

SECTION 13

MAJOR EQUIPMENT SUMMARY

The major equipment items in all nonproprietary units are listed in Tables 13-1 through 13-35.

Equipment items listed are shown with dimensions and/or capacity, as well as design pressure, temperature, and in most cases, materials of construction. The size and capacity shown are the design requirements for the most demanding condition. These capacity ratings exceed, in most cases, the requirements for conditions shown on the process flowsheets that, on all drawings, describe the typical case.

Equipment numbers are included for all equipment. The third digit, 3 or 6, in the four-digit group denotes second- and third-train equipment, respectively, when more than one train is involved.

Units 11, 20, 32, and 34 are proprietary processes. Equipment for these and for a few package systems is not listed.

Table 13-1 - Major Equipment Summary
Unit 8 - Coal Mine

Item No.	Description	Size
<u>Mine Equipment</u> 8-0801-01 through -06 8-1001-01 and -02 8-1002-01 8-2801-01 through -15 8-2802-01 through -06 8-3501-01 through -06 8-3502-01 through -06 8-3505-01 through -06 8-3601-01 through -24 8-3602-01 through -06 8-3603-01 through -03 8-3604-1 through -06 8-3605-01 through -12 8-3606-01 through -06 8-3607-01 through -12 8-3608-01 through -06 8-3609-01 through -03 8-3610-01 and -02 8-3611-01 through -06 8-3612-01 through -06 8-3613-01 through -06 8-3614-01 through -06 8-3615-01 through -60 8-3616-01 through -06 8-3617-01 through -06 8-3618-01 through -06 8-3619-01 through -05	Mine pumping system Hydraulic crane Mobile crane Rotary blasthole drill Trac-drill w/compressor Dragline Coal shovel Front-end loader Coal hauler Dozer w/ripper Reject hauler Scrapper Grader Rubber-tired dozer Track dozer Sprinkler truck Tire truck Low boy w/tractor Fuel lube truck Flatbed truck ANFO truck Explosive truck Pickup truck Passenger bus Welding truck Electrical truck Dump truck	15 ton 50 ton 175 yd ³ 15 yd ³ 120 ton 120 ton 35 yd ³ 50 ton 5 ton 30 passenger 10 ton

Table 13-2 - Major Equipment Summary
Unit 9 - Coal Preparation

Item Number	Description	Size	Operating		Material and Remarks
			Press. (psig)	Temp (°F)	
<u>Feeders</u>					
9-0501 through -0503	ROM coal hopper feeder	6'-0" x 40'-0"		ambient	CS
9-0504 through -0506	Coarse coal breaker feeder	6'-0" x 100'-0"		ambient	CS
9-0901	Primary sampler			ambient	CS
<u>Pumps</u>					
9-1501 through -1512	Primary cyclone pump	1'-0" x 10", 200-hp motor	50	ambient	CS rubber lined
9-1513 through -1518	Secondary cyclone pump	1'-0" x 10", 200-hp motor	50	ambient	CS rubber lined
9-1519 through -1524	Classifying pump	1'-0" x 10", 200-hp motor	50	ambient	CS rubber lined
9-1525 and -1526	Polishing pump	1'-0" x 10", 200-hp motor	50	ambient	CS rubber lined
9-1528	Centrate pump	1'-0" x 10", 200-hp motor	50	ambient	CS rubber lined
9-1529 and -1530	Recirculating water pump	1'-0" x 10", 200-hp motor	50	ambient	CS rubber lined
9-1531 and -1532	Spray bar pump	1'-0" x 10", 200-hp motor	50	ambient	CS rubber lined

Table 13-2 (Contd)

Item Number	Description	Size	Operating		Material and Remarks
			Press. (psig)	Temp (°F)	
9-1533 and -1534	Thickener under flow pump	800 gpm, 75-hp motor	50	ambient	SS rotor, CS rubber lined case
<u>Other Major Equipment</u>					
9-1801 and -1802	Jig blower	4,000 cfm, 3.5 psig		ambient	CS
9-1901	Water head tank	25'-0" x 28'-0" L x 18'-0" H		ambient	CS resin coated
9-2002	Raw coal conveyor	5'-0" x 9,250'-0"		ambient	
9-2003	Raw coal conveyor	5'-0" x 450'-0"		ambient	
9-2004 through -2006	Breaker refuse conveyor	3'-0" x 100'-0"		ambient	
9-2007	Plant refuse conveyor	3'-0" x 250'-0"		ambient	
9-2008	Plant tailings conveyor	3'-0" x 150'-0"		ambient	
9-2009	High ash coal conveyor	3'-0" x 1,000'-0"		ambient	
9-2010	Low ash coal conveyor	3'-0" x 1,000'-0"		ambient	
9-2101 through -2103	Rotary breaker	16'-0" x 36'-3" openings		ambient	CS

Table 13-2 (Contd)

Item Number	Description	Size	Operating		Material and Remarks
			Press. (psig)	Temp (°F)	
9-2104 and -2105	Middlings crusher	2'-8" x 6'-0"			CS
9-2201 through -2208	Fine coal centrifuge	4'-8"		ambient	CS, 304 SS baskets
9-2211 through -2214	Tailings/centrifuge	3'-8" x 11'-0" horizontal solid bowl		ambient	304 SS
9-2209 and -2210	Jig coal centrifuge	4'-8"		ambient	CS, 304 SS baskets
9-2601 through -2603	Truck dump hopper	400-ton, 2'-0" grizzly		ambient	CS
9-2604 and -2605	Plant refuse hopper	300 ton		ambient	CS
9-2606 through -2608	Breaker refuse hopper	300 ton		ambient	CS
9-2701 and -2702	Jig refuse screen	8'-0" x 20'-0" SD 3" bar spacing		ambient	CS
9-2703 through -2705	Vibrating grizzly screen	8'-0" x 20'-0" SD 3" bar spacing		ambient	CS
9-2706 through -2713	Raw coal screen	8'-0" x 20'-0" 3-D 9/16", 3/8", 5/16"		ambient	CS, 304 SS media
9-2714 and -2715	Jig sieve bend	8'-0" x 2'-8" 28 mesh		ambient	CS, 304 SS media

Table 13-2 (Contd)

Item Number	Description	Size	Operating		Material and Remarks
			Press. (psig)	Temp (°F)	
9-2716 and -2717	Jig coal screen	8'-0" x 20'-0" DD 3/8", 28M		ambient	CS, 304 SS media
9-2718 through -2725	Fine sieve bend	8'-0" x 2'-8", 28M		ambient	CS, 304 SS media
9-2726 through -2733	Fine coal screen	8'-0" x 20'-0" 3-D 3/16", 8M, 28M		ambient	CS, 304 SS media
9-2734	Slag dewatering screen	8'-0" x 20'-0" 3-D 1/4", 1/8", 28M		ambient	CS, 304 SS media
9-2744 through -2767	Primary hydrocyclone	2'-2"		ambient	CS ceramic lined
9-2768 through -2779	Secondary hydrocyclone	2'-2"		ambient	CS ceramic lined
9-2780 through -27151	Classifying hydrocyclone	10"		ambient	CS ceramic lined
9-27152 through -27175	Polishing hydrocyclone	10"		ambient	CS ceramic lined
9-27176 through -27183	"Vor-Sivs," Model 2000	1/4 mm		ambient	CS, 304 SS basket
9-2801	Tramp iron magnet	5'-0"		ambient	Electromagnet
9-2802	Tramp metal detector	5'-0"		ambient	

Table 13-2 (Contd.)

Item Number	Description	Size	Operating		Material and Remarks
			Press. (psig)	Temp (°F)	
9-3101 and -3102	Baum jig	225 ft ²		ambient	CS resin coated
9-3201 through -3208	Primary feed sump			ambient	CS resin coated
9-3209 through -3212	Secondary feed sump			ambient	CS resin coated
9-3213 through -3216	Classifying feed sump			ambient	CS resin coated
9-3217	Polishing feed sump			ambient	CS resin coated
9-3301 and -3302	Lamella settler-thickener	41'-0" dia x 41'-0" dia x 36'-0" H		ambient	Lamella: PVC, CS acid-proof painted

Table 13-3 - Major Equipment Summary
 Unit 10 - Coal Storage, Grinding, and Drying

Item Number	Description	Size	Operating		Material and Remarks
			Press. (psig)	Temp (°F)	
<u>Feeders</u>					
10-0501 through -0503	Vibrating feeder, electromechanical	400-TPH, 5-hp motor each		ambient	CS
10-0504 through -0508	Vibrating feeder, electromechanical	200-TPH, 1-hp motor each		ambient	CS
10-0509 through -0512	Vibrating feeder electromechanical	15-TPH, 1/4-hp motor each		ambient	CS
<u>Samplers</u>					
10-0901 and -0902	Primary 3-stage sampling system	50-hp motor each		ambient	CS
10-0903 through -0906	Secondary single-stage sampling system	5-hp motor each		ambient	CS
<u>Material Handling</u>					
10-2003 and -2004	Transverse stockpile belt conveyor	4'-0" x 800'-0", 1,500-TPH, 100-hp motor each		ambient	
10-2005 through -2008	Longitudinal stockpile belt conveyor, reversible	4'-0" x 1,600'-0", 1,500-TPH, 200-hp motor each		ambient	
10-2009 through -2012	Feed hoppers, self-propelled railway included	5-hp motor each		ambient	CS

Table 13-3 (Contd)

Item Number	Description	Size	Operating		Material and Remarks
			Press. (psig)	Temp (°F)	
10-2013 through -2015	Bucket wheel stacker-reclaimer, crawler-mounted	4'-6" belt; 1,800-TPH, 575-hp motor each		ambient	CS
10-2016 through -2018	Shuttle belt, self-propelled, crawler-mounted	5'-0" belt; 1,800-TPH, 450-hp motor each		ambient	
10-2019 through -2022	Conveyor belt tripper, self-propelled	4'-0"; 50-hp motor each		ambient	CS
10-2023 and -2024	Plant feed belt conveyor	4'-0" x 800'-0"; 60'-0" lift 1,500-TPH, 150-hp motor each		ambient	
10-2025	Intermediate belt conveyor	4'-0" x 50'-0"; 1,500-TPH, 75-hp motor		ambient	
10-2026 through -2028	Distribution belt conveyor	4'-0" x 100'-0"; 25'-0", 1,500-TPH, 75-hp motor each		ambient	
10-2029 and -2030	Bucket elevator	150'-0" high, 350-TPH, 100-hp motor		ambient	CS
10-2031 through -2034	Horizontal flight conveyor	3'-6" x 50'-0"; 200-TPH, 15-hp motor		ambient	CS
10-2035 and -2036	Bucket elevator	125'-0" high, 400-TPH, 100-hp motor		ambient	CS
10-2037	Bucket elevator	100'-0" high, 300-TPH, 60-hp motor		ambient	CS

Table 13-3 (Contd)

Item Number	Description	Size	Operating		Material and Remarks
			Press. (psig)	Temp (°F)	
10-2038	Horizontal flight conveyor	3'-0" x 50'-0", 150-TPH, 10-hp motor			
<u>Mills</u>					
10-2101 through -2103	2-row cage mill	6'-0", 365-TPH, 500/700-hp motors each		ambient	CS
10-2104 through -2108	4-row cage mill	6'-0", 135-TPH, 600/800-hp motors each		ambient	CS
10-2109 through -2112	6-row cage mill	6'-0", 72-TPH, 500/700-hp motors each		ambient	CS
<u>Bins</u>					
10-2601	Hopper bin, 3 outlets	1,100-ton capacity		ambient	CS
10-2602	Hopper bin, 5 outlets	675-ton capacity		ambient	CS
10-2603 through -2612	Hopper bin, single outlet	200-ton capacity		ambient	CS
10-2613	Hopper bin, 4 outlets	285-ton capacity		ambient	CS

Table 13-3 (Contd)

Item Number	Description	Size	Operating		Material and Remarks
			Press. (psig)	Temp (°F)	
<u>Dryers</u>					
10-3401	Fluid bed, steam tube dryer system (cyclonic, dust collector, ducts included)	675 TPH, 11'-0" W x 12'-0" H x 75'-0" L			CS
10-3402	Fluid bed, steam tube dryer system	810 TPH, 13'-0" W x 12'-0" H x 75'-0" L			CS
10-3403	Fluid bed, steam tube dryer system	285 TPH, 5'-6" W x 12'-0" H x 75'-0" L			CS
<u>Other Major Equipment</u>					
10-2801 and -2802	Metal detector	4'-0"			
10-2803 and -2804	Electromagnetic tramp iron removal unit	4'-0"			
10-3801 through -3807	Belt scale, coal-to-storage controlling, recording	4'-0"			

Table 13-4 - Major Equipment Summary
Unit 11 - Oxygen Plant

Item Number	Description	Size	Operating		Material and Remarks
			Pross. (psig)	Temp (°F)	
11-	4 5,000-TPD units or equivalent produce 98% purity oxygen. Turkey installation including filters, dryers, air compressors to augment supply available from process plant, columns, pumps, electrical system, and O ₂ compressor to 500 psig. Compressors are steam-turbine driven.	19,000 TPD	Manufacturer's design		

Table 13-5 - Major Equipment Summary
Unit 12 - Coal Slurrying and Dissolving

Item Number	Description	Size	Operating		Material and Remarks
			Press. (psig)	Temp (°F)	
<u>Vessels</u>					
12-1201	Slurry mix vessel	22'-0" D x 42'-0" TT	10	451	SA-285C 1/4" CA
12-1202	Slurry vapor flash drum	4'-0" D x 16'-0" TT	8	260	SA-516 1/8" CA
12-1203	Slurry vapor condensate drum	6'-0" D x 12'-0" TT	6	100	SA-285C 1/8" CA
12-1204, -1234, and -1264	High-pressure primary separator	9'-0" D x 36'-0" TT	2,025	850	SA-387 Cr 22 308 SS overlay
12-1205	High-pressure intermediate flash drum	9'-0" D x 27'-0" TT	2,005	370	A-516 1/8" CA
12-1206	High-pressure condensate drum	8'-0" D x 24'-0" TT	1,995	150	A-516 1/8" CA
12-1207	High-pressure condensate surge drum	6'-0" D x 15'-0" TT	1,960	102	A-516 1/8" CA
12-1208	High-pressure vapor expander flash drum	12'-0" D sphere	1,095	82	A-516 1/8" CA
12-1209	High-pressure slurry flash drum	11'-0" D x 30'-0" TT	1,980	550	A-516 1/4" CA
12-1210	1st IP slurry flash drum	11'-0" D x 30'-0" TT	1,105	549	A-516 1/4" CA
12-1211	1st IF slurry vapor condensate drum	4'-0" D x 20'-0" TT	1,100	120	A-516 1/4" CA

Table 13-5 (Contd)

Item Number	Description	Size	Operating		Material and Remarks
			Press. (psig)	Temp (°F)	
12-1212	1st IP condensate flash drum	6'-0" D x 18'-0" TT	1,095	98	A-516 1/8" CA
12-1213	2nd IP slurry flash drum	11'-0" D x 30'-0" TT	530	548	A-516 1/4" CA
12-1214	2nd IP slurry vapor condensate drum	4'-0" D x 20'-0" TT	520	120	A-516 1/8" CA
12-2115	2nd IP condensate flash drum	6'-0" D x 18'-0" TT	510	95	A-516 1/8" CA
12-1216	Low-pressure slurry flash drum	11'-0" D x 30'-0" TT	255	548	A-516 1/4" CA
12-1217	Low-pressure slurry vapor condensate drum	4'-0" D x 20'-0" TT	245	120	A-516 1/8" CA
12-1218	Low-pressure condensate flash drum	6'-0" D x 18'-0" TT	235	94	A-516 1/8" CA
<u>Exchangers</u>					
12-1301	Slurry vapor air condenser	4.644 MM Btu/hr, 6,245 ft ² 1 bay, 8.8'-0" x 8'-0", 2 fans @ 5 hp	10	451	T A-285
12-1302	Slurry vapor water condenser	48,200 MM Btu/hr, 9,280 ft ² 2 shells, 42'-20'	8 35	260 120	SH A-387 T 321 SS

Table 13-5 (Contd)

Item Number	Description	Size	Operating		Material and Remarks
			Press. (psig)	Temp (°F)	
12-1303	HP separator vapor feed gas exchanger	305.32 MM Btu/hr, 41,100 ft ² 1 shell, 51"-16'	2,015	840	SH A-387 Gr 22, 308L clad T 321 SS
12-1304	HP separator overhead vapor air condenser	147,465 MM Btu/hr, 578,400 ft ² 6 bays, 15'-0" x 40'-0", 12 fans @ 25 hp	2,000	370	SH CS 1/4" CA T CS
12-1305	HP separator overhead liquid air cooler	27,694 MM Btu/hr, 124,000 ft ² 1 bay, 2-10'-6" x 40'-0", 4 fans @ 25 hp	2,000	370	SH CS 1/4" CA T CS
12-1306	HP separator overhead liquid water cooler	1,907 MM Btu/hr, 9,170 ft ² 2 shells, 46"-20'	35 1,995	120 120	SH CS 1/4" CA T B111-443
12-1307	HP separator overhead condensate water cooler	0.927 MM Btu/hr, 430 ft ² 1 shell, 15"-20'	35 1,995	120 150	SH CS 1/4" CA T B111-443
12-1308, -1338, and -1368	HP separator slurry - feed exchanger	210.275 MM Btu/hr, 34,125 ft ² 2 shells, 62"-60'	2,025 2,235	850 642	SH A-387 Gr 11 clad 308L T 321 SS
12-1309	HP separator slurry - overhead condensate	68.398 MM Btu/hr, 8,420 ft ² 1 shell, 35"-60'	235 2,010	550 667	SH A 204 B 308 Cl T 321 SS
12-1310	HP separator slurry - steam generator	296.506 MM Btu/hr, 49,650 ft ² 4 shells, 96"-24'	600 1,990	497 646	SH CS 1/16" CA T 410 SS

Table 13-5 (Contd)

Item Number	Description	Size	Operating		Material and Remarks
			Press. (psig)	Temp (°F)	
12-1311	HP flash vapor - steam generator	8.837 MM Btu/hr, 630 ft ² 1 shell, 42"-10'	65 1,980	312 550	SH CS 1/8" CA T 410 SS
12-1312	HP flash vapor air condenser	10.748 MM Btu/hr, 33,000 ft ² 1 bay, 10'-0" x 24'-0", 2 fans @ 20 hp	1,975	350	T CS
12-1313	HP flash vapor water condenser	0.917 MM Btu/hr, 860 ft ² 1 shell, 23"-16'	35 1,970	120 120	SH CS 1/4" CA T B-111 443
12-1314	1st IP flash vapor - steam generator	3.884 MM Btu/hr, 290 ft ² 1 shell 34"-10'	65 1,105	312 549	SH CS 1/16" CA T CS
12-1315	1st IP flash vapor air condenser	6.240 MM Btu/hr, 28,350 ft ² 1 bay, 12'-0" x 20'-0", 2 fans @ 20 hp	1,100	201	T CS
12-1316	2nd IP flash vapor - steam generator	2.676 MM Btu/hr, 255 ft ² 1 shell, 34"-8'	65 530	312 548	SH CS 1/16" CA T CS
12-1317	2nd IP flash vapor air condenser	3.087 MM Btu/hr, 19,630 ft ² 1 bay, 16'-0" x 20'-0", 2 fans @ 15 hp	525	161	T CS
12-1318	LP flash vapor air condenser	3.280 MM Btu/hr, 5,725 ft ² 1 bay, 5'-0" x 12'-0", 3 fans @ 5 hp	255	546	T CS
<u>Furnaces</u>					
12-1401, -1431, and -1461	Dissolver preheater	168,246 MM Btu/hr 12'-0" x 45'-0" x 55'-0" cabin type	2,225	700	321 SS tubes

Table 13-5 (Contd)

Item Number	Description	Size	Operating		Material and Remarks
			Press. (psig)	Temp (°F)	
<u>Pumps</u>					
12-1501, -1531, and -1561	Dissolver feed pump	4,010 gpm, 3,000-ft TDH, 7,600 hp	2,235	451	CS, stellite facings
12-1502	Dissolver feed pump spare	4,010 gpm, 3,000-ft TDH, 7,600 hp	2,235	451	CS, stellite facings
12-1503 and -1504	Hot HC condensate pump and spare	9 gpm, 1 hp, 3,600 rpm	40	260	API S-1
12-1505	Cold HC condensate pump	10 gpm, 3 hp, 1,750 rpm	40	100	API S-1
12-1506 and -1507	Sour water pump and spare	91 gpm, 3 hp, 1,750 rpm	35	100	API S-1
12-1508	1st-stage slurry hydraulic turbine	13,073 gpm, 3,870 hp	1,980	550	316 SS stellite hard facings
12-1509	2nd-stage slurry hydraulic turbine	12,654 gpm, 2,480 hp	1,105	549	316 SS stellite hard facings
12-1510	3rd-stage slurry hydraulic turbine	12,411 gpm, 1,170 hp	530	548	316 SS stellite hard facings
12-1511	1st-stage condensate hydraulic turbine	616 gpm, 175 hp	1,960	102	316 SS
12-1512	2nd-stage condensate hydraulic turbine	627 gpm, 125 hp	1,096	102	316 SS
12-1513	3rd-stage condensate hydraulic turbine	631 gpm, 60 hp	510	95	316 SS

Table 13-5 (Contd)

Item Number	Description	Size	Operating		Material and Remarks
			Press. (psig)	Temp (°F)	
<u>Compressors</u>					
12-1801	Makeup hydrogen compressor	519.302 MM SCFD, 14,000 hp each, 2 single-stage recip.	2,235	250	SA 4340
12-1802	Recycle hydrogen compressor	265.616 MM SCFD, 13,600 hp, 1 single-stage recip.	2,235	236	SA 4340
12-1803	HP vapor expander	471.284 MM SCFD, 10,000 hp, centrifugal	1,960	146	SA 4340
<u>Other Major Equipment</u>					
12-2001 through -2004	Coal screw feeder	208.33 TPH each, 200 hp 11'-0" long	10	200	CS 1/4" CA
<u>Conveyors</u>					
12-3801	Coal weigh belt conveyor	833.33 TPH, 10 hp, 16'-0" long	ambient	200	CS
<u>Agitators</u>					
12-2401	Slurry agitator	50 hp x 25 to 40 rpm	10	451	CS 1/4" CA
<u>Reactor</u>					
12-2501, -2531, and -2561	Dissolver	12'-6" x 122'-0"	2,025	850	A-387 GR 22 308L overlay

Table 13-6 - Major Equipment Summary
 Unit 13 - SRC Atmospheric Distillation

Item Number	Description	Size	Operating		Material and Remarks
			Press. (psig)	Temp (°F)	
<u>Columns</u>					
13-1101	Atmospheric fractionator	14'-0" x 18'-0" x 20'-0" x 74'-4" TT	17.17	741	CS 1/8" CA, CS 1/4" CA, CS clad with 1/8" 410 SS
13-1102	Distillate stripper	5'-6" x 17'-0" TT	15.7	470	CS 1/8" CA
<u>Vessels</u>					
13-1201	Reflux drum	10'-0" x 30'-0" TT	11.8	270	CS 1/8" CA
13-1202	Fractionator overhead receiver	5'-6" x 17'-0" TT	8.3	120	CS 1/4" CA
13-1203	Vent gas knockout drum	6'-0" x 10'-0" TT	6.3	120	CS 1/8" CA
<u>Exchangers</u>					
13-1301	Feed-bottoms exchanger	265,200 MM Btu/hr, 75,200 ft ² 8 shells, 51"-26' AEU	240 70	623 741	SH CS clad with T 5% Cr, 1/8" Mo
13-1302	Overhead air condenser	55,901 MM Btu/hr, 245,000 ft ² 4 bays, 16'-0" x 30'-0", 8 fans @ 15 hp	15.3	297	CS, header: CS 1/4" CA

Table 13-6 (Contd)

Item Number	Description	Size	Operating		Material and Remarks
			Press. (psig)	Temp (°F)	
13-1303	Naphtha air condenser	82.653 MM Btu/hr, 380,000 ft ² 7 bays, 16'-0" x 30'-0", 14 fans @ 10 hp	11.8	270	CS, header: CS 1/4" CA
13-1304	Atmospheric PA - steam generator	15.834 MM Btu/hr, 3,100 ft ² 1 shell, 66"/44"-16' AKT	75 56	312 402	SH CS 1/8" CA T CS
13-1305	Distillate stripper reboiler	6.343 MM Btu/hr, 900 ft ² 1 shell, 54"/27"-16' AKT	157 70	470 741	SH CS 1/4" CA T.5% Cr, 1/2% Mo
<u>Fixed Heater</u>					
13-1401 and -1402	Feed furnace	250.00 MM Btu/hr	220	749	321 SS Tubes
<u>Pumps</u>					
13-1501 and -1502	Reflux pump and spare	1,000-gpm, 134-ft TDH, 50-hp motor	80	270	API S-1, CS
13-1503 and -1504	Pump around pump and spare	3,164-gpm, 177-ft TDH, 150-hp motor	96	590	API S-6, 410 SS
13-1505 and -1506	Distillate pump and spare	700 gpm, 196-ft TDH, 50-hp motor	100	470	API S-6, 410 SS
13-1507 and -1508	Slurry recycle pump	8,390 gpm	65	741	API S-6
13-1509 and -1510	Naphtha pump and spare	270-gpm, 182-ft TDH, 20-hp motor	90	120	API S-6, CS

Table 13-6 (Contd)

Item Number	Description	Size	Operating		Material and Remarks
			Press. (psig)	Temp (°F)	
13-1511 and -1512	Sour water pump and spare	140-gpm, 117-ft TDH, 10-hp motor	73	120	API A-8, 316 SS
13-1513 and -1514	Vent gas condensate pump	10-gpm, 82-ft TDH, 3-hp motor	51	120	API S-1, CS
<u>Compressors</u>					
13-1801 and -1802	Vent gas compressor and spare	10,530 MM SCFD, 1,500-hp motor	75	199	

Table 13-7 - Major Equipment Summary
Unit 14 - SRC Vacuum Distillation

Item Number	Description	Size	Operating		Material and Remarks
			Press. (psig)	Temp (°F)	
<u>Package Plant</u>					
14-0801	Vacuum system package	75.659 MM SCFD @ 10 mm Hg	10 mm Hg minimum		
<u>Vessels</u>					
14-1101 and -1131	Vacuum fractionator	48'-0" dia sphere	32 mm Hg	825	CS 1/8" CA (upper half) CS clad with 1/8" 410 S (lower half)
<u>Exchangers</u>					
14-1301 and -1331	Light vacuum distillate PA air cooler	32,274 MM Btu/hr, 140,000 ft ² 2 bays, 16'-0" x 30'-0", 4 fans @ 15 hp	25	266	CS, header: CS 1/4" CA
14-1302 and -1332	Light vacuum distillate PA, BFW exchanger	26,058 MM Btu/hr, 8,400 ft ² 2 shells, 39"-20' BEU	35 190	360 312	SH CS 1/8" CA T CS
14-1303 and -1333	Heavy vacuum distillate PA, 150-psig steam generator	201,443 MM Btu/hr, 29,360 ft ² 4 shells, 83"/59"-20' AKT	180 45	380 523	SH CS 1/8" CA T CS
14-1304 and -1334	Heavy vacuum distillate PA, 50-psig steam generator	64,290 MM Btu/hr, 7,000 ft ² 2 shells, 69"/46"-16' AKT	65 35	312 430	SH CS 1/8" CA T CS

Table 13-7 - Major Equipment Summary
Unit 14 - SRC Vacuum Distillation

Item Number	Description	Size	Operating		Material and Remarks
			Press. (psig)	Temp (°F)	
<u>Fired Heaters</u>					
14-1401 and -1431	Vacuum tower feed furnace	182.546 MM Btu/hr	17.7	825	5% Cr 1/2% Mo, 1/8" CA
<u>Pumps</u>					
14-1501, -1502, -1531, and -1532	Light vacuum distillate pump and spare	2,033-gpm, 150-hp motor	75	360	APIS-1
14-1503, -1504, -1533, and -1534	Heavy vacuum distillate pump and spare	12,484-gpm, 700-hp motor	55	523	APIS-6
14-1505, -1506, -1535, and -1536	Vacuum bottoms pump and spare	606-gpm, 350-hp motor	535	810	APIS-6

Table 13-8 - Major Equipment Summary
Unit 15 - Pyrolysis

Item Number	Description	Size	Operating		Material and Remarks
			Press. (psig)	Temp (°F)	
<u>Columns</u>					
15-1101	Pyrolysis HP fractionator	13'-0" ID x 37'-6" TT	478	800	A-387 Gr 22 CL 2
15-1102	LP contactor	2'-0" ID x 10'-0" TT	35	120	CS 1/8" CA
<u>Vessels</u>					
15-1202	HP fractionator overhead receiver	10'-0" ID x 30'-0" TT	464	120	CS 1/4" CA
15-1204	Compressor knockout drum	9'-0" ID x 27'-0" TT	461	100	CS 1/4" CA
15-1205	LP flash drum	2'-6" ID x 7'-6" TT	35	799	A-294 GRC
<u>Exchangers</u>					
15-1301	Pyrolysis vapor, cold pyrolysis carrier gas	82.429 MM Btu/hr, 2,575 ft ² 2 shells, 60"-28' BEU	508 477	450 680	SH A-204 GRC T 321 SS
15-1302	Pyrolysis vapor, 180-psig steam generator	28.940 MM Btu/hr, 4,700 ft ² 1 shell, 75"/50"-16' BKM	180 474	380 496	SH CS 1/4" CA T 5 CR 1/2 Mo
15-1303	Pyrolysis vapor, 65-psig steam generator	30.095 MM Btu/hr, 5,725 ft ² 1 shell, 81"/55"-16' BKM	65 471	312 360	SH CS 1/4" CA T 5 CR 1/2 Mo
15-1304	Pyrolysis vapor air cooler	128.588 MM Btu/hr, 21,930 ft ² (bare tube)	467.8	360	316 SS

Table 13-8 (Contd)

Item Number	Description	Size	Operating		Material and Remarks
			Press. (psig)	Temp (°F)	
15-1305	Recycle oil/1,300-psig steam generator	191.623 MM Btu/hr, 17,500 ft ² 1 shell, 49"-60' BEM	1,300 477	579 800	SH A-204 GRC T 321 SS
15-1306	Syngas, warm pyrolysis carrier gas	99.616 MM Btu/hr, 2,920 ft ² 1 shell, 92"-10' BEM	505 470	325 158	SH A-204 GRC T 321 SS
15-1307	Receiver vapor trim cooler	4.804 MM Btu/hr, 4,880 ft ² 1 shell, 42"-20' AES	464 50	120 100	SH CS T
<u>Pumps</u>					
15-1501 and -1502	HP fractionator recycle oil pump and spare	4,097-gpm, nominal 300-hp motor	536	800	316 SS
15-1503 and -1504	Contacting bottoms pump and spare	289-gpm, nominal 60-hp motor	227	119	API S-1
<u>Compressors</u>					
15-1801	Cold pyrolysis carrier gas compressor	5247.3 ACFM, single-stage, centrifugal, 1,500-hp motor	491 In 538 Out	100	Low alloy 4320
15-1802	Atomizing gas compressor	1025.73 ACFM, 4-stage, barrel-type, centrifugal, 1,750-hp motor	538 In 800 Out	450 537	

Table 13-8 (Contd)

Item Number	Description	Size	Operating		Material and Remarks
			Press. (psig)	Temp (°F)	
<u>Materials Handling Equipment</u>					
15-2001 and -2002	HP coal feeder	3,500-ft TPD coal 23" dia 2,300-hp motor	500	200	4140 Hard chrome plated
<u>Filters</u>					
15-2201	Pyrolyzer cyclone	12.553 MM SCFH 5'-6" ID x 25'-0"	496	1,100	A-387 Gr 22
15-2202	Pyrolyzer cyclone	12.553 MM SCFH 4'-7" ID x 21'-4"	488	1,100	A-387 Gr 22
15-2203	Ionizer/collector	12.553 MM SCFH 15'-0" W x 20'-0" L x 25'-0" H 25 kW	480	1,100	A-387 Gr 22
<u>Reactors</u>					
15-2501 and -2502	Pyrolyzer/spare	3'-0" ID x 2'-0" x 42'-0" TT	500	1,100	A-387 Gr 22, CL 2

Table 13-9 - Major Equipment Summary
 Unit 16 - Pyrolysis Atmospheric Distillation

Item Number	Description	Size	Operating		Material and Remarks
			Press. (psig)	Temp (°F)	
<u>Columns</u>					
16-1101	Main fractionator	6'-0" ID x 3'-0" ID x 63'-0" TT	14.34	625	A-285C
16-1102	Mid-distillate stripper	3'-0" ID x 17'-0" TT	14.42	453	A-285C
<u>Vessels</u>					
16-1201	Compressor stage 2 knockout drum	2'-0" ID x 8'-0" TT	43.00	120	A-285C
16-1202	Compressor stage 3 knockout drum	2'-0" ID x 8'-0" TT	151.7	120	A-515 70
16-1203	Overhead receiver	5'-6" ID x 22'-0" TT	5.3	120	A-285C
16-1204	Acid gas knockout drum	2'-0" ID x 8'-0" TT	465.3	100	A-515 70
<u>Exchangers</u>					
16-1301	Overhead vapor/cold fractionator feed exchanger	9.955 MM Btu/hr, 2,520 ft ² 1 shell 20"-34' AES	28.34 12.80	280 350	SH CS 1/8" CA T CS
16-1302	Overhead vapor air cooler	11.251 MM Btu/hr 1 bay, 10'-0" x 40'-0", 2 15-hp motors	9.8	290	CS, header: CS 1/4" CA
16-1303	SRC HVD, warm fractionator feed exchanger	10.091 MM Btu/hr, 3,050 ft ² 1 shell, 20"-39' AES	25.34 20.00	395 523	SH CS 1/8" CA T CS

Table 13-9 (Contd)

Item Number	Description	Size	Operating		Material and Remarks
			Press. (psig)	Temp (°F)	
16-1304	HP fractionator slurry fractionator feed exchanger	16.412 MM Btu/hr, 3,760 ft ² 4 shells, 20"-21' CJN	22.34 2,000.3	586 646	SH CS 1/4" CA T 5 Cr 1/2 Mo
16-1305	HP fractionator vapor/fractionator feed exchanger	6.411 MM Btu/hr, 620 ft ² 1 shell, 8"-28' CEN	19.34 2,025.3	616 850	SH CS 321 SS clad T 321 SS
<u>Exchangers</u>					
16-1306	Compressor 1st-stage disc. air cooler	0.268 MM Btu/hr	46	288	CS
16-1307	Compressor 2nd-stage disc. air cooler	0.300 MM Btu/hr	154.7	287	CS
16-1308	Acid/gas air cooler	0.317 MM Btu/hr 1 bay, 8'-6" x 10'-0" for above 3 coils 1 10-hp motor	471.3	287	CS
16-1309	Acid/gas trim cooler	0.038 MM Btu/hr, 31 ft ² double pipe	468.3 50	120 95	SH CS T inhibited admiralty.
<u>Pumps</u>					
16-1501 and -1502	Pyrolysis atm bottoms pump and spare	160-gpm, 30-hp motor	185.3	617	12% Cr impeller

Table 13- 9 (Contd)

Item Number	Description	Size	Operating		Material and Remarks
			Press. (psig)	Temp (°F)	
16-1503 and -1504	Pyrolysis mid-distillate pump and spare	170-gpm, 15-hp motor	85.3	434	CS
16-1505 and -1506	Reflux pump and spare	160-gpm, 15-hp motor	75.3	120	CS
16-1507 and -1508	Pyrolysis naphtha pump and spare	100-gpm, 10-hp motor	85.3	120	CS
16-1509 and -1510	Water condensate pump and spare	20-gpm, 1-hp motor	15.3	120	CS
<u>Compressors</u>					
16-1801	Acid/gas compressor, 3-stage reciprocating	1st stage: 636 ACFM 2nd stage: 220 ACFM 3rd stage: 74.14 ACFM 1 300-hp, 720-rpm induction motor	46 154.7 471.3	286 287 287	

Table 13-10 - Major Equipment Summary
Unit 17 - Sour Gas Compression

Item Number	Description	Size	Operating		Material and Remarks
			Press. (psig)	Temp (°F)	
<u>Vessels</u>					
17-1201	LP-stage compressor suction scrubber	4'-6" ID x 10'-0" TT	75	650	A-516 Gr 70, 1/4" CA
17-1202	IP-stage compressor suction scrubber	4'-6" ID x 10'-0" TT	190	650	A-516 Gr 70, 1/4" CA
17-1203	HP-stage compressor suction scrubber	4'-6" ID x 10'-0" TT	550	650	A-516 Gr 70, 1/4" CA
17-1204	HP gas scrubber	8'-6" ID x 11'-6" TT	1,205	650	A-516 Gr 70, 1/4" CA
<u>Exchangers</u>					
17-1301	LP cooler	4.58 MM Btu/hr	150	350	316 SS, header: CS 1/4" CA
17-1302	LP-stage compressor discharge cooler	2.47 MM Btu/hr	250	350	316 SS, header: CS 1/4" CA
17-1303	IP-stage compressor discharge cooler	4.70 MM Btu/hr	575	350	316 SS, header: CS 1/4" CA
17-1304	HP-stage compressor discharge cooler	4.65 MM Btu/hr	1,160	350	316 SS, header: CS 1/4" CA

Table 13-10 (Contd)

Item Number	Description	Size	Operating		Material and Remarks
			Press. (psig)	Temp (°F)	
<u>Compressors</u> 17-1801 and -1802	Multicylinder, 3-stage, reciprocating compressor and spare	LP stage: 13.321 MM SCFD, 1 cyl	60	114 In	
			175	193 Out	
			170	113 In	
			504	211 Out	
		IP stage: 23.291 MM SCFD, 2 cyl	499	107 In	
			1,101	195 Out	
		HP stage: 41.432 MM SCFD, 2 cyl			
		1 5,500-hp, 4,000-V, WP II synchronous motor			

Table 13-11 - Major Equipment Summary
Unit 18 - Process Gasification

Item Number	Description	Size	Operating		Material and Remarks
			Press. (psig)	Temp (°F)	
<u>Vessels</u>					
18-1201	1,300-psig steam drum	9'-0" ID x 27'-0" TT	1,300	579	A-204 Gr C
18-1202	800-psig steam drum	12'-0" ID x 36'-0" TT	800	520	A-516-70
18-1203	Slag slurry receiver	13'-6" ID x 39'-0" TT	15.3	250	CS
18-1204	1,300-psig steam drum	8'-0" ID x 24'-0" TT	1,300	579	A-204 GR C
18-1205	Condensate drum	3'-0" ID x 5'-0" TT	872	530	
<u>Exchangers</u>					
18-1301	Syngas, 1,300-psig steam superheater	90.172 MM Btu/hr, 2,570 ft ² 2 shells, 67"-10'	1,300 457	950 1,800	SH A-387 Cr 11 refractory lined T Incoloy 800
18-1302	Oxygen preheat	53.193 MM Btu/hr, 4,060 ft ² 4 shells, 26"-12' BEU	496 1,300	600 950	SH A-387 Cr 11 T 304 SS
18-1303	Syngas/BFW preheat	87.874 MM Btu/hr, 2,880 ft ² 2 shells, 51"-12' BEM	1,350 432	530 900	SH CS 1/16" CA T 321 SS
<u>Pumps</u>					
18-1501 and -1502	Slag section water recycle pump and spare	12,000-gpm, 800-hp motor	496	467	Low-speed, hard-faced CS

Table 13-11 (Contd)

Item Number	Description	Size	Operating		Material and Remarks
			Press. (psig)	Temp (°F)	
18-1503 and -1504	Water circulation pump and spare (for 18-1204)	90-gpm, 40-hp motor	1,300	579	316 SS
18-1505 and -1506	Slag slurry pump and spare, 15-hp motor	510 gpm	35	250	Low-speed hard alloy
18-1507 and -1508	Water circulation pump and spare (for 18-1202)	5,700-gpm, 200-hp motor	840	520	316 SS
18-1509 and -1510	Water circulation pump and spare (for 18-1201)	3,060-gpm 115-ft TDH, 125-hp motor	1,300	579	316 SS
<u>Boilers</u>					
18-1601	1,300-psig steam boiler	76.658 MM Btu/hr, 1,400 ft ² 2 shells, 67"-12' BEM	1,300 442	579 1,520	SH A-387 refractory lined T Incoloy 800
18-1602	800-psig steam boiler	414.543 MM Btu/hr, 5,820 ft ² 2 shells, 81"/54"-30' BKN	800 437	520 1,465	SH A-387 refractory lined T Incoloy 800
<u>Separation Equipment</u>					
18-2201 through -2203	Gasifier offgas 1st-stage cyclones	30.463 MM SCFH 6'-0" ID x 30'-6"	496	1,800	A-387 Gr 21 CL 2

Table 13-11 (Contd)

Item Number	Description	Size	Operating		Material and Remarks
			Press. (psig)	Temp (°F)	
18-2204 through -2206	Gasifier offgas 2nd-stage cyclone	30.463 MM SCFH 4'-0" ID x 18'-8"	479	1,800	A-387 Gr 21 CL 2
18-2207	Syngas ionizer/collector	30.463 MM SCFH, 55 kW 24'-0" W x 30'-0" L x 25'-0" H	427	770	
18-2210	Slag lump remover	1,770 TPD 14" dia 1,200-rpm, 30-hp motor	496	467	316 SS, chrome boride liner
<u>Reactors</u>					
18-2501	Process gasifier	Stage 2: 13'-0" ID x 52'-0" TT Stage 1: 13'-0" ID x 17'-6" TT	496 496	1,800 3,000	A-387 Gr 21 CL 2

Table 13-12 - Major Equipment Summary
Unit 19 - Shift Conversion

Item Number	Description	Size	Operating		Material and Remarks
			Press. (psig)	Temp (°F)	
<u>Vessels</u> 19-1201, -1221 -1241, and -1261	Shift effluent knockout drum	8'-0" ID x 16'-0" TT	355	100	CS, clad 1/8" 204L SS
<u>Exchangers</u> 19-1301, -1321, -1341, and -1361	1st-shift effluent boiler	93.182 MM Btu/hr, 3,830 ft ² 1 shell, 70"/45"-20' BKM	435 405	456 911	SH CS T 321 SS
19-1302, -1322, -1342, and -1362	2nd-shift effluent boiler	23.161 MM Btu/hr, 1,430 ft ² 1 shell, 59"/40"-12' BKM	435 392	456 678	SH CS T 321 SS
19-1303, -1323, -1343, and -1363	3rd-shift effluent boiler	38.025 MM Btu/hr, 5,460 ft ² 1 shell, 70"/47"-26' BKM	435 375	456 615	SH CS T 321 SS
19-1304, -1324, -1344, and -1364	Boiler feedwater heater	37.350 MM Btu/hr, 3,670 ft ² 1 shell, 41"-20' BEM	500 370	406 486	SH CS T 304 SS
19-1305, -1325, -1345, and -1365	Shift effluent air cooler	215.11 MM Btu/hr, 20,435 ft ² 5 bays, 15'-3" x 40'-0", 10 30-hp motors	365	360	T 304 SS HDR 304L SS
19-1306, -1326, -1346, and -1366	Shift effluent water cooler	21.460 MM Btu/hr, 10,460 ft ² 2 shells, 54"-20' AES	85 360	120 150	SH CS 1/4" CA T 316 SS
<u>Reactors</u> 19-2501, -2521, -2541, and -2561	1st-shift reactor	15'-3" ID x 19'-0" TT 2" high alumina castable lining 2,603 ft ³ Co Mo catalyst	420	1,000	CS, 304L SS 1/8" clad

Table 13-12 (Contd)

Item Number	Description	Size	Operating		Material and Remarks
			Press. (psig)	Temp (°F)	
19-2502, -2522, -2542, and -2562	2nd-shift reactor	18'-4" ID x 22'-0" TT 4,805 ft ³ Co Mo catalyst	400	678	CS 304 SS 1/8" clad
19-2503, -2523, -2543, and -2563	3rd-shift reactor	15'-6" ID x 19'-6" TT 2,922 ft ³ Co Mo catalyst	387	615	A-204 Gr C, 1/4" CA

Table 13-13 - Major Equipment Summary
 Unit 20 - Selective Acid Gas Removal

Item Number	Description	Size	Operating		Material and Remarks
			Press. (psig)	Temp (°F)	
20-	Physical Solvent Extraction Plant (proprietary process) for removal of H ₂ S, CO ₂ and organic sulfur from synthesis gas, complete with regeneration facilities	900 MM SCFD, dry basis	370 psig, Manufacturer's design		

Table 13-14 - Major Equipment Summary
Unit 21 - Heavy Liquids Hydrotreating

Item Number	Description	Size	Operating		Material and Remarks
			Press. (psig)	Temp (°F)	
<u>Columns</u>					
21-1101	Fractionator	13'-0" ID x 6'-6" ID x 63'-0" TT	14	626	SA-285-C
21-1102	Stripper	6'-6" ID x 20'-6" TT	14	453	
<u>Vessels</u>					
21-1203	Feed surge drum	14'-0" ID x 25'-0" TT	50	485	SA-515-70
21-1204, -1234, and -1264	High-pressure separator	6'-8" ID x 17'-0" TT	2,655	120	SA-515-70
21-1205, -1235, and -1265	Intermediate-pressure separator	5'-6" ID x 13'-6" TT	570	120	SA-515-70
21-1206, -1236, and -1266	Low-pressure separator	5'-6" ID x 18'-6" TT	70	120	SA-295-C
21-1207, -1237, and -1267	Suction knockout drum	3'-0" ID x 10'-0" TT	1,002	120	SA-515-70
21-1208, -1238, and -1268	Sour water drum	3'-0" ID x 7'-6" TT	2,655	120	SA-515-70
21-1209	Overhead receiver	10'-0" ID x 31'-0" TT	8	120	SA-285-C
21-121C	Compressor knockout drum	5'-0" ID x 10'-0" TT	6	120	CS 1/8" CA

Table 13-14 (Contd)

Item Number	Description	Size	Operating		Material and Remarks
			Press. (psig)	Temp (°F)	
<u>Exchangers</u>					
21-1301, -1331, and -1361	Recycle gas, effluent heat exchanger	189 MM Btu/hr	2,687 2,793	575 473	SH CS 1/4" CA T 1-1/4 Cr, 1/2 Mo
21-1302, -1332, and -1362	Combined charge, effluent heat exchanger	185 MM Btu/hr.	2,788 2,692	700 800	SH 321 SS clad T
21-1303, -1333, and -1363	Effluent air cooler	140 MM Btu/hr	2,676	335	Monel
21-1305	Overhead vapor, fractionator feed exchanger	47 MM Btu/hr	70 12	120 350	CS 1/8" CA
21-1306	Overhead vapor air cooler	47 MM Btu/hr	10	270	CS 1/8" CA
21-1307	Distillate, fractionator feed heat exchanger	23 MM Btu/hr, 4,940 ft ² 1 shell, 47"-20' ABS	60 65	434 315	SH CS T CS
21-1308	Bottoms, fractionator feed heat exchanger	46 MM Btu/hr, 7,000 ft ² 2 shells, 40"-20' ABS	60 60	617 410	CS CS
21-1309	Distillate air cooler	34 MM Btu/hr, 137,000 ft ² 2 bays, 10'-8" x 40'-0", 4 25-hp motors	60	320	CS 1/4" CA

Table 13-14 (Contd)

Item Number	Description	Size	Operating		Material and Remarks
			Press. (psig)	Temp (°F)	
<u>Fired Heaters</u>					
21-1401, -1431, and -1461	Reactor charge heater	42 MM Btu/hr	2,780	750	321 SS
21-1402	Fractionator charge heater	176 MM Btu/hr	55	626	5% Cr, 1/2 Mo, 1/8" CA
<u>Pumps</u>					
21-1501 and -1502, -1531 and -1532, -1561 and -1562	Reactor charge pump and spare	570 gpm	2,788	485	CA-15, 1/8" CA
21-1503/33/63	Wash water pump	69 gpm	2,676	100	CS 1/8" CA
21-1504	Spare wash water pump	69 gpm	2,676	100	CS 1/8" CA
21-1505 and -1506	Bottoms pump and spare	799 gpm	60	617	405 SS, APIS-6
21-1507 and -1508	Distillate pump and spare	937 gpm	100	434	CS, APIS-1
21-1509 and -1510	Reflux pump and spare	621 gpm	15	120	CS, APIS-1
21-1511 and -1512	Naphtha pump and spare	331 gpm	60	120	CS, APIS-1
21-1513 and -1514	Condensed water pump and spare	10 gpm	60	120	CS, APIS-1

Table 13-14 (Contd)

Item Number	Description	Size	Operating		Material and Remarks
			Press. (psig)	Temp (°F)	
21-1515 and -1516	Condensed offgas recycle pump and spare	10 gpm	31	120	CS, APIS-1
<u>Compressors</u>					
21-1801, -1801, and -1861	Recycle compressor	566.5 MM SCFD, 1,500-hp motor	2,800	150	Vertically split centrifugal
21-1802, -1832, and -1862	Makeup compressor	35.1 MM SCFD, 2,500-hp motor	2,800	324	Multistage reciprocating
21-1803 and -1804	Fractionator offgas recycle pump and spare	2.7 MM SCFD, 300-hp motor	90	208	
<u>Reactors</u>					
21-2501, -2531, and -2561	Reactor No. 1	13'-6" ID x 45'-0" TT	2,737	775	SA-387-22, C1 2 321 SS clad
21-2502, -2532, and -2562	Reactor No. 2	13'-6" ID x 45'-0" TT	2,715	800	SA-387-22, C1 2 321 SS clad

Table 13-15 - Major Equipment Summary
Unit 22 - Thermal Cracking

Item Number	Description	Size	Operating		Material and Remarks
			Press. (psig)	Temp (°F)	
<u>Columns</u>					
22-1101	Evaporator	15'-6" ID x 42'-0" TT	100	830	A-387C, 410 SS internals
22-1102	Fractionator	12'-0" ID x 72'-0" TT	95	670	A-516, 410 SS internals
<u>Vessels</u>					
22-1201	Feed surge drum	9'-6" ID x 34'-6" TT	50	355	A-285C
22-1202	Reaction chamber	9'-0" ID x 56'-0" TT	400	950	A-387C, 410 clad
22-1203	Flash drum	12'-0" ID x 30'-0" TT	20	737	A-515, 410 SS clad
22-1204	Flash distillate accumulator	7'-6" ID x 24'-0" TT	5	120	A-285C
22-1205	Fractionator overhead receiver	6'-6" ID x 18'-6" TT	85	120	A-515
<u>Exchangers</u>					
22-1301	Gas/oil quench, feed exchanger	10.089 MM Btu/hr, 9,000 ft ² 3 shells, 35"-20" AES	430	450	SH CS 410 SS clad T 12% Cr
22-1302	Tar/feed exchanger	34.391 MM Btu/hr, 6,810 ft ² 3 shells, 30"-20" AES	85	737	SH CS 410 SS clad
			135	415	T 12% Cr

Table 13-15 (Contd)

Item Number	Description	Size	Operating		Material and Remarks
			Press. (psig)	Temp (°F)	
22-1303	Gas/oil quench air cooler	29,416 MM Btu/hr, 48,078 ft ² 1 bay, 9'-6" x 40'-0", 2 20-hp motors	420	378	
22-1304	Flash drum overhead feed exchanger	20,743 MM Btu/hr, 5,060 ft ² 1 shell, 48"-20' AJS	20	737	SH CS 410 SS clad T 321 SS
22-1305	Flash drum overhead, Gas/oil recycle exchanger	59,391 MM Btu/hr, 15,540 ft ² 2 shells, 53"-20' AES	15	721	SH CS 410 SS clad T 321 SS
22-1306	Steam generator	68,000 MM Btu/hr, 17,340 ft ² 2 shells, 83"/55"-20' AKU	65	225	SH CS 1/16 CA T 12 Cr
22-1307	Flash drum overhead air cooler	42,190 MM Btu/hr, 190,739 ft ² 2 bays, 14'-0" x 40'-0", 4 20-hp motors	10	596	CS
22-1308	Fractionator overhead air condenser	51,809 MM Btu/hr, 162,820 ft ² 3 bays, 10'-9" x 40'-0", 6 20-hp motors	90	375	CS, header: CS 1/4" CA
<u>Furnaces</u>					
22-1401 and -1402	Fuel oil and gas/oil furnaces	312,884 MM Btu/hr (total)	600 In 400 Out	670 In 950 Out	304 SS 0.06" CA
<u>Pumps</u>					
22-1501 and -1502	Feed pump and spare	770-gpm, 290'-0" TDH, 75-hp motor	160	355	CS, API S-1

Table 13-15 (Contd)

Item Number	Description	Size	Operating		Material and Remarks
			Press. (psig)	Temp (°F)	
22-1503 and -1504	Fuel oil recycle pump and spare	2,222-gpm, 1,644 ft-TDH, 1,250-hp motor	650	670	410 SS
22-1505 and -1506	Gas/oil recycle pump and spare	1,218-gpm, 1,415-ft TDH, 600-hp motor	585	450	CS, API S-1
22-1507 and -1508	Gas/oil quench pump and spare	1,222-gpm, 976-ft TDH, 350-hp motor	430	450	CS 1/4" CA 12% Cr impeller
22-1509 and -1510	Flash distillate pump and spare	1,000-gpm, 213-ft TDH, 75-hp motor	95	120	CS, API S-1
22-1511 and -1512	Thermal tar pump and spare	600-gpm, 225-ft TDH, 40-hp motor	90	737	410 SS
22-1513 and -1514	Fractionator reflux pump and spare	400-gpm, 171-ft TDH, 25-hp motor	145	120	CS, API S-1
<u>Compressors</u>					
22-1801	Flash distillate vapor compressor	0.066 MM SCFD, 20-hp motor	5 In 100 Out	120 In	
22-1802	Gas compressor	14.175 MM SCFD, 1,750-hp motor	85 In 485 Out	120 In	

Table 13-16 - Major Equipment Summary
Unit 23 - Coking

Item Number	Description	Size	Operating		Material and Remarks
			Press. (psig)	Temp (°F)	
<u>Package Unit</u>					
23-0801 through -0803	Coke calciner	13'-0" ID x 180'-0"	atm	1,600 to 2,600	CS refractory lined
<u>Columns</u>					
23-1101	Main fractionator	7'-0" ID x 57'-0" TT	55	700	Upper: CS 1/4" CA Lower: A516 Gr 70 410 SS clad, trays 304 SS
23-1102	Evaporator	8'-6" ID x 37'-0" TT	61	800	A-516 Gr 70, 1/8" 410 SS clad
23-1103	Blowdown knockout drum	4'-0" ID x 45'-0" TT	9	790	A-516 Gr 70, 410 SS clad
23-1104	Blowdown quench drum	12'-0" ID x 20'-0" TT	0.5	180	CS 1/8" CA
<u>Vessels</u>					
23-1201 through -1204	Coke drums	21'-0" ID x 94'-0" TT	85.3	970	CS 1/8" 410 SS clad
23-1205	Fractionator overhead receiver	8'-0" ID x 24'-0" TT	45.3	100	CS 1/8" CA
23-1206	Warmup separator	3'-6" ID x 7'-0" TT	600	83	CS 1/8" CA
23-1207	Soaking drum	7'-6" ID x 15'-0" TT	350	970	CS 1/8" 410 SS clad

Table 13-16 (Contd)

Item Number	Description	Size	Operating		Material and Remarks
			Press. (psig)	Temp (°F)	
23-1208	Antifoam drum	3'-6" ID x 14'-0" TT	14.7	60	CS 1/8" CA
23-1209	Blowdown settling drum	14'-0" ID x 42'-0" TT	2.48	220	CS 1/8" CA
23-1210	Oil/water separator	13,600-gal design	10	200	CS 1/8" CA
23-1211	Compressor knockout drum	4'-6" ID x 9'-0" TT	150.3	120	CS 1/8" CA
23-1212	Coker gas knockout drum	5'-0" ID x 10'-0" TT	460	100	CS 1/8" CA
<u>Exchangers</u>					
23-1301	Quench water air cooler	229.269 MM Btu/hr	55	180	CS, header: CS 1/4" CA
23-1302	Blowdown knockout drum vapor air cooler	2.21 MM Btu/hr	7.6	350	CS, header: CS 1/4" CA
23-1303	15-psig steam generator	13.097 MM Btu/hr	250 790	15 20	SH CS 1/8" CA T CS
23-1304	Fractionator overhead vapor air cooler	130.882 MM Btu/hr	360	53.3	CS, header: CS 1/4" CA
23-1305	Fractionator overhead vapor trim cooler	2.575 MM Btu/hr	120	50.3	SH CS 1/4" CA T inhibited admiralty
23-1306	Overhead receiver vapor air cooler	2.091 MM Btu/hr	153.3	247	CS, header: CS 1/4" CA

Table 13-16 (Contd)

Item Number	Description	Size	Operating		Material and Remarks
			Press. (psig)	Temp (°F)	
23-1307	Coker gas air cooler	2.823 MM Btu/hr	464	274	CS, header: CS 1/4" CA
23-1308	Coker gas trim cooler	0.574 MM Btu/hr	462	120	SH CS 1/4" CA T Inhibitive admiralty
<u>Heaters</u>					
23-1401	Coker heater	97.73 MM Btu/hr abs. (design) feed.preheat 18.287 MM Btu/hr abs. (design)	563 165	1,080 645	9 Cr 1 Mo, 1/8" CA Tubes
<u>Pumps</u>					
23-1501 and -1502	Reflux pump and spare	677 gpm	88	100	API S-1
23-1503 and -1504	Naphtha pump and spare	26 gpm	90	100	API S-1
23-1505 and -1506	Fractionator bottoms pump and spare	799 gpm	570	700	API S-6
23-1507 and -1508	Evaporator bottoms pump and spare	203 gpm	360	800	API S-6
23-1509 and -1510	Warmup separator pump and spare	26 gpm	82	600	API S-1
23-1511 and -1512	Antifoam injection pump and spare	2 gpm	90	60	API S-1
23-1513 and -1514	Blowdown knockout drum oil pump and spare	0 to 20 gpm	70	790	API S-6

Table 13-16 (Contd)

Item Number	Description	Size	Operating		Material and Remarks
			Press. (psig)	Temp (°F)	
23-1515 and -1516	Blowdown settling drum oil pump and spare	0 to 10 gpm	25	220	API S-1
23-1517 and -1518	953 gpm	953 gpm	55	220	API S-1
23-1519 and -1520	Blowdown quench drum bottoms pump and spare	9,163 gpm	55	180	API S-1
23-1521 and -1522	Separator clean water pump and spare	1,260 gpm	25	200	API S-1
23-1523 and -1524	Separator oil pump and spare	100 gpm	25	200	API S-1
23-1525 and -1526	Slop tank oil pump and spare	70 gpm	80	200	API S-1
23-1527 and -1528	Coke settling basin clear water pump and spare	1,000 gpm	25	125	API S-1
23-1529 and -1530	Jet pump and spare	820 gpm	2,400	125	410 SS
23-1531 and -1532	Fractionator overhead receiver H ₂ O pump and spare	125 gpm	60	100	API S-1

Table 13-16 (Contd)

Item Number	Description	Size	Operating		Material and Remarks
			Press. (psig)	Temp (°F)	
<u>Compressors</u>					
23-1801	Overhead receiver vapor compressor	1st stage: 2,137 ACFM 2nd stage: 803 ACFM	153.3 452.3	247 271	
<u>Tanks</u>					
23-1901	Stop tank	10,000 bbl	14.7	200	CS
23-1902	Coke storage pit				CS
<u>Separation Equipment</u>					
23-2201 and -2202	Oily water sand filters	1,336-gpm max design	50	200	CS
23-2203	Coke settling basin				CS
23-2204	Thickener				CS

Table 13-17 - Major Equipment Summary
Unit 24 - Naphtha Hydrotreating

Item Number	Description	Size	Operating		Material and Remarks
			Press. (psig)	Temp (°F)	
<u>Columns</u>					
24-1101	Stabilizer	6'-6" ID x 12'-0" ID x 78'-0" TT	192	463	CS 1/4" CA, 304 SS internals
24-1102	Naphtha splitter	5'-6" ID x 10'-0" ID x 66'-6" TT	30	350	A-516 Gr 70, 1/8" CA
<u>Vessels</u>					
24-1201	Feed surge drum	10'-6" ID x 37'-0" TT	50	100	A-285C, CS 1/8" CA
24-1202	Product separator	8'-0" ID x 39'-9" TT	980	130	A-387J, CS 1/4" CA, 304 LSS internals
24-1203	Stabilizer reflux drum	6'-0" ID x 15'-0" TT	180	130	A-515, CS 1/4" CA
24-1204	Splitter reflux drum	4'-6" ID x 13'-0" TT	20	156	CS 1/8" CA
<u>Exchangers</u>					
24-1301	Reactor effluent/feed exchanger	431.425 MM Btu/hr, 34,920 ft ² 12 shells, 50"-10' BEU	1,100	700	SH A 204 Gr B 309 L Weld T 1/8" overlay, 321 SS
24-1302	Reactor effluent air cooler	184.008 MM Btu/hr, 34,960 ft ² 8 bays, 13'-7" x 40'-0", 16 25-hp motors	982	800	Header: CS 1/4" CA

Table 13-17 (Contd)

Item Number	Description	Size	Operating		Material and Remarks
			Press. (psig)	Temp (°F)	
24-1303	Stabilizer feed, bottoms exchanger	74.683 MM Btu/hr, 8,860 ft ² 2 shells, 42"-2' AES	200 190	350 463	SH CS 1/8" CA T 5 Cr 1/2 Mo
24-1304	Stabilizer overhead condenser	9,535 MM Btu/hr, 2,289 ft ² 1 bay, 11'-0" x 40'-0", 2 20-hp motors	184	273	Header: CS 1/4" CA
24-1305	Stabilizer reboiler	34,038 MM Btu/hr, 4,110 ft ² 1 shell, 40"-20' AJS	190	463	SH CS 1/4" CA, T 5 Cr 1/2 Mo
24-1308	Stabilizer bottoms, naphtha feed exchanger	18,455 MM Btu/hr, 5,000 ft ² 2 shells, 31"-20' CEU	1,110 180	200 245	SH CS 1/8" CA T CS
24-1309	Reactor effluent steam generator	77.103 MM Btu/hr, 19,500 ft ² 2 shells, 95"/62"-20' BKU	70 985	225 419	SH CS 1/8" CA T 5 Cr 1/2 Mo
24-1310	Splitter feed, bottoms exchanger	28,450 MM Btu/hr, 8,250 ft ² 3 shells, 33"-20' AES	182 100	293 350	SH CS 1/8" CA T CS
24-1311	Splitter overhead air condenser	21,034 MM Btu/hr, 5,000 ft ² 1 bay, 15'-6" x 40'-0", 2 30-hp motors	25	252	CS, header: CS 1/8" CA
24-1312	Splitter reboiler	29,150 MM Btu/hr, 4,600 ft ² 2 shells, 46"-10' AES	30 80	350 476	SH CS 1/8" CA T CS
24-1313	Light naphtha cooler	1,156 MM Btu/hr, 640 ft ² 2 shells, 13"-20" AES	75 50	156 120	SH CS 1/8" CA T inhibited admiralty

Table 3-17 (Contd)

Item Number	Description	Size	Operating		Material and Remarks
			Press. (psig)	Temp (°F)	
24-1314	Heavy naphtha cooler	17.260 MM Btu/hr, 5,540 ft ² 2 shells, 33"-20' AES	105 50	205 120	SH CS 1/8" CA T inhibited admiralty
<u>Heaters</u>					
24-1401	Naphtha hydrotreater heater	27.116 MM Btu/hr	1,065 1,025	700 In 750 Out	321 SS 0.06" CA
<u>Pumps</u>					
24-1501 and -1502	Feed pump and spare	1,020-gpm, 800-hp motor	1,107	100	CS; API S-1
24-1503 and -1504	Wash water pump and spare	60-gpm, 50-hp motor	1,000	120	CS reciprocating
24-1505 and -1506	Stabilizer reflux pump and spare	175-gpm, 10-hp motor	230	130	304 SS, API S-6
24-1507 and -1508	Splitter bottoms pump and spare	1,080 gpm	60	350	CS, API S-1
24-1509 and -1510	Splitter reflux pump and spare	235 gpm	35	156	CS, API S-1
24-1511 and -1512	Splitter overhead pump and spare	160 gpm	35	156	CS, API S-1

Table 13-17 (Contd)

Item Number	Description	Size	Operating		Material and Remarks
			Press. (psig)	Temp (°F)	
<u>Compressors</u>					
24-1801	Recycle gas multi-stage centrifugal, barrel-type compressor	476.011 MM SCFD 6,000-hp, 4,000-V, WP II motor	980 1,100	130 Inlet 144 Outlet	CS
24-1803 and -1804	HP acid gas single-cylinder reciprocating compressor and spare	3.632 MM SCFD, 40-hp motor	980 1,100	130 Inlet 144 Outlet	CS
24-1805 and -1806	LP acid gas 2-stage horizontal opposed compressor and spare	3.674 MM SCFD, 600-hp motor	180 1,100	130 Inlet 150 Outlet	CS
<u>Reactors</u>					
24-2501	Reactor	12'-0" ID x 55'-0" TT	1,010	800	SA 387, GR11 CL 2 308L overlay, 321 SS internals

Table 13-18 - Major Equipment Summary
Unit 25 - Naphtha Reforming

Item Number	Description	Size	Operating		Material and Remarks
			Press. (psig)	Temp (°F)	
<u>Columns</u>					
25-1101	Stabilizer	10'-9" ID x 6'-6" ID x 82'-6" TT	154	416	CS 1/8" CA
<u>Vessels</u>					
25-1201	Flash separator	11'-0" ID x 27'-6" TT	125	120	CS 1/8" CA
25-1202	Stabilizer reflux drum	6'-6" ID x 18'-0" TT	145	120	CS 1/8" CA
<u>Exchangers</u>					
25-1301	Reactor effluent, feed exchanger	284.029 MM Btu/hr	285 138	806 138	SH CS 1/8" CA T 1-1/4 Cr, 1/2 Mo
25-1302	Reactor effluent air cooler	96.000 MM Btu/hr	128	250	T CS, header: CS 1/8" CA
25-1303	Stabilizer feed, bottoms exchanger	42.603 MM Btu/hr	170	350 416	SH CS 1/8" CA T CS
25-1304	Stabilizer bottoms air cooler	5.686 MM Btu/hr	144	160	T CS, header: CS 1/8" CA
25-1305	Stabilizer bottoms water cooler	2.806 MM Btu/hr	50	120	SH CS 1/8" CA T Inhibited admiraalty

Table 13-18 (Contd)

Item Number	Description	Size	Operating		Material and Remarks
			Press. (psig)	Temp (°F)	
25-1306	Stabilizer overhead condenser	6.566 MM Btu/hr	147	158	T CS, header: CS 1/8" CA
25-1307	Stabilizer reboiler	11.200 MM Btu/hr	154 25	416 507	SH CS 1/8" CA T CS
<u>Heaters</u>					
25-1401	Reformer heater No. 1	62.000 MM Btu/hr	234 219	806 In 960 Out	CS 1/8" CA
25-1402	Reformer heater No. 2	63.000 MM Btu/hr	210 195	820 In 960 Out	1-1/4 Cr, 1/2 Mo 1/8" CA
25-1403	Reformer heater No. 3	29.000 MM Btu/hr	188 173	890 In 960 Out	1-1/4 Cr, 1/2 Mo 1/8" CA
25-1404	Reformer heater No. 4	12.000 MM Btu/hr	166 151	930 In 960 Out	1-1/4 Cr, 1/2 Mo 1/8" CA
<u>Pumps</u>					
25-1501 and -1502	Naphtha feed pump and spare	900-gpm design	285	100	API S-1
25-1503 and -1504	Stabilizer feed pump and spare	900-gpm design	185	120	API S-1
25-1505 and -1506	Stabilizer reflux pump and spare	330-gpm design	195	120	API S-1

Table 13-18 (Contd)

Item Number	Description	Size	Operating		Material and Remarks
			Press. (psig)	Temp (°F)	
<u>Compressors</u>					
25-1801 and -1802	Recycle gas compressor and spare	173.706 MM SCFD	125 285	120 In 257 Out	Low Alloy 4340
25-1803 and -1804	Make gas compressors Stage 1 Stage 2	47.902 MM SCFD 108.183 MM SCFD	125 405 392 1,100	120 In Out 100 In Out	CS 1/8" CA
<u>Reactors</u>					
25-2501	Reformer reactor No. 1	7,600-lb catalyst	218	960	A-204-GRC-1/8" CA
25-2502	Reformer reactor No. 2	10,120-lb catalyst	194	960	A-387-GR11-CL2-1/8" CA
25-2503	Reformer reactor No. 3	20,175-lb catalyst	172	960	A-387-GR11-CL2-1/8" CA
25-2504	Reformer reactor No. 4	53,450-lb catalyst	150	960	A-387-GR11-CL2-1/8" EA

Table 13-19 - Major Equipment Summary
Unit 26 - Olefinic Gas/Acid Gas Removal

Item Number	Description	Size	Operating		Material and Remarks
			Press. (psig)	Temp (°F)	
<u>Columns</u>					
26-1101	Amine contactor	7'-0" ID x 96'-6" TT 35 trays	455	155	A-516 S 1/4" CA SS304 trays
26-1102	Amine regenerator	13'-6" ID x 70'-0" TT 21 trays	19	260	A-516 S 1/4" CA SS304 trays
26-1103	Caustic precontactor	2'-6" ID x 41'-0" TT	449	120	A-516 1/8" CA
26-1104	Caustic contactor	4'-6" ID x 63'-6" TT	446	120	A-516 1/8" CA
26-1105	Water wash column	4'-6" ID x 27'-0" TT	442	100	A-516 1/8" CA
<u>Vessels</u>					
26-1201	Rich amine surge drum	9'-0" ID x 45'-0" TT	75	155	A-516 1/8" CA
26-1202	Amine oil separator	2'-6" ID x 6'-6" TT	75	155	A-516 1/8" CA
26-1203	Amine sump	5'-6" ID x 6'-0" high	atm	60/180	CS
26-1204	Amine reflux drum	4'-6" ID x 12'-0" TT	11	120	A-516 1/4" CA
<u>Exchangers</u>					
26-1301	Sweet gas	1.3 MM Btu/hr, 1,200 ft ² 1: shell, 24"-16'	444 60	120 100	SH CS 1/8" CA T CS
26-1302	Amine air cooler	34.5 MM Btu/hr, 187,200 ft ² 2 bays, 17'-0" x 40'-0", 4 fans @ 30 hp	60	187	CS

Table 13-19 (Contd)

Item Number	Description	Size	Operating		Material and Remarks
			Press. (psig)	Temp (°F)	
26-1303	Amine exchanger	38.5 MM Btu/hr, 10,700 ft ² 3 shells, 37"-20' (series)	19	260	SH A-285C 1/4" CA T CS
26-1304	Amine condenser	34.7 MM Btu/hr, 152,000 ft ² 2 bays, 17.8'-0" x 30'-0", 4 fans @ 30 hp	14	233	T CS
26-1305	Amine reboiler	71.1 x MM Btu/hr, 10,000 ft ² 2 shells, 78"-20'	19	260	SH A-285C 1/4" CA T Titanium
26-1306	Amine reclaimr	3.04 x MM Btu/hr, 720 ft ² 1 shell, 51"-20'	47.5	295	SH A-285C 1/8" CA T Titanium
<u>Pumps</u>					
26-1501 and -1502	HP amine pump and spare	1,190 gpm, 500 hp, 3,600 rpm	530	120	API 3-1
26-1503 and -1504	Amine booster pump and spare	1,225 gpm, 60 hp, 3,600 rpm	60	187	API S-1
26-1505 and -1506	Amine reflux pump and spare	25 gpm, 1.5 hp, 3,500 rpm	76	120	API S-6
26-1507 and -1508	Weak caustic pump and spare	30 gpm, 1.5 hp	504	120	CS reciprocating
26-1509 and -1510	Strong caustic pump and spare	100 gpm, 5 hp	500	120	CS triplex reciprocating

Table 13-19 (Contd)

Item Number	Description	Size	Operating		Material and Remarks
			Press. (psig)	Temp (°F)	
26-1511 and -1512	Caustic makeup pump and spare	2 gpm, 1 hp, 1,800 rpm	500	60	API S-1
26-1513 and -1514	Water circulating pump and spare	80 gpm, 5 hp, 1,750 rpm	495	100	API-S-1
26-1515 and -1516	Amine sump pump and spare	25 gpm, 1.5 hp, 1,750 rpm	30	60/180	API S-1
26-1517	Amine transfer pump	50 gpm, 1.5 hp, 1,750 rpm	30	80	API S-1
<u>Tanks</u>					
26-1901	Amine surge tank	23'-0" D x 22'-0" high	atm	187	CS, cone roof, 1/8" CA
26-1902	Amine storage tank	12'-0" D x 12'-0" high	atm	80	CS, cone roof
26-1903	Caustic storage tank	10'-6" D x 20'-0" high	atm	60	CS, cone roof
<u>Separation Equipment</u>					
26-2201	Gas filter/separator	57.1 MM SCFD	460	100	A-285C CA 1/8" CA
26-2202	Amine filler	110 gpm	50	187	
<u>Other Major Equipment</u>					
26-2801 and -2802	Inhibitor antifoam injectors	0.05 gpm, 1/4 hp	200	60	SS 316-package w/diaphragm pump

Table 13-20 - Major Equipment Summary
Unit 27 - Saturate Gas/Acid Gas Removal

Item Number	Description	Size	Operating		Material and Remarks
			Press. (psig)	Temp (°F)	
<u>Columns</u>					
27-1101 and -1102	Amine contactor	9'-6" ID x 75'-0" TT 25 trays	1,075	150	A-516 S 1/4" CA SS304 trays
27-1103	Amine regenerator	14'-0" ID x 70'-0" TT 21 trays	19	260	A-516 S 1/4" CA SS304 trays
27-1104	Caustic precontactor	5'-6" ID x 36'-0" TT	1,070	120	A-516 1/8" CA
27-1105	Caustic contactor	9'-6" ID x 45'-0" TT	1,067	120	A-516 1/8" CA
27-1106	Water wash column	9'-6" ID x 22'-0" TT	1,057	100	A-516 1/8" CA
<u>Vessels</u>					
27-1201	Rich amine surge drum	12'-0" ID x 64'-0" TT	75	150	A-516 1/8" CA
27-1202	Amine oil separator	3'-6" ID x 8'-0" TT	75	150	A-516 1/8" CA
27-1203	Amine sump	8'-0" ID x 6'-0" high	atm	60/180	CS
27-1204	Amine reflux drum	7'-6" ID x 12'-0" TT	11	120	A-516 1/4" CA
<u>Exchangers</u>					
27-1301	Gas/gas exchanger	10.5 MM Btu/hr, 9,400 ft ² 1 shell, 44"-40"	1,063 1,082	100 105	SH CS 1/8" CA T CS
27-1302	Amine air cooler	80.9 MM Btu/hr, 466,409 ft ² 4 bays, 20.3'-0" x 40'-0", 2 fans @ 40 hp	60	182	CS

Table 13-20 (Contd)

Item Number	Description	Size	Operating		Material and Remarks
			Press. (psig)	Temp (°F)	
27-1303	Amine exchanger	105.2 MM Btu/hr, 29,660 ft ² 3 shells, 61"-20'	19 75	260 226	SH A-285C CA 1/4 T CS
27-1304	Amine condenser	83.3 MM Btu/hr, 373,032 ft ² 3 bays, 21.8'-0" x 40'-0", 2 fans @ 30 hp	14	230	T CS
27-1305	Amine reboiler	178.2 MM Btu/hr, 24,952 ft ² 4 shells, 87"-20'	19 47.5	260 292	SH A-285C CA 1/4 T Titanium
27-1306	Amine reclaimer	7.64 MM Btu/hr, 1,700 ft ² 1 shell, 81"-20'	20 100	303 338	SH A-285C CA 1/8 T Titanium
<u>Pumps</u>					
27-1501 through -1503	Amine pump and spare	1,510 gpm, 1,230 hp, 3,600 rpm	1,150	120	API S-1
27-1504 through -1506	Amine booster pump and spare	1,535 gpm, 75 hp, 3,600 rpm	60	182	API S-1
27-1507 and -1508	Amine reflux pump and spare	215 gpm, 15 hp, 3,500 rpm	76	120	API S-6
27-1509 and -1510	Weak caustic pump and spare	80 gpm, 5 hp	1,125	120	CS reciprocating
27-1511 and -1512	Strong caustic pump and spare	250 gpm, 15 hp	1,120	120	CS triplex reciprocating
27-1513 and -1514	Caustic makeup pump and spare	7 gpm, 7.5 hp, 1,800 rpm	1,120	60	API S-1

Table 13-20 (Contd)

Item Number	Description	Size	Operating		Material and Remarks
			Press. (psig)	Temp (°F)	
27-1515 and -1516	Water circulating pump and spare	250 gpm, 15 hp, 1,750 rpm	1,110	100	API S-1
27-1517 and -1518	Amine sump pump and spare	50 gpm, 5 hp, 1,750 rpm	60	60/180	API S-1
27-1519	Amine transfer pump	50 gpm, 3 hp, 1,750 rpm	30	80	API S-1
<u>Tanks</u>					
27-1901	Amine surge tank	35'-0" D x 24'-0" high	atm	182	CS, cone roof, 1/8" CA
27-1902	Amine storage tank	12'-0" D x 12'-0" high	atm	80	CS, cone roof
27-1903	Caustic storage tank	20'-0" D x 20'-0" high	atm	60	CS, cone roof
<u>Separation Equipment</u>					
27-2201	Gas filter/separator	540 MM SCFD	1,085	86	
27-2202	Amine filter	270 gpm	50	160	A-285C CA 1/8" CA
<u>Other Major Equipment</u>					
27-2801 and -2802	Inhibitor anti-foam injectors	0.1 gpm, 1/4 hp	750	100	SS 316, package w/diaphragm pump

Table 13-21 - Major Equipment Summary
 Unit 28 - Olefin Recovery and Polymerization

Item Number	Description	Size	Operating		Material and Remarks
			Press. (psig)	Temp (°F)	
<u>Columns</u>					
28-1101	Absorber	3'-6" ID x 50'-0" TT	409	0	A-516 70, 1/8" CA
28-1102	Rich oil deethanizer	3'-6" ID x 27'-0", 15 trays 5'-6" ID x 45'-0", 19 trays Overall 78' TT	395	301	A-516 70
28-1103	Rich oil still	5'-6" ID x 80'-0" TT	164	500	A-515 70, 1/8" CA
<u>Vessels</u>					
28-1201 through -1203	Molecular sieve driers	7'-6" ID x 23'-0" TT	443	440	A-515 70, 1/8" CA
28-1204	Regeneration separator	2'-6" ID x 5'-0" TT	440	100	A-516 70, 1/8" CA
28-1205	Feed gas rich oil separator	5'-0" ID x 21'-8" TT	420	-20	A-516 70, 1/8" CA
28-1206	Absorber presaturator	5'-0" ID x 15'-9" TT	400	-20	A-516 70, 1/8" CA
28-1207	Deethanizer lean oil presaturator	5'-0" ID x 15'-10" TT	370	10	A-516 70, 1/8" CA impact test/ SA-20 @ -20°F
28-1208	Rich oil still drum	5'-0" ID x 17'-0" TT	151	98	A-515 70, 1/8" CA

Table 13-21 (Contd)

Item Number	Description	Size	Operating		Material and Remarks
			Press. (psig)	Temp (°F)	
<u>Exchangers</u>					
28-1301	Regeneration heater	2.52 MM Btu/hr, 130 ft ² 1 shell, 10"-14' BEU	450	440	SH A-285C, 1/8" CA T A-179
28-1302	Regeneration cooler	2.83 MM Btu/hr, 310 ft ² 2 shells, 12"-10' BEU	50 445	115 440	SH A-285C, 1/8" CA T inhibited admiralty
28-1303	Gas/gas exchanger	5.39 MM Btu/hr, 4,290 ft ² 2 shells, 25"-20' BEM	400 434	85 100	SH A-516 70, impact tested T CS, killed
28-1304	Gas, deethanizer residue exchanger	0.48 MM Btu/hr, 1,740 ft ² 4 shells, 12"-20' BEM	374 427	90 100	SH A-516 70, impact tested T CS, killed
28-1305	Feed chiller	7.56 MM Btu/hr, 2,530 ft ² 1 shell, 52"/35"-20' BKU	2 427	-40 -20	SH A-516 70, 1/8" CA impact tested T CS, killed
28-1306	Prosaturation chiller	2.41 MM Btu/hr, 1,160 ft ² 1 shell, 41"/27"-14' BKU	2 406	-40 -20	SH A-516 70, 1/8" CA impact tested T CS, killed

Table 13-21 (Contd)

Item Number	Description	Size	Operating		Material and Remarks
			Press. (psig)	Temp (°F)	
28-1307	Deethanizer lean oil chiller	5.53 MM Btu/hr, 560 ft ²	2	-40	SH A-516 70, 1/8" CA impact tested T CS, killed
28-1308	Lean oil presaturator, deethanizer feed exchanger	1 shell, 30"/19"-16' BKU	379	56	SH A-516 70, 1/8" CA impact tested T CS, killed
		0.54 MM Btu/hr, 85 ft ²	384	66	
28-1309	Deethanizer reboiler	1 shell, 13"-8' AES	420	-20	SH A-516 70, 1/8" CA impact tested T CS, killed
		7.72 MM Btu/hr, 910 ft ²	396	297	
28-1310	Deethanizer side reboiler	1 shell, 29"/19"-20' BKU	165	357	SH A-285 C, 1/8" CA T A-179
		14.70 MM Btu/hr, 1,050 ft ²	394	216	
28-1311	Lean oil cooler	1 shell, 23"-20' AJS	164	500	SH A-285C, 1/8" CA T A-179
		7.69 MM Btu/hr, 1,700 ft ²	150	260	
28-1312	Lean oil, deethanizer feed exchanger	2 shells, 21"-16' AES	50	115	SH A-285C, 1/8" CA T A-179
		5.14 MM Btu/hr, 600 ft ²	150	100	
28-1313	Rich oil still reboiler	2 shells, 15"-12' AES	406	-8	SH A-516 70, impact tested T CS, killed
		23.33 MM Btu/hr, 2,250 ft ²	164	500	
		1 shell, 47"/31"-20' BKU	1,250	574	SH A-285C, 1/8" CA T A-179

Table 13-21 (Contd)

Item Number	Description	Size	Operating		Material and Remarks
			Press. (psig)	Temp (°F)	
28-1314	Rich oil still condenser	18.14 MM Btu/hr, 16,290 ft ² 3 shells, 50"-20' AES	158	117	SH A-285C, 1/8" CA T inhibited admiralty
<u>Pumps</u>					
28-1501 and -1502	Rich oil pump and spare	216-gpm, 55-ft TDH, 5-hp motor	444	0	316 SS, heavy duty API S-1
28-1503 and -1504	Presaturated lean oil pump and spare	200-gpm, 95-ft TDH, 7.5-hp motor	446	-20	316 SS, heavy duty API S-1
28-1505 and -1506	Presaturated lean oil pump and spare	258-gpm, 203-ft TDH, 15-hp motor	432	10	316 SS, API S-1
28-1507 and -1508	Cold lean oil pump and spare	253-gpm, 75-hp motor	425	25	316 SS, API S-1
28-1509 and -1510	Rich oil still reflux pump and spare	440-gpm, 204-ft TDH, 20-hp motor	209	98	CS, API S-1
28-1511 and -1512	Rich oil still product pump and spare	150-gpm, 75-hp motor	500	98	CS, API S-1

Table 13-22 - Major Equipment Summary
 Unit 29 - Hydrogen Recovery and Purification

Item Number	Description	Size	Operating		Material and Remarks
			Press. (psig)	Temp (°F)	
<u>Packaged Plants</u>					
29-081	Cryogenic hydrogen upgrading package	27,000 MM SCFH	1,055	-40	
<u>Vessels</u>					
29-1201, -1202, -1203, and -1251, -1252, -1253	Molecular sieve driers	11'-0" ID x 21'-0" TT	1,067	440	SA-516 70
29-1204, and -1254	Regeneration separator	2'-0" ID x 7'-0" TT	1,062	100	SA-516 70
29-1205	Hydrogen knockout drum	8'-0" ID x 32'-0" TT	1,000	120	SA-516 70
<u>Exchangers</u>					
29-1301 and -1351	Regeneration heater	5.41 MM Btu/hr, 225 ft ²	1,072	440	SH CS 1/8" CA
29-1302 and -1352	Regeneration cooler	1 shell, 13"-14' BEU	625	493	T CS
		6.02 MM Btu/hr, 600 ft ² 2 shells, 15"-14' BEU	50 1,063	115 440	SH CS 1/8" CA T inhibited admiralty
29-1303	Feed/effluent exchanger	43.35 MM Btu/hr, 1,250 ft ² 2 shells, 28"-10' BEU	1,036 1,013	450 788	SH CS 1/8" CA T CS
29-1304	Effluent cooler	36.21 MM Btu/hr, 89,328 ft ² 1 bay, 14'-6" x 40'-0", 2 25-hp motors	1,007	427	Killed CS, header: CS 1/8" CA

Table 13-22 (Contd)

Item Number	Description	Size	Operating		Material and Remarks
			Press. (psig)	Temp (°F)	
<u>Pumps</u> 29-1501 and -1502	Deethanizer liquid feed pump and spare	500-gpm, 455-ft TDH, 75-hp motor	225	-37	A-352 LCB, API S-1
<u>Reactors</u> 29-2501	Trace methanator	8'-0" ID x 34'-3" TT			A-387 Gr 11 CI 2-1/8" CA

Table 13-23 - Major Equipment Summary
Unit 30 - SNG Purification

Item Number	Description	Size	Operating		Material and Remarks
			Press. (psig)	Temp (°F)	
<u>Packaged Equipment</u>					
30-0801	Methanation circulating oil cleanup package	32 gpm C ₂₀ H ₄₂	486	690	
30-0802	CO ₂ removal package	543 MM SCFD of 63.5 V% H ₂	1,055	-250	
30-0803	SNG glycol drying package	156.8 MM SCFD	1,002	100	
<u>Vessels</u>					
30-1201	Methanation compressor suction separator	18'-0" ID x 48'-0" TT	6	95	Split flow vapor outlet, A-516 CS 1/8" CA
30-1202	Methanation compressor 2nd-stage suction separator	14'-0" ID x 39'-0" TT	37	105	Split flow vapor outlet, A-516
30-1203	Methanation compressor 3rd-stage suction separator	11'-0" ID x 30'-6" TT	126	105	Split flow vapor outlet, CS 1/8" CA
30-1204	Methanation high-pressure steam drum	4'-0" ID x 10'-6" TT			
30-1205	Methanation effluent condensate separator	6'-6" ID x 19'-6" TT	313	132	Split flow vapor outlet, CS 1/8" CA

Table 13-23 (Contd)

Item Number	Description	Size	Operating		Material and Remarks
			Press. (psig)	Temp (°F)	
30-1206	SNG compressor suction separator	6'-6" ID x 19'-6" TT	285	103	Split flow vapor outlet, CS 1/8" CA
30-1207	SNG compressor 2nd-stage suction separator	5'-6" ID x 15'-0" TT	536	105	Split flow vapor outlet, CS 1/8" CA
30-1208	SNG compressor 2nd-stage discharge separator	5'-0" ID x 13'-6" TT	1,002	100	Split flow vapor outlet, CS 1/8" CA
<u>Exchangers</u>					
30-1303	Methanation compressor 1st stage discharge intercooler	27.45 MM Btu/hr, 9,295 ft ² 2 shells, 40"-20'	42 50	295 115	SH CS T B-111 443
30-1302	Methanation compressor 2nd stage discharge intercooler	30.67 MM Btu/hr, 11,150 ft ² 2 shells, 44"-20'	131 50	314 115	SH CS T B-111 4433
30-1303	Methanation feed/effluent exchanger.	48.11 MM Btu/hr, 8,850 ft ² 1 shell, 37"-40'	382 328	600 690	SH A-285C T A-285C
30-1304	Methanation circulating oil boiler	123.10 MM Btu/hr, 10,035 ft ² 2 shells, 43"-20'	481 1,250	690 574	SH A-285C T CS tubes
30-1305	Methanation effluent steam generator	17.95 MM Btu/hr, 1,700 ft ² 1 shell, 46"-20'	75 350	350 500	SH A-285C T A-209
30-1306	Methanation effluent air cooler	106.82 MM Btu/hr, 49,290 ft ² 4 bays, 21'-6" x 40'-0", 4 fans @ 40 hp	323	305	T CS

Table 13-23 (Cont'd.)

Item Number	Description	Size	Operating		Material and Remarks
			Press. (psig)	Temp (°F)	
30-1307	Polish methanation feed/effluent exchanger	109.89 MM Btu/hr, 75,070 ft ² 4 shells, 50"-60"	308 295	804 556	SH CS 1/8" CA T CS tubes
30-1308	Polish methanation air cooler	10.59 MM Btu/hr, 117,100 ft ² 1 bay, 20'-6" x 40'-0", 2 fans @ 40 hp	290	200	T CS
30-1309	SNG compressor 1st-stage discharge intercooler	17.99 MM Btu/hr, 5,115 ft ² 2 shells, 48"-16'	50 541	115 206	SH CS 1/4" CA T B-111 443
30-1310	SNG compressor 2nd-stage discharge intercooler	18.85 MM Btu/hr, 5,755 ft ² 2 shells, 51"-16'	50 1,010	115 209	SH CS 1/4" CA T B-111 443
<u>Furnaces</u>					
30-1401	Methanator startup heater	16.05 MM Btu/hr	377	600	CS 1/8" CA
30-1402	Polish methanation startup heater	36.63 MM Btu/hr	308	804	CS 1/8" CA
<u>Pumps</u>					
30-1501	Methanation compressor condensate pump	15 gpm, 0.75 hp, 1,150 rpm	6	95	API S-1
30-1502 and -1503	Methanation circulating oil pump and spare	6,133 gpm, 600 hp, 1,750 rpm	480	690	API S-4

Table 13-23 (Contd)

Item Number	Description	Size	Operating		Material and Remarks
			Press. (psig)	Temp (°F)	
<u>Compressors</u>					
30-1801	Methanation compressor	156.80 MM SCFD, 8,700-rpm, 34,000 hp turbine	382	315	CS
30-1802	DEC ₂ overhead compressor	21.35 MM SCFD 500-hp motor	285	103	CS reciprocating
30-1803	SNG compressor	152.35 MM SCFD, 22,500-rpm, 12,600-hp turbine	541	206	4140
<u>Reactors</u>					
30-2501	Zinc oxide guard	5'-6" ID x 12'-6" TT	377	600	CS 1/8" CA
30-2502	Liquid phase methanator	11'-0" ID x 92'-6" TT	369	600	CS 1/8" CA
30-2503	Polish methanator	6'-4" ID x 31'-0" TT	308	856	A-515 1/8" CA refractory lined

Table 13-24 - Major Equipment Summary
Unit 31 - LPG Fractionation

Item Number	Description	Size	Operating		Material and Remarks
			Press. (psig)	Temp (°F)	
<u>Packaged Equipment</u>					
31-0801	Propane LPG sweetening package	322 gpm LPG	232	100	
31-0802	Butane LPG sweetening package	189 gpm LPG	96	105	
31-0803	Refrigeration package	11,000 ton @ -40°F			
<u>Columns</u>					
31-1101	Deethanizer	7'-0" ID x 17'-0" 7 trays 8'-0" ID x 34'-6" 10 trays Overall 55'-6" TT	215	22 min. 140 max.	A-516
31-1102	Depropanizer	6'-0" ID x 17'-0" 8 trays 7'-0" ID x 34'-0" 12 trays Overall 57'-0" TT	195	205	A-515
31-1103	Debutanizer	4'-0" ID x 51'-6" TT 15 trays	60	259	A-285C
<u>Vessels</u>					
31-1201	Deethanizer compressor 1st-stage suction drum	5'-6" ID x 15'-0" TT	5	95	A-285C

Table 13-24 (Contd)

Item Number	Description	Size	Operating		Material and Remarks
			Press. (psig)	Temp (°F)	
31-1202	Deethanizer compressor 2nd stage suction drum	4'-0" ID x 12'-0" TT	51	100	A-285C
31-1203	Deethanizer accumulator	7'-0" ID x 22'-0" TT	205	5	A-516
31-1204	Depropanizer accumulator	7'-6" ID x 21'-0" TT	185	100	A-515
31-1205	Debutanizer accumulator	5'-0" ID x 15'-0" TT	50	100	A-285C
<u>Exchangers</u>					
31-1301	Deethanizer compressor 1st-stage discharge intercooler	4.873 MM Btu/hr, 2,408 ft ² 1 shell, 30"-20' BEM	56 50	237 115	SH A-285C T inhibited admiralty
31-1302	Deethanizer condenser	25.617 MM Btu/hr, 7,090 ft ² 1 shell, 48"/72"-20' BKU	210 1.3	22 -40	SH A-516 T A-179
31-1303	Deethanizer reboiler	30.538 MM Btu/hr, 4,960 ft ² 1 shell, 45"/66"-24' AKT	215 30	140 302	SH A-285C T A-179
31-1304	Depropanizer condenser	24.453 MM Btu/hr, 18,540 ft ² 2 shells, 50"-24' AEL	190 50	110 115	SH A-285C T inhibited admiralty
31-1305	Depropanizer reboiler	25.071 MM Btu/hr, 4,481 ft ² 1 shell, 43"/60"-24' AKT	195 35	205 347	SH A-285C T A-179

Table 13-24 (Contd)

Item Number	Description	Size	Operating		Material and Remarks
			Press. (psig)	Temp (°F)	
31-1306	Debutanizer condenser	9.929 MM Btu/hr, 6,923 ft ² 1 shell, 44"-24' AEL	55 50	125 115	SH A-285C T inhibited Admiralty
31-1307	Debutanizer condenser	7.044 MM Btu/hr, 967 ft ² 1 shell, 34"/48"-14' AKT	60 40	259 360	SH A-285C T A-179
<u>Pumps</u>					
31-1501	Deethanizer compressor No. 1 condensate pump	10-gpm, 3-hp motor	265	95	CS, API S-1
31-1502	Deethanizer compressor No. 2 condensate pump	10-gpm, 3-hp motor	265	100	CS, API S-1
31-1503 and -1504	Deethanizer reflux pump and spare	800-gpm, 30-hp motor	247	5	Cast steel, impact tested, A-350 @ -58E
31-1505 and -1506	Depropanizer overhead pump and spare	800-gpm, 40-hp motor	230	100	CS, API S-1
31-1507 and -1508	Debutanizer overhead pump and spare	250-gpm, 10-hp motor	91	100	CS, API S-1
31-1801	Deethanizer feed compressor	20.772 MM SCFD, 4,000-hp motor	213	239	

Table 13-25 - Major Equipment Summary
Unit 32 - Sulfur Plant

Item Number	Description	Size	Operating		Material and Remarks
			Press. (psig)	Temp (°F)	
32-	2 identical, parallel, three-stage Claus Sulfur plants	770 LTPD sulfur in gas to each Claus plant	Manufacturer's design		
32-	1 Tailgas Beavon sulfur removal plant	80 LTPD	Manufacturer's design		
32-19-	Sulfur product storage tank with pump and bulk spray unit	2,300,000 gal 100'-0" ID x 4'-0" high	atm	280	CS, foam glass insulated with steam heating coils

Table 13-26 - Major Equipment Summary
Unit 33 - Fuel Gas Generation

Item Number	Description	Size	Operating		Material and Remarks
			Press. (psig)	Temp (°F)	
<u>Vessels</u>					
33-1201	1,300-psig steam drum	8'-6" ID x 42'-6" TT	1,300	579	A-204 Gr C, 1/8" Weld overlay with 308L
33-1202	1,300-psig steam drum	9'-0" ID x 50'-0" TT	1,300	579	A-204 Gr C, 1/8" Weld overlay with 308L
33-1203	650-psig steam drum	12'-0" ID x 60'-0" TT	650	497	CS 1/4" CA, SA-516 70
33-1204	Slag slurry receiver	8'-0" ID x 10'-0" TT	15	250	CS 1/4" CA
33-1205	Sour water knockout drum	16'-0" ID x 40'-0" TT	310	120	CS 1/4" CA
<u>Exchangers</u>					
33-1301	Raw fuel gas, steam superheater	274.8 MM Btu/hr, 7,920 ft ² 2 shells, 70"-16' BEM	650	1,000	SH A-387 Gr 11 Cl 2, 1/8" CA T Incoloy 800
33-1302	Raw fuel gas, steam superheater	90.6 MM Btu/hr, 3,400 ft ² 2 shells, 67"-8' BEM	400	1,800	SH A-387 Gr 11 Cl 2, 1/8" CA T
33-1305	Superheated steam, oxygen preheater	90.6 MM Btu/jr, 4,500 ft ² 1 shell, 53"-16' BEU	1,284	900	SH A-387 Gr 11 Cl 2, 1/8" CA
			392	1,615	T Weld overlay, 321 SS
			1,292	900	
			480	600	

Table 13-26 (Contd)

Item Number	Description	Size	Operating		Material and Remarks
			Press. (psig)	Temp (°F)	
33-1304	Raw fuel gas, steam generator	208.9 MM Btu/hr, 7,200 ft ² 2 shells, 67"-16' BEM	1,300 384	900 1,550	SH A-387 Gr 11 Cl 2, 1/8" CA T Incoloy 800
33-1305	Raw fuel gas, 1,300-psig steam generator	295.9 MM Btu/hr, 8,400 ft ² 2 shells, 63"-20' BEM	1,320 376	579 1,403	SH A-387 Gr 11 Cl 2, 1/8" CA T Incoloy 800
33-1307	Raw fuel gas, 650-psig generator	685.2 MM Btu/hr, 21,600 ft ² 2 shells, 61"-40' BEM	670 363	497 1,190	SH CS 1/16" CA T 321 SS
33-1308	Raw fuel gas, 1,300-psig BFW heater	194.0 MM Btu/hr, 12,400 ft ² 2 shells, 54"-16' BEM	1,320 335	530 678	SH A-387 Gr 11 Cl 2, 1/8" T Weld overlay 308 L 304 SS
33-1309	Raw fuel gas, 650-psig BFW heater	106.0 MM Btu/hr, 10,280 ft ² 1 shell, 69"-16' BEM	670 347	447 530	SH CS 1/16" CA T 304 SS
33-1310	Raw fuel gas, 1,300-psig BFW heater	83.0 MM Btu/hr, 5,460 ft ² 1 shell, 65"-10' BEM	1,330 339	322 447	SH CS 1/16" CA T 304 SS
33-1311	Raw fuel gas, 650-psig BFW heater	103.0 MM Btu/hr, 15,000 ft ² 1 shell, 67"-24' BEM	685 323	331 382	SH CS 1/16" CA T 304 SS
33-1312	Raw feed gas, air cooler	407.0 MM Btu/hr, 2,145,000 ft ² 22 bays, 16'-0" x 3'-6", 44 40-hp motors	324	242	T 316 SS Header 316L SS
33-1313	Raw feed gas, water cooler	36.9 MM Btu/hr, 60,320 ft ² 8 shells, 50"-20' BJS	321 50	120 110	SH CS 1/16" CA T 316 SS

Table 13-26 (Contd)

Item Number	Description	Size	Operating		Material and Remarks
			Press. (psig)	Temp (°F)	
33-1314	Raw fuel gas, fuel gas exchanger	161.0 MM Btu/hr, 53,000 ft ² 8 shells, 54"-20' BJS	289 333	275 300	SH CS 1/16" CA T 304 SS
33-1315	Raw fuel gas, quench water exchanger	83.1 MM Btu/hr, 19,780 ft ² 2 shells, 58"-20' BJU	329 425	254 224	SH CS 1/16" CA T 304 SS
<u>Pumps</u>					
33-1501 and -1502	Quench recycle pump and spare	5,000 gpm	445	448	Impeller 25% Cr 3-5°C Case A-297 Gr CA 15
33-1503 and -1504	Slag slurry pump and spare	523 gpm	80	250	Impeller 25% Cr 3-5°C Case A-297 Gr CA 15
33-1505 and -1506	Water circulation pump and spare	5,116 gpm	1,415	579	316 SS
33-1507 and -1508	Water circulation pump and spare	6,316 gpm	1,365	579	316 SS
33-1509 and -1510	Water circulation pump and spare	11,175 gpm	715	497	316 SS

Table 13-26 (Contd.)

Item Number	Description	Size	Operating		Material and Remarks
			Press. (psig)	Temp (°F)	
<u>Other Major Equipment</u>					
33-2001 through -1505	High-pressure coal feeder	3,340-TPD, 2,500-hp motor			CS, abrasion-resistant liners and flights
33-2201	Primary char cyclone	6' 6"-0" ID x 27'-6"	400	1,800	CS refractory lined
33-2202	Secondary char cyclone	12' 4"-0" ID x 19'-0"	400	1,800	CS refractory lined
33-2205	Slag lump remover	14", 30-hp motor		448	316 SS, Cr boride lining
33-2210 through -1513	Syngas ionizer collector	32,000 ACFM 15'-0" W x 20'-0" L x 25'-0" H 45 kW	368	1,190	CS refractory-lined vessel, 316 SS internals
33-2501	Fuel gas gasifier	Stage 2: 28'-0" ID x 64'-0" TT Stage 1: 25'-0" ID x 24'-0" TT	400	1,800	CS refractory lined CS refractory lined, water cooled

Table 13-27 - Major Equipment Summary
 Unit 34 - Fuel Gas/Acid Gas Removal

Item Number	Description	Size	Operating		Material and Remarks
			Press. (psig)	Temp (°F)	
34-	4 parallel trains. Identical physical solvent low temperature extraction plants for removal of H ₂ S, CO ₂ organic sulfur from fuel gas, complete with regeneration facilities	1,300 MM SCFD	300 psig, Manufacturer's design		

Table 13-28 - Major Equipment Summary
Unit 35 - Steam and Power Generation

Item Number	Description	Size	Operating		Material and Remarks
			Press. (psig)	Temp (°F)	
<u>Turbines - Generators</u>					
35-0101 through -0118	Gas turbine	74,800 kW, ISO			
35-0119 through -0136	Gas turbine generator	75 MW, 0.85 PF 13.9 kV, 60 Hz			
35-0137 through -0140	Steam turbine		1,250	875	
35-0141 through -0144	ST generator	120 MW, 0.85 PF 13.8 kV, 60 Hz			
<u>Electrical Equipment</u>					
35-0201 and -0202	Power transformer	600 MVA, 13.8 kV/230 kV			
35-0203 and -0204	Circuit breaker	600 MVA			
<u>Packaged Equipment</u>					
35-0801 through -0803	Deminerlizer with chemical feeders and controls	2,500 gpm	10	80	
<u>Vessels</u>					
35-1201	Blowdown drum	6'-0" ID x 12'-0"	350	450	

Table 13-28 (Contd)

Item Number	Description	Size	Operating		Material and Remarks
			Press. (psig)	Temp (°F)	
35-1202	Plant air receiver	12'-0" ID x 35'-0" TT	125	150	CS
35-1203	Nitrogen receiver	12'-0" ID x 32'-0" TT	125	150	CS
<u>Exchangers:</u>					
35-1301 through -1304	Steam turbine condenser	950 MM Btu/hr 1,000,000 lb/hr	2.5" HgA	109	CS
35-1305 through -1308	Deaerator	1,000,000 lb/hr	15	250	CS
35-1309 through -1311	Air, fuel gas heat exchanger		250	600	CS
<u>Pumps</u>					
35-1501 through -1508	Condensate pump and spare	2,200 gpm	75	109	CA 6NM
35-1509 through -1516	Boiler feed pump and spare	2,200 gpm	1,500	250	CA 6NM
35-1517 through -1524	Low pressure economizer pump and spare				CS
35-1525 through -1532	Circulating water pump	120,000 gpm	50	109	CS

Table 13-28 (Contd)

Item Number	Description	Size	Operating		Material and Remarks
			Press. (psig)	Temp (°F)	
35-1533 through -1534	Condensate transfer pump and spare	3,500 gpm	100	80	CS
<u>Boilers</u>					
35-1601 through -1618	Heat recovery steam generator	250,000 lb/hr	1,250	875	
<u>Tanks</u>					
35-1901 through -1902	Condensate storage tank	84'-0" ID x 48'-0" high 2,000,000 gal			CS cone roof
35-1902	Demincralizer acid storage tank	50,000 gal			CS
35-1903	Demincralizer caustic storage tank	50,000 gal			CS

Table 13-29 - Major Equipment Summary
Unit 36 - Process Waste Water Treating

Item Number	Description	Size	Operating		Material and Remarks
			Press. (psig)	Temp (°F)	
<u>Columns</u>					
36-1101/31	Stripper	9'-6" ID x 101'-6" TT 44 trays	16.5	252	SH A-286 trays 304L SS
36-1151	Ammonia absorber	8'-0" ID x 36'-0" TT 12 trays	15	212	SH A-286 trays 304L SS
36-1152	Ammonia stripper	10'-0" ID x 60'-0" TT 24 trays	225	437	SH A-516 304L SS clad trays 304 SS
36-1153	Ammonia fractionator	7'-6" ID x 60'-0" TT 24 trays	300	428	SH A-416 304 SS clad trays 304 SS
<u>Vessels</u>					
36-1201	Ammonia-sulfide water feed drum	13'-0" ID x 46'-0" TT	5	110	A-285C
36-1202	Hydrocarbon accumulator	4'-0" ID x 8'-0" TT	15	110	A-285C
36-1203 and -1204	Reboiler condensate pot	4'-0" ID x 4'-0" TT	5	228	A-285C
36-1251	Phosphoric acid tank	10'-0" ID x 40'-0" TT	atm	ambient	316 SS 3/32" CA
36-1252	Flash drum	7'-0" ID x 9'-6" TT	300	428	A-516 1/8" CA

Table 13-29 (Contd)

Item Number	Description	Size	Operating		Material and Remarks
			Press. (psig)	Temp (°F)	
36-1253	Caustic feed tank	11'-0" ID x 33'-0" TT	0	ambient	A-516 1/8" CA
36-1254	Ammonia fractionator feed drum	7'-6" ID x 25'-0" TT	300	428	A-516 304L SS clad
36-1255	Ammonia reflux drum	3'-0" ID x 3'-6" TT	300	428	304L SS
<u>Exchangers</u>					
36-1301/31	Reboiler	102.47 MM Btu/hr 12,809 ft ² 2 shells	17 50	252 298	SH A-285C T Titanium
36-1351	Solution exchanger	930 ft ² 1 shell	75 225	428 528	SH 304L SS 3/32" CA T 304L SS
36-1352	Solution cooler	9,700 ft ² 1 shell	75 225	428 428	SH CS 3/32" CA T 304L SS
36-1353	Ammonia stripper condenser	9,000 ft ² 1 shell	225 225	428 428	SH 304L SS 3/32" CA T 304L SS

Table 13-29 (Contd)

Item Number	Description	Size	Operating		Material and Remarks
			Pross. (psig)	Temp (°F)	
36-1354	Ammonia stripper cooler	4,150 ft ² 1 shell	75	428	SH CS 3/32" CA T 304L SS
36-1355	Ammonia stripper reboiler	2,450 ft ² 1 shell	605 225	500 428	SH CS 1/8" CA T 304L SS
36-1356	Ammonia condenser	9,860 ft ² 1 shell	300 75	428 428	SH CS 3/32" CA T CS
<u>Pumps and Drivers</u>					
36-1501	Ammonia water feed pump	2,127 gpm, 100 hp	75	108	CS
36-1502 and -1503	Stripper feed pump and spare	2,127 gpm, 60 hp	80	108	CS
36-1504, -1505, and -1505	Product water pump and spare	660 gpm, 850 hp	1,200	252	CS
36-1506	Recovered hydrocarbon pump	100 gpm, 7.5 hp	65	108	CS
36-1551	Phosphoric acid pump	10 gpm, 1-1/2 hp	25	100	316 SS

Table 13-29 (Contd)

Item Number	Description	Size	Operating		Material and Remarks
			Press. (psig)	Temp (°F)	
36-1552 and -1553	Absorber solution cooler pump and spare	1,330 gpm, 120 hp	20	100	304 SS
36-1554 and -1555	Rich solution pump and spare	1,255 gpm, 400 hp	300	212	304 SS
36-1556	Caustic pump	0 to 17 gpm, 2 hp	280	ambient	304 SS Teflon diaphragm
36-1557 and -1558	Fractionator feed pump and spare	300 gpm, 40 hp	140	428	304 SS
36-1559 and -1560	Fractionator reflux pump and spare	200 gpm, 15 hp	75	428	Case, CS Impeller 304 SS
<u>Tanks</u> 36-1901	Feed surge tank	96'-0" ID x 56'-0" high		ambient	CS, floating roof API standard

Table 13-30 - Major Equipment Summary
 Unite 37 - Buildings and General Facilities

Facility	Description	Size (ft ²)
Administration Building	Steel frame, metal, insulated, 2-story	35,000
Laboratory	Steel frame, metal, insulated, 1-story	18,000
Control House (2)	Steel frame, metal, insulated, 1-story	16,000
Change House	Steel frame, metal, insulated, 1-story	40,000
Cafeteria	Steel frame, metal, insulated, 1-story	12,000
Maintenance Shop	Steel frame, metal, insulated, 20-ft eave	40,000
Warehouse	Steel frame, metal, insulated, 12-ft eave	40,000
Chemical Storage	Steel frame, metal, insulated, 8-ft eave	15,000
Miscellaneous Switch Houses and Operator Field Offices	Steel frame, metal, insulated, 8-ft eave	15,000
Fire Station and Equipment (2)	Steel frame, metal, insulated, 15-ft eave	5,000
Medical Building	Steel frame, metal, insulated, 1-story	10,000
Guard House (7)	Steel frame, metal, insulated, 8-ft eave	1,000
Security	Steel frame, metal, insulated, 1-story	3,000

Table 13-31 - Major Equipment Summary
 Unit 38 - Fire Water System

Item Number	Description	Size	Operating		Material and Remarks
			Press. (psig)	Temp (°F)	
<u>Pumps</u>					
38-1501 through -1503	Fire water pumps and spare	4,200 gpm	125	60	CI vertical turbine
38-1504	Jockey pump	50 gpm	100	60	CI reciprocating

Table 13-32 - Major Equipment Summary
 Unit 39 - Potable and Sanitary Water System

Item Number	Description	Size	Operating		Material and Remarks
			Press. (psig)	Temp (°F)	
<u>Packaged Plants</u>					
39-0801	Chlorine injection package	1 to 5 lb/day			Package unit
<u>Pumps</u>					
39-1501	Potable water deep well pump	250 gpm	50	60	CS
39-1502 and -1503	Potable water pump and spare	100 gpm	75	60	CS
<u>Tanks</u>					
39-1901	Potable water storage tank	24,000 gal	atm	ambient	CS
<u>Filters</u>					
39-2201	Potable water filter	100 gpm	atm	ambient	CS

Table 13-33 - Major Equipment Summary
Unit 40 - Raw Water System

Item Number	Description	Size	Operating		Material and Remarks
			Press. (psig)	Temp (°F)	
<u>Packaged Plants</u>					
40-0801	Chlorine and chemical injection package	50 to 250 lb/day Cl ₂			Package unit
<u>Pumps</u>					
40-1501 and -1502	River water pump and spare	20,000 gpm	35	60	CS
40-1503 and -1504	Sludge pump and spare	500 gpm	55	60	CS
40-1505 and -1506	Filtered water pump and spare	19,500 gpm	45	60	CS
40-1507 and -1508	Plant water pump and spare	19,500 gpm	45	60	CS
40-1509 through -1517	Cooling tower pump and spare	50,000 gpm	45	60	CS
<u>Cooling Towers</u>					
40-1701	Cooling tower, natural draft hyperbolic	11,600 MM Btu/hr 690,000 gpm	atm	120 In 86 Out	Concrete
<u>Tanks</u>					
40-1901	Water storage tank	4,200,000 gal	atm	ambient	CS 1/8" CA

Table 13-33 (Contd)

Item Number	Description	Size	Operating		Material and Remarks
			Press. (psig)	Temp (°F)	
<u>Filters</u>					
40-2201	River water screen	20,000 gpm	atm	ambient	CS
40-2202	Clarifier	150,000 gal	atm	ambient	CS
40-2203	River water sand filter	20,000 gpm	atm	ambient	CS
<u>Mixers</u>					
40-2401	Clarifier rake agitator	8 hp	atm	ambient	CS
<u>Sumps</u>					
40-3201	River water sump	60,000 gal	atm	ambient	Concrete
<u>Basins</u>					
40-4101	River water basin	400,000 gal	atm	ambient	Concrete

Table 13-34 - Effluent Water, Treating
Unit 41 - Effluent Water Treating

Item Number	Description	Size	Operating		Material and Remarks
			Press. (psig)	Temp (°F)	
<u>Packaged Plants</u>					
41-0801	Sewage treatment plant	100 gpm			
<u>Vessels</u>					
41-1201	Oil skimmer	10,000 gal	atm	130	CS
41-1202	Oil/water separator	23,000 gal	75	ambient	CS
<u>Exchangers</u>					
41-1301	Pump and compressor water air cooler	5.0 MM Btu/hr	25	140	Header, CS T CS
<u>Pumps</u>					
41-1501 and -1502	Storm and water skimmed oil pump and spare	50 gpm	50	60	CS
41-1503 and -1504	Pump and compressor water pump and spare	1,000 gpm	50	130	CS
41-1505 and -1506	Oily water sump pump and spare	250 gpm	35	60	CS
41-1507 and -1508	Separated oil pump and spare	50 gpm	125	60	CS

Table 15-34 (Contd)

Item Number	Description	Size	Operating		Material and Remarks
			Press. (psig)	Temp (°F)	
41-1509 and -1510	Separated water pump and spare	250 gpm	125	60	CS
41-1511 and -1512	Slop tank pump and spare	50 gpm	465	60	CS
41-1513 and -1514	Neutralization lift pump and spare	2,000 gpm	30	100	CS
41-1515 and -1516	Sanitary lift pump and spare	100 gpm	35	60	CS
<u>Tanks</u>					
41-1901	Slop tank	6,000 gal	atm	ambient	CS
<u>Filters</u>					
41-2201	Oily water sump sand filter	125 gpm	atm	ambient	CS
41-2202	Oily water sump sand filter	125 gpm	atm	ambient	CS
41-2203	Settler-clarifier	120,000 gal	atm	ambient	CS
<u>Other Major Equipment</u>					
31-2801	Storm water roll skimmer	50 gpm	atm	ambient	CS

Table 13-34 (Contd)

Item Number	Description	Size	Operating		Material and Remarks
			Press. (psig)	Temp (°F)	
<u>Flotation Equipment</u>					
41-3101	Floating aerator	25 hp	atm	ambient	CS
41-3102	Floating aerator	25 hp	atm	ambient	CS
<u>Sumps</u>					
41-3201	Oily water sump	15,000 gal	atm	ambient	Concrete
<u>Basins</u>					
41-4101	Neutralization basin	50,000 gal	atm	ambient	Gunitied excavation
<u>Ponds</u>					
41-5301	Storm water pond	5 acres	atm	ambient	Excavated, compacted
41-5302	Biopond	1 acre	atm	ambient	Excavated, compacted

Table 13-35 - Major Equipment Summary
Unit 42 - Product Storage and Tank Farm

Item Number	Description	Size	Operating		Material and Remarks
			Press. (psig)	Temp (°F)	
<u>Pumps</u>					
42-1501 and -1502	Propane transfer pump and spare	450-gpm, 40-hp motor	200	-40	CS API-610, S-1
42-1503 and -1504	Butane transfer pump and spare	450-gpm, 40-hp motor	200	30	CS API-610, S-1
42-1505 and -1506	Ammonia transfer pump and spare	450-gpm, 40-hp motor	200	-30	CS API-610, S-1
42-1507 and -1508	Naphtha rundown transfer pump and spare	1,500-gpm, 75-hp motor	100	100	CS API-610, S-1
42-1509 and -1510	Naphtha intermediate transfer pump and spare	500-gpm, 30-hp motor	75	100	CS API-610, S-1
42-1511 and -1512	Naphtha intermediate transfer pump and spare	1,000-gpm, 75-hp motor	75	100	CS API-610, S-1
42-1513 and -1514	Light naphtha transfer pump and spare	2,000-gpm, 100-hp motor	75	100	CS API-610, S-1
42-1515 and -1516	Polymerized gasoline transfer pump and spare	750-gpm, 40-hp motor	75	100	CS API-610, S-1
42-1517 and -1518	SRC solvent transfer pump	200-gpm, 5-hp motor	20	275	CS API-610, S-1

Table 13-35 (Contd)

Item Number	Description	Size	Operating		Material and Remarks
			Press. (psig)	Temp (°F)	
42-1519 and -1520	Gas/oil intermediate transfer pump.	1,000-gpm, 75-hp motor	75	120	CS API-610, S-1
42-1521 through -1523	Gasoline pool circulating pump and spare	20,000-gpm, 1,000-hp motor	20	90	CS API-610, S-1
42-1524 through -1527	Tank car loading pump and spare	2,200-gpm, 100-hp motor	120	120	CS API-610, S-4
42-1528 and -1529	Pipeline pump and spare	1,900-gpm, 700-hp motor	630	120	CS API-610, S-4

Table 13-35 (Contd)

Item Number	Description	Total Number	Volume per Tank		Storage		Manways		Tank Type
			(bbl)	(gal)	Press. (psia)	Temp (°F)	No.	Dia (in.)	
42-1901 through -1906	Propane run tank	6	2,000 21'-0" dia x 32'-0"	84,000	atm	-40	2	20	A-537 Gr A 1/8" CA (inner) double wall, dome roof, Perlite insulation, API standards
42-1907 through -1912	Butane run tank	6	2,000 21'-0" dia x 32'-0"	84,000	atm	30	2	20	A-516 70 1/8" CA (inner) double wall, dome roof, Perlite insula- tion, API standards
42-1913 and -1914	Ammonia run tank	2	2,000 21'-0" dia x 32'-0"	84,000	atm	-30	2	20	CS 1/16" CA (inner) double wall, dome roof, Perlite insula- tion, API standards
42-1915	Naphtha rundown tank	1	1,000 18'-0" dia x 24'-0"	42,000	atm	100	2	20	CS 1/8" CA, cone roof, inert cover gas
42-1916 through -1918	Naphtha rundown tank	3	4,000 27'-0" dia x 40'-0"	168,000	atm	100	2	20	CS 1/8" CA, cone roof, inert cover gas
42-1919 and -1920	Naphtha rundown tank	2	10,000 38'-6" dia x 48'-0"	420,000	atm	100	2	20	CS 1/8" CA, cone roof

Table 13-35 (Contd)

Item Number	Description	Total Number	Volume per Tank		Storage		Manways		Tank Type
			(bbl)	(gal)	Press. (psia)	Temp (°F)	No.	Dia (in.)	
42-1921	Propane product tank	1	180,000 109'-0" dia x 109'-0"	7,560,000	atm	-40	4	20	A-537 Gr A 1/8" CA (inner) double wall, dome roof, Perlite insulation, API standards
42-1922	Butane product tank	1	82,000 86'-0" dia x 80'-0"	3,444,000	atm	30	2	20	A-516 70 1/8" CA, dome roof, 4" insulation, API standards
42-1923	Ammonia product tank	1	20,000 55'-0" dia x 48'-0"	840,000	atm	-30			CS 1/16" CA (inner) double wall, Perlite insulation, API standards
42-1924 and -1925	Naphtha intermediate storage tank	2	60,000 88'-0" dia x 56'-0"	2,520,000	atm	100	2	20	CS 1/8" CA, cone roof, inert cover gas
42-1926 and -1927	Naphtha intermediate storage tank	2	125,000 126'-0" dia x 56'-0"	5,250,000	atm	100	4	20	CS 1/8" CA, cone roof

Table 13-35 (Contd)

Item Number	Description	Total Number	Volume per Tank		Storage		Manways		Tank Type
			(bbl)	(gal)	Press. (psia)	Temp (°F)	No.	Dia (in.)	
42-1921	Propane product tank	1	180,000 109'-0" dia x 109'0"	7,560,000	atm	-40	4	20	A-537 Gr A 1/8" CA (inner) double wall, dome roof, Perlite insulation, API standards
42-1922	Butane product tank	1	82,000 86'-0" dia x 80'-0"	3,444,000	atm	30	2	20	A-516 70 1/8" CA, dome roof, 4" insulation, API standards
42-1923	Ammonia product tank	1	20,000 55'-0" dia x 48'-0"	840,000	atm	-30			CS 1/16" CA (inner) double wall, Perlite insulation, API standards
42-1924 and -1925	Naphtha intermediate storage tank	2	60,000 88'-0" dia x 56'-0"	2,520,000	atm	100	2	20	CS 1/8" CA, cone roof, inert cover gas
42-1926 and -1927	Naphtha intermediate storage tank	2	125,000 126'-0" dia x 56'-0"	5,250,000	atm	100	4	20	CS 1/8" CA, cone roof

Table I. 35 (Contd)

Item Number	Description	Total Number	Volume per Tank		Storage		Manways		Tank Type
			(bbl)	(gal)	Press. (psi.g)	Temp (°F)	No.	Dia (in.)	
42-1928	light naphtha intermediate storage tank	1	40,000 72'-0" dia x 56'-0"	1,680,000	atm	100	2	20	CS 1/8" CA, floating roof
42-1929	Polymerized gasoline intermediate storage tank	1	15,000 48'-0" dia x 48'-0"	630,000	atm	100	2	20	CS 1/8" CA, cone roof, inert cover gas
42-1930 and -1931	SRC solvent storage tank	2	100,000 113'-0" dia x 56'-0"	4,200,000	atm	275	4	20	CS 1/8" CA, cone roof
42-1932 through -1935	Gas/oil intermediate storage tank	4	175,000 150'-0" dia x 56'-0"	7,350,000	atm	130	4	20	CS 1/8" CA, cone roof, inert cover gas
42-1936 through -1940	Gasoline blending tank	5	50,000 80'-0" dia x 56'-0"	2,100,000	atm	100	2	20	CS 1/8" CA, floating roof
42-1941 and -1942	Gasoline product storage tank	2	120,000 124'-0" dia x 56'-0"	5,040,000	atm	100	2	20	CS 1/8" CA, floating roof
42-1943	Gasoline product storage tank	1	150,000 140'-0" dia x 56'-0"	6,300,000	atm	100	2	20	CS 1/8" CA, floating roof
42-1944 and -1945	Distillate fuel storage tank	2	150,000 140'-0" dia x 56'-0"	6,300,000	atm	120	2	20	CS 1/8" CA, cone roof