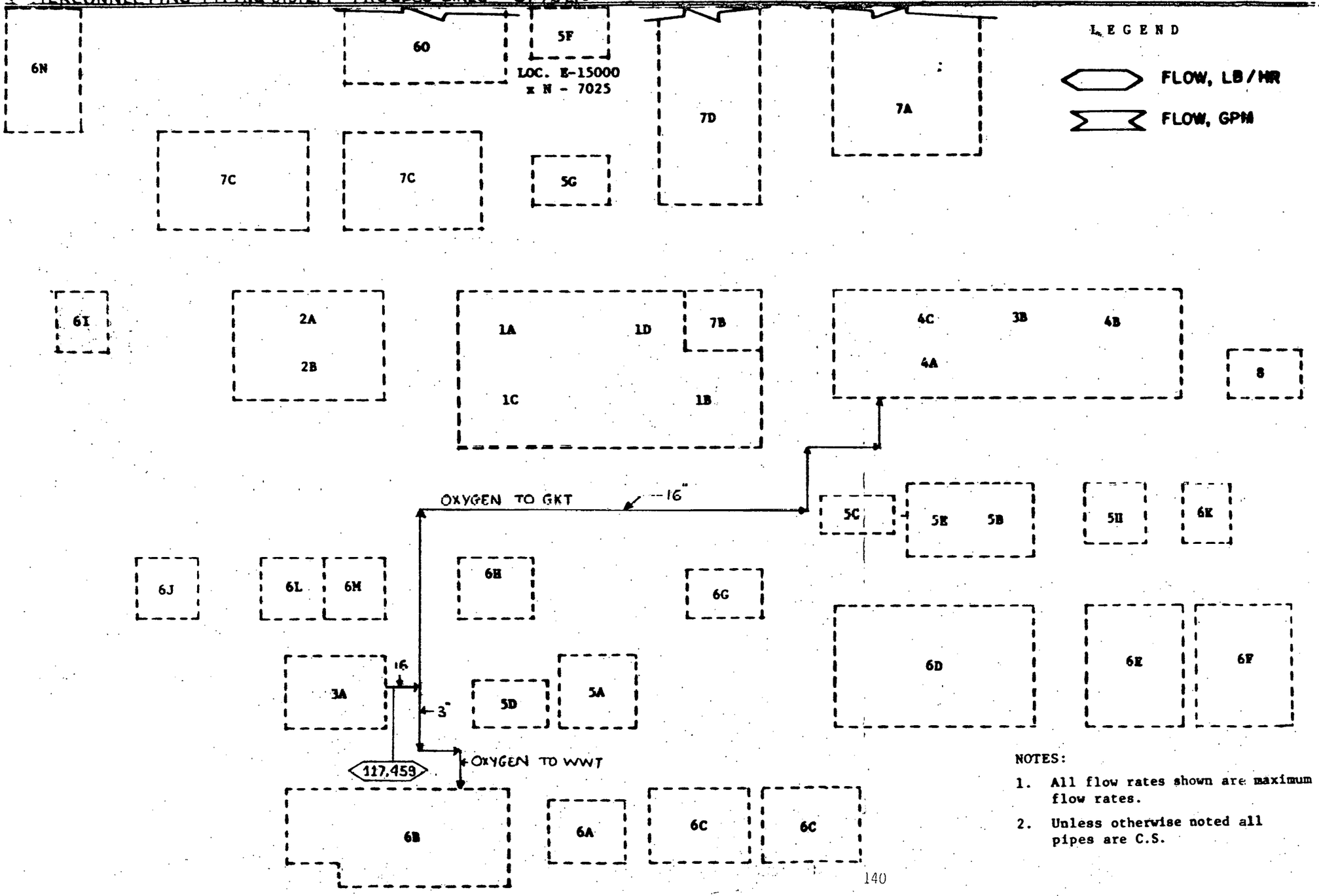
AT NEWMAN, KENTUCKY

DATE 1/12/84

BY B. Shah CKD.

CRIPTION U&O DESIGN BASELINE UPDATE MARCH 1984 DWG. 00-16-05011, REV. 0

TERCONNECTING PIPING SYSTEM - PROCESS LINES - OXYGEN



LEGEND

FLOW, LB/HR

FLOW, GPM

1 AREA 12 SRC
1A SRC Process
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NOTES:

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2. Unless otherwise noted all pipes are C.S.

RUST, BIRMINGHAM, ALABAMA

FOR 6,000 T/D SRC-I DEMONSTRATION PLANT

AT NEWMAN, KENTUCKY

DESCRIPTION II&O DESIGN BASELINE UPDATE MARCH 1984

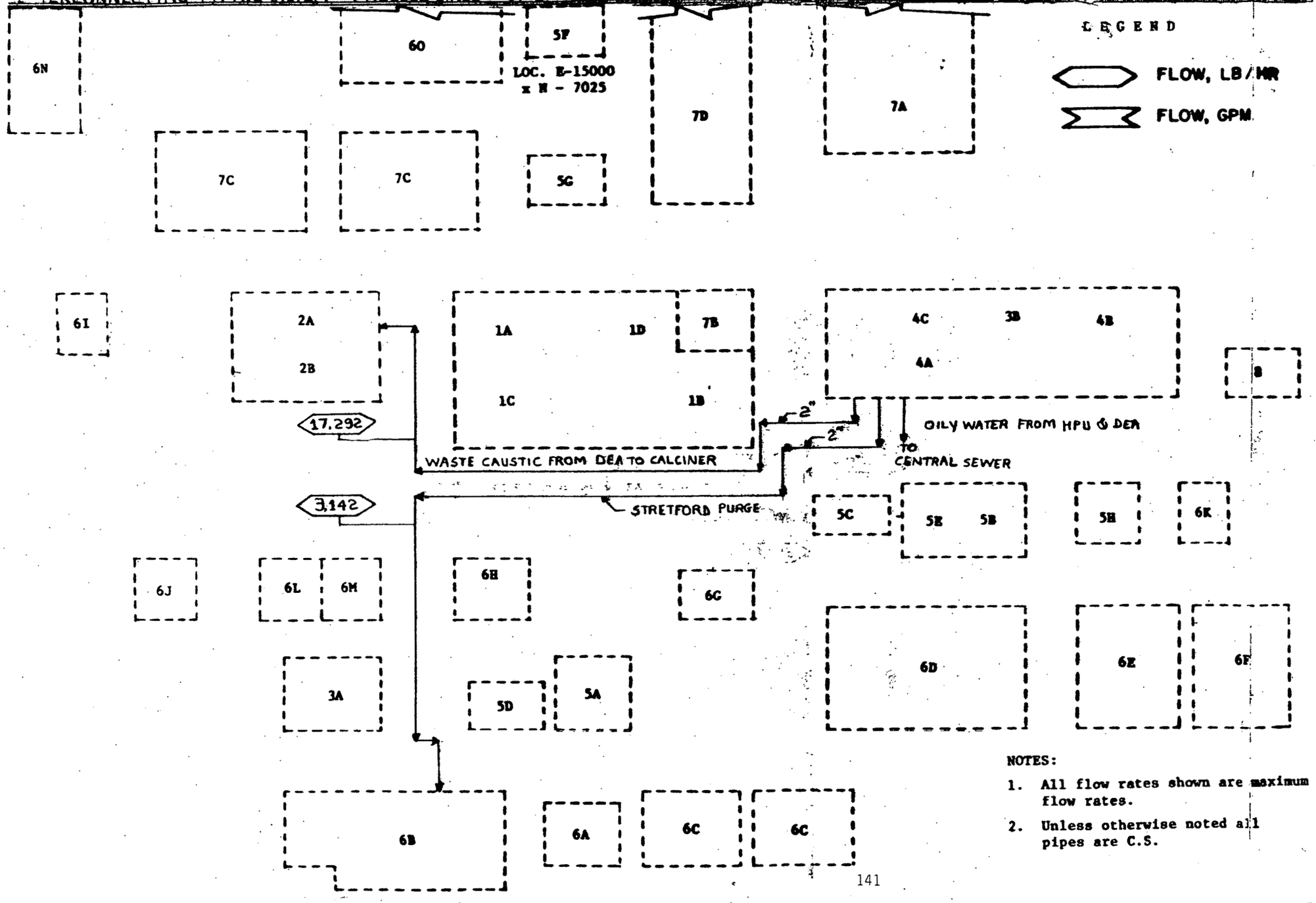
INTERCONNECTING PIPING SYSTEM - PROCESS LINES - GAS SYSTEM WASTE STREAMS

BECHTEL JOB No. 21-2548

DATE 1/12/84

BY B. Shah CHKD.

DWG. 00-16-05012, REV 0



LEGEND

FLOW, LB/HR

FLOW, GPM

1 AREA 12 SRC
1A SRC Process
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NOTES:

1. All flow rates shown are maximum flow rates.
2. Unless otherwise noted all pipes are C.S.

RUST, BIRMINGHAM, ALABAMA

PROPOSAL OR JOB NO. 21-2548

FOR 6,000 T/D SRC-I DEMONSTRATION PLANT
NEWMAN, KENTUCKY

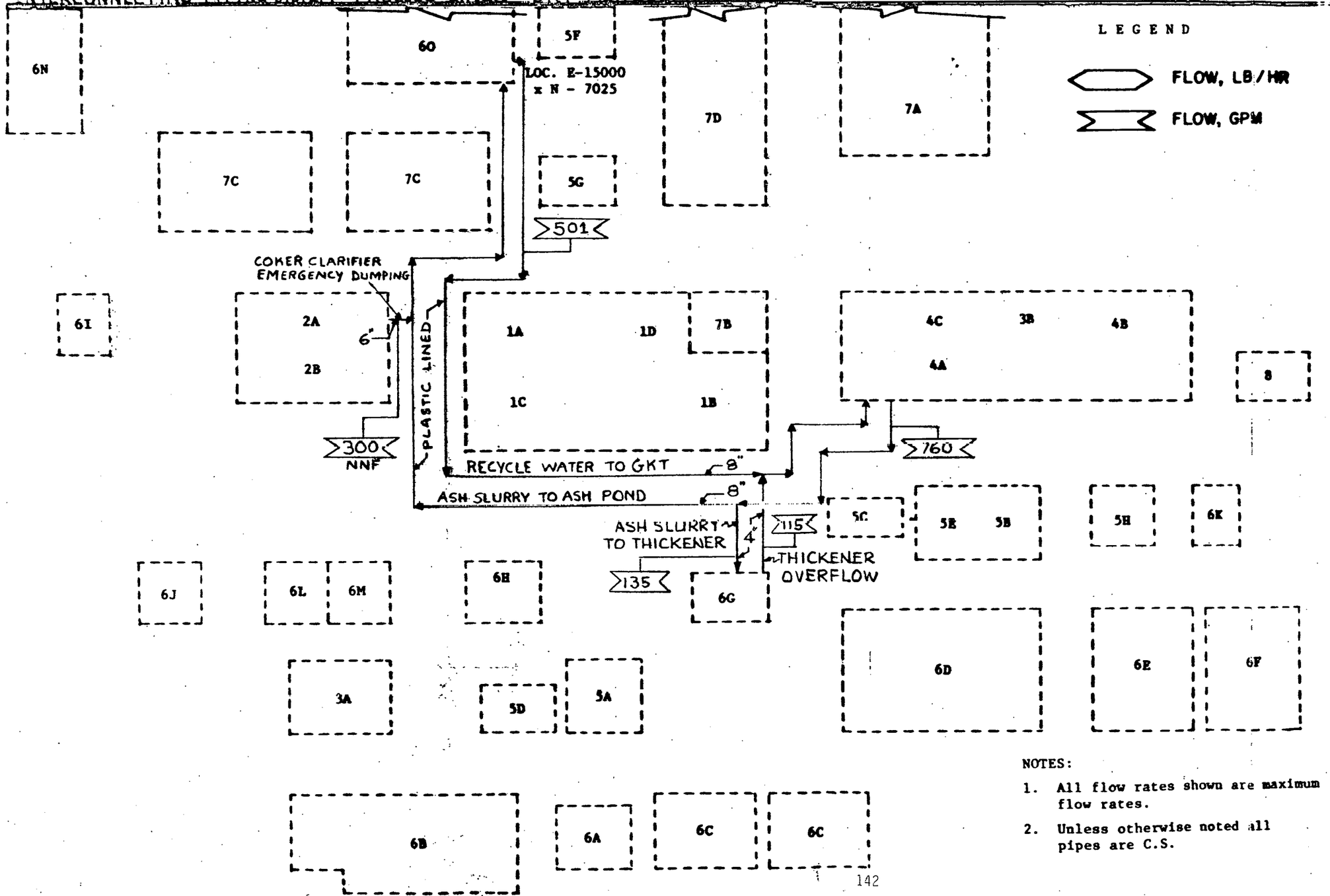
DATE 1/12/84

BY B. Shah CKD.

CRIPTION U&O DESIGN BASELINE UPDATE MARCH 1984

DWG. 00-16-05013, REV 0

NTERCONNECTING PIPING SYSTEM - PROCESS LINES - GKT ASH SLURRY



LEGEND

FLOW, LB/HR

FLOW, GPM

1 AREA 12 SRC
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5C Cooling Tower No. 1
5D Cooling Tower No. 2
5E Power House and Air Compressor
5F Flare
5G Liquid Thermal Oxidizer
5H Gas Incinerator

6 AREA 17 OFFSITES
6A Water Treatment
6B Wastewater Treatment
6C Surge Basin
6D Hazardous Waste Landfill
6E Non-Hazardous Waste Landfill
6F Landfill Cover Stock Pile
6G Evaporator
6H Central Control Building
6I Administration Building
6J Service Change Building
6K Contract Maintenance Change Bldg.
6L Warehouse Building
6M Maintenance Building
6N Storm Retention Pond
6O Ash Ponds

7 AREA 11 RAW MATERIAL & PRODUCT STORAGE
7A Coal Storage
7B Coal Pulverizer
7C Liquid Storage
7D SRC/TSL Storage

8 NAPHTHA HYDROTREATER

NOTES:

1. All flow rates shown are maximum flow rates.
2. Unless otherwise noted all pipes are C.S.

RUST BIRMINGHAM, ALABAMA

PROPOSAL OR JOB NO. 21-2548

FOR 6,000 T/D SRC-I DEMONSTRATION PLANT

AT NEWMAN, KENTUCKY

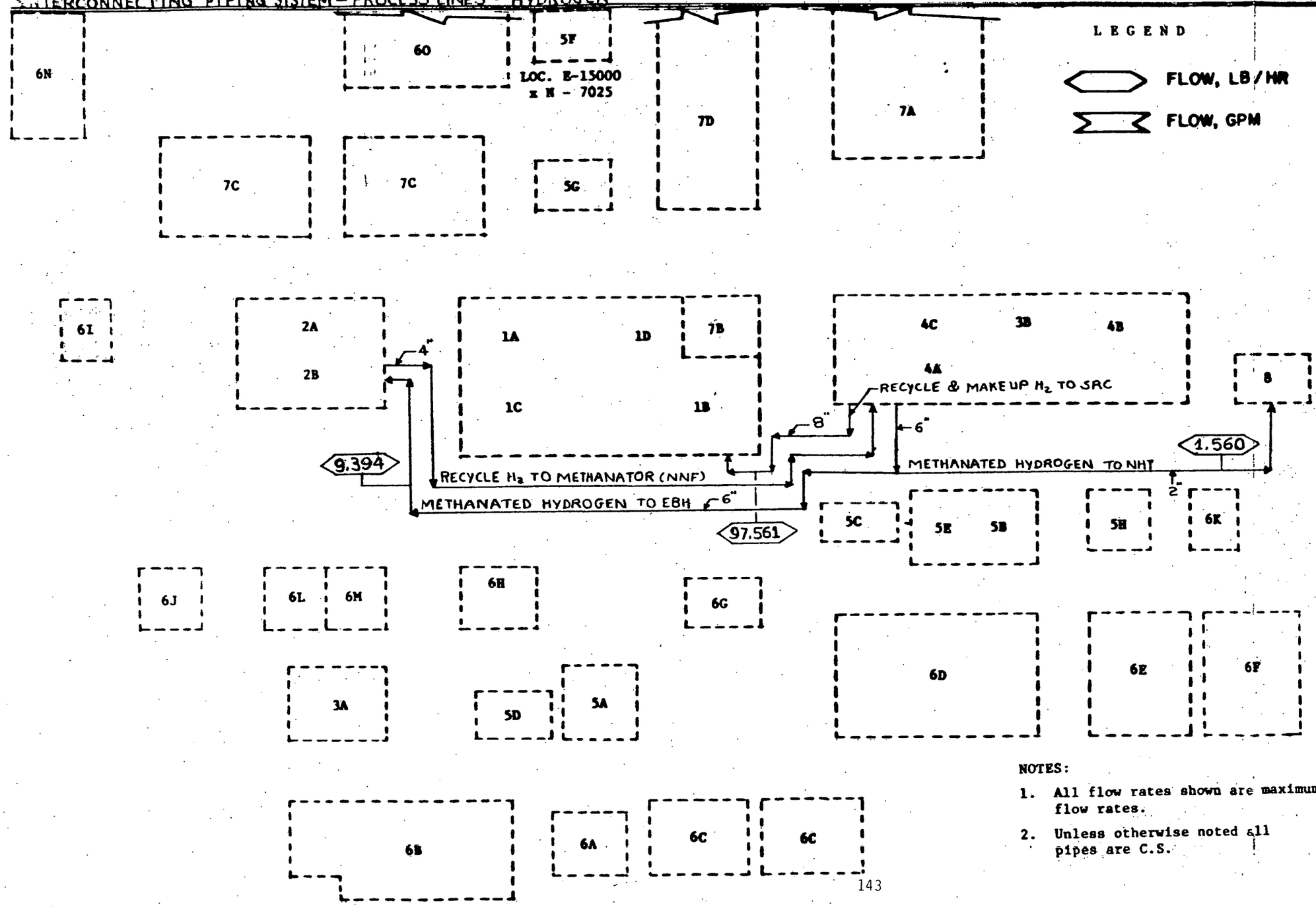
DATE 4/12/83

BY B. Shah CKD.

DESCRIPTION U&O DESIGN BASELINE UPDATE MARCH 1984

DWG. 00-16-05014, REV. 0

INTERCONNECTING PIPING SYSTEM – PROCESS LINES - HYDROGEN



LEGEND

FLOW, LB/HR

FLOW, GPM

1 AREA 12 SRC
1A SRC Process
1B Deashing
1C Product Fractionation
1D Solidification

2 AREA 13 PRODUCT UPGRADING
2A Coker/Calciner
2B Expanded-bed Hydrocracker

3 AREA 14 CRYOGENIC SEPARATION
3A Air Separation
3B Hydrogen Purification

4 AREA 15 GAS SYSTEMS
4A Gasification
4B Gas Treatment
4C Sulfur Recovery

5 AREA 16 UTILITIES
5A Main Substation
5B BFW Treatment
5C Cooling Tower No. 1
5D Cooling Tower No. 2
5E Power House and Air Compressor
5F Flare
5G Liquid Thermal Oxidizer
5H Gas Incinerator

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6O Ash Ponds

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7A Coal Storage
7B Coal Pulverizer
7C Liquid Storage
7D SRC/TSL Storage

8 NAPHTHA HYDROTREATER

NOTES:

1. All flow rates shown are maximum flow rates.
2. Unless otherwise noted all pipes are C.S.

RUST, BIRMINGHAM, ALABAMA

FOR 6,000 T/D SRC-I DEMONSTRATION PLANT

AT NEWMAN, KENTUCKY

CRIPTION U&O DESIGN BASELINE UPDATE MARCH 1984

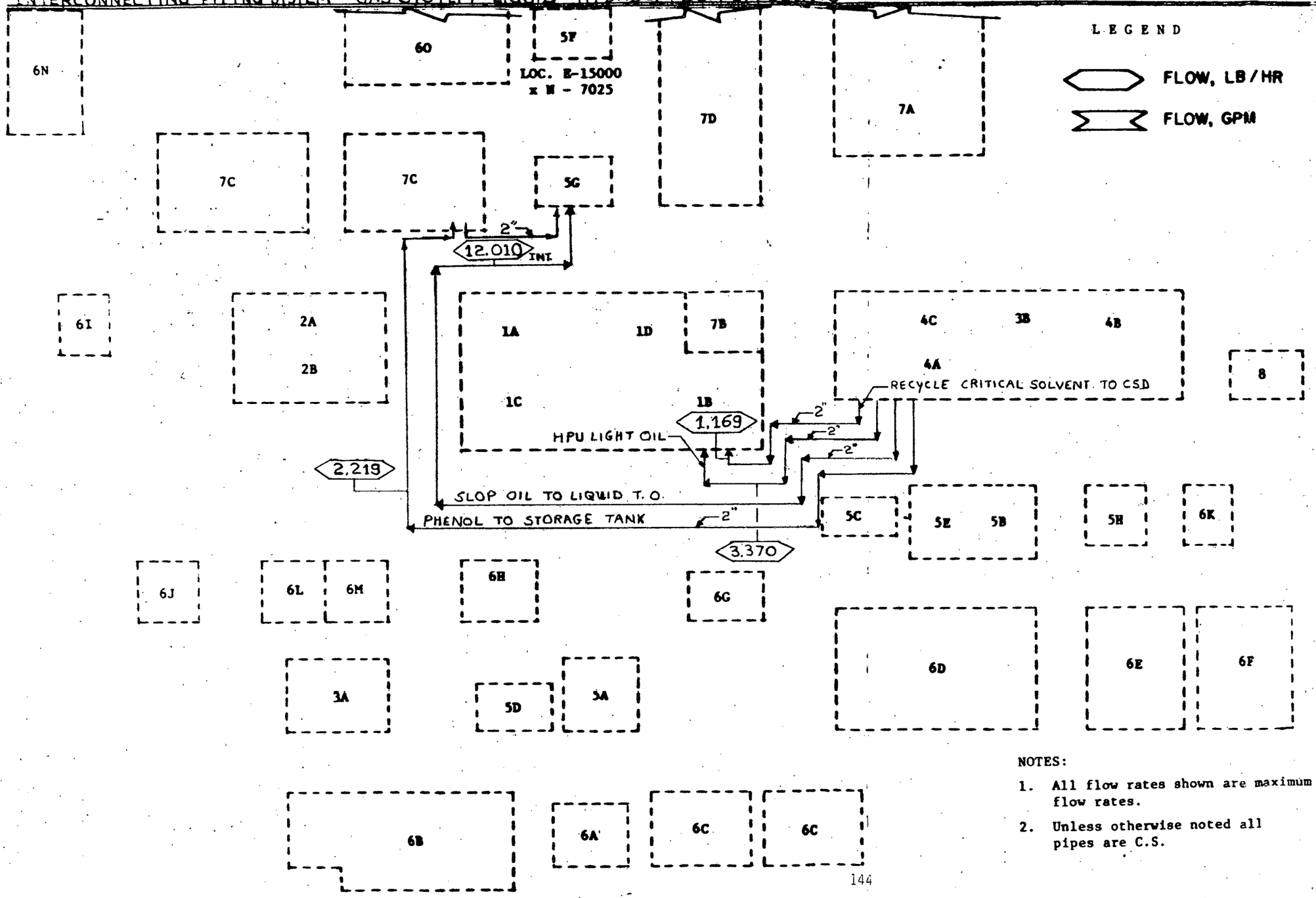
PROPOSAL OR JOB NO. 21-2548

DATE 1/3/84

BY B Shah CHD.

DWG. 00-16-05015, REV. 0

INTERCONNECTING PIPING SYSTEM – GAS SYSTEM LIQUID HYDROCARBON EFFLUENTS



LEGEND

FLOW, LB/HR

FLOW, GPM

1 AREA 12 SRC
1A SRC Process
1B Deashing
1C Product Fractionation
1D Solidification

2 AREA 13 PRODUCT UPGRADING
2A Coker/Calciner
2B Expanded-bed Hydrocracker

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6N Storm Retention Pond
6O Ash Ponds

7 AREA 11 RAW MATERIAL & PRODUCT STORAGE
7A Coal Storage
7B Coal Pulverizer
7C Liquid Storage
7D SRC/TSL Storage

8 NAPHTHA HYDROTREATER

NOTES:

1. All flow rates shown are maximum flow rates.
2. Unless otherwise noted all pipes are C.S.

RUST, IRMINGHAM, ALABAMA

FOR 6,000 T/D SRC-I DEMONSTRATION PLANT

AT NEWMAN, KENTUCKY

DESCRIPTION U&O DESIGN BASELINE UPDATE MARCH 1984

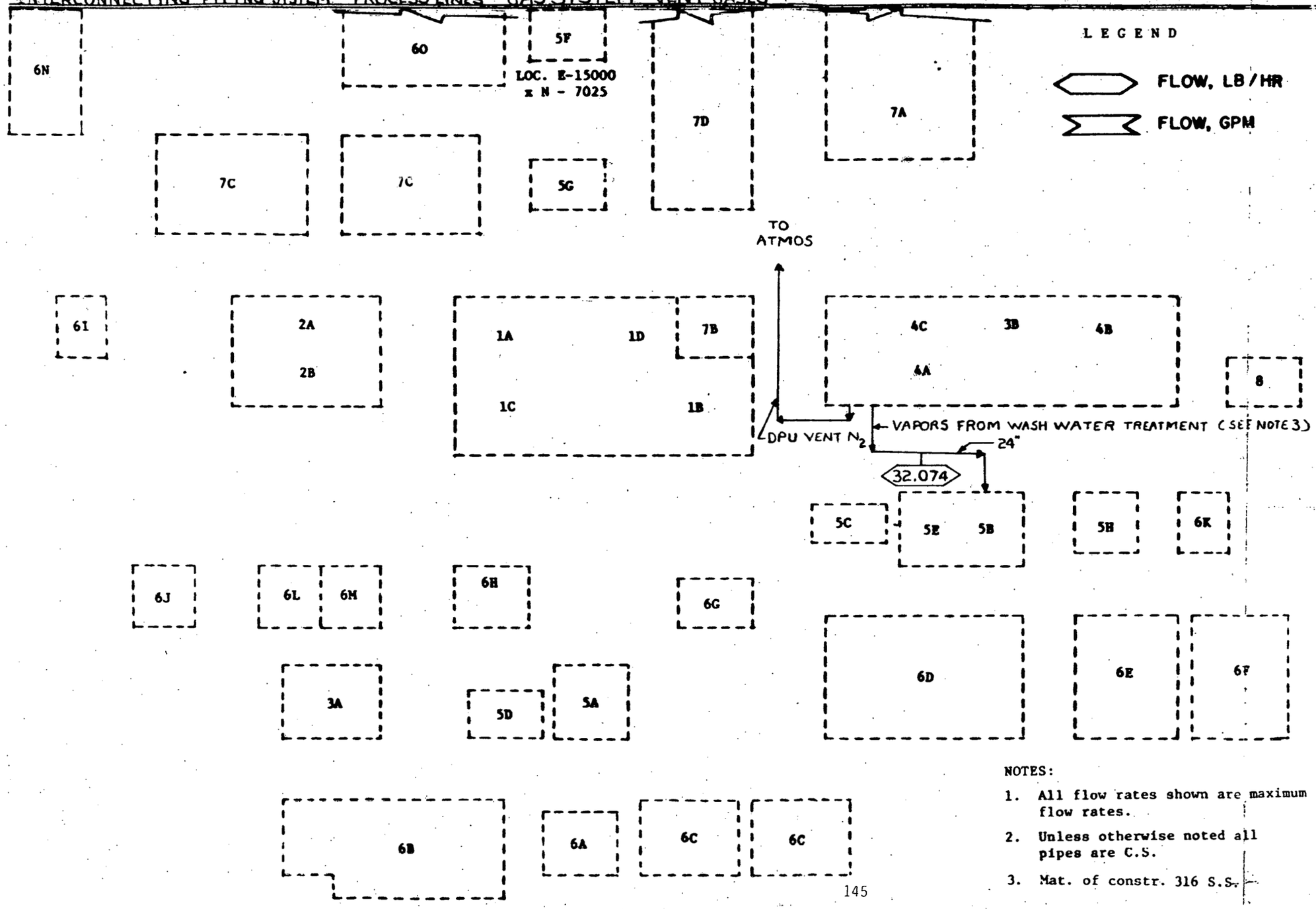
PROPOSAL OR JOB NO. 21-2548

DATE 1/12/84

BY B. Shah CHKD.

DWG. 00-16-05016, REV. 0

INTERCONNECTING PIPING SYSTEM - PROCESS LINES - GAS SYSTEM VENT GASES



LEGEND

FLOW, LB/HR

FLOW, GPM

1 AREA 12 SRC
1A SRC Process
1B Deashing
1C Product Fractionation
1D Solidification

2 AREA 13 PRODUCT UPGRADING
2A Coker/Calciner
2B Expanded-bed Hydrocracker

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6M Maintenance Building
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60 Ash Ponds

7 AREA 11 RAW MATERIAL & PRODUCT STORAGE
7A Coal Storage
7B Coal Pulverizer
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7D SRC/TSL Storage

8 NAPHTHA HYDROTREATER

NOTES:

1. All flow rates shown are maximum flow rates.
2. Unless otherwise noted all pipes are C.S.
3. Mat. of constr. 316 S.S.

RUST, BIRMINGHAM, ALABAMA

PROPOSAL OR JOB NO. 21-2548

FOR 6,000 T/D SRC-I DEMONSTRATION PLANT

AT NEWMAN, KENTUCKY

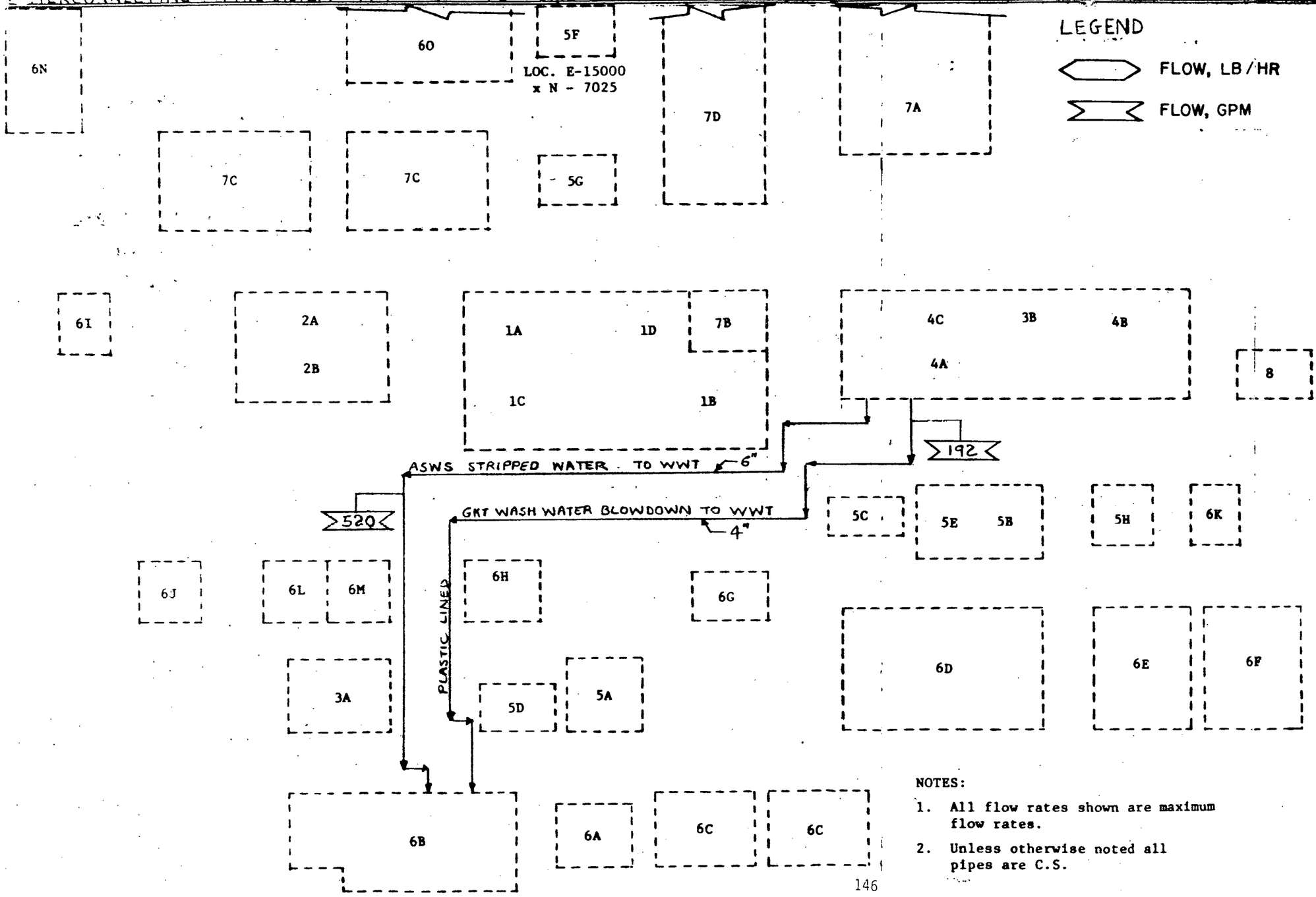
DATE 1/3/84

BY B. Shah CKD.

CRIPTION U&O DESIGN BASELINE UPDATE MARCH 1984

DWG. 00-16-05017, REV. 0

TERCONNECTING PIPING SYSTEM - PROCESS LINES - GAS SYSTEM WASTE WATER



LEGEND

FLOW, LB/HR

FLOW, GPM

NOTES:

1. All flow rates shown are maximum flow rates.
2. Unless otherwise noted all pipes are C.S.

1 AREA 12 SRC
1A SRC Process
1B Deashing
1C Product Fractionation
1D Solidification

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8 NAPTHA HYDROTREATER

RUST, BIRMINGHAM, ALABAMA

PROPOSAL OR JOB NO. 21-2548

FOR 6,000 T/D SRC-I DEMONSTRATION PLANT

AT NEWMAN, KENTUCKY

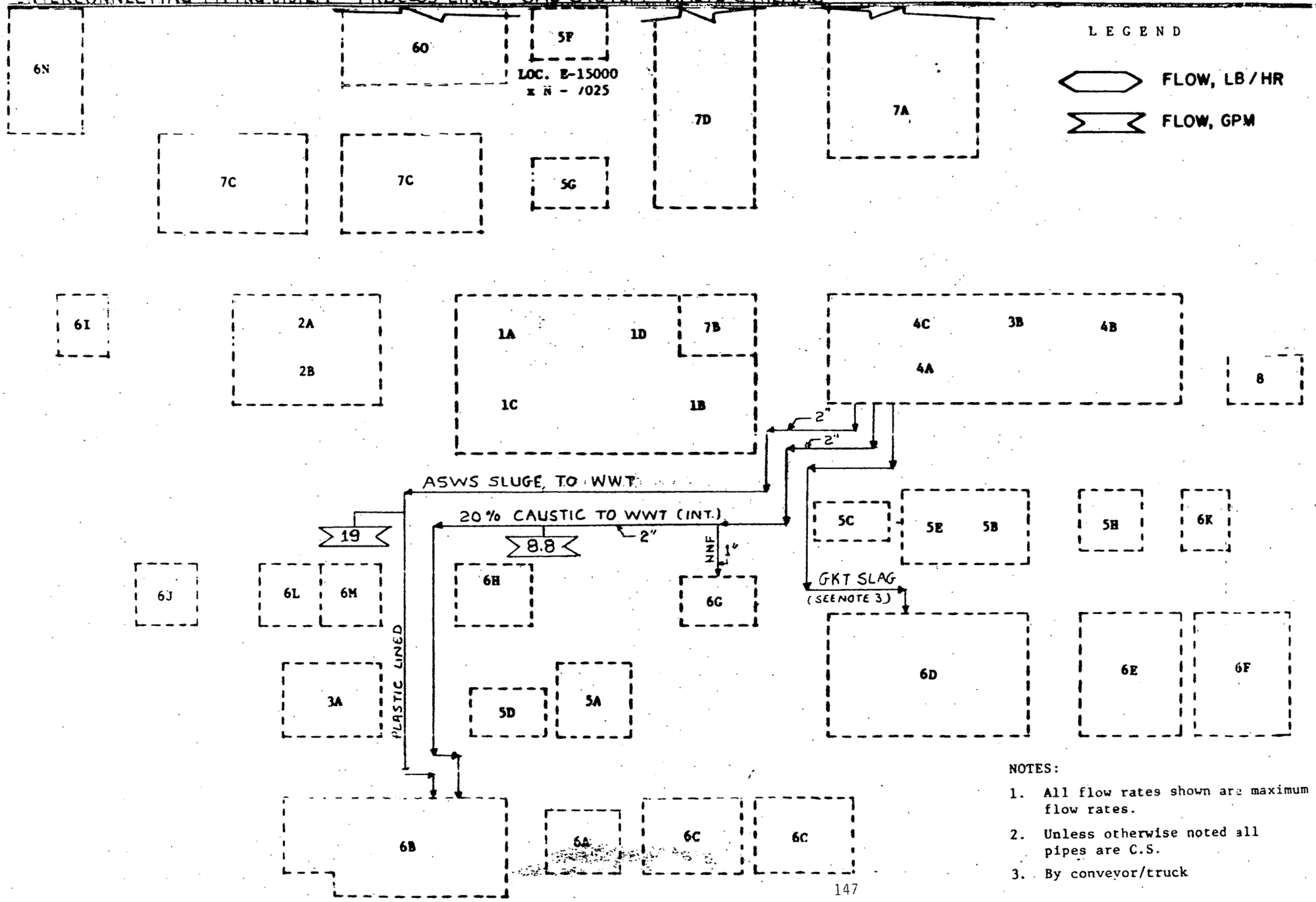
DATE 1/12/84

BY B. Shah CKD.

DESCRIPTION U&O DESIGN BASELINE UPDATE MARCH 1984

DWG. 00-16-05018, REV. 0

INTERCONNECTING PIPING SYSTEM - PROCESS LINES - GAS SYSTEM WASTE STREAMS



LEGEND

FLOW, LB/HR

FLOW, GPM

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- 1A SRC Process
- 1B Deashing
- 1C Product Fractionation
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7 AREA 11 RAW MATERIAL & PRODUCT STORAGE
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8 NAPHTHA HYDROTREATER

NOTES:

1. All flow rates shown are maximum flow rates.
2. Unless otherwise noted all pipes are C.S.
3. By conveyor/truck

RUST, BIRMINGHAM, ALABAMA

PROPOSAL OR JOB NO. 21-2548

FOR 6,000 T/D SRC-I DEMONSTRATION PLANT

AT NEWMAN, KENTUCKY

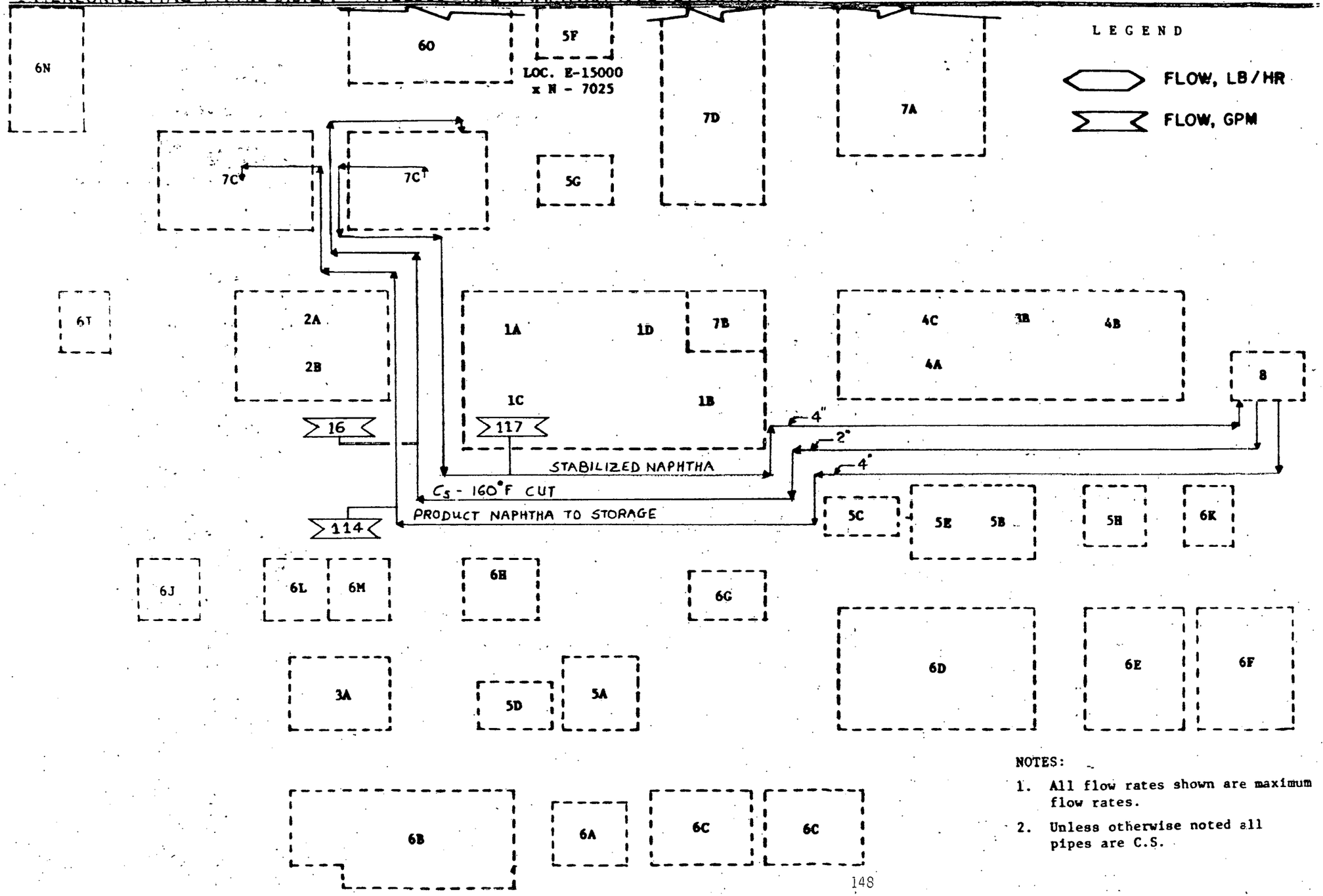
DATE 1/12/84

BY B. Shah CKD.

DESCRIPTION U&O DESIGN BASELINE UPDATE MARCH 1984

DWG. 00-16-05019, REV. 0

INTERCONNECTING PIPING SYSTEM - PROCESS LINES - NAPHTHA HYDROTREATING



LEGEND

FLOW, LB/HR

FLOW, GPM

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8 NAPHTHA HYDROTREATER

NOTES:

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2. Unless otherwise noted all pipes are C.S.

RUST, BIRMINGHAM, ALABAMA

PROPOSAL OR JOB No. 21-2548

FOR 6,000 T/D SRC-I DEMONSTRATION PLANT

DATE 1/24/84

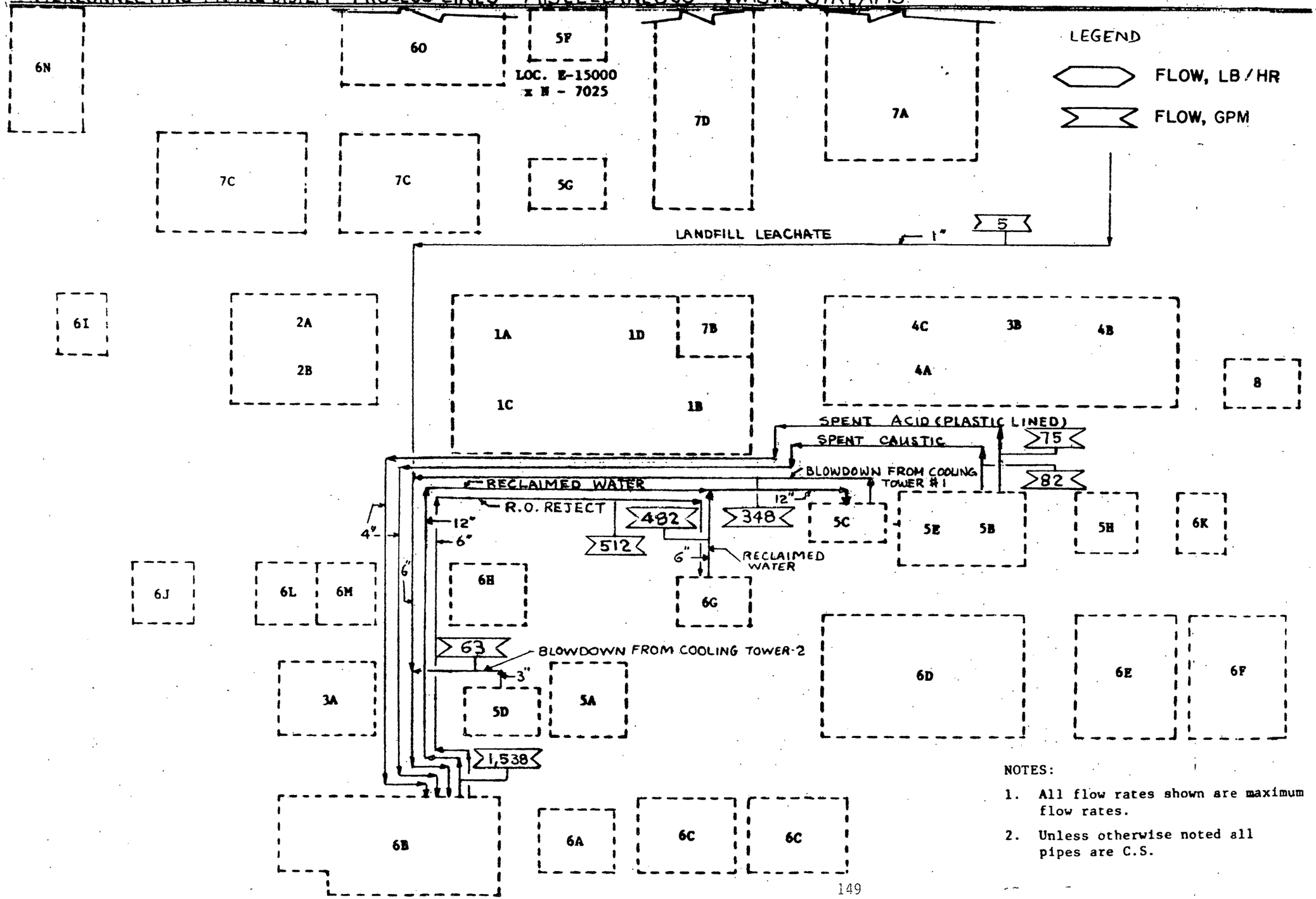
AT NEWMAN, KENTUCKY

BY B. Shah CKD.

DESCRIPTION U&O DESIGN BASELINE UPDATE MARCH 1984

DWG. 00-16-05020, REV. 0

INTERCONNECTING PIPING SYSTEM – PROCESS LINES - MISCELLANEOUS - WASTE STREAMS



LEGEND

FLOW, LB/HR

FLOW, GPM

NOTES:

1. All flow rates shown are maximum flow rates.
2. Unless otherwise noted all pipes are C.S.

1 AREA 12 SRC
1A SRC Process
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60 Ash Ponds

7 AREA 11 RAW MATERIAL & PRODUCT STORAGE
7A Coal Storage
7B Coal Pulverizer
7C Liquid Storage
7D SRC/TSL Storage

8 NAPHTHA HYDROTREATER

Rust International Corporation

LINE CALCULATIONS SUMMARY SHEET

UTILITIES LINES - H.P. BOILER FEED WATER

CONTRACT NO. 21-2548
AREA NO. 16
REF. DWG 00-16-03001
SHEET 1 OF 21

CLIENT ICRC
PROJECT 6.000 T/D SRC-I

LINE NO.	FROM	TO	CONTENTS	FLOW CONDITIONS								LINE SIZE INCH *	VELOCITY FT/SEC	PRESSURE DROP PSI/100 FT	EQUIVALENT LENGTH FT	REMARKS
				LB/HR	G.P.M.	PRESS. PSIG	TEMP °F	LB/FT³	VISC. CP.	Z	SURFACE TENSION² (M.W.)					
	BFW TREATMENT	10"-HEADER	H.P. BOILER FEED WATER	803,604	1682	1100	220	59.63	0.27			10	7.5	0.64		
	10"-HEADER	POWER HOUSE	"	370,800	776	1100	220	59.63	0.27			8	5.40	0.45		
	10"-HEADER	HPU GASIFICATION, AREA 19 & 15	"	321,074	672	1100	220	59.63	0.27			8	4.70	0.34		
	8"-HEADER	SRC PROCESS AREA-12	"	158,036	331	1100	220	59.63	0.27			6	4.10	0.35		
	8"-HEADER	DESUPER-HEATER	"	19,614	42	1100	220	59.63	0.27			2	4.42	1.66		
	8"-HEADER	COKER / CALCINER. AREA-13	"	124,440	260	1100	220	59.63	0.27			6	3.2	0.23		

PREPARED BY B Shah
DATE 1/20/84
APPROVED BY
DATE

REVISION △		REVISION △		REVISION △	
BY	DATE	BY	DATE	BY	DATE
APP'D	DATE	APP'D	DATE	APP'D	DATE

REMARKS * SCH. 80
(1) LB. (MASS)/FT. HR
(2) DYNE/CM

FORM 44-152 (8/82)

Rust International Corporation

LINE CALCULATION SUMMARY SHEET

UTILITIES LINES - L.P. BOILER FEED WATER

CONTRACT NO. 21-2548
AREA NO. 16
REF DWG 00-16-03002
SHEET 2 OF 21

CLIENT ICRC
PROJECT 6,000 TPD SRC-1

LINE NO.	FROM	TO	CONTENTS	FLOW CONDITIONS								LINE SIZE INCH *	VELOCITY FT/SEC	PRESSURE DROP PSI/100 FT	EQUIVALENT LENGTH FT	REMARKS
				LB/HR	G.P.M.	PRESS. PSIG	TEMP °F	LB/FT³	VISC. CP.	Z	SURFACE TENSION² (M.W.)					
	BFW TREATMENT	10"- HEADER	L.P. BOILER FEEDWATER	532,769	1115	220	220	59.63	0.27			10	4.33	0.22		
	10"- HEADER	INCINERATOR AREA-16		26,412	55	220	220	59.63	0.27			3	2.3	0.28		
		NAPHTHA HYDROTREATER		2,640	5.5	220	220	59.63	0.27			1	2.0	0.79		
	10"- HEADER	HPU, GASIFICATION	L.P. BOILER FEED WATER	281,269	589	220	220	59.63	0.27			8	3.61	0.22		
	8"- HEADER	SRC PROCESS AREA-12		126,771	265	220	220	59.63	0.27			6	2.82	0.18		
	8"- HEADER	EBH AREA-13		91,237	191	220	220	59.63	0.27			4	4.61	0.76		
	8"- HEADER	COCKER / CALCINER		24,400	51	220	220	59.63	0.27			2	4.67	1.7		
	8"- HEADER	LIQUID THERMAL OXIDIZER		40,240	84	220	220	59.63	0.27			3	3.50	0.64		

PREPARED BY B. Shah
DATE 11/19/84
APPROVED BY
DATE

REVISION △ BY DATE APP'D DATE
REVISION △ BY DATE APP'D DATE
REVISION △ BY DATE APP'D DATE

REMARKS * SCH. 40
(1) LB. (MASS)/FT. HR
(2) DYNE/CM

FORM 44-152 (8/82)

Rust International Corporation

LINE CALCULATIONS SUMMARY SHEET

UTILITIES - LINES - 900 PSIG 850°F STEAM

CONTRACT NO. 21-2548
AREA NO. 16
REF DWG 00-16-03003
SHEET 3 OF 21

CLIENT JCRC
PROJECT 6,000 TPD SRC-1 PROJECT

LINE NO.	FROM	TO	CONTENTS	FLOW CONDITIONS								LINE SIZE INCH *	VELOCITY FT/SEC	PRESSURE DROP PSI/100 FT	EQUIVALENT LENGTH FT	REMARKS
				LB/HR	ACFS	PRESS. PSIG	TEMP °F	LB/FT³	VISC. C.P.	Z	SURFACE TENSION² (M.W.)					
	COKER / CALCINER	10"- HEADER	STEAM	122,000	28.2	865	850	(1.20)	0.0305			10	56.50	0.60		
	10"- HEADER	ERH AREA-13	STEAM	5,256	1.22	865	850	(1.20)	0.0305			3	26.60	0.68		
	10"- HEADER	FLARE AREA 15	STEAM	106,000	24.5	865	850	(1.20)	0.0305			6	135.60	5.8		
	10"- HEADER	ASU AREA-14	STEAM	18,645	4.32	865	850	(1.20)	0.0305			3	94.20	7.0		
	10"- HEADER	450 PSIG STEAM HEADER	STEAM	90,784	21.1	865	850	(1.20)	0.0305			4	264.0	34.5		
	SRC PROCESS AREA 12	10"- HEADER	STEAM	12,720	2.94	865	850	(1.20)	0.0305			4	36.80	0.87		
	10"- HEADER	HPU, GASIFICATION AREA-14 & 15	STEAM	237,195	54.9	865	850	(1.20)	0.0305			12	77.80	0.87		
	14"- HEADER	POWER HOUSE AREA-16	STEAM	5,000	1.16	865	850	(1.20)	0.0305			3	25.3	0.62		
	POWER HOUSE	14"- HEADER	STEAM	360,000	83.3	865	850	(1.20)	0.0305			14	97.90	1.18		
	14"- HEADER	NHT	STEAM	1,400	0.324	865	850	(1.20)	0.0305			2	15.30	0.43		

PREPARED BY B Shah
DATE 1/19/84
APPROVED BY
DATE

REVISION △			
BY	DATE	BY	DATE
APP'D	DATE	APP'D	DATE

REVISION △	
BY	DATE
APP'D	DATE

REMARKS * SCH 80
(1) LB. (MASS)/FT. HR
(2) DYNE/CM

FORM 44-152 (8/82)

Rus International Corporation

LINE CALCULATIONS SUMMARY SHEET

UTILITIES - LINES - 450 PSIG STEAM

CONTRACT NO. 21-2548
AREA NO. 16
REF. DWG 00-16-03004
SHEET 4 OF 21

CLIENT ICRC
PROJECT 6,000 TPD SRC-1

LINE NO.	FROM	TO	CONTENTS	FLOW CONDITIONS								LINE SIZE INCH	VELOCITY FT/SEC	PRESSURE DROP PSI/100 FT	EQUIVALENT LENGTH FT	REMARKS
				LB/HR	ACFS	PRESS. PSIG	TEMP °F	LB/FT³	VISC.	Z	SURFACE TENSION[2] (M.W.)					
	10"- HEADER	COKER/ CALCINER. AREA-13	STEAM.	1,520	0.42	450	460	1.006				2	20.5	0.60		
	10"- HEADER	WASTE TREATMENT	STEAM	129,441	35.7	450	460	1.006				6	197	10.3		
	DESUPER HEATER	10"- HEADER	STEAM.	110,398	30.5	450	460	1.006				6	168	7.73		
	10"- HEADER	150 PSIG STEAM HEADER	STEAM	35,000	9.66	450	460	1.006				4"	121	6.79		
	SRC PROCESS AREA - 12	10"- HEADER	STEAM	122,230	33.8	450	460	1.006				10	67.6	0.72		
	8"- HEADER	HPU, GASIFICATION AREA 14.8 15	STEAM	51,780	14.3	450	460	1.006				8	45.0	0.45		
	8"- HEADER	POWER HOUSE AREA-16	STEAM	34,426	9.51	450	460	1.006				6	52.4	0.91		

PREPARED BY B Shah
DATE 1/19/84
APPROVED BY
DATE

REVISION △ BY DATE APP'D DATE
REVISION △ BY DATE APP'D DATE
REVISION △ BY DATE APP'D DATE

REMARKS * SCH 80
(1) LB. (MASS)/FT. HR
(2) DYNE/CM

FORM 44-152 (8/82)

Rust International Corporation

LINE CALCULATIONS SUMMARY SHEET

UTILITIES - LINES 150 PSIG STEAM

CONTRACT NO. 21-2548
AREA NO. 16
REF. DWG. 00-16-03005
SHEET 5 OF 21

CLIENT ICRC
PROJECT 6.000 TPD SRC-1 PROJECT

LINE NO.	FROM	TO	CONTENTS	FLOW CONDITIONS								LINE SIZE INCH *	VELOCITY FT/SEC	PRESSURE DROP PSI/100 FT	EQUIVALENT LENGTH FT	REMARKS
				LB/HR	ACFS	PRESS. PSIG	TEMP °F	LB/FT³	VISC. CP	Z	SURFACE TENSION² (M.W.)					
	LIQUID THERMAL OXIDIZER	10"- HEADER	STEAM	39,842	30.5	150	366	0.363				8	87.8	0.62		
	10"- HEADER	COKER / CALCINER AREA-13	STEAM	40,062	30.7	150	366	0.363				8	88.7	0.62		
	EBH AREA-13	10"- HEADER	STEAM	19,459	14.9	150	366	0.363				6	74.30	0.64		
	450 PSIG STEAM HEADER	10"- HEADER.	STEAM	35,000	26.8	150	366	0.363				4	303.0	14.6		
	10"- HEADER	75 PSIG STEAM HEADER	STEAM	25,000	19.1	150	366	0.363				4	216.0	7.83		
	10"- HEADER	SRC PROCESS AREA- 12	STEAM	7,536	5.77	150	366	0.363				4	65.30	0.85		
	10"- HEADER	HPU, GASIFICATION AREA 14 & 15	STEAM	40,321	30.9	150	366	0.363				8	89.00	0.63		
	INCINERATOR AREA 15	10"- HEADER	STEAM	26,150	20.0	150	366	0.363				6	99.70	1.11		
	6"- HEADER	POWER HOUSE	STEAM	580	0.444	150	366	0.363				2	19.00	0.20		

PREPARED BY B. Shah
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REMARKS * SCH 40
(1) LB. (MASS)/FT. HR
(2) DYNE/CM

FORM 44-152 (8/82)

Rust International Corporation

LINE CALCULATIONS SUMMARY SHEET

UTILITIES - LINES - 75 PSIG STEAM

CONTRACT NO. 21-2548
AREA NO. 16
REF. DWG 00-16-00006
SHEET 6 OF 21

CLIENT ICRC
PROJECT 6,000 TPD SRC-1

LINE NO.	FROM	TO	CONTENTS	FLOW CONDITIONS								LINE SIZE INCH	VELOCITY FT/SEC	PRESSURE DROP PSI/100 FT	EQUIVALENT LENGTH FT	REMARKS
				LB/HR	ACFS	PRESS. PSIG	TEMP °F	LB/FT³	VISC.[1]	Z	SURFACE TENSION[2] (M.W.)					
	POWER HOUSE AREA - 16	6"- HEADER	STEAM	2,852	3.88	75	320	0.204				4	43.90	0.25		
	HPU - GASIFICATION AREA - 14 & 15	6"- HEADER	STEAM	14,052	19.1	75	320	0.204				6	95.00	0.63		
	6"- HEADER	COAL PULVERIZER AREA 11	STEAM	2,500	3.40	75	320	0.209				4	38.00	0.20		
	SRC PROCESS AREA - 12	12"- HEADER	STEAM	60,835	82.8	75	320	0.204				12	106.00	0.33		
	12"- HEADER	27 PSIG STEAM HEADER	STEAM	95,000	129.4	75	320	0.204				10	236.00	1.77		
	150 PSIG STEAM HEADER	12"- HEADER	STEAM	25,000	34.0	75	320	0.204				4	385.00	13.9		
	10"- HEADER	MAINT. BLDG	STEAM	2,400	3.27	75	320	0.204				4	36.90	0.18		
	10"- HEADER	WASTE TREATMENT AREA 17	STEAM	35.000	47.7	75	320	0.204				8	137.00	0.87		
	8"- HEADER	COOLING TOWER NO. 2 AREA - 16	STEAM	NNF								4				
	8"- HEADER	EBH AREA - 13	STEAM	10,770	14.7	75	320	0.204				6	73.30	0.38		
	8"- HEADER	COKER / CALCINER	STEAM	18,813	25.6	75	320	0.204				6	128.0	1.07		
	6"- HEADER	LIQUID STORAGE	STEAM	2,000	2.72	75	320	0.204				4	30.8	0.13		
	6"- HEADER	SRC/TSL STORAGE	STEAM	2,500	3.40	75	320	0.204				4	38.50	0.20		
	6"- HEADER	COAL STORAGE	STEAM	2,500	3.40	75	320	0.204				4	38.50	0.20		
	12"- HEADER	EVAPORATOR	STEAM			75	320	0.204				12				

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REMARKS
(1) LB. (MASS)/FT. HR
(2) DYNE/CM

FORM 44-152 (8/82)

Rust International Corporation

LINE CALCULATIONS SUMMARY SHEET

UTILITIES - LINES - 27 PSIG STEAM

CONTRACT NO. 21-2548
AREA NO. 16
REF DWG 00-16-03007
SHEET 7 OF 21

CLIENT ICRC
PROJECT 6,000 TPD SRC-1

LINE NO.	FROM	TO	CONTENTS	FLOW CONDITIONS								LINE SIZE INCH *	VELOCITY FT/SEC	PRESSURE DROP PSI/100 FT	EQUIVALENT LENGTH FT	REMARKS
				LB/HR	ACFS	PRESS. PSIG	TEMP °F	LB/FT³	VISC.[1]	Z	SURFACE TENSION[2] (M.W.)					
	75 PSIG STEAM HEADER	20"- HEADER	STEAM	95,000	266.6	27	270	0.099				10	487	3.65		
	HPU - GASIFICATION AREA - 14 & 15	20" - HEADER	STEAM	108,665	304.9	27	270	0.099				20	158	0.20		
	POWER HOUSE AREA 16	20" - HEADER	STEAM	10,517	29.6	27	270	0.099				6	147	0.82		
	20"- HEADER	BFW TREATMENT	STEAM	147,071	412.7	27	270	0.099				20	213	0.36		
	20"- HEADER	EXCESS STEAM CONDENSER	STEAM	91,561	257	27	270	0.099				12	330	1.43		

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REMARKS * SCH-40
[1] LB. (MASS)/FT. HR
[2] DYNE/CM

FORM 44-152 (8/82)

Rust International Corporation

LINE CALCULATIONS SUMMARY SHEET

UTILITIES LINES - COMPRESSED AIR

CONTRACT NO. 21-2548
AREA NO. 16
REF DWG 00-16-03008
SHEET 3 OF 21

CLIENT ICRC
PROJECT 6000 TPD SRC-1

LINE NO.	FROM	TO	CONTENTS	FLOW CONDITIONS								LINE SIZE INCH *	VELOCITY FT/SEC	PRESSURE DROP PSI/100 FT	EQUIVALENT LENGTH FT	REMARKS
				LB/HR	SCFM	PRESS. PSIG	TEMP °F	LB/FT³	VISC.[1]	Z	SURFACE TENSION[2] (M.W.)					
	POWER HOUSE AIR COMPR.	10"- HEADER	INSTRUMENT AIR/ PLANT AIR	44,754	9815	100	90	0.561				10	40.5	0.158		
	10"- HEADER	HPU. GASIFICATION AREA 14, & 15	INSTRUMENT AIR	5,686	1247	100	90	0.561				4	31.8	0.302		
	10"- HEADER	HPU. GASIFICATION AREA 14 & 15	PLANT AIR	5,180	1136	100	90	0.561				4	29.0	0.251		
	10"- HEADER	COOLING TOWER NO. 1	INSTRUMENT AIR	228	50	100	90	0.561				1	18.3	0.578		
	10"- HEADER	COOLING TOWER NO. 1	PLANT AIR	228	50	100	90	0.561				1	18.3	0.578		
	4"- HEADER	INCINERATOR	INSTRUMENT AIR	912	200	100	90	0.561				2	19.4	0.264		
	4"- HEADER	INCINERATOR	PLANT AIR	342	75	100	90	0.561				2	7.3	0.041		
	3"- HEADER	NHT	INSTRUMENT AIR	456	100	100	90	0.561				2	9.7	0.070		
	3"- HEADER	NHT	PLANT AIR	1,140	250	100	90	0.561				2	24.2	0.404		
	12"- HEADER	HAZARDOUS WASTE LANDFILL	INSTRUMENT AIR	23	5	100	90	0.561				1	1.9	0.007		
	12"- HEADER	HAZARDOUS WASTE LANDFILL	PLANT AIR	23	5	100	90	0.561				1	1.9	0.007		
	12"- HEADER	SRC PROCESS AREA 12	INSTRUMENT AIR	4,104	900	100	90	0.561				4	23.0	0.160		
	12"- HEADER	SRC PROCESS AREA 12	PLANT AIR	6,384	1400	100	90	0.561				4	35.8	0.377		
	12"- HEADER	EVAPORATOR	INSTRUMENT AIR	228	50	100	90	0.561				1	18.3	0.578		
	12"- HEADER	EVAPORATOR	PLANT AIR	91	20	100	90	0.561				1	7.5	0.102		

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REMARKS * SCH 40
(1) LB. (MASS)/FT. HR
(2) DYNE/CM

FORM 44-152 (8/82)

Rust International Corporation

LINE CALCULATIONS SUMMARY SHEET

UTILITIES - LINES - COMPRESSED AIR

CONTRACT NO. 21-2548
AREA NO. 16
REF. DWG 00-16-03008
SHEET 9 OF 21

CLIENT ICRC
PROJECT 8,000 TPD SRC-1

LINE NO.	FROM	TO	CONTENTS	FLOW CONDITIONS								LINE SIZE INCH	VELOCITY FT/SEC	PRESSURE DROP PSI/100 FT	EQUIVALENT LENGTH FT	REMARKS
				LB/HR	SCFM	PRESS. PSIG	TEMP °F	LB/FT³	VISC.[1]	Z	SURFACE TENSION[2] (M.W.)					
	12"- HEADER	MAIN CONTROL BLDG.	INSTRUMENT AIR	228	50	100	90	0.561				1	18.6	0.578		
	12"- HEADER	MAIN CONTROL BLDG	PLANT AIR	68	15	100	90	0.561				1	5.6	0.062		
	3"- HEADER	MAINT. BLDG	INSTRUMENT AIR	23	5	100	90	0.561				1	1.9	0.007		
	3"- HEADER	MAINT. BLDG	PLANT AIR	912	200	100	90	0.561				2	19.4	0.264		
	3"- HEADER	WAREHOUSE BLDG	INSTRUMENT AIR	23	5	100	90	0.561				1	1.9	0.007		
	3"- HEADER	WAREHOUSE BLDG	PLANT AIR	23	5	100	90	0.561				1	1.9	0.007		
	8"- HEADER	ASU - AREA 14	INSTRUMENT AIR	3,283	720	100	90	0.561				4	18.4	0.105		
	2"- HEADER	COOLING TOWER NO. 2	INSTRUMENT AIR	228	50	100	90	0.561				1	18.8	0.578		
	2"- HEADER	COOLING TOWER NO. 2	PLANT AIR	114	25	100	90	0.561				1	9.4	0.156		
	4"- HEADER	WASTE TREATMENT	INSTRUMENT AIR	91	20	100	90	0.561				1	7.5	0.102		
	4"- HEADER	WASTE TREATMENT	PLANT AIR	4,241	930	100	90	0.561				4	23.8	0.171		
	2"- HEADER	WATER TREATMENT	INSTRUMENT AIR	205	45	100	90	0.561				1	16.9	0.474		
	2"- HEADER	WATER TREATMENT	PLANT AIR	46	10	100	90	0.561				1	3.8	0.029		
	8"- HEADER	EBH - AREA 13	INSTRUMENT AIR	2,280	500	100	90	0.561				3	22	0.206		
	3"- HEADER	EBH-AREA-13	PLANT AIR	1,952	428	100	90	0.561				3	18.8	0.151		

PREPARED BY B. Shah
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REMARKS
(1) LB. (MASS)/FT. HR
(2) DYNE/CM

FORM 44-152 (8/82)

Rust International Corporation

LINE CALCULATIONS SUMMARY SHEET

UTILITIES LINES - COMPRESSED AIR

CONTRACT NO. 21-2548
AREA NO. 16
REF. DWG 00-16-0308
SHEET 10 OF 21

CLIENT ICRC
PROJECT 6,000 TPD SRC-1

LINE NO.	FROM	TO	CONTENTS	FLOW CONDITIONS								LINE SIZE INCH	VELOCITY FT/SEC	PRESSURE DROP PSI/100 FT	EQUIVALENT LENGTH FT	REMARKS
				LB/HR	SCFM	PRESS. PSIG	TEMP °F	LB/FT³	VISC.[1]	Z	SURFACE TENSION[2] (M.W.)					
	4"- HEADER	COKER / CALCINER	INSTRUMENT AIR	684	150	100	90	0.561				2	14.5	0.151		
	8"- HEADER	COKER / CALCINER	PLANT AIR	9,576	2100	100	90	0.561				4	53.6	0.84		
	3"- HEADER	LIQUID STORAGE	INSTRUMENT AIR	456	100	100	90	0.561				2	9.7	0.07		
	3"- HEADER	LIQUID STORAGE	PLANT AIR	456	100	100	90	0.561				2	9.7	0.07		
	3"- HEADER	FLARE AREA-16	INSTRUMENT AIR	342	75	100	90	0.561				2	7.3	0.041		
	3"- HEADER	FLARE AREA-16	PLANT AIR	456	100	100	90	0.561				2	9.7	0.07		
	3"- HEADER	SRC/TSL STORAGE	INSTRUMENT AIR	342	75	100	90	0.561				2	7.3	0.041		
	3"- HEADER	SRC/TSL STORAGE	PLANT AIR	342	75	100	90	0.561				2	7.3	0.041		
	3"- HEADER	LIQUID T.O.	INSTRUMENT AIR	342	75	100	90	0.561				2	7.3	0.041		
	3"- HEADER	LIQUID T.O.	PLANT AIR	912	200	100	90	0.561				2	19.4	0.264		

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REMARKS
(1) LB. (MASS)/FT. HR
(2) DYNE/CM

FORM 44-152 (8/82)

Rust International Corporation

LINE CALCULATIONS SUMMARY SHEET

UTILITIES - LINES - NITROGEN

CONTRACT NO. 21-2548
AREA NO. 16
REF. DWG 00-16-03009
SHEET 11 OF 21

CLIENT ICRC
PROJECT 6,000 TPD SRC-1

LINE NO.	FROM	TO	CONTENTS	FLOW CONDITIONS								LINE SIZE INCH	VELOCITY FT/SEC	PRESSURE DROP PSI/100 FT	EQUIVALENT LENGTH FT	REMARKS
				LB/HR	SCFM	PRESS. PSIG	TEMP °F	LB/FT³	VISC.[1]	Z	SURFACE TENSION[2] (M.W.)					
	ASU AREA - 14	12"- HEADER	NITROGEN	116,927	26,400	80	77	0.461				12	90.6			
	8"- HEADER	EBH AREA-13	NITROGEN	2,976	672	80	77	0.461				4	20.3			
	8"- HEADER	COKER/ CALCINER	NITROGEN	961	217	80	77	0.461				2	24.9			
	8"- HEADER	LIQUID STORAGE	NITROGEN	6,865	1550	80	77	0.461				4	46.8			
	8"- HEADER	COAL STORAGE AREA 11	NITROGEN	2,879	650	80	77	0.461				4	19.6			
	12"- HEADER	SRC PROCESS AREA 12	NITROGEN	40,384	9118	80	77	0.461				10	44.5			
	12"- HEADER	HPU, GASIFICATION	NITROGEN	115,257	26,023	80	77	0.461				12	89.3			
	12" HEADER	NHT	NITROGEN	443	100	80	77	0.461				2	11.5			

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REMARKS
(1) LB. (MASS)/FT. HR
(2) DYNE/CM

FORM 44-152 (8/82)

Rust International Corporation

LINE CALCULATIONS SUMMARY SHEET

UTILITIES LINES - FUEL GASES

CONTRACT NO. 21-2548
AREA NO. 16
REF. DWG 00-16-03010
SHEET 12 OF 21

CLIENT ICRC
PROJECT 6000 TPD SRC-1

LINE NO.	FROM	TO	CONTENTS	FLOW CONDITIONS								LINE SIZE INCH	VELOCITY FT/SEC	PRESSURE DROP PSI/100 FT	EQUIVALENT LENGTH FT	REMARKS
				LB/HR	SCFM (ACFS)	PRESS. PSIG	TEMP °F	LB/FT³	VISC.[1]	Z	SURFACE TENSION[2] (M.W.)					
	HPU, GASIFICATION AREA 14 & 15	4"- HEADER	HYDROGEN	21,411	40,150	664	60	0.411				6	79.7			
	6" HEADER	SRC-PROCESS AREA 12	HYDROGEN	10,239	19,200	664	60	0.411				4	86.7			
	6"- HEADER	BOILER	HYDROGEN	16,129	30,245	664	60	0.411				6	60.0			
	HPU, GASIFICATION	3"- HEADER	LPG	4,748	623	80	100	0.76				3	33.8			
	3" HEADER	HPU, GASIFICATION	LPG	828	108.7	80	100	0.76				2	13.0			
	3"-HEADER	BOILER	LPG	127	16.7	80	100	0.76				1	7.7			
	2" HEADER	INCINERATOR	LPG	58	7.6	80	100	0.76				1	3.5			
	2"- HEADER	NHT	LPG	13	1.7	80	100	0.76				1	0.8			
	3"- HEADER	COAL PULVERIZER	LPG	25	3.3	80	100	0.76				1	1.5			
	3"- HEADER	SRC PROCESS AREA 12	LPG	264	34.7	80	100	0.76				1	16.1			
	2"- HEADER	EBH - AREA-12	LPG	37	4.8	80	100	0.76				1	2.2			
	2"- HEADER	COKER / CALCINER	LPG	39	5.1	80	100	0.76				1	2.4			
	2"- HEADER	L.T.O.	LPG	58	7.6	80	100	0.76				1	3.5			
	2"- HEADER	FLARE AREA-16	LPG	58	7.6	80	100	0.76				1	3.5			
	HPU, GASIFICATION AREA 14 & 15	16" HEADER	FUEL GAS	39,064	24,989	80	105	0.155				16	57.0			
	16"- HEADER	HPU GASIFICATION AREA 14 & 15	FUEL GAS	333	213	80	105	0.155				2	25.6			
	10"- HEADER	BOILER	FUEL GAS	25,087	6048	80	105	0.155				10	82.1			
	10"- HEADER	NHT	FUEL GAS	1,519	972	80	105	0.155				4	30.8			

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REMARKS
(1) LB. (MASS)/FT. HR
(2) DYNE/CM

FORM 44-152 (8/82)

Rust International Corporation

LINE CALCULATIONS SUMMARY SHEET

UTILITIES LINES - FUEL GASES

CONTRACT NO. 21-2548
AREA NO. 16
REF. DWG 00-16-03010
SHEET 13 OF 21

CLIENT ICRC
PROJECT 6,000 TPD SRC-1

LINE NO.	FROM	TO	CONTENTS	FLOW CONDITIONS								LINE SIZE INCH	VELOCITY FT/SEC	PRESSURE DROP PSI/100 FT	EQUIVALENT LENGTH FT	REMARKS
				LB/HR	SCFM (ACFS)	PRESS. PSIG	TEMP °F	LB/FT³	VISC.[1]	Z	SURFACE TENSION[2] (M.W.)					
	16"-HEADER	COAL PULVERIZER	FUEL GAS	3,449	2206	80	105	0.155				6	30.8			
	16"-HEADER	SRC PROCESS AREA 12	FUEL GAS	26,175	16,744	80	105	0.155				14	49.9			
	10"-HEADER	EBH-AREA-13	FUEL GAS	3,653	2337	80	105	0.155				6	32.6			
	10"-HEADER	COCKER/ CALCINER	FUEL GAS	6,778	4336	80	105	0.155				8	35.0			
	10"-HEADER	FLARE AREA-16	FUEL GAS	746	477	80	105	0.155				4	15.1			
	4"-HEADER	LIQUID THERM-OXIDIZER	FUEL GAS	746	477	80	105	0.155				4	15.1			

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REMARKS
(1) ~~(1)~~ LB. (MASS)/FT. HR
(2) DYNE/CM

FORM 44-152 (8/82)

Rust International Corporation

LINE CALCULATIONS SUMMARY SHEET

UTILITIES LINES - FUEL OIL

CONTRACT NO. 21-2548
AREA NO. 16
REF. DWG 00-16-03011
SHEET 14 OF 21

CLIENT ICRC
PROJECT 6,000 TPD

LINE NO.	FROM	TO	CONTENTS	FLOW CONDITIONS								LINE SIZE INCH	VELOCITY FT/SEC	PRESSURE DROP PSI/100 FT	EQUIVALENT LENGTH FT	REMARKS
				LB/HR	G.P.M.	PRESS. PSIG	TEMP °F	SP. GR.	VISC.[1]	Z	SURFACE TENSION[2] (M.W.)					
	LIQUID STORAGE	4"- HEADER	FUEL OIL	47.775	109	80	180	0.876				4	2.75			
	4"- HEADER	COKER/ CALCINER	FUEL OIL	2,450	5.6	80	180	0.876				1	2.1			
	4"- HEADER	EBH AREA-13	FUEL OIL	2,260	5.2	80	180	0.876				1	1.9			
	4"- HEADER	SRC- PROCESS AREA-12	FUEL OIL	28,778	66	80	180	0.876				3	2.9			
	4"- HEADER	HPU - GASIFICATION	FUEL OIL	3,884	8.9	80	180	0.876				1	3.3			
	4"- HEADER	BOILER	FUEL OIL	45,000	103	80	180	0.876				4	2.5			
	4"- HEADER	TURBINE POWER GENERATOR	FUEL OIL	37,500	85.5	80	180	0.876				4	2.15			

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REMARKS
(1) LB. (MASS)/FT. HR
(2) DYNE/CM

FORM 44-152 (8/82)

Rust International Corporation

LINE CALCULATIONS SUMMARY SHEET

UTILITIES LINES - COOLING WATER SUPPLY

CONTRACT NO. 21-2598
AREA NO. 16
REF. DWG 00-16-03012
SHEET 15 OF 21

CLIENT ICRC
PROJECT 6,000 TPD SRC-1

LINE NO.	FROM	TO	CONTENTS	FLOW CONDITIONS								LINE SIZE INCH	VELOCITY FT/SEC	PRESSURE DROP PSI/100 FT	EQUIVALENT LENGTH FT	REMARKS
				LB/HR	G.P.M.	PRESS. PSIG	TEMP °F	LB/FT³	VISC. CP	Z	SURFACE TENSION² (M.W.)					
	COOLING TOWER NO. 1 AREA 16	48"- HEADER	COOLING WATER		90,205	95	88	62.17	0.77			48	16.00	0.501		
	48"- HEADER	HPU, GASIFICATION AREA 14, 15	COOLING WATER		73,890	95	88	62.17	0.77			48	13.70	0.332		
	10"- HEADER	POWER HOUSE AREA 16	COOLING WATER		2,500	95	88	62.17	0.77			10	10.17	1.24		
	10"- HEADER	NHT	COOLING WATER		200	95	88	62.17	0.77			4	5.05	0.985		
	24"- HEADER	SRC PROCESS AREA -12	COOLING WATER		10,100	95	88	62.17	0.77			20	11.66	0.754		
	24"- HEADER	18"- HEADER	COOLING WATER		4,215	95	88	62.17	0.77			18	6.05	0.247		
	18"- HEADER	ERH AREA -13	COOLING WATER		2,424	95	88	62.17	0.77			10	9.85	1.27		
	18"- HEADER	COKER/CALCINER AREA 13	COOLING WATER		1,791	95	88	62.17	0.77			10	7.28	0.656		
	COOLING TOWER NO. 2 AREA - 16	24" HEADER	COOLING WATER		14,071	95	88	62.17	0.77			24	11.22	0.568		
	24"- HEADER	ASU - AREA 14	COOLING WATER		13,551	95	88	62.17	0.77			24	10.81	0.527		
	24"- HEADER	WASTE TREATMENT	COOLING WATER		520	95	88	62.17	0.77			6	5.77	0.779		

PREPARED BY B. Shah
DATE 1/20/84
APPROVED BY
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REVISION △		REVISION △		REVISION △		REMARKS
BY	DATE	BY	DATE	BY	DATE	(1) LB. (MASS)/FT. HR
APP'D	DATE	APP'D	DATE	APP'D	DATE	(2) DYNE/CM

FORM 44-152 (8/82)

Rust International Corporation

LINE CALCULATIONS SUMMARY SHEET

UTILITIES LINES - COOLING WATER RETURN

CONTRACT NO. 21-2548
AREA NO. 16
REF. DWG 00-16-03013
SHEET 16 OF 21

CLIENT ICRC
PROJECT 6,000 TPD SRC-1

LINE NO.	FROM	TO	CONTENTS	FLOW CONDITIONS								LINE SIZE INCH	VELOCITY FT/SEC	PRESSURE DROP PSI/100 FT	EQUIVALENT LENGTH FT	REMARKS
				LB/HR	G.P.M.	PRESS. PSIG	TEMP °F	LB/FT³	VISC.[1]	Z	SURFACE TENSION[2] (M.W.)					
	LIQUID THERMAL OXIDIZER	10"- HEADER	COOLING WATER		1	35	115	61.79				1	0.37			
	COKER / CALCINER	10"- HEADER	COOLING WATER		1,797	35	115	61.79				10	7.31			
	EBH AREA-13	18"- HEADER	COOLING WATER		2,425	35	115	61.79				10	9.86			
	SRC PROCESS AREA-12	24"- HEADER	COOLING WATER		10,107	35	115	61.79				20	11.67			
	HPU, GASIFICATION	48"- HEADER	COOLING WATER		73,939	35	115	61.79				48	13.70			
	48"- HEADER	COOLING TOWER NO. 1 AREA-16	COOLING WATER		90,279	35	115	61.79				48	16.03			
	POWER HOUSE AREA-16	10"- HEADER	COOLING WATER		2,509	35	108	61.89				10	10.28			
	INCINERATOR AREA-16	4"- HEADER	COOLING WATER		1	35	115	61.79				1	0.37			
	NHT	4"- HEADER	COOLING WATER		200	35	115	61.79				4	5.05			
	ASU AREA 14	COOLING TOWER NO. 2	COOLING WATER		13,551	35	115	61.79				24	10.81			
	WASTE TREATMENT	24"- HEADER	COOLING WATER		520	35	115	61.79				6	5.77			

PREPARED BY B. Shah
DATE 1/20/84
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BY	DATE	BY	DATE	BY	DATE
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REMARKS
(1) LB. (MASS)/FT. HR
(2) DYNE/CM

FORM 44-152 (8/82)

Rust International Corporation

LINE CALCULATIONS SUMMARY SHEET

UTILITIES LINES - PROCESS WATER

CONTRACT NO. 21-2548
AREA NO. 16
REF. DWG 00-16-03014
SHEET 17 OF 21

CLIENT ICRC
PROJECT 6,000 TPD SRC-1

LINE NO.	FROM	TO	CONTENTS	FLOW CONDITIONS								LINE SIZE INCH	VELOCITY FT/SEC	PRESSURE DROP PSI/100 FT	EQUIVALENT LENGTH FT	REMARKS
				LB/HR	G.P.M. (ACFS)	PRESS. PSIG	TEMP °F	SP. GR. (LB/FT³)	VISC.[1]	Z	SURFACE TENSION[2] (M.W.)					
	WATER TREATMENT AREA 17	20"- HEADER	PROCESS WATER		6,592	100	88					20	7.61	0.333		
	20"- HEADER	WASTE TREATMENT	PROCESS WATER		200	100	88					3	8.7	3.87		
	20"- HEADER	ASU AREA 14	PROCESS WATER		96	100	88					3	4.17	0.97		
	20"- HEADER	COOLING TOWER NO 2	PROCESS WATER		500	100	88					6	5.56	0.72		
	4"- HEADER	MAINT. BLDG	PROCESS WATER		40	100	88					2	3.83	1.35		
	4"- HEADER	WAREHOUSE BLDG.	PROCESS WATER		40	100	88					2	3.83	1.35		
	4"- HEADER	SERVICE CHANGE BLDG.	PROCESS WATER		40	100	88					2	3.83	1.35		
	14"- HEADER	EBH- AREA 13	PROCESS WATER		780	100	88					8	5.01	0.42		
	14"- HEADER	COKER/ CALCINER	PROCESS WATER		1,021	100	88					8	6.56	0.70		
	8"- HEADER	LIQUID STORAGE	PROCESS WATER		120	100	88					4	3.03	0.38		
	8"- HEADER	FLARE AREA-16	PROCESS WATER		120	100	88					6	1.33	0.05		
	6"- HEADER	SRC/TSL STORAGE	PROCESS WATER		45	100	88					2	4.31	1.67		
	6"- HEADER	COAL STORAGE	PROCESS WATER		45	100	88					2	4.31	1.67		
	18"- HEADER	MAIN CONTROL BLDG.	PROCESS WATER		40	100	88					2	3.83	1.35		
	18"- HEADER	SRC PROCESS AREA 12	PROCESS WATER		108	100	88					3	4.70	1.22		
	18"- HEADER	EVAPORATOR	PROCESS WATER		40	100	88					2	3.83	1.35		

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REMARKS
(1) LB. (MASS)/FT. HR
(2) DYNE/CM

FORM 44-152 (8/82)

Rust International Corporation

LINE CALCULATIONS SUMMARY SHEET

UTILITIES LINES - PROCESS WATER

CONTRACT NO. 21-2548
AREA NO. 16
REF. DWG 00-16-03014
SHEET 18 OF 21

CLIENT ICRC
PROJECT 6,000 TPD SRC-I PROJECT

LINE NO.	FROM	TO	CONTENTS	FLOW CONDITIONS								LINE SIZE INCH	VELOCITY FT/SEC	PRESSURE DROP PSI/100 FT	EQUIVALENT LENGTH FT	REMARKS
				LB/HR	G.P.M. (ACFS)	PRESS. PSIG	TEMP °F	SP. GR.[1] (LB/FT³)	VISC.[1]	Z	SURFACE TENSION[2] (M.W.)					
	16" - HEADER	COAL PULVERIZER	PROCESS WATER		40	100	88					2	3.83	1.35		
	16" - HEADER	HPU, GASIFICATION AREA - 14 & 15	PROCESS WATER		230	100	88					4	5.80	1.29		
	12" - HEADER	COOLING TOWER NO. 1	PROCESS WATER		2,014	100	88					10	8.20	0.82		
	12" - HEADER	POWER HOUSE	PROCESS WATER		100	100	88					3	4.35	1.05		
	12" - HEADER	BFW TREATMENT	PROCESS WATER		1,080	100	88					8	6.94	0.78		
	4" - HEADER	INCINERATOR AREA - 16	PROCESS WATER		40	100	88					2	3.83	1.35		
	4" - HEADER	NHT	PROCESS WATER		140	100	88					4	3.54	0.51		

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REMARKS
(1) LB. (MASS)/FT. HR
(2) DYNE/CM

FORM 44-152 (8/82)

Rust International Corporation

LINE CALCULATIONS SUMMARY SHEET

UTILITIES LINES - POTABLE WATER

CONTRACT NO. 21-2548
AREA NO. 16
REF. DWG 00-16-03015
SHEET 19 OF 21

CLIENT ICRC
PROJECT 6,000 TPD SRC-1

LINE NO.	FROM	TO	CONTENTS	FLOW CONDITIONS								LINE SIZE INCH	VELOCITY FT/SEC	PRESSURE DROP PSI/100 FT	EQUIVALENT LENGTH FT	REMARKS
				LB/HR	G.P.M.	PRESS. PSIG	TEMP °F	SP. GR. (LB/FT³)	VISC.[1]	Z	SURFACE TENSION[2] (M.W.)					
	WATER TREATMENT	8"- HEADER	POTABLE WATER		898	30	62					8	5.76	0.552		
	8"- HEADER	WASTE TREATMENT	POTABLE WATER		20	30	62					2	1.91	0.375		
	8"- HEADER	ASU - AREA 14	POTABLE WATER		25	30	62					2	2.39	0.561		
	8"- HEADER	WATER TREATMENT	POTABLE WATER		45	30	62					2	4.30	1.67		
	4"- HEADER	MAINT. BLDG.	POTABLE WATER		79	30	62					3	3.43	0.67		
	4"- HEADER	WAREHOUSE BLDG.	POTABLE WATER		40	30	62					2	3.83	1.35		
	4"- HEADER	SERVICE CHANGE BLDG.	POTABLE WATER		200	30	62					4	5.04	0.985		
	6"- HEADER	EBH- AREA-13	POTABLE WATER		65	30	62					3	2.82	0.47		
	6"- HEADER	COKER/ CALCINER	POTABLE WATER		65	30	62					3	2.82	0.47		
	6"- HEADER	ADMIN. BLDG	POTABLE WATER		62	30	62					3	2.7	0.43		
	2"- HEADER	LIQUID STORAGE	POTABLE WATER		5	30	62					2	0.5	0.03		
	2"- HEADER	FLARE AREA-16	POTABLE WATER		5	30	62					2	0.5	0.03		
	2"- HEADER	SRC/TSL STORAGE	POTABLE WATER		5	30	62					2	0.5	0.03		
	2"- HEADER	COAL STORAGE	POTABLE WATER		10	30	62					2	1.0	0.108		
	6"- HEADER	MAIN CONTROL BLDG.	POTABLE WATER		92	30	62					3	4.0	0.90		
	6"- HEADER	SRC PROCESS AREA 12	POTABLE WATER		25	30	62					2	2.39	0.561		
	6"- HEADER	EVAPORATOR	POTABLE WATER		50	30	62					2	4.78	2.03		

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REMARKS
(1) LB. (MASS)/FT. HR
(2) DYNE/CM

FORM 44-152 (8/82)

Rust International Corporation

LINE CALCULATIONS SUMMARY SHEET

UTILITIES LINES - POTABLE WATER

CONTRACT NO. 21-2548
AREA NO. 16
REF. DWG 00-16-03015
SHEET 20 OF 21

CLIENT ICRC
PROJECT 6,000 TPD SRC-1

LINE NO.	FROM	TO	CONTENTS	FLOW CONDITIONS								LINE SIZE INCH	VELOCITY FT/SEC	PRESSURE DROP PSI/100 FT	EQUIVALENT LENGTH FT	REMARKS
				LB/HR	G.P.M.	PRESS. PSIG	TEMP °F	SP. GR. (LB/FT³)	VISC.[1]	Z	SURFACE TENSION[2] (M.W.)					
	6"- HEADER	COAL PULVERIZER	POTABLE WATER		25	30	62					2	2.39	0.561		
	4"- HEADER	HPU, GASIFICATION AREA 14 & 15	POTABLE WATER		60	30	62					3	2.60	0.406		
	4"- HEADER	POWER HOUSE	POTABLE WATER		25	30	62					2	2.39	0.561		
	4"- HEADER	BFW TREATMENT	POTABLE WATER		50	30	62					2	4.78	2.03		
	4"- HEADER	INCINERATOR	POTABLE WATER		50	30	62					2	4.78	2.03		
	4"- HEADER	CONT. SERVICE BLDG.	POTABLE WATER		135	30	62					4	3.41	0.484		
	4"- HEADER	NHT	POTABLE WATER		25	30	62			-		2	2.39	0.561		

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REMARKS
(1) LB. (MASS)/FT. HR
(2) DYNE/CM

FORM 44-152 (8/82)

Rust International Corporation

LINE CALCULATIONS SUMMARY SHEET

UTILITIES LINES - STEAM CONDENSATE

CONTRACT NO. 21-2548
AREA NO. 16
REF. DWG 00-16-03016
SHEET 21 OF 21

CLIENT ICRC
PROJECT 6000 TPD SRC-1

LINE NO.	FROM	TO	CONTENTS	FLOW CONDITIONS								LINE SIZE INCH	VELOCITY FT/SEC	PRESSURE DROP PSI/100 FT	EQUIVALENT LENGTH FT	REMARKS
				LB/HR	G.P.M.	PRESS. PSIG	TEMP °F	LB/FT³	VISC.[1]	Z	SURFACE TENSION[2] (M.W.)					
	LIQUID STORAGE	3"- HEADER	CONDENSATE	2000	4.4	90.0	320	56.64				2	0.42			
	COKER / CALCINER	3"- HEADER	CONDENSATE	18,065	36.8	90.0	146	61.23				2	3.52			
	EBH - AREA 13	3"- HEADER	CONDENSATE	6,571	14.5	90.0	320	56.64				2	1.38			
	WASTE TREATMENT	6"- HEADER	CONDENSATE	162,041	357	90.0	320	56.64				6	3.96			
	MAINT. BLDG	6"- HEADER	CONDENSATE	2,400	5.3	90.0	320	56.64				2	0.51			
	SRC PROCESS AREA 12	8"- HEADER	CONDENSATE	23,778	52.4	90.0	320	56.64				3	2.27			
	HPU, GASIFICATION AREA 14 & 15	10"- HEADER	CONDENSATE	432,870	901	90.0	173	59.97				8	5.77			
	POWER HOUSE	10"- HEADER	CONDENSATE	24,489	53.9	90.0	320	56.64				3	2.34			
	10"- HEADER	BFW TREATMENT	CONDENSATE	667,724	1390	90.0	270	59.87				10	6.18			

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REMARKS
(1) LB. (MASS)/FT. HR
(2) DYNE/CM.

FORM 44-152 (8/82)

Rust International Corporation

LINE CALCULATIONS SUMMARY SHEET
PROCESS LINES
PROCESS SOLVENTS & FLUSHING OIL

CONTRACT NO. 21-2548
AREA NO. 16
REF. Dwg. 00-16-05001
SHEET 1 OF 20

CLIENT ICRC
PROJECT 6000 T/D SRC-I DEMONSTRATION PLANT
PLANT LOCATION: NEWMAN, KENTUCKY

LINE NO.	LINE NAME	FROM		TO		CONTENTS	FLOW CONDITIONS								LINE SIZE INCH *	VELOCITY FT/SEC	PRESSURE DROP PSI/100 FT	EQUIVALENT LENGTH FT	REMARKS
		Area	Unit	Area	Unit		LB/HR	G.P.M.	PRESS. PSIG	TEMP °F	LB/FT³	VISC.[1]	Z	SURFACE TENSION[2] (M.W.)					
		11	LIQUID STG STAB. NAPHTHA TK.	13	EBH / P-13229A/B	STABILIZED NAPHTHA	NNF	-	-	-	-	-	-	-	2	-	-	-	-
		11	LIQUID ST. M.O. ST. TK	13	COKER / V-13114	MEDIUM OIL		50	-	-	-	-	-	-	3		-		NNF
		11		12	CSD / V-12706	CRITICAL SOLVENT		292	110	70	53.61	1.45	-	-	6	3.24	0.190	3110	
		11	LIQUID ST. PROCESS SOLV TANK	12	SRC V-12101	PROCESS SOLVENT		400	154	400	56.16	1.45	-	-	6	4.44	0.3463	2226	

PREPARED BY B. Shah
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BY	DATE	BY	DATE	BY	DATE
APP'D	DATE	APP'D	DATE	APP'D	DATE

REMARKS
(1) LB. (MASS)/FT. HR
(2) DYNE/CM
* UNLESS OTHERWISE NOTED ALL PIPES ARE C.S.

Rust International Corporation

LINE CALCULATIONS SUMMARY SHEET

PROCESS LINES - COAL & KMAC

CONTRACT NO. 21-2548
AREA NO. 16
REF. Dwg. 00-16-05002
SHEET 2 OF 20

CLIENT ICRC
PROJECT 6000 T/D SRC-I DEMONSTRATION PLANT
PLANT LOCATION: NEWMAN, KENTUCKY

LINE NO.	LINE NAME	FROM Area	FROM Unit	TO Area	TO Unit	CONTENTS	FLOW CONDITIONS LB/HR	G.P.M.	PRESS. PSIG	TEMP °F	LB/FT³	VISC.¹	Z	SURFACE TENSION² (M.W.)	LINE SIZE INCH	VELOCITY FT/SEC	PRESSURE DROP PSI/100 FT	EQUIVALENT LENGTH FT	REMARKS
		11	COAL PULVERIZER	15	DPU/ DC-11321A,B	COAL	91,650		0	121	43.7	-	-	-	8 (3)	(TWO (2) LINES)			
		12	CSD/ DC-12703A/B	15	GKT/ BH-15002.1 BH-15002.2	KMAC	145,347		0.3	400	BULK-16 TRUE=90				(4)				
		15	GKT	12	CSD	RECYCLE N_2	33,072		0.2	158	0.058	0.0198	-	-	TWO (4) 12" LINES				
		11	COAL PULVERIZER	12	SRC BH-12201A/B	PULVERIZED COAL	466,667		0	180	93.56				(3)	(EIGHT (8) LINES)			
		15	DPU C-11341	11	COAL PULVERIZER	RECYCLE GAS									(3)				
		12	SRC C-11343A,B	11	COAL PULVERIZER	RECYCLE GAS									(3)				

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REMARKS
(1) LB. (MASS)/FT. HR
(2) DYNE/CM
(3) PNEUMATIC TRANSPORT (INCLUDED IN AREA 11: COAL PULVERIZING)
(4) PNEUMATIC TRANSPORT (BY OTHERS)

Rust International Corporation

LINE CALCULATIONS SUMMARY SHEET

PROCESS LINES - CRUDE LIQUID PRODUCTS

CONTRACT NO. 21-2548
AREA NO. 16
REF. Dwg. 00-16-05003
SHEET 3 OF 20

CLIENT ICRC
PROJECT 6000 T/D SRC-I DEMONSTRATION PLANT
PLANT LOCATION: NEWMAN, KENTUCKY

LINE NO.	LINE NAME	FROM		TO		CONTENTS	FLOW CONDITIONS								LINE SIZE INCH *	VELOCITY FT/SEC	PRESSURE DROP PSI/100 FT	EQUIVALENT LENGTH FT	REMARKS
		Area	Unit	Area	Unit		LB/HR	G.P.M.	PRESS. PSIG	TEMP °F	LB/FT³	VISC.¹	Z	SURFACE TENSION² (M.W.)					
		11	CRUDE L.O. TANK	12	SRC/ V-12513	CRUDE LIGHT OIL		152							4				NNF
		11	CRUDE M.O. TANK	12	SRC/ V-12514	CRUDE MEDIUM OIL		76							3				NNF
		11	CRUDE H.O. TANK	12	SRC/ V-12516	CRUDE HEAVY OIL		102							4				NNF

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REMARKS
(1) LB. (MASS)/FT. HR
(2) DYNE/CM
* UNLESS OTHERWISE NOTED ALL PIPES ARE C.S.

Rust International Corporation

LINE CALCULATIONS SUMMARY SHEET

PROCESS LINES - SRC & TSL - SRC

CONTRACT NO. 21-2548
AREA NO. 16
REF. Dwg. 00-16-05004
SHEET 4 OF 20

CLIENT ICRC
PROJECT 6000 T/D SRC-I DEMONSTRATION PLANT
PLANT LOCATION: NEWMAN, KENTUCKY

LINE NO.	LINE NAME	FROM Area	FROM Unit	TO Area	TO Unit	CONTENTS	FLOW CONDITIONS LB/HR	G.P.M.	PRESS. PSIG	TEMP °F	LB/FT³	VISC.[1]	Z	SURFACE TENSION[2] (M.W.)	LINE SIZE INCH *	VELOCITY FT/SEC	PRESSURE DROP PSI/100 FT	EQUIVALENT LENGTH FT	REMARKS
		12	SRC/X-12806	11	STORAGE	SOLID SRC-	183,400	-	14.7	200	73.6				-	-	-	-	BELT CONV-EYOR
		12	SRC/X-12806	11	STORAGE	SOLID TSL-SRC	183,400	-	14.7	200	73.6				-	-	-	-	BELT CONV-EYOR
		12	CSD/ P-12708 A/B	13	EDII/ V-13203	MOLTEN SRC	169,558	308	100	448	68.64	184	-	-	6	3.42	1.20	322	
		12	CSD/ P-12708 A/B	13	COKER/ T-13101	MOLTEN SRC	84,779	154	100	488	68.64	484	-	-	4	3.96	3.30	235	
		13	EBH/ P-13264 A/B	12	E-12805	MOLTEN TSL-SRC	82,050	153	100	654	65.75	11.4	-	-	3	6.64	2.7	313	

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REMARKS
(1) LB. (MASS)/FT. HR
(2) DYNE/CM
* UNLESS OTHERWISE NOTED ALL PIPES ARE C.S.

Rust International Corporation

LINE CALCULATIONS
SUMMARY SHEET
PROCESS LINES
FRACTIONATED LIQUID PRODUCTS TO TANK FIRM

CONTRACT NO. 21-2548
AREA NO. 16
REF. Dwg. 00-16-05005
SHEET 5 OF 20

CLIENT ICRC
PROJECT 6000 T/ RC-I DEMONSTRATION PLANT
PLANT LOCATION: NEWMAN, KENTUCKY

LINE NO.	LINE NAME	FROM Area	FROM Unit	TO Area	TO Unit	CONTENTS	FLOW CONDITIONS LB/HR	G.P.M.	PRESS. PSIG	TEMP °F	LB/FT³	VISC.[1]	Z	SURFACE TENSION[2] (M.W.)	LINE SIZE INCH *	VELOCITY FT/SEC	PRESSURE DROP PSI/100 FT	EQUIVALENT LENGTH FT	REMARKS
		12	SRC/ E-12517	11	LIQUID STORAGE	STABILIZED NAPHTHA	50,538	130	100	110	48.5	1.02	—	—	4	3.28	0.30	2818	
		12	SRC/ E-12520	11	STORAGE	MEDIUM OIL	75,688	161	100	180	58.67	3.7	—	—	4	4.06	0.59	726	
		12	SRC/ E-12524	11	STORAGE	HEAVY OIL	44,391	88	100	180	68.64	40.1	—	—	3	3.82	1.5	2945	

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REMARKS
(1) LB. (MASS)/FT. HR
(2) DYNE/CM
* UNLESS OTHERWISE NOTED ALL PIPES ARE C.S.

Rust International Corporation

LINE CALCULATIONS SUMMARY SHEET

PROCESS LINES - SOUR WATERS

CONTRACT NO. 21-2548
AREA NO. 16
REF. Dwg. 00-16-05006
SHEET 6 OF 20

CLIENT ICRC
PROJECT 6000 T/D SRC-I DEMONSTRATION PLANT
PLANT LOCATION: NEWMAN, KE

LINE NO.	LINE NAME	FROM Area	FROM Unit	TO Area	TO Unit	CONTENTS	FLOW CONDITIONS LB/HR	G.P.M.	PRESS. PSIG	TEMP °F	LB/FT³	VISC.¹	Z	SURFACE TENSION² (M.W.)	LINE SIZE INCH *	VELOCITY FT/SEC	PRESSURE DROP PSI/100 FT	EQUIVALENT LENGTH FT	REMARKS
		13	COKER/ P-13114 A/B P-13111 A/B		6"-HEADER ASWS	SOUR WATER	94,782	–	70	150	61.6	1.5	–	–	3	8.33	2.70	361	
		13	EBH/ P-13207 A/B		6"-HEADER (ASWS)	SOUR WATER	105,446		70	125	59.38	1.32	–	–	6	2.46	0.120	127	
			COMBINED C/C & EBH SOUR WATER		6"-HEADER	SOUR WATER	200,228		70	136	61.6	1.32	–	–	6	4.5	0.380	1520	
		12	SRC/ P-12508 A/B		6"-HEADER (ASWS)	SOUR WATER	107,838		65	125	61.76)	1.27	–	–	4	5.49	0.90	26	
			6"-HEADER	15	ASWS/ V-15501	COMBINED C/C, EBH & SRC SOUR WATER	308066			125	61.60	1.28			6	6.93	0.93	593	
			NHT		6"-HEADER (ASWS)	SOUR WATER									4				

PREPARED BY B. Shah
DATE 1/24/84
APPROVED BY
DATE

REVISION △	BY	DATE
	APP'D	DATE

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REVISION △	BY	DATE
	APP'D	DATE

REMARKS
(1) LB. (MASS)/FT. HR * MAT. OF CONST. 304 S.S.
(2) DYNE/CM

Rust International Corporation

LINE CALCULATIONS SUMMARY SHEET

PROCESS LINES - SOUR GASES

CONTRACT NO. 21-2548
AREA NO. 16
REF. Dwg. 00-16-05007
SHEET 7 OF 20

CLIENT: ICRC
PROJECT: 6000 T/D SRC-I DEMONSTRATION PLANT
PLANT LOCATION: NEWMAN, KENTUCKY

LINE NO.	LINE NAME	FROM Area	FROM Unit	TO Area	TO Unit	CONTENTS	FLOW CONDITIONS LB/HR	G.P.M. (ACFS)	PRESS. PSIG	TEMP °F	LB/FT³	VISC.¹	Z	SURFACE TENSION² (M.W.)	LINE SIZE INCH *	VELOCITY FT/SEC	PRESSURE DROP PSI/100 FT	EQUIVALENT LENGTH FT	REMARKS
		13	EBH/ T-13201 V-13217		8"-HEADER (HP OFF GAS)	HP OFF GAS	19,500		1825	110	3.9	0.03	-	-	4	15.85	0.360	1653	
		12	SRC/ V-12413		8"-HEADER (HP OFF GAS)	HP SOUR GAS	135,104		1845	110	2.56	0.03	-	-	8	40.33	0.70	29	
			8"-HEADER (HP OFF GAS)	15	HP DEA/ FL-15301	COMBINED SRC HP GAS & EBH HP GAS	154604			110		0.03			8	44.21	0.88	615	
		13	COKER/ V-13104		6"-HEADER (LP OFF GAS)	LP COKER OFF GAS	9,050		100	100	0.4	0.024			6	32.36	0.88	367	
		13	EBH/ V-13224		6"-HEADER (LP OFF GAS)	EBH LP OFF GAS	4330		100	110	0.63	0.03			4	25.43	0.15	127	
			6"-HEADER (LP OFF GAS)		8"-HEADER (LP OFF GAS)	COMBINED, C/C. EBH L.P. GAS.	13380		99	100	0.423	0.03	-	-	6	45.12	0.210	1534	
		12	SRC/ V-12505 A/B		8"-HEADER (LP OFF GAS)	SRC LP OFF GAS	2024		110	110	0.542	0.03			4	11.74	0.040	26	
		12	SRC/ V-12515		8"-HEADER (LP OFF GAS)	NAPHTHA FRAC. OFF GAS	1202		100	135	0.963	0.02			3	7.68	0.030	26	
			8"-HEADER	15		COMBINED SRC, N. FRAC. C/C & EBH L P OFF GAS	16606		96	100	0.437	0.03			8	30.53	0.08	606	
			NHT		8"-HEADER	NHT SOUR GAS	3179								4				
		12	SRC/ V-12507	15	CLAUS/ V-15701	SRC WASTE-WATER FLASH GAS	36		10.3	125	0.15	0.033	-	-	2	3.12	0.002	594	

PREPARED BY: B Shah
DATE: 1/25/84
APPROVED BY:
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REMARKS
(1) LB. (MASS)/FT. HR
(2) DYNE/CM
* UNLESS OTHERWISE NOTED ALL PIPES ARE C.S.

Rust International Corporation

LINE CALCULATIONS SUMMARY SHEET
PROCESS LINES
LIQUID PRODUCTS FROM EBH TO PRODUCT FRACTIONATION

CONTRACT NO. 21-2548
AREA NO. 16
REF. Dwg. 00-16-05008
SHEET 8 OF 20

CLIENT ICRC
PROJECT 6000 T/D SRC-I DEMONSTRATION PLANT
PLANT LOCATION: NEWMAN, KENTUCKY

LINE NO.	LINE NAME	FROM Area	FROM Unit	TO Area	TO Unit	CONTENTS	FLOW CONDITIONS LB/HR	G.P.M.	PRESS. PSIG	TEMP °F	LB/FT³	VISC.[1]	Z	SURFACE TENSION[2] (M.W.)	LINE SIZE INCH *	VELOCITY FT/SEC	PRESSURE DROP PSI/100 FT	EQUIVALENT LENGTH FT	REMARKS
		13	EBH/ V-13217	12	SRC/ T-12502	HP NAPHTHA	750		485	111	37.46	0.33	-	-	1	1.84	0.70	418.78	
		13	EBH/ P-13225 A/B	12	SRC/ V-12513	LP NAPHTHA	17,354	44	50	115	49.31	1.00	-	-	2	4.21	0.960	422	
		13	EBH/ P-13222 A/B	12	SRC/ V-12514	DISTILLATE	28,800	73	50	452	49.45	0.88	-	-	2	6.98	2.40	423	
		13	EBH/ P-13223 A/B P-13261 A/B P-13262 A/B	12	SRC/ V-12516	HEAVY OIL	17,491	39	50	446	59.33	3.75	-	-	2	3.73	1.20	421	

PREPARED BY B. Shah
DATE 1/24/84
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REMARKS
(1) LB. (MASS)/FT. HR
(2) DYNE/CM
* UNLESS OTHERWISE NOTED ALL PIPES ARE C.S.

Rust International Corporation

LINE CALCULATIONS SUMMARY SHEET

PROCESS LINES - VENT GASES TO INCINERATOR

CONTRACT NO. 21-2548
AREA NO. 16
REF. Dwg. 00-16-05009
SHEET 9 OF 20

CLIENT: ICRC
PROJECT: 6000 T/D SRC-I DEMONSTRATION PLANT
PLANT LOCATION: NEWMAN, KENTUCKY

LINE NO.	LINE NAME	FROM Area	FROM Unit	TO Area	TO Unit	CONTENTS	FLOW CONDITIONS LB/HR	FLOW CONDITIONS ACFM [1]	FLOW CONDITIONS PRESS. PSIG	FLOW CONDITIONS TEMP °F	FLOW CONDITIONS LB/FT-HR	FLOW CONDITIONS VISC.[1]	FLOW CONDITIONS Z	FLOW CONDITIONS SURFACE TENSION[2] (M.W.)	LINE SIZE INCH *	VELOCITY FT/SEC	PRESSURE DROP PSI/100 FT	EQUIVALENT LENGTH FT	REMARKS
		11	LIQUID STORAGE	16	GAS INCINERATOR	VENT GAS		773							10				

PREPARED BY B. Shah
DATE 1/25/84
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DATE

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REMARKS
(1) LB. (MASS)/FT. HR
(2) DYNE/CM
* UNLESS OTHERWISE NOTED ALL PIPES ARE C.S.

Rust International Corporation

LINE CALCULATIONS SUMMARY SHEET
PROCESS LINES
COKER/CALCINER LIQUID EFFLUENTS

CONTRACT NO. 21-2548
AREA NO. 16
REF. Dwg. 00-16-05010
SHEET 10 OF 20

CLIENT: ICRC
PROJECT: 6000 T/D SRC-I DEMONSTRATION PLANT
PLANT LOCATION: NEWMAN, KENTUCKY

LINE NO.	LINE NAME	FROM Area	FROM Unit	TO Area	TO Unit	CONTENTS	FLOW CONDITIONS LB/HR	G.P.M.	PRESS. PSIG	TEMP °F	LB/FT³	VISC.[1]	Z	SURFACE TENSION[2] (M.W.)	LINE SIZE INCH *	VELOCITY FT/SEC	PRESSURE DROP PSI/100 FT	EQUIVALENT LENGTH FT	REMARKS
		13	COKER/ P-13104 A/B	12	SRC/ V-12513	UNSTABILIZED NAPHTHA	2,420	6	122	115	55.9	1.72	-	-	1½[3]	0.95	0.11	549	
		13	COKER/ P-13103	12	SRC/ V-12514	MEDIUM OIL	10,145	25	100	458	51.85	0.75	-		2	2.39	0.34	652	
		13	COKER/ P-13115 A/B	16	INCINERATOR	WET SLOP OIL	21,750	50	50	150	54.29	1.5	-	-	2	4.78	1.410	1796	(INT.)
		13	CALC/ P-13177A/B	17	WWT	CALCINER SCRUBBER WW	27,375	50	72.3	161	69.4	0.95	-	-	3	2.17	0.230	2165	

PREPARED BY B. Shah
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REMARKS * UNLESS OTHERWISE NOTED ALL PIPES ARE C.S.
(1) LB. (MASS)/FT. HR
(2) DYNE/CM
(3) MAT. OF CONST. 304 S.S.

Rust International Corporation

LINE CALCULATIONS SUMMARY SHEET

PROCESS LINES - OXYGEN

CONTRACT NO. 21-2548
AREA NO. 16
REF. Dwg. 00-16-05011
SHEET 11 OF 20

CLIENT: ICRC
PROJECT: 6000 T/D SRC-I DEMONSTRATION PLANT
PLANT LOCATION: NEWMAN, KENTUCKY

LINE NO.	LINE NAME	FROM		TO		CONTENTS	FLOW CONDITIONS								LINE SIZE INCH *	VELOCITY FT/SEC	PRESSURE DROP PSI/100 FT	EQUIVALENT LENGTH FT	REMARKS
		Area	Unit	Area	Unit		LB/HR	G.P.M.	PRESS. PSIG	TEMP °F	LB/FT[1]	VISC.[1]	Z	SURFACE TENSION[2] (M.W.)					
		14	ASU/ C-14167	15	GKT/ TRAINS 1-3	OXYGEN	117459		45	241	0.25	0.061	—	—	16	117.28	0.280	2437	
			16"-HEADER	17	WWT	OXYGEN									3				

PREPARED BY B. Shah
DATE 1/24/84
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REMARKS * UNLESS OTHERWISE NOTED ALL PIPES ARE C.S.
(1) LB. (MASS)/FT. HR
(2) DYNE/CM

Rust International Corporation

LINE CALCULATIONS SUMMARY SHEET

PROCESS LINES - GAS SYSTEM WASTE STREAMS

CONTRACT NO. 21-2548
AREA NO. 16
REF. Dwg. 00-16-05012
SHEET 12 OF 20

CLIENT ICRC
PROJECT 6000 T/D SRC-I DEMONSTRATION PLANT
PLANT LOCATION: NEWMAN KENTUCKY

LINE NO.	LINE NAME	FROM		TO		CONTENTS	FLOW CONDITIONS								LINE SIZE INCH *	VELOCITY FT/SEC	PRESSURE DROP PSI/100 FT	EQUIVALENT LENGTH FT	REMARKS
		Area	Unit	Area	Unit		LB/HR	G.P.M.	PRESS. PSIG	TEMP °F	LB/FT³	VISC.[1]	Z	SURFACE TENSION[2] (M.W.)					
		15	BSRU/ E-15809	17	WWT	STRETFORD PURGE	3,142	6	50	270	62.7				2	0.57	0.033	2891	
		15	DEA/ P-15310 A/B	13	CALC/ V-13181	WASTE CAUSTIC	17,292	34	125	115	61.9	1.36	-	-	2	3.25	0.780	2441	

PREPARED BY B Shah
DATE 1/24/84
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REMARKS * UNLESS OTHERWISE NOTED ALL PIPES ARE C.S.
(1) LB. (MASS)/FT. HR
(2) DYNE/CM

Rust International Corporation

LINE CALCULATIONS SUMMARY SHEET

PROCESS LINES - GKT ASH SLURRY

CONTRACT NO. 21-2548
AREA NO. 16
REF. Dwg. 00-16-05013
SHEET 13 OF 20

CLIENT: ICRC
PROJECT: 6000 T/D SRC-I DEMONSTRATION PLANT
PLANT LOCATION: NEWMAN, KENTUCKY

LINE NO.	LINE NAME	FROM Area	FROM Unit	TO Area	TO Unit	CONTENTS	FLOW CONDITIONS LB/HR	G.P.M.	PRESS. PSIG	TEMP °F	LB/FT³	VISC.[1]	Z	SURFACE TENSION[2] (M.W.)	LINE SIZE INCH *	VELOCITY FT/SEC	PRESSURE DROP PSI/100 FT	EQUIVALENT LENGTH FT	REMARKS
		15	GKT/ P-15156 A/B	17	ASH POND	ASH SLURRY		760	135	149	70.5		-	-	8 (3)	4.87	0.340	6664	
		17	ASH POND	15	WWU/ S-15053-1/3	WASH WATER		501	100	97	62.03	1.71	-	-	8 (3)	3.21	0.150	6658	
		13	COKER/ P-13154 A/B	17	ASH POND	COKE SLURRY		300				0.802			6				
		16	8" HEADER	17	EVAPORATOR	ASH SLURRY	76,755	136	135	149	70.5				4				
		17	EVAPORATOR	16	8" HEADER	THICKENER OVER FLOW WATER	57,567	115	100						4				

PREPARED BY: B. Shah
DATE: 1/24/84
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BY	DATE	BY	DATE	BY	DATE
APP'D	DATE	APP'D	DATE	APP'D	DATE

REMARKS: * UNLESS OTHERWISE NOTED ALL PIPES ARE C.S.
[1] LB. (MASS)/FT. HR
[2] DYNE/CM
(3) PLASTIC LINED

Rust International Corporation

LINE CALCULATIONS SUMMARY SHEET

PROCESS LINES - HYDROGEN

CONTRACT NO. 21-2548
AREA NO. 16
REF. Dwg. 00-16-05014
SHEET 14 OF 20

CLIENT: ICRC
PROJECT: 6000 T/D SRC-I DEMONSTRATION PLANT
PLANT LOCATION: NEWMAN, KENTUCKY

LINE NO.	LINE NAME	FROM		TO		CONTENTS	FLOW CONDITIONS								LINE SIZE INCH *	VELOCITY FT/SEC	PRESSURE DROP PSI/100 FT	EQUIVALENT LENGTH FT	REMARKS
		Area	Unit	Area	Unit		LB/HR	ACFS	PRESS. PSIG	TEMP °F	LB/FT³	VISC.[1]	Z	SURFACE TENSION[2] (M.W.)					
		15	COMP/ C-15601 A-C	12	E-12403/ R-12402	RECYCLE HYDROGEN	97,561	13.93	2950	224	1.95	0.03	-	-	8	35.63	0.460	492	
		15	METH/ V-15651	13	6"-HEADER	METHANATED HYDROGEN	9394		600	100	0.305	0.022	-	-	6	41.4	0.140	68	
		-	6"-HEADER	13	EBH/ V-13201	METHANATED HYDROGEN	9394		600	100	0.305	0.022	-	-	6	41.4	0.140	2176	-
			6"-HEADER		NHT	METHANATED HYDROGEN	1560								2				
-		13	EBH	15	METH/ E-15653 A	RECYCLE HYDROGEN	NNF								4				
															4				

PREPARED BY: B. Bhat
DATE: 1/24/84
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BY	DATE	BY	DATE	BY	DATE
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REMARKS * UNLESS OTHERWISE NOTED ALL PIPES ARE C.S.
[1] LB. (MASS)/FT. HR
[2] DYNE/CM

Rust International Corporation

LINE CALCULATIONS SUMMARY SHEET
PROCESS LINES
GAS SYSTEM LIQUID HYDROCARBON EFFLUENTS

CONTRACT NO. 21-2548
AREA NO. 16
REF. Dwg. 00-16-05015
SHEET 15 OF 20

CLIENT ICRC
PROJECT 6000 T/D SRC-I DEMONSTRATION PLANT
PLANT LOCATION: NEWMAN KENTUCKY

LINE NO.	LINE NAME	FROM		TO		CONTENTS	FLOW CONDITIONS								LINE SIZE INCH *	VELOCITY FT/SEC	PRESSURE DROP PSI/100 FT	EQUIVALENT LENGTH FT	REMARKS
		Area	Unit	Area	Unit		LB/HR	G.P.M.	PRESS. PSIG	TEMP °F	LB/FT³	VISC.¹	Z	SURFACE TENSION² (M.W.)					
		15		11	LIQUID STORAGE	PHENOL	2219								2				
		14	HPU/ P-14750 A/B	12	SRC V-12513	LIGHT OIL	3370		65.3	102	49.72	0.69	-	-	2	0.81	0.050	576	
		15	NRSR/ V-15017-1 -15017-2	12	CSD	RECYCLE CRITICAL SOLVENT	1169	3	47.3	40	55.3	1.75	-	-	2	0.29	0.010	594	
		15	LPG/ E-15808 ASWS/ P-15501 A/B ASWS/ P-15506	16	LIQUID THERMAL OXIDIZER	SLOP OIL	12,010	30	49.3	124	49.92	1.35	-	-	2	2.87	0.510	3949	INT.
		11	LIQUID STORAGE	16	LIQUID THERMAL OXIDIZER	PHENOL	2219								2				

PREPARED BY B Shah
DATE 1/29/84
APPROVED BY
DATE

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REMARKS: * UNLESS OTHERWISE NOTED ALL PIPES ARE C.S.
(1) LB (MASS)/FT. HR
(2) DYNE/CM.

Rust International Corporation

LINE CALCULATIONS SUMMARY SHEET

PROCESS LINES - GAS SYSTEM VENT GASES

CONTRACT NO. 21-2548
AREA NO. 16
REF. Dwg. 00-16-05016
SHEET 16 OF 20

CLIENT: ICRC
PROJECT: 6000 T/D SRC-I DEMONSTRATION PLANT
PLANT LOCATION: NEWMAN, KENTUCKY

LINE NO.	LINE NAME	FROM Area	FROM Unit	TO Area	TO Unit	CONTENTS	FLOW CONDITIONS LB/HR	G.P.M. (ACFS)	PRESS. PSIG	TEMP °F	LB/FT³	VISC.[1]	Z	SURFACE TENSION[2] (M.W.)	LINE SIZE INCH *	VELOCITY FT/SEC	PRESSURE DROP PSI/100 FT	EQUIVALENT LENGTH FT	REMARKS
		15	DPU		TO ATMOS	VENT N_2	4384		8.3	396	0.065	0.05	-	-	-	-	-	-	
		15	GKT / C-15151 A/B C-15152 A/B	17	BOILER HOUSE	VENT GAS	32,074	-	0.3	153	0.061	0.042	-	-	24[3]	53.87	0.010		

PREPARED BY: B. Shah
DATE: 1/24/84
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REMARKS * UNLESS OTHERWISE NOTED ALL PIPES ARE C.S.
(1) LB. (MASS)/FT. HR
(2) DYNE/CM
(3) MAT. OF CONSTR. 316 S.S.

Rust International Corporation

LINE CALCULATIONS SUMMARY SHEET

PROCESS LINES - GAS SYSTEM WASTE WATER

CONTRACT NO. 21-2548
AREA NO. 16
REF. Dwg. 00-16-05017
SHEET 17 OF

CLIENT ICRC
PROJECT 6000 T/D SRC-I DEMONSTRATION PLANT
PLANT LOCATION: NEWMAN, KENTUCKY

LINE NO.	LINE NAME	FROM		TO		CONTENTS	FLOW CONDITIONS								LINE SIZE INCH *	VELOCITY FT/SEC	PRESSURE DROP PSI/100 FT	EQUIVALENT LENGTH FT	REMARKS
		Area	Unit	Area	Unit		LB/HR	G.P.M.	PRESS. PSIG	TEMP °F	LB/FT³	VISC.[1]	Z[1]	SURFACE TENSION[2] (M.W.)					
		15	GKT/ E-15152 A-D	17	WWT	WASH WATER		192	78.3	97	62.03	1.71	-	-	4 (3)	4.84	0.740	2914	-
		15	ASWS/ E-15503	17	WWT	ASWS STRIPPED WATER		520	70.3	120	62.12	1.33	-	-	6	5.78	0.60	2939	

PREPARED BY	B. Ghosh	REVISION △		REVISION △		REVISION △		REMARKS * UNLESS OTHERWISE NOTED ALL PIPES ARE C.S.
DATE	1/24/84	BY	DATE	BY	DATE	BY	DATE	(1) LB. (MASS)/FT. HR
APPROVED BY		APP'D	DATE	APP'D	DATE	APP'D	DATE	(2) DYNE/CM
DATE								(3) PLASTIC LINED

Rust International Corporation

LINE CALCULATIONS SUMMARY SHEET

PROCESS LINES - GAS SYSTEM WASTE STREAMS

CONTRACT NO. 21-2548
AREA NO. 16
REF. Dwg. 00-16-05018
SHEET 18 OF 20

CLIENT ICRC
PROJECT 6000 T/D SRC-I DEMONSTRATION PLANT
PLANT LOCATION: NEWMAN KENTUCKY

LINE NO.	LINE NAME	FROM		TO		CONTENTS	FLOW CONDITIONS								LINE SIZE INCH *	VELOCITY FT/SEC	PRESSURE DROP PSI/100 FT	EQUIVALENT LENGTH FT	REMARKS
		Area	Unit	Area	Unit		LB/HR	G.P.M.	PRESS. PSIG	TEMP °F	LB/FT³	VISC.¹	Z	SURFACE TENSION² (M.W.)					
		15	ASWS / P-15507 A/B	17	WWT	SLUGE		19	25.3	250	59.89	0.58	-	-	2 (4)	1.82	0.220	289E	
		15	CAUSTIC / P-15815 A/B	17	WWT	20% CAUSTIC		8.8	50.3	100	75.3	6.3	-	-	2	0.84	0.120	283?	
		15	GKT / CV-15054-1, 2, 3	17	LANDFILL	SLAG	22,000		0.5	157									3)
		16	2" HEADER	17	EVAPORATOR	20% CAUSTIC		NNF							1				

PREPARED BY B. Shah
DATE 1/24/84
APPROVED BY
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REVISION △ BY DATE APP'D DATE
REVISION △ BY DATE APP'D DATE

REMARKS * UNLESS OTHERWISE NOTED ALL PIPES ARE C.S.
(1) LB. (MASS)/FT. HR
(2) DYNE/CM
(3) BY CONVEYOR/TRUCK
(4) PLASTIC LINED

Rust International Corporation

LINE CALCULATIONS SUMMARY SHEET

PROCESS LINES - NAPHTHA HYDROTREATING

CONTRACT NO. 21-2548
AREA NO.
REF. Dwg. 00-16-05019
SHEET 19 OF 20

CLIENT ICRC
PROJECT 6000 T/D SRC-I DEMONSTRATION PLANT
PLANT LOCATION: NEWMAN, KENTUCKY

LINE NO.	LINE NAME	FROM		TO		CONTENTS	FLOW CONDITIONS								LINE SIZE INCH *	VELOCITY FT/SEC	PRESSURE DROP PSI/100 FT	
		Area	Unit	Area	Unit		LB/HR	G.P.M.	PRESS. PSIG	TEMP °F	LB/FT³	VISC.[1]	Z	SURFACE TENSION[2] (M.W.)				
			NHT	11	LIQUID STORAGE	NAPHTHA		114							4			
		11	LIQUID STORAGE		NHT / NHT FEED TANK	STABILIZED NAPHTHA		117	100	110	48.5	1.02	-	-	4	2.97	0.230	6664
			NHT	11	LIQUID STORAGE	C_5 - 160°F CUT									2			

PREPARED BY B. Shah
DATE 1/24/84
APPROVED BY
DATE

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REVISION △ BY DATE APP'D DATE

REMARKS * UNLESS OTHERWISE NOTED ALL PIPES ARE C.S.
(1) LB. (MASS)/FT. HR
(2) DYNE/CM

Rust International Corporation

LINE CALCULATIONS SUMMARY SHEET

PROCESS LINES - MISCELLANEOUS WASTE STREAMS

CONTRACT NO. 21-2548
AREA NO. 16
REF. DWG. 00-16-05020
SHEET 20 OF 20

CLIENT ICRC
PROJECT 6000 T/D SRC-I DEMONSTRATION PLANT
PLANT LOCATION: NEWMAN, KENTUCKY

LINE NO.	LINE NAME	FROM Area	FROM Unit	TO Area	TO Unit	CONTENTS	FLOW CONDITIONS LB/HR	G.P.M.	PRESS. PSIG	TEMP °F	LB/FT³	VISC.¹	Z	SURFACE TENSION² (M.W.)	LINE SIZE INCH *	VELOCITY FT SEC	PRESSURE DROP PSI/100 FT	EQUIVALENT LENGTH FT	REMARKS
		16	COOLING TOWER NO 1	17	WASTEWATER TREATMENT	WATER		368							6				
		16	COOLING TOWER NO. 2		6" HEADER	WATER		63							3				
		16	BFW & CONDENSATE TREATMENT	17	WASTEWATER TREATMENT	SPENT ACID	37,610	75							4				PLASTIC LINED
		17	WASTWATER TREATMENT	16	12" HEADER	RECLAIMED WATER		1,538							12				
		17	EVAPORATOR	16	12" HEADER	RECLAIMED WATER		482							6				
		16	12" HEADER	16	COOLING TOWER #1	RECLAIMED WATER		2,020							12				
		16	BFW & CONDENSATE	17	WASTEWATER TREATMENT	SPENT CAUSTIC	41,250	82							4				
		17	WASTE WATER TREATMENT	17	EVAPORATOR	REVERSE OSMOSIS REJECT	256,000	512							6				
		17	LANDFILL	16	COOLING TOWER BLOWDOWN 6" HEADER	LANDFILL LEACHATE		5							1				

PREPARED BY B Shah
DATE 1/25/84
APPROVED BY
DATE

REVISION △ BY DATE APP'D DATE
REVISION △ BY DATE APP'D DATE
REVISION △ BY DATE APP'D DATE

REMARKS * UNLESS OTHERWISE NOTED ALL PIPES ARE C.S.
(1) LB. (MASS)/FT. HR
(2) DYNE/CM

2.3.3 Layout Drawings

The following layout drawings are included after this page.

00-16-40001D Plot Plan, Bridge Piping Layout (Sheet 1)
00-16-40002D Plot Plan, Bridge Piping Layout (Sheet 2)
00-16-40003D Plot Plan, Bridge Piping Sections (Sheet 3)
00-16-10004D Sewer System Layout

MATCH LINE SEE DWG NO 00-16-40002 D

T-POLE SUPPORTS

ADMINISTRATION BUILDING

AREA 13 COKER/CALCINER

AREA 12 EXPANDED-BED HYDROCRACKER

AREA 11 COAL PULVERIZER

AREA 18 SRC PROCESS UNIT

1ST AND 2ND TIER OF TIES BRIDGE IS 30'-0" WIDE

AREA 14 HYDROGEN PURIFICATION

SULFUR RECOVERY

GAS TREATMENT

AREA 15 GAS SYSTEM

GASIFICATION

HYDROGEN COMPRESSION

NAPTHA HYDRO-TREATER

COOLING TOWER #1

POWER HOUSE

BOILER FEED WATER TREATMENT

T-POLE SUPPORTS

GAS INCINERATOR

CONTRACT SERVICE CHANGE BLDG

T-POLE SUPPORTS

WAREHOUSE

MAINTENANCE BUILDINGS & STORAGE

LABORATORY

EVAPORATORS

HAZARDOUS WASTE LANDFILL

NON-HAZARDOUS WASTE LANDFILL

LANDFILL COVER STOCKPILE

SERVICE CHANGE BUILDING

SURGE POND

AREA 19 AIR SEPARATION UNIT

COOLING TOWER

SUB STATION

RELOCATED AMACO 8 Φ PIPELINE

SURGE BASINS

AREA 17 WATER TREATMENT

AREA 17 WASTE TREATMENT

WATER INTAKE STRUCTURE

GENERAL NOTES

1. ALL BRIDGES SHALL BE 20'-0 WIDE, UNLESS NOTED.
2. ALL T-POLES SUPPORTS SHALL BE 8'-0" WIDE.
3. ALL SLEEPERS SHALL BE A MAX OF 30" FROM EXISTING GRADE IN LIQUID STORAGE AND COAL STORAGE AREAS SEE DRAWING NO. 00-16-40002 D FOR LAYOUT.
4. PIPE BRIDGE COORDINATES ARE APPROXIMATE AND ARE NOT TO BE CONSTRUED AS FINAL COORDINATE FOR BRIDGE DESIGN.

1	BASELINE UPDATE	2-84	MWH	

DRAFTSMAN — DATE 9-6-81
CHECKED
ENGINEER

6,000 TPD SRC I DEMONSTRATION PLANT
NEWMAN KENTUCKY
For UNITED STATES DEPARTMENT OF ENERGY

TITLE: PLOT PLAN BRIDGE PIPING LAYOUT SHEET 1 OF 3

SCALE 1" = 200'

International Coal Refining Company, Allentown, PA

THE RUST ENGINEERING COMPANY, Birmingham, Alabama

DWG NO 00-16-40001 D REV D

ASH POND

ASH POND

FLARE & NTOU

PIPE SLEEPER

RAIL SCALE

STORM RETENTION POND

PIPE SLEEPERS TYPICAL IN STORAGE AREA

FUEL OIL

FUTURE SQ M

FUTURE SQ M

HEAVY OIL

HEAVY OIL

CRUDE HEAVY OIL

CRUDE OIL

PRODUCT NAPHTHA

PRODUCT NAPHTHA

SRC PROCESS SOLVENT

NHT FEED NAPHTHA

CRITICAL SOLVENT

CRUDE LIGHT OIL

CRUDE MEDIUM OIL

MIDDLE DIST PROD

MIDDLE DIST PROD

PHENOL

INCINERATOR & PUMP HOUSE

SRC STORAGE

TSL STORAGE

COAL STORAGE

S.O.M. PULVERIZER

SAMPLING

TRUCK UNLOADING

RETENTION POND

DWG. 00-16-40003 D

FOR ENLARGED VIEW OF TYPICAL TRUCK UNLOADING STATION SEE DWG NO. 00-11-40001D

LIQUID LOADING (TRUCK)

PIPE SLEEPERS

COKE SILOS

SRC LOADING

RAIL UNLOADING

LIQUID LOADING (RAIL)

SEE ENLARGED VIEW OF TYPICAL RAIL UNLOADING STATION DWG NO. 00-11-40001D

SECURITY FENCE

MATCH LINE SEE DWG. NO 00-16-40001D

1ST AND 2ND TIER OF TUBES BRIDGE IS 30'-0" WIDE

DWG 00-16-40001D

N5000 N4640 N4540 N4480 N4440 N4400 N4320 N4300

E 13000 E 14000 E 14263 E 15000 E 16000 E 17000 E 17320 E 17420 E 17450

E 12865 E 12895

N

REFERENCE DRAWINGS

1. DRAWING NO. 00 16 40003 D BRIDGE PIPING SECTIONS AND DETAIL SHEET 3 OF 3
2. DRAWING NO 00-11-40001 D LIQUID LOADING FOR RAIL AND TRUCK PLAN AND ELEVATION

D

GENERAL NOTES

FOR GENERAL NOTES SEE DRAWING NO. 00-16-40001 D

REV.	CHANGE NOTICE	REVISION DESCRIPTION	DATE	BY	CHKD	APPD
2		BASELINE UPDATE	2-84	MWH		
1		BASELINE UPDATE	3-19-82	RCS		

DRAFTSMAN — DATE 9-14-81

R.C.S. CHECKED — 12 10 81

ENGINEER

APPROVED

8,000 TPD SRC I DEMONSTRATION PLANT
NEWMAN KENTUCKY
For UNITED STATES DEPARTMENT OF ENERGY

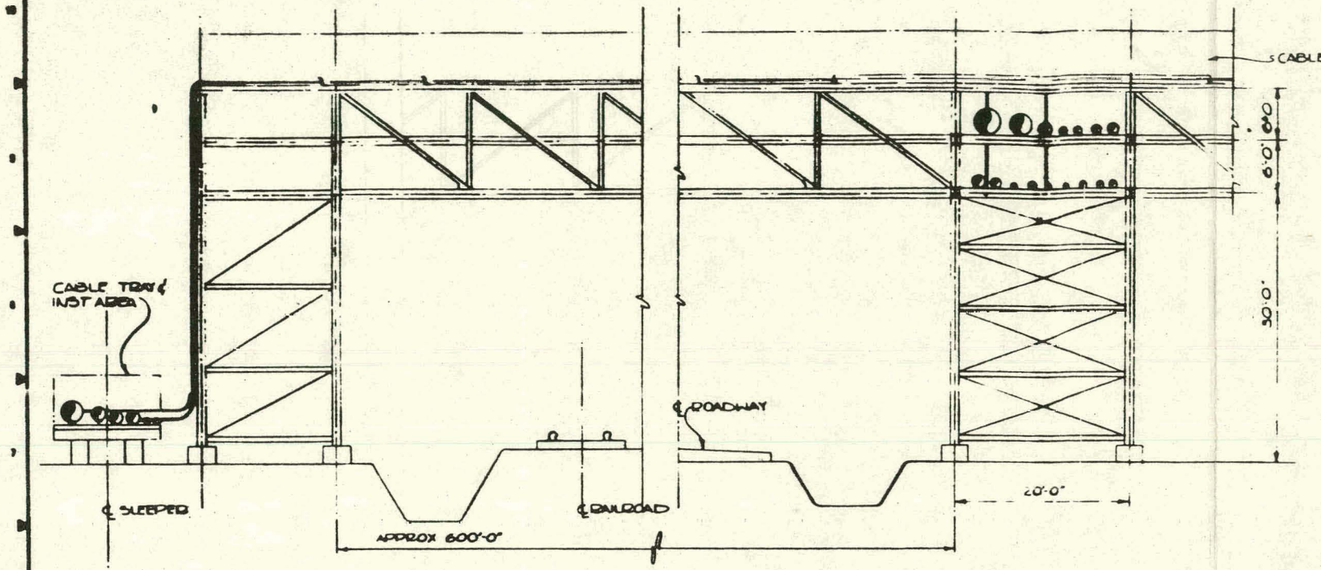
TITLE: PLOT PLAN BRIDGE PIPING LAYOUT SHEET 2 OF 3

SCALE 1" = 200' — WT.

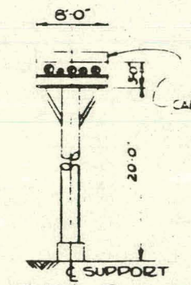
International Coal Refining Company Allentown, PA

THE RUST ENGINEERING COMPANY

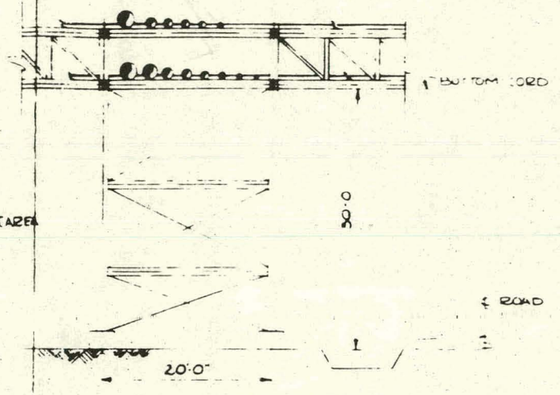
DWG. NO. 00-16-40002 D — REV 2



SECTION 'AA' @ RR TRACKS
REF. DWG. NO. 00-16-40002 D



TYPICAL T-POLE SUPPORT



SECTION CC
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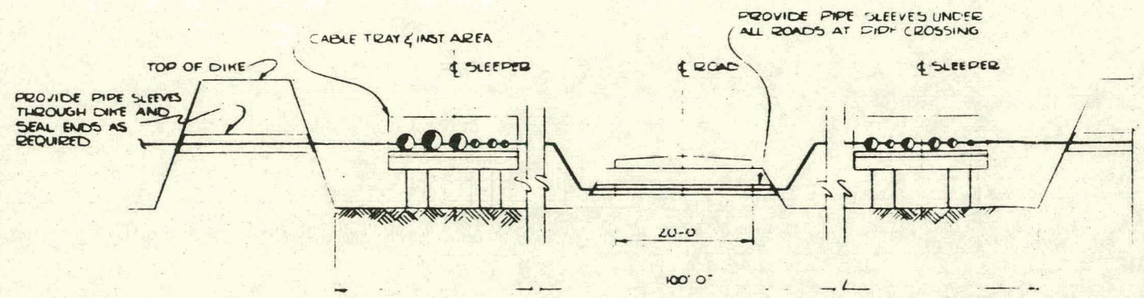

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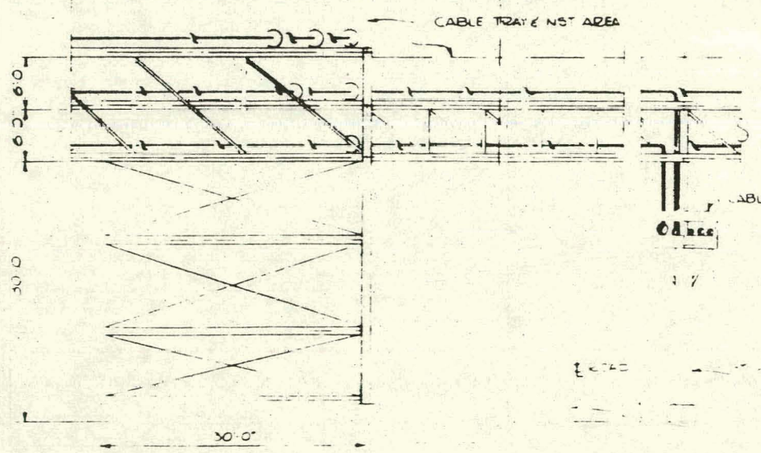
REF. DWG. NO. 00-16-40002 D

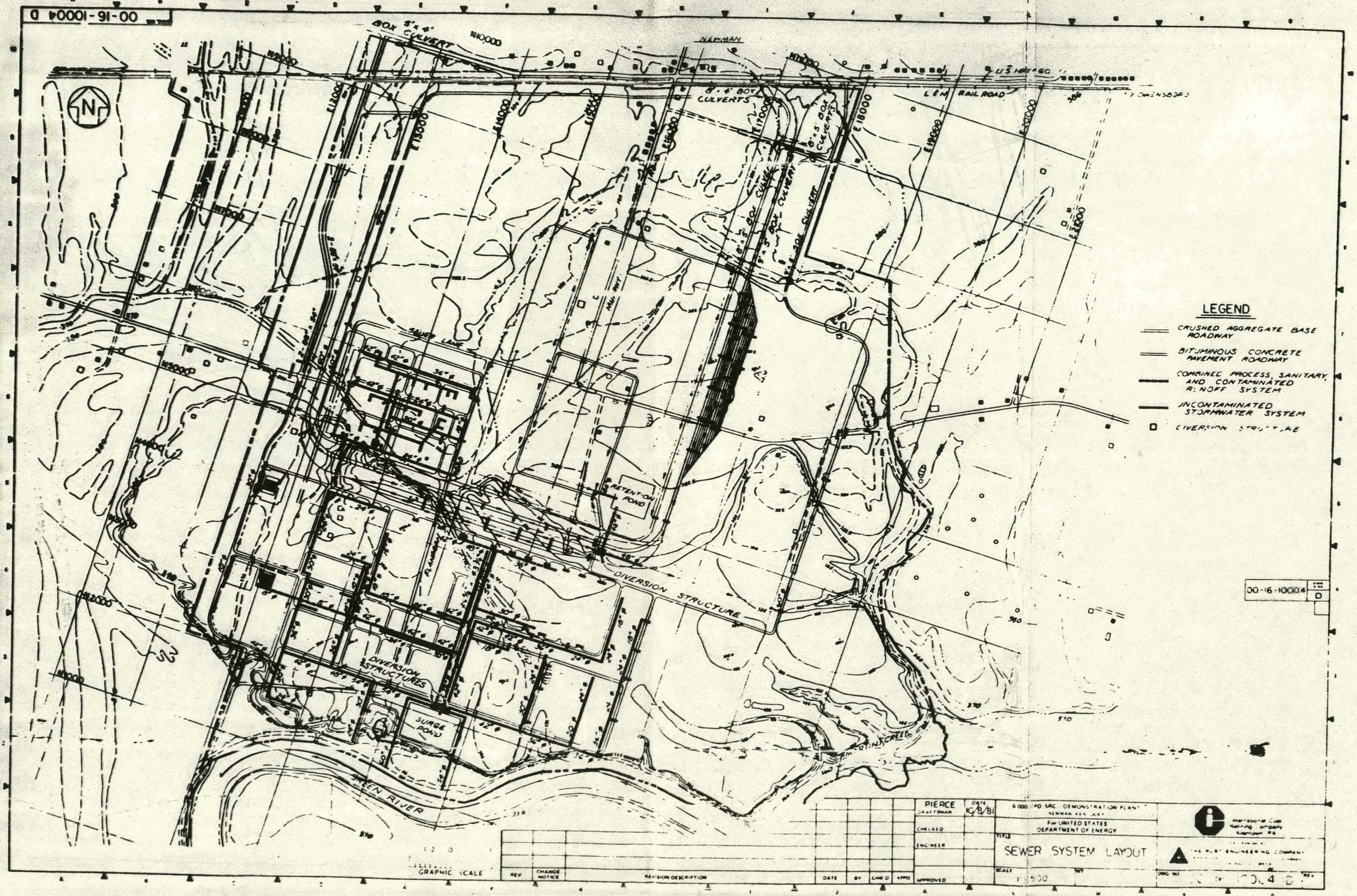


REV	CHANGE NOTICE	REVISION DESCRIPTION	DATE	BY	CHK'D	APP'D

DRAFTSMAN H SHERROD	DATE	6,000 TPD SRC-I DEMONSTRATION PLANT HENDERSON KENTUCKY For UNITED STATES DEPARTMENT OF ENERGY
CHECKED		
ENGINEER		TITLE [illegible]
APPROVED		SCALE [illegible] DWG NO [illegible] REV D

International Coal Refining Company, Allentown PA
THE RUST ENGINEERING COMPANY

00-16-10004 D


BOX 8'x 4' CULVERT
N10000
NEWMAN
8'-4' BOX CULVERTS
L & M RAIL ROAD
U.S. HWY 60
TO OWENSBORO
E12000
E13000
E14000
E15000
E16000
E17000
E18000
E19000
E20000
E21000
N11000
N12000
N13000
N14000
N15000
SALINE LAKE
RETENTION POND
DIVERSION STRUCTURE
DIVERSION STRUCTURES
SURGE POND
GREEN RIVER
GRAPHIC SCALE
LEGEND
CRUSHED AGGREGATE BASE ROADWAY
BITUMINOUS CONCRETE PAVEMENT ROADWAY
COMBINED PROCESS, SANITARY, AND CONTAMINATED RUNOFF SYSTEM
UNCONTAMINATED STORMWATER SYSTEM
DIVERSION STRUCTURE
00-16-10004 D
PIERCE
DRAFTSMAN
CHECKED
ENGINEER
APPROVED
DATE 10/8/81
6 000 TPD SRC DEMONSTRATION PLANT
NEWMAN KENTUCKY
For UNITED STATES DEPARTMENT OF ENERGY
SEWER SYSTEM LAYOUT
SCALE 1" = 500'
REV
CHANGE NOTICE
REVISION DESCRIPTION
DATE
BY
CHKD
APPD

2.4 UTILITY SYSTEMS INTEGRATION

2.4.1 Instrumentation Requirements

2.4.1.1 The instrumentation and control system for the utilities and offsites of the SRC plant will be designed for extensive use of remote control systems which will be provided for all of the essential functions required for start-up, shutdown, selection of alternates, flow routes, operation of inter-related systems, removal of problem equipment from service, placing spares into operation, and other operator activity that would otherwise require frequent trips to equipment items for local control.

2.4.1.2 The control system will utilize up-to-date state of the art techniques with special emphasis on operator interface. Micro-processor based control will be utilized with the analog loops arranged to permit relative ease of interface with the controllers. For most applications, the use of digital control will be supervisory set-point control.

2.4.1.3 Pneumatic instrumentation will be considered for application where environment prevents the use of electronic instruments. Otherwise pneumatic instrumentation will not be used, or will be limited to applicable areas.

2.4.1.4 Electronic loops for all areas will have 4-20 milliamp dc signals, or as stated in the general engineering specification.

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